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Obesity Facts

Abstracts

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PLENARY LECTURES

Monday, 13 May 2024

PL1 – Impact of Ethnicity and Socioeconomic Position on Obesity in Children

PL1

Socioeconomic Position and Obesity

Bann, D.

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Health inequalities are an important public health concern which continue to be discussed and debated, as in the previous 50 years. In more recent years, the DNA revolution has occurred, providing evidence on the importance of genetic factors for key health traits. Yet this has largely focused on establishing the presence or absence of effects. The health inequality literature has shown us that many 'effects' are likely to be largely or even entirely dependent on context. Cohort studies are well placed to contribute to both fields, enabling comparisons by year of birth (1946 to 2001) and age (infancy to old age). This talk will give an overview of ongoing work using cohorts to better understand socioeconomic inequalities in obesity; it will also discuss the potential for using genetically informed designs in this context.

Tuesday, 14 May 2024

PL2 – GLP-1RA and Cognitive Functions

PL2

The expanding impact of central nervous system GLP-1 receptor signaling

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GLP-1 based medicines stem from a reasonably precise understanding of the physiological and pharmacological roles of glucagon-like peptide-1 action in control of normal and disordered energy homeostasis, coupled with extensive clinical validation, and cardiovascular safety. GLP-1 receptors are widely distributed within the brain, and activation of neuronal GLP-1Rs decreases gastric emptying, and reduces appetite, enabling weight loss. Central GLP-1 also activates sympathetic nervous system activity and energy expenditure in preclinical studies, findings that have not meaningfully translated in humans. Neuronal GLP-1Rs also transduce aversive signals, contributing to the gastrointestinal side effects of GLP-1R agonists (GLP-1RAs). Remarkably, both small peptide and high molecular weight GLP-1 medicines effectively communicate with the brain, producing clinically meaningful weight loss, side effects, and a range of non-metabolic actions. GLP-1 receptors modulate dopamine activity and dependence-linked behaviors in preclinical studies and are being interrogated in people with dependence on alcohol, smoking, and a range of addition-related behaviors. GLP-1RAs also promote neuronal connectivity and survival, increase brain insulin sensitivity, and reduce neuroinflammation, supporting their exploration for treatment of neurodegenerative disorders such as Alzheimer's and Parkinson's disease. Intriguingly, central nervous system (CNS) GLP-1Rs also transduce signals that control local and systemic inflammation, findings with implications for the reduction of complications associated with type 2 diabetes and obesity. Here we highlight emerging concepts of GLP-1 action in the CNS, highlighting translational biology and ongoing pivotal clinical trials.

PL3 – The "Exposome Hypothesis" and Obesity

PL3

The Exposome Hypothesis and Obesity

Blüher, M.

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Obesity is a chronic, progressive, not curable disease that is frequently characterized by relapse after short-term interventions. Through increased fat mass and adipose tissue dysfunction, obesity can contribute to multiple severe comorbidities. The fundamental cause of obesity is a long-term positive energy balance caused by too many calories consumed, too little physical activity and low energy expenditure. The pathophysiological origins of obesity are complex and include biological, societal, behavioral, environmental, economic and other factors and their interaction. Biological pathomechanisms of obesity development include inherited factors that modulate how the brain regulates appetite and satiety through complex and fine-tuned circuits in the hypothalamus. In addition, genetic factors may alter signals from adipose tissue, gut and other tissues that regulate periphery to brain crosstalk.

Although biological and societal factors represent the main drivers of the obesity pandemic, these factors are not able to entirely explain all cases of obesity and individual heterogeneous trajectories of the disease. Recently, it has been hypothesized that exposure to known and unrecognized obesogenic factors may play an underappreciated role in the development of obesity. In this context, the exposome refers to all influences over the whole life of a person of all the exposures and its relationship to disease. The obesogenic exposure of a person starts at conception and in utero, continuing over childhood and adolescence to adulthood. In contrast to the genome, the exposome is highly dynamic and variable throughout lifespan. Data derived from epidemiological studies linking excess weight with elevated ambient temperatures, in utero, and intergenerational effects as well as epigenetics, microorganisms, microbiota, sleep curtailment, and endocrine disruptors, among others, suggests the possibility that they may work alone or synergistically as several alternative putative contributors to the pathophysiology of obesity. Main society-related drivers of the worldwide increase in obesity prevalence are changes in global food markets, constant availability of energy dense nutrients that are rich in carbohydrates and fat paired with low demands for physical activity in private and working environments.

Here, data supporting the exosome hypothesis are summarized based on access to patients with metabolic abnormalities and extreme human phenotypes, including metabolically healthy obesity, monogenic obesity as well as longitudinal data (up to ~10 years after weight loss) and follow-up samples from patients who underwent a two-step bariatric surgery strategy. Using the Leipzig Obesity BioBank (n>8,000 AT donors including children with state of the art molecular technologies, data are reviewed that suggest that the exposome may define distinct obesity phenotypes.

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Wednesday, 15 May 2024

PL4 – Obesity and Cancer

PL4

Obesity and Cancer

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Adipose tissue is the largest endocrine organ and an accepted contributor to overall energy homeostasis. There is strong evidence linking increased adiposity to the development of more than a dozen types of cancer. With increased adiposity comes metabolic dysfunction and insulin resistance, and increased systemic insulin and glucose support the growth of many cancers. There is also an important direct crosstalk between adipose tissue and various organs. For example, the healthy development and function of the mammary gland, as well as the development, growth and progression of breast cancer, are heavily impacted by the breast adipose tissue in which breast epithelial cells are embedded. Cells of the adipose tissue are responsive to external stimuli, including overfeeding, leading to remodeling and important changes in the secretion of factors known to drive the development and growth of cancers. Loss of factors like adiponectin and increased production of leptin, endotrophin, steroid hormones, and inflammatory mediators have been determined to be important mediators of the obesity-cancer link. Obesity is also associated with a structural remodeling of the adipose tissue, including increased localized fibrosis and disrupted angiogenesis that contribute to the development and progression of cancers. Furthermore, tumor cells feed off the adipose tissue, where increased lipolysis within adipocytes leads to the release of fatty acids and stromal cell aerobic glycolysis leading to the increased production of lactate. Both have been hypothesized to support the higher energetic demands of cancer cells. Endotrophin is a factor we defined approximately 12 years ago, and 2) Leptin, for which we unraveled novel pathological aspects. While we investigated these hormones initially with a focus on the pathophysiology of adipose tissue, we identified that these two factors exert striking synergistic effects with respect to tumor growth. These growth-stimulatory effects spill over into the area of several cancers, with particular relevance to cancers that manifest at a higher rate in the context of obesity. These include breast and colon cancers, hepatocellular carcinomas, in addition to pancreatic and prostate cancers.

PL5 – The Role of Artificial Intelligence in the Diagnosis, Management and Research of Obesity

PL5

Network Medicine, Artificial Intelligence, and Metabolic Disease

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In the modern omic era, we increasingly recognize the complexity of biological systems and the interrelationships that exist among their components. The time-honored strategy of analyzing these systems by focusing on a single element has had limited success. Network medicine is a new discipline that focuses holistically on complex (patho) biological systems, and incorporates principles of network science and systems biology to identify mechanisms of disease and potential treatment strategies. The biological networks of note are defined at each omic level—metabolic networks, protein-protein interaction networks, and transcriptomic networks—with links between each level. Analyzing these intricate networks requires novel mathematical and computational approaches that continue to evolve and are now beginning to incorporate deep learning and other artificial intelligence-based strategies. In this presentation, I will demonstrate the application of these principles to metabolic diseases, showing how all diseases are polygenic and influenced by environmental determinants; how systems context can explain genetic penetrance; and how network structures can guide the selection of potential drug targets and the repurposing of approved drugs for novel uses. These principles and strategies for optimizing the use of multiomic data sets as explored through the lens of molecular networks will ultimately promote the successful evolution of precision medicine for metabolic and other diseases.

EASO SESSION

Sunday, 12 May 2024

ES1 – Teaching Workshop: EASO Psychology, Behaviour & Mental Health Working Group We Are Not Equipped to Deal With That': Overcoming barriers to treatment for people living with obesity and mental illness

ES1.01

The Eating Disorders In weight-related Therapy (EDIT) Collaboration: understanding complex interventions

Lister, N.[1]*; Khalid, R.*[1]*; Pryde, S.*[2]*; Jardine, I.*[1]*; Johnson, B.*[2]*; Jebeile, H.*[1]*; Eating Disorders In Weight Related Therapy Collaboration, O.*[1]

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Weight management interventions are complex and vary in the way they are delivered and the strategies they use to change behaviours. The Eating Disorders In weight-related Therapy (EDIT) Collaboration aims to identify individual changes in eating disorder risk during weight management by combining data from >50 RCTs. Understanding how intervention components may increase or decrease the risk of eating disorders would enable future interventions to be optimised. An EDIT coding framework and guidebook were developed, through expert consultation including people with lived experience, to assess these components.

Eighty-five delivery features were coded based on the Template for Intervention Description and Replication (TIDieR) checklist, including intervention duration, intensity and mode of delivery. Intervention strategies is the broad term used to describe the behaviour change content of interventions grouped under key categories relevant to weight management interventions. There were 88 unique intervention strategies captured across five categories: intervention intent, framing and outcomes; dietary strategies; eating behaviours / disorder eating; movement and sleep related strategies; and psychological health related strategies. Each trial was coded, using publicly available data, according to the framework, with codes verified by the trialist. This presentation will include a detailed mapping of intervention components used in weight management trials measuring effect on eating disorder risk.

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ES1.02

The role of psychological trauma in obesity and other cardiometabolic conditions

Valdimarsdóttir, U. A.

Department of Epidemiology, University of Iceland, Iceland

The large majority of humans are exposed to psychological trauma or other adversities during their life course, and a significant proportion of these occur in early life. These adverse events have a considerable impact on our mental well-being, behaviors, and physiology – which may leave us more vulnerable to various health hazards. The lecture will provide an overview of the evidence for the impact of life adversities and trauma on the development of obesity as well as other cardiometabolic outcomes. A particular focus will be on evidence from the unique Nordic health utilization registers as well as recently established cohorts, e.g. the SAGA cohort (N=31.790 women) specifically designed for exploring the health impacts of trauma.

ES2 – Teaching Workshop (Joint EASO Scientific Advisory Board and EASO Obesity Management Working Group): Phenotyping Obesities Beyond BMI

ES2.01

Mechanisms linking adiposity and cardiovascular disease

Sattar, N.

University of Glasgow, Ireland

In general, there is abundant evidence linking excess weight to atherosclerotic cardiovascular disease (ASCVD), and in particular to fatal events, with such associations appearing to be largely explained by intermediate risk factors (SBP, lipids and diabetes). The link between obesity and incident heart failure are stronger than obesity to ASCVD links and the mechanisms are only partially explained by traditional risk factors. More recent evidence points to haemodynamic and cellular over nutrition pathways linking obesity and incident heart failure, with the latter likely upstream of systemic inflammation. This talk will talk through the best current evidence available linking obesity and a range of CV outcomes, and point out the need for considerable further research to unpick mechanisms linking obesity to other CV conditions such as arrhythmias, PAD, valvular disease esp Aortic stenosis, although some mechanisms can be guessed. The talk will expand many issues discussed in a recent review linking excess adiposity to a range of complications in people living with type 2 diabetes, where we have underestimated the impact of obesity (1).

Reference

(1) Sattar N, Presslie C, Rutter MK, McGuire DK. Cardiovascular and Kidney Risks in Individuals With Type 2 Diabetes: Contemporary Understanding With Greater Emphasis on Excess Adiposity. Diabetes Care. 2024 Feb 27:dci230041. doi: 10.2337/dci23-0041. Epub ahead of print. PMID: 38412040.

ES2.02

Energy expenditure and BAT (indirect calorimetry and thermography)

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The physiology of weight gain and weight loss is complex, multifactorial, and by far to be completely elucidated. A recent systematic review identified more than 100 determinants of weight loss and maintenance. Of those, reducing energy intake, increasing energy expenditure, and monitoring behaviors showed the strogest level of evidence. One of the major determinants is the balance between energy intake and energy expenditure. Body mass in humans is strongly associated with the rate of heat production as defined by resting energy expenditure (REE). Furthermore, the REE is related to the body composition (BC) and both are important parameters for health status. REE usually accounts for more than 60% of the total energy expenditure and is directly related to the amount of fat-free mass, which is more active metabolically than fat mas. Recent guidelines recommend BC (mandatory) and REE (when available) assessment for a proper nutritional and metabolic evaluation and follow up. Currently, the reference method for REE measurement is indirect calorimetry (IC) which calculates REE by measuring the amount of oxygen used (VO2) and carbon dioxide released (VCO2) in a controlled environment.

Furthermore, besides the fat-free mass, brown adipose tissue (BAT) contributes to energy expenditure and also heat production (thermogenesis). BAT can directly convert chemical energy stored in lipids and carbohydrates into heat. Although the role of BAT in thermogenesis has been well known for many decades, the role of this tissue in the control of body weight and as a therapeutic target for obesity has been considered at the beginning of 2000s. Currently, the 'gold standard' method for determination of the volume and activity of BAT in human subjects is cold-induced 18F-fluorodeoxyglucose (18F-FDG) uptake assessed by positron emission tomography scan (PET-CT). However, more recently, the infrared thermography (IRT) emerged as a simple non-invasive technique with reliable and repeatable results for the BAT evaluation in humans. The IRT can be used to easily evaluate different therapeutic strategies involved in the activation BAT to tackle obesity and its metabolic and cardiovascular complications.

Both IC and IRT are useful tools that help clinicians better phenotype obesities, especially when they are combined with BC assessment techniques. Taking into the account the individual resting energy expenditure, the thermogenesis capacity, and body composition a more personalized approach according to the phenotype of the disease can be offered for patients with obesity.

ES2.03

The heart (epicardial adipose tissue and coronary TC)

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Epicardial adipose tissue (EAT) is a unique and multifunctional adipose compartment of the heart, located between the myocardium and the epicardium. EAT is a white adipose tissue, albeit it also has brown or beige fat-like features. No muscle fascia divides EAT and myocardium; this allows a direct interaction and crosstalk between the epicardial fat and the myocardium. Due to its distinctive transcriptome and functional proximity to the heart, pericoronary adipose tissue (PCAT) and left atrial EAT can play a key role in the development and progression of coronary artery disease, atrial fibrillation, and heart failure.

EAT can be clinically measured with cardiac imaging techniques such as echocardiography, computed tomography (CT), and magnetic resonance imaging, that can help to predict and stratify cardiovascular risk.

Clinically, EAT, given its rapid metabolism and simple measurability, can be considered a novel therapeutic target, owing to its responsiveness to drugs with pleiotropic and clear beneficial cardiovascular effects such as the glucagon-like peptide-1 receptor (GLP-1R) agonists.

Routine coronary CT angiography (CCTA) also allows the evaluation of EAT and PCAT attenuation, which is a measure of density expressed in Hounsfield units (HU), which ranges between −30 HU and −190 HU, where a lower negative means higher density. Radiographic fat density is determined by adipocyte hypertrophy, hyperplasia, and fibrosis which oppositely influence fat CT attenuation. Hypertrophic and hyperplastic fat depots usually have low density.

Increased EAT and PCAT attenuation, reported in patients with CAD or severe COVID-19, could be caused by inflammation and fibrosis,

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mitigating the expected effects of hypertrophic or hyperplastic fat cells on fat CT attenuation.
EAT and PCAT attenuation, could be considered a biosensor of vascular inflammation and may be used to track response to drugs with pleiotropic and clear beneficial cardiometabolic effects.

Monday, 13 May 2024

ES3 – 3rd PAFF-Working Group Session

ES3.01

Fat-free mass and Physical Activity as determinants energy intake and appetite control: implications for sedentariness and obesity

Blundell, J. E.

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There is extensive evidence that physical activity (PA) is intimately connected with the control of body composition including: dose-response effect of the amount of exercise on weight loss (and regain), systematic reviews and meta-analyses showing clear effects on weight loss in people living with obesity, low PA and high sedentary behaviour predicting weight gain, etc. However all of these effects are reflected in the average and do not apply to all people. There is considerable variability due to differences in the modality of exercise, its frequency duration and intensity, and the huge individual variability among people performing the PA. The inverse relationship between amount of PA and adiposity is to be expected and is bidirectional. The relationship between long term PA and body weight is complex – Blundell and Beaulieu, 2023 (https://doi.org/10.1016/j.appet.2023.106482) - for review.
Can these effects be understood within a broader theory of appetite? Considering the energy balance equation, the relationship between energy expenditure (EE) and energy intake (EI) is dynamic (not static). This means that PAEE has an indirect effect on body weight via an action on the appetite response. This concept originated more than 50 years ago in the work of Edholm, McCance, Widdowson and others who proposed that: 'the differences between the intakes of food (of individuals) must originate in the differences in the expenditure of energy' (Edholm et al, 1955 p 297). This proposal was neglected for a long time, but taken up 15 years ago when a strong association was observed between fat-free mass (but not fat mass) and EI (doi:10.1242/dmm.009837), which has been widely confirmed. The effect of FFM is mediated by resting metabolic rate suggesting that EE is a driver of EI (Blundell et al, 2020) (https://doi.org/10.1016/j.physbeh.2020.112846). The level of physical activity is also a modest driver of food intake (Hopkins et al, 2019) (https://doi.org/10.1038/s41366-018-0308-6). However, for PAEE the relationship with EI is U-shaped as demonstrated in the classic study of Jean Mayer on jute mill workers many years ago.
A pattern of effects has emerged in which the expression of human appetite is influenced by the level of PA, but it is complex. Evidence shows that exercise can exert a dual action: a stimulation of the drive to eat but a simultaneous strengthening of post-prandial satiety. Overall, this means that appetite is better controlled. In contrast, sedentariness (low PA) does not pull down EI to meet a lower level of EE, and is often associated with a higher than expected food intake. It is reasonable to propose that sedentary behaviour (low PA) weakens appetite control and permits overconsumption. One way to interpret these effects is to consider PA within a general model involving interactions among body composition, appetite and satiety.

ES3.02

Physical activity/exercise to improve physical function and general health after bariatric surgery

Oppert, J.

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Surgery-induced weight loss is associated with marked decrease in lean body mass and muscle mass as well as in cardiorespiratory fitness and muscle strength (in absolute values), which could have detrimental effects on metabolism, physical function and general health. In this context, implementing exercise training is recommended as part of lifestyle modifications during post-surgery follow-up. Systematic reviews with meta-analysis have shown that exercise training (aerobic, resistance, or a combination of both) conducted after bariatric surgery compared to controls without exercise after surgery: 1) results in an additional weight and fat loss of only about 2 kg on average (with a high strength of evidence), 2) reduces the loss of lean body mass occurring during the first year after bariatric surgery by about 1 kg (with a moderate strength of evidence). Such effect size for body weight loss should be considered of relatively modest magnitude, especially when compared to the effects of bariatric surgery itself. A major beneficial effect of exercise training after bariatric surgery is to improve physical fitness. Systematic reviews with meta-analysis have documented that both cardiorespiratory fitness and muscle strength were increased with exercise training in the post-bariatric setting. The mean improvement in VO2max in the exercise group was +2.7 ml/min/kg which appears non negligible considering the very low levels of VO2max usually observed in patients who are candidates to bariatric surgery. This effect was observed in parallel with a large improvement in walking capacity (e.g., as assessed during a 6-min walking test). Increases in muscle strength observed are remarkable considering they occur in the context of the massive lean mass loss through negative energy balance induced by surgery. Recent observational data point to the possible association of moderate-intensity physical activity with lower post-bariatric weight regain, although confirmatory studies would be required in this field. This body of knowledge leads to practice recommendations focussed on exercise training programs based on a combination of aerobic and resistance training with the primary aim to enhance general health benefits brought about by increased physical activity and fitness, rather than additional weight and fat loss.

ES3.03

Cardiopulmonary exercise test in people with obesity: a deep insight in functional limitation

Battista, F.

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Obesity is a major risk factor for several chronic diseases and is nowadays spreading enormously worldwide, undermining the global health and quality of life of the general population. This negative effect on people's health and well-being is due to many functional impairment and limitations in activity of daily living. Most patients with obesity complain of shortness of breath, inability to perform actions requiring even moderate cardiovascular effort, impaired balance, premature fatigue, and many other limitations. The cardiopulmonary exercise test (CPET) provides is the gold standard for measuring cardiorespiratory fitness and provides a wealth of information regarding the type of functional limitation, be it cardiogenic, peripheral or ventilatory. The measurement of cardiorespiratory fitness is one of the most important health indicators for both healthy and chronically ill individuals. Moreover, understanding the origin of functional limitation allows the most appropriate intervention with both pharmacological and non-pharmacological treatment. The functional limitation characteristic of individuals with obesity does not only affect cardiorespiratory fitness as muscle strength is also reduced due to the sarcopenia that often accompanies obesity. Balance is also impaired in individuals with obesity, limiting movement and the propensity to exercise

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due to the increased risk of falling. In addition, metabolic response to exercise may be affected by obesity and described with CPET, as well as the blood pressure response to submaximal and maximal exercise can be carefully studied with an exercise stress test. Functional assessment of all the components of functional capacity is therefore essential in order to intervene in a targeted manner and counteract the limitations to which people with obesity are subjected.

ES4 – SWEET Symposium

ES4

SWEET Symposia. Barriers and Facilitators to the Use of Sweeteners and Sweetness Enhances to replace Sugar

Harrold, J.[1]; *Scott, C.*[2]; *Martinez, J. A.*[3]; *Raben, A.*[4]; *Eskens, E. J.*[5]; *Murphy, R. J.*[6]; *Kuznesof, S.*[7]; *Raats, M.*[8]; *Nychas, G.*[9]; *Halford, J. C.*[10]; *SWEET Consortium, o.*[10]

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There is an ongoing debate regarding the use of non-nutritive sweeteners to reduce sugar consumption. The Horizon 2020 SWEET project examined the barriers & facilitators to the use of sweeteners & sweetness enhancers (S&SEs) and the likely risks & benefits of using them to replace sugar in the diet in the context of health, obesity, safety & sustainability. The project included i) production, regulatory and commercial barriers, ii) acute and chronic effects of novel S&SE blends iii) long-term weight management outcomes, iv) observational data and biomarkers within populations, v) environmental impact vi) stakeholder, media and consumer perspectives and vii) toxicity issues.

Clinical findings in SWEET demonstrated that S&SEs in beverages, semi-solid and solid sweet food matrices support lower glycaemic responses with no adverse impact on appetite, metabolic or health markers either acutely or after 2-weeks repeated daily consumption. Similar findings were observed in the 12-month weight loss maintenance study. Here, adults with overweight or obesity were offered a healthy low sugar diet for 1-year following weight loss (≥5%) and instructed to either use or avoid S&SEs. Those in the S&SE condition demonstrated improved weight loss maintenance. This was associated with greater diet satisfaction, higher positive mood, lower craving, and lower explicit liking for sweet foods at 6 months. Avoidance of S&SEs was associated with higher liking for sweet over savoury foods at 6 and 12 months. As in previous long-term cohort studies, the four European cohorts analysed in SWEET showed conflicting results on the association between the use of S&SE containing beverages and health outcomes. The detection of S&SE excretion in urine exposed errors in standard methods of dietary assessment and a need to establish 'truer' markers of intake.

Reduced Sugar versions of beverages and foods were developed with a diverse set of S&SEs. S&SE databases were generated including a i) health impact database of 286 human clinical publications, ii) a technological database capturing research and development aspects of S&SEs for food scientists and iii) a sweetness database based on sweetness potency and synergies of S&SEs. Novel life cycle sustainability assessments demonstrated that using sweeteners instead of sugar in drinks greatly reduces environmental impact. In more complex food products (e.g. biscuits) this may not be the case because additional bulking agents are needed to compensate for the absence of sugar and this may lead to higher environmental impact. Consumers perceived the benefits of S&SEs to include weight loss, diabetes management and oral health. S&SEs from plant-based sources were more positively perceived than those from artificial sources. Avoidance of S&SEs is mainly driven by perceived risks to health. Opportunities exist for the use of sweeteners from plant sources; however, novel sweeteners will require considerable effort to familiarize consumers with them. An analysis of regulatory assessments and consumer acceptance of sweeteners identifying hurdles to S&SE approval as well as European regional differences regarding consumer S&SE uses and acceptance will also be discussed along with broader consumer and toxicology issues.

Tuesday, 14 May 2024

ES5 – IMI SOPHIA

ES5

Stratification of Obesity Phenotypes to Optimise Future Therapy: the IMI SOPHIA project

Cali, A.[1]; *Ibberson, M.*[2]; *Sparso, T.*[1]; *Pattou, F.*[3]; *Mcgillicuddy, D.*[4]; *Van Der Schueren, B.*[5]; *Le Roux, C.*[6]

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Obesity is not simply a behavioural or lifestyle issue, but a set of complex chronic and relapsing diseases worthy of the same consideration as any other life-threatening diseases. While obesity is often viewed as a single risk factor for other diseases, there are in fact many distinguishable subpopulations living with different types of obesity, including those defined by risks of complications and others by optimal treatment response. While subpopulations will overlap, the decomposition of the amorphous collective of people with obesity into clinically relevant subpopulations will revolutionise future obesity care. Using the SOPHIA federated database, we identified six specific disease subpopulations which predict the risk of obesity complications. Predicting treatment response before bariatric surgery has been refined by the SOPHIA weight loss prediction tool, which now improves conversations between patients and clinicians. The prediction of obesity risk and response to obesity treatment go far beyond the current 'one size fits all' approaches, which have often delivered poor results to date. By diagnosing and treating better defined subpopulations of obesity, we may be able to offer new hope. This is also true for patients with type 1 diabetes who develop obesity, especially as they have been a forgotten minority. New scientific knowledge generated will only have value when it changes perceptions and behaviours of people living with obesity, clinicians, regulatory bodies, payment agencies and industry alike. There is a common ill-informed perception that obesity is solely a behavioural condition and that it is the responsibility of people living with obesity to address their own condition through willpower alone. This perception is held by patients themselves, by clinicians, by payment agencies, and by industry and leads to inappropriate choices: patients do not seek medical help, clinicians fail to apply chronic disease models to treat the disease, reimbursement agencies are slow to pay for treatment and industry try to develop one-size-fits-all interventions. This is deeply counterproductive, given the ongoing cost (to the patient's quality of life, in clinical time and resources) of obesity and its complications. By helping stakeholders to understand that obesity is a set of complex and chronic diseases, and that complications and clinical outcomes can be predicted and prevented, we may be able to establish a new narrative, understanding and vocabulary.

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JOINT SESSION

Monday, 13 May 2024

JS1 – Joint Session EASO/EASD Is Diabetes an Adiposity Based Disease

JS1.01

What we learned from the DiRECT trial

Taylor, R.

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Testing the Twin Cycle Hypothesis led to proof of the reversibility of type 2 diabetes (T2D), and also to understanding the underlying pathophysiology. To do this, a method had been established to achieve 15kg weight loss in 8 weeks in an acceptable manner suitable for most people. The Counterpoint study yielded very clear results - T2D was a simple condition of intra-organ fat accumulation. This led to the important question of whether this could be put to therapeutic use in everyday clinical practice. The Diabetes Remission Clinical Trial (DiRECT) was a randomised clinical trial carried out by NHS Primary Care nurses or dietitians. Participants were treated according to best guidelines (Control; n=149) or to rapid weight loss (Intervention; n=149). After the short low calorie liquid diet a stepped return to normal eating led to the long term phase of weight maintenance. Substantial weight loss was obtained in the intervention group, and was still averaging 6.1kg at 5 years. Those who minimised weight regain (8.9kg below baseline) remained in remission. By intention to treat, the number of serious adverse events was more than halved in the Intervention group and cancer was diagnosed in 1/149 compared with 8/149 in the control group. Improvement in quality of life was maintained at 5 years. Importantly, functional beta cell capacity had returned to normal by 2 years in those maintaining remission. Intrahepatic and intrapancreatic fat levels predicted remission or relapse. DiRECT has established that effective dietary weight loss is possible and that this is the treatment of choice for type 2 diabetes for people who wish to return to full health.

JS1.02

Moving from beta-cell to brain to treat diabesity

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In this overview, I will discuss the panorama of drugs used to treat diabetes and how this has evolved over the years. I will particularly focus on recent developments and how evidence from the last nine years or so have been implemented in clinical guidelines.

JS2 – WHO Joint Session / Ongoing work to prevent and manage obesity in the WHO European Region

JS2.01

Overweight and obesity in 7- to 9-year-old children from 26 countries: preliminary results of the World Health Organization European Childhood Obesity Surveillance Initiative-COSI 2021-2023

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Introduction: In 2021–2023, the sixth round of the World Health Organization (WHO) European Childhood Obesity Surveillance Initiative (COSI) was conducted in 37 countries. Since 2007/08, COSI has provided country-level estimates of overweight and obesity for primary school children aged 6–9 years using measured height and weight, collected by countries using a standard methodology1. Data presented here are the first COSI estimates of overweight and obesity following the COVID-19 pandemic.
Methods: Out of 37 COSI countries that participated in the sixth round, 26 have finished the process of data validation and have been included in the analysis: Albania, Austria, Azerbaijan, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, Georgia, Hungary, Israel, Kazakhstan (Almaty city only), Latvia, Lithuania, Luxembourg, Malta, Montenegro, North Macedonia, Portugal, Republic of Moldova, San Marino, Slovakia, Slovenia, Sweden and Uzbekistan. Data from the other 11 countries are undergoing validation and will be available for the conference (Czechia, Germany - Bremen city only, Greece, Ireland, Italy, Kyrgyzstan, Poland, Romania, Spain, Türkiye and Ukraine). For the first time COSI was implemented in the humanitarian setting (Ukraine). Data collectors measured children using the COSI protocol and weight status was calculated using the 2007 WHO-recommended growth reference 1,2,3. Sampling weights were applied.1 Only one targeted age group per country was included in the analysis (i.e. 7-year-olds if they were targeted, otherwise the nearest targeted age group).
Results: We included 127651 children (7-9 years old) in the analysis. Preliminary results suggests a high heterogeneity in the region, with values for overweight (incl obesity) ranging from 9.5% in Uzbekistan to 41.9% in Cyprus among children and from 2.8% to 19.7% in the same countries for obesity. Results according to sex showed a similar picture for boys with overweight prevalence ranging from 10.7% in Uzbekistan to 47.9% in Cyprus and from 4.0% to 24.8% in the same countries for obesity. Among girls, values ranged from 8.0% in Uzbekistan to 36.2% in Cyprus for overweight and from 1.8% in Uzbekistan to 15.1% in Malta for obesity. Preliminary results suggests overweight and obesity have increased in some countries since the fifth round. Future analyses will include all countries who collected data.
Conclusion: These preliminary results provide the latest information on the burden of childhood overweight and obesity in the WHO European Region. COSI is an important source of information for public health and future work is needed to use the data to inform policy action in countries.

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JS2.02

Mapping and prioritizing obesity management services in Europe

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Introduction: Obesity is the leading cause of death and disability in Europe and almost 60% of adults and one in three children are with overweight or obesity. No country is on track to reach the target of halting the rise in obesity by 2025 and reaching this goal will require innovation and identifying new ways to promote healthy behaviours and improve clinical practice related to noncommunicable diseases (NCDs). WHO published in 2023 a framework1 on how obesity prevention and management services could be organized and how to strengthen the health system capacity to deliver these services through a primary care approach. The WHO Regional Office for Europe (WHO/EURO) is currently working with Portugal and Türkiye to map the countries' existing situation of obesity prevention and management health services to assess current gaps and needs.
Methods: WHO/EURO will be working with the two countries individually on this mapping exercise using the WHO UHC Service Package Delivery & Implementation (SPDI) Platform. Based on gaps identified, a few priority areas for action will be identified by each country to target first.
Results: Portugal had developed a new Integrated Model of Care for the Prevention and Treatment of Obesity. It covers health promotion actions, as well as specific actions for early identification, referral, management and follow-up of individuals living with overweight and obesity, across the different levels of care. It was designed to ensure timely access to quality healthcare for individuals with overweight and obesity, based on an approach essentially provided by Primary Healthcare (PHC). The implementation of this integrated model of care includes the reinforcement of obesity prevention measures in PHC, focusing on health promotion and surveillance initiatives that are already in place in the services provided by PHC units. It covers also the implementation of an early identification of overweight and obesity in PHC for individuals who have an increased risk of obesity or who are in a life cycle stage that is particularly vulnerable and for individuals identified with overweight, brief counselling for healthy eating and physical activity should be considered, as well as initial strategies for weight loss, such as group intervention programs or digital intervention programs. For individuals identified with obesity, a "Specialized and multidisciplinary obesity appointment", as part of an intervention program of at least 24 months should be provided in PHC2.
Türkiye will conduct a similar exercise.
Conclusion: Conducting this mapping exercise will assist countries in identifying their gaps and needs with regards obesity health services and will support countries in taking a holistic, integrated approach to prevent and manage obesity.

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Conflict of Interest: None Disclosed

Funding: No funding to report

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JS2.03

Policy actions for reducing obesity in WHO Europe: an overview of recent developments from prevention to management

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Overweight and obesity remain one of the major public health challenges facing the WHO European Region, affecting one in three children and almost 60% of adults. Overweight and obesity are estimated to be responsible for more than 1.2 million deaths across the WHO European Region every year; they are also the leading behavioural factor contributing to disability. Not enough has been done to solve the problem of obesity and no country is on track to meet the target to halt the rise in obesity established in the WHO Global Strategy for the Prevention and Control of noncommunicable diseases (NCDs). The Special Initiative on NCDs and Innovation of the WHO Regional Office for Europe is accelerating support for countries to address this challenge through the development of innovative tools and convening of Member States. In 2023, through a summit of the Spouses of European Leaders' Network on the Prevention of Childhood Obesity was launched; a network of countries working together to guide sugar calorie reduction was established and; a collaborative project with the European Commission to support physical activity promotion in the Region continues. This session will provide an update of ongoing initiatives to help reduce obesity in the WHO European Region.

Conflict of Interest: None Disclosed

Funding: No funding to report

SPECIAL SESSION

Monday, 13 May 2024

SS1 – New Technologies for Obesity Science: from research to clinical applications

SS1.01

The identification of a novel cell type with multipotency properties in Human Adipose tissue using single cell technologies

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Adipocyte dysfunction is a critical factor in the onset of metabolic diseases, underscoring the necessity to explore the mechanisms behind. Our research, employing single-cell analysis, reveals that progenitor cells within four distinct human adipose depots—both brown and white—diverge into two primary pathways: an adipogenic lineage and a structural lineage, both originating from a shared progenitor. The gene signature for adipogenesis highlights mitochondrial activity genes and correlates with traits related to fat distribution identified in genome-wide association studies. We introduce the term "structural Wnt-regulated adipose tissue-resident (SWAT) cells" for the structural cell lineage, characterized by an extracellular matrix and developmental gene signature. Remarkably, when separated from adipogenic cells, SWAT cells exhibit a multipotent nature, either reverting to a progenitor state or differentiating into adipogenic cells, depending on the culture medium used. Moreover, label transfer algorithms successfully identify these cell types within human adipose tissue datasets. Our findings present a comprehensive differentiation map of human adipocytes and define the multipotent SWAT cell, providing a new perspective on adipose tissue regulation.

SS1.02

The characteristics of a diagnostic test: the experience of Laboratory Medicine

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According to the Thornbury hierarchy, the framework to evaluate a diagnostic test is starting with the technical efficacy (analytical validity) to move to the second step which is the diagnostic efficacy (clinical validity), through the third step which is the diagnostic and therapeutic impact (clinical utility), to ultimately demonstrate the effects on patient outcomes as well as the socio-economic benefit taking into consideration ethical, legal and social impact. Evidence has been collected to demonstrate that test accuracy is one component of test evaluation, but does not capture the impact of tests on patients. Only by looking at the test-treatment pathway as a whole can we identify the effects on clinical and economical outcomes. However, it was found that the link between a laboratory test and outcomes is quite elusive as other diagnostic tests, interventions and healthcare professionals (e.g. physicians, nurses) may affect the final outcomes. Regarding the analytical validity, the current hierarchy to establish the analytical performance specifications (APS) has been defined in the 2014 Milan Conference. Basically, a consensus has been found on a three-levels criteria to set the APS for a specific measurand (laboratory test) that are: a) APS based on outcomes; b) APS based on the biological variation, and c) state-of-the art. Unfortunately, the outcome-based APS are available for a limited number of laboratory tests, while the data-base of the European Federation of Laboratory Medicine provides information on APS based on the biological variation for about 400 laboratory tests. In the last few years data have been collected to demonstrate that setting appropriate APS allows clinical laboratories to achieve quality and safety in both diagnoses and patient treatment. I will provide some examples highlighting as better analytical performances should improve the value of the test in clinical practice. This is particularly true in the case of cardiac troponin when introducing high-sensitivity assays, as well as for C-reactive protein. The future trends in laboratory medicine is to promote the concept of "value-based" laboratory medicine, by improving clinical outcomes while reducing costs. A fundamental step in improvement programs is the promotion of "integrated diagnostics" through the interaction and cooperation between clinical laboratories and other diagnostic departments, namely radiologists to provide the clinicians with a common diagnostic report which should be complemented by Artificial Intelligence tools to make more understandable and actionable the diagnostic information.

Tuesday, 14 May 2024

SS2 – Nutrition Education in Europe: Innovative Approaches

SS2

Sensory-based Food Education for families of Fussy-Eating Children, with and without Neurodevelopmental Disorders

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Introduction: Fussy-eating children may have an increased risk of becoming overweight or living with obesity, with fussy eating and weight status also correlating with neurodevelopmental disorders (NDs) such

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as autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD). Our sensory-based food education programme (TasteBuddyTraining) involves a multifaceted approach, taking into account challenges associated with fussy eating, anxiety around eating, mealtime communication, parental stress, neurodevelopmental disorders and obesity. The overall study aim was to investigate the effect of the TasteBuddyTraining program on children with and without ND in a non-invasive, school-based approach. Further assessing changes in fussy eating and food variety, mealtime behaviours and anxiety around food in children with ND, comparing them with children without ND of the same age.

Methods: To investigate the effect of the TasteBuddyTraining, 81 children with ND (n = 33), and without (n = 48), aged 8–12 years, and their parents, participated in a 7-week food intervention. Children were matched on age, ND, and sex, and randomized into Immediate-intervention and Delayed-intervention groups. Parents completed the Children's Eating Behaviour Questionnaire (CEBQ), Meals in Our Household Questionnaire (MOHQ) and a food-variety questionnaire. Children answered the Multidimensional Anxiety Scale for Children (MASC). Body composition measurements were also performed for parent-child dyads using bioelectrical impedance analysis (BIA).

Results: Overall, results showed increased food acceptance, decreased fussy eating and indications of increased enjoyment of food. Long-term effects and results were evident regardless of children's ND status. Results also indicated better structure around meals, reduced problematic mealtime behaviour and parents were less prone to use food as a reward. Parental concern about their children´s diet was decreased. Children with NDs and their parents had significantly higher mean BMI-SDS (BMI standard deviation score) and fat percentage at pre-intervention than children without NDs and their parents. Mean BMI-SDS and fat percentage lowered significantly between time points for children with NDs and their parents but not for children without NDs or their parents. Lastly, measures indicated that anxiety scores did not increase during the intervention and six months post-intervention.

Conclusion: Our TasteBuddyTraining approach shows promise as a nutritional education program, offering a simple, non-invasive way to decrease fussy eating and increase food variety in the long term, positively affecting several indices of health and well-being in children and their families.

TOPIC SESSION

Sunday, 12 May 2024

TS01 – Adipose Tissue Niche and Tumour Microenvironment in Obesity

TS01.01

Linking Obesity and Cancer

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Over a person's lifetime somatic cells will accumulate spontaneously occurring gene mutations, the majority of which do not cause disease. However, accumulation of such mutations can lead to transformation and tumour formation. The global incidence of cancer has more than doubled over the past 30 years – primarily due to increasing living standards, modern lifestyles and an ageing population. The common denominator for these, is alterations to the physiological homeostasis of the individual at risk rather than a change in mutational burden. One of the physiological stressors is obesity.

A strong correlation between obesity and cancer risk is established in large epidemiological studies — in particular for post-menopausal breast, endometrial and colon cancer. Globally, overweight/obesity may account for 544 300 cancer cases every year and is currently implicated in 15-20% of cancer-related mortalities. This places obesity second only to smoking as the most prevalent preventable cause of cancer.

Efforts to delineate the interaction between obesity and cancer have been confounded by the spectrum of physiological changes that define obesity. These include alterations in circulating hormones and metabolites, inflammation, and comorbidities (e.g. diabetes), each of which has the capacity to affect tumour formation. Consequently, determining the causal connections between obesity and cancer is highly complex and multidimensional. In this presentation I will provide an overview of such known molecular pathways linking the obese environment to cancer initiation and progression. These includes 1) how obesity alters macrophages and CD8 T-cells to create a pro-tumorigenic environment and 2) how the obese state governs selection of specific and more aggressive cancer cell phenotypes.

TS01.02

Adipose stem cells reprogram the colon rectal cancer stem cells

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Obesity is a strong risk factor for cancer progression, posing obesity-related cancer as one of the leading causes of death. Nevertheless, the molecular mechanisms that endow cancer cells with metastatic properties in patients affected by obesity remain unexplored.

Our research shows that IL-6 and HGF, secreted by tumor neighboring visceral adipose stromal cells (V-ASCs), expand the metastatic colorectal (CR) cancer cell compartment (CD44v6+), which in turn secretes neurotrophins such as NGF and NT-3, and recruits adipose stem cells within tumor mass. Visceral adipose-derived factors promote vasculogenesis and the onset of metastatic dissemination by activation of STAT3, which inhibits miR-200a and enhances ZEB2 expression, effectively reprogramming CRC cells into a highly metastatic phenotype. Notably, obesity-associated tumor microenvironment provokes a transition in the transcriptomic expression profile of cells derived from the epithelial consensus molecular subtype (CMS2) CRC patients towards a mesenchymal subtype (CMS4). STAT3 pathway inhibition reduces ZEB2 expression and abrogates the metastatic growth sustained by adipose-released proteins. Together, our data suggest that targeting adipose factors in colorectal cancer patients with obesity may represent a therapeutic strategy for preventing metastatic disease.

TS01.03

The site-specific crosstalk between adipose tissue and tumor cells involves mitochondrial calcium signalling

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Introduction: The excessive accumulation of adipose tissue in obesity is associated with an altered secretion of adipokines, leading to chronic low-grade inflammation, insulin resistance, and an increased risk of metabolic diseases like type 2 diabetes, cardiovascular diseases, and certain

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types of cancer. Several pathological conditions, including tumor formation and progression, are directly related to mitochondrial dysfunctions, and reprogramming of mitochondrial metabolism (including altered Ca2+ signalling) is now considered as an emerging hallmark of cancer. However, the crosstalk between adipose cells and tumor cells is not completely understood. In this study, we aimed to determine whether the interplay between adipose tissue and cancer influences mitCa2+ uptake and to uncover specific signatures between different adipose tissue depots or between various states of adipose cells differentiation.

Methods: Visceral and subcutaneous adipose tissue were isolated from patients enrolled in the Center for the Study and the Integrated Treatment of Obesity of the University Hospital of Padova, who underwent bariatric surgery for weight loss, or plastic surgery after bariatric surgery-induced weight loss, respectively. Adipose derived stem cells (ADSC) were isolated from adipose tissue, plated and cultured in adipogenic medium to induce adipogenic differentiation. Conditioned media from cultured adipocytes were collected at different time points of adipogenic differentiation and were used to treat esophageal adenocarcinoma (OE33) and triple negative breast cancer (MDA-MB-231) cell lines. For measurements of [Ca2+]cyt and [Ca2+]mit, cells were infected with cytosolic (Ad-cytAEQ) or low-affinity mitochondrial (Ad-mtAEQmut) probes and, after 48h, Ca2+ transients were evoked by agonist treatments.

Results: The two cell lines were differently susceptible to the different conditioned media of ADSCs. In particular, in OE33 cells the effects on mitochondrial calcium uptake were attributable to media collected from ADSC derived from visceral adipose tissue, whereas in MDA-MB-231 cells the same effect was elicited by those derived from subcutaneous adipose tissue. Conversely, when media derived from subcutaneous adipose tissue were tested on OE33 and visceral adipose tissue-derived on MDA-MB-231, no effects were observed. Moreover, the increase of mitCa2+ uptake was dependent exclusively on conditioned media derived from adipose-specific undifferentiated stem cell population, whereas the treatment with conditioned media from heterogenous stromal vascular fraction, or from mature adipocytes did not affect mitCa2+ uptake.

Conclusions: These data suggest that adipose tissue releases specific factors that positively modulate mitCa2+ signalling in cancer cells, in a depot-dependent and cell-specific manner. A univocal relationship underlies the response of cancer cells to the adjacent adipose tissue. In fact, visceral adipose tissue is the natural environment of the esophagus, just as subcutaneous adipose tissue is for the mammary gland (and not *vice versa*). More studies are needed in order to identify the molecular key players in this relationship.

TS01.04

Immune-mediated tumor microenvironment remodeling depends on the high fat diet duration

Marlin, S.; Rougé, S.; Goncalves Mendès, N.; Rossary, A.; Farges, M.

Human Nutrition Unit UMR 1019 - INRAE/UCA - ECREIN Team

Breast cancer ranks among the most prevalent cancers globally, particularly affecting women (1). Contributing risk factors include non-optimal lifestyle combining dietary imbalance and a sedentary, obesity, and postmenopausal status, all linked to a long-term hormonal and inflammation exposure (2). Physical activity confers protection against breast cancer by influencing hormone levels, immune responses, and oxidative defences (3,4). This study aimed to evaluate the impact of prolonged obesity on the efficacy of physical activity in preventing and managing breast cancer during mammary tumorigenesis.

Ovariectomized 35-week-old C57BL/6 mice were subjected to an enriched environment to induce spontaneous physical activity and were fed a high-fat diet (HFD) throughout the experiment. After 42 days (Short-term (ST), n=10) or 88 days (Long-term, LT, n=10) on the HFD, syngenic EO771 cells were implanted into the 4th mammary glands, and tumor growth was monitored for 30 days. Upon sacrifice, the tumor microenvironment (TME) immune infiltrate and metabolic parameters were assessed using various methods. Data, expressed as mean ± SEM, were analyzed using a Mann-Whitney test.

The median survival was significantly shorter in the LT group compared to the ST group (22 days vs 25.5 days, p=0.0296). Despite similar spontaneous physical activity and individual food intake in both groups, the LT group exhibited higher visceral adipose tissue mass (p=0.04) and reduced skeletal muscle mass (p=0.0765). In the TME, the LT group showed decreased proportions of NK cells (p=0.05) and TCD8+ cells (p=0.002), with a tendency for increased T regulatory cells (p=0.1), resulting in a collapse of the T8/Treg ratio (p=0.03). Additionally, the LT group displayed a significant decrease in tumor triglyceride content (p=0.0143) accompanied by altered enzyme activities indicative of oxidative stress.

In our experimental conditions, prolonged exposure to a high-fat diet (LT HFD) was associated with tumor growth despite an elevated spontaneous physical activity. LT HFD promoted a tolerogenic TME by enhancing lipid consumption and oxidative stress while recruiting anti-tumor immune cells. Future investigations should explore the inter-organ exchanges between tumor and tissues such as adipose tissue and skeletal muscles. The prospect of combining enforced physical activity with immunotherapy may counteract the long-term effects of a hypercaloric diet.

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TS02 – Advances in the Pharmacological Treatment of Children and Adolescents with Obesity

TS02.01

Dosing of antidepressants in relation to body weight in children and adolescents with overweight and obesity- a population-based study

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Introduction: Medicines to children are commonly dosed according to weight or age to adjust for physiologic and pharmacokinetic differences compared to adults. Overweight and obesity could result in substantial differences in drug exposure as the higher proportion of fat mass might lead to pharmacokinetic alterations. However, paediatric recommendations regarding optimal dosing of SSRI (selective serotonin reuptake inhibitors) in individuals with elevated body weight are lacking.

Methods: The aim of the present study was to evaluate the prescribed doses of SSRI in relation to body weight.

The population-based BMI Epidemiology Study (BEST) Gothenburg cohort has height and weight available from school health care records in the city of Gothenburg, Sweden, and information on prescription of SSRI from linkage with the National Prescribed Drug Register. We included boys and girls who were prescribed the antidepressants fluoxetine (n=347) or sertraline (n= 733) with a weight measurement not earlier than three months before, or later than six months after the dispensing date from the BEST Gothenburg cohort. We compared the dose and the dose per kg

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body weight for individuals with overweight and obesity versus normal weight, using Student's t-test (standard deviation [sd]).

Results: Individuals with overweight or obesity received slightly lower doses of fluoxetine in first prescriptions, but no significant differences were seen for iterated prescriptions. However, the mean dose per kg body weight was clearly lower in individuals with overweight or obesity compared with normal weight in first prescriptions (overweight and obesity: 0.22 mg/kg (sd =0.08); normal weight 0.34 mg/kg (sd=0.14), p<0.001), and in iterated (overweight and obesity: 0.33 mg/kg (sd=0.15); normal weight: 0.42 mg/kg (sd=0.17), p<0.01) prescriptions. For sertraline, there were no significant dose differences between individuals with overweight or obesity compared with normal weight. Pronounced differences were seen in mean dose per kg body weight in first (overweight and obesity: 0.69 mg/kg (sd=0.26); normal weight 0.96 mg/kg (sd=0.44), p<0.001) and iterated (overweight and obesity: 1.00 mg/kg (sd=0.59); normal weight 1.39 mg/kg (sd=0.76), p<0.001) prescriptions.

Conclusion: The prescribed doses of SSRI were essentially similar in individuals with overweight or obesity compared with normal weight, but the dose per kg body weight was significantly lower. This finding suggests that children and adolescents with elevated weight could be at risk of being underdosed. Given the ongoing obesity epidemic, there is a large need for more knowledge regarding drug disposition in children and youth with obesity. High-quality clinical studies addressing pharmacodynamics, pharmacokinetics and optimal dosing in this population are warranted.

TS02.02

The impact of behavioural weight management interventions on eating behaviour traits in children with overweight or obesity: systematic review and meta-analysis

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Introduction: Behavioural weight management interventions (BWMIs) have emerged as pivotal strategies for addressing childhood obesity. Targeting eating behaviour traits (EBTs; individual tendencies determining food intake/occasions) could play an important role in the effectiveness of personalized behavioural interventions that can contribute to evidence-based strategies to address the complex issue of childhood overweight and obesity. The present study describes a systematic review and meta-analysis of BWMIs and their impact on eating behaviour traits.

Methods: Seven databases were searched, and eligible studies included randomised controlled trials reporting EBT outcomes following behavioural weight management interventions delivered to children with overweight or obesity (<18 years of age). Synthesis without meta-analysis (SWiM) was applied for EBTs where meta-analysis was not feasible.

Results: The review identified nine trials characterizing the impact of BWMIs on 15 eating behaviour traits. Meta-analyses of data from three trials at intervention conclusion and 28 weeks (±8 weeks) post-intervention revealed positive short-term effects on dietary restraint (SMD random effect 0.42 [95%CI 0.13, 0.70]). However, these effects were not sustained at follow-up.

Conclusion: Findings suggest that BWMIs in children living with overweight/obesity are beneficial for the improvement of some EBTs at intervention end, including dietary restraint, emotional eating, external eating, food responsiveness, and enjoyment of food. However, this remains a relatively unexplored area and underscoring the need for more research to strengthen understanding into the multifaceted impact of child BWMIs on a comprehensive range of EBTs.

TS03 – Community Approaches to Improving Food Security for Health and Wellbeing

TS03.01

Community food growing as an intervention to improve diet, wellbeing and food security

Hardman, C.

Department of Psychology, University of Liverpool, UK

Poor diet is a major contributor to obesity and non-communicable diseases including coronary heart disease, type II diabetes, stroke and cancers. Consuming a diet rich in plant-based foods, and with fewer animal sources, substantially reduces disease risk for multiple health outcomes whilst also having co-benefits for the health of the planet. However, there are marked socio-economic inequalities in dietary intake, and communities experiencing socio-economic disadvantage are more likely to have difficulties with accessing affordable healthier foods. Food insecurity (the lack of secure access to sufficient amounts of safe and nutritious food for normal growth and development) disproportionally affects disadvantaged communities and has risen sharply in many European countries, being further exacerbated by the cost-of-living crisis. Poor mental health is particularly prevalent in areas of high socio-economic deprivation, and stress is known to drive unhealthy eating behaviours. Holistic approaches are therefore needed that simultaneously address dietary, physical and mental health challenges.

This talk will focus on community-driven approaches to alleviating food insecurity, specifically growing fresh fruit and vegetables in local communities, and the potential for these approaches to act as interventions to improve diet quality, wellbeing and food security. Food growing in local communities can take many forms (e.g. growing at home, allotments, community gardens/food-growing projects), and recent findings from the 'Rurban Revolution' research project indicate that people who are more engaged with food growing in urbanised areas tend to make healthier and more ethical food choices. During the Covid-19 pandemic, home food-growers also reported higher levels of wellbeing and food security compared to non-growers. Evidence also indicates that using more spaces in towns and cities in Great Britain for food growing could substantially increase production of fresh fruit and vegetables and help to meet the dietary needs of local populations. These findings concur with wider evidence which indicates that community food-growing in urban areas can positively contribute to food security at household and community levels, and have extended benefits for individuals via developing skills, social connections and wellbeing. Future research directions, opportunities and challenges for translating these findings into health and societal impacts will also be considered.

TS03.02

Community Cooking Skills and Food Agency Interventions: Do They Increase Diet Quality?

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Food agency, or one's capacity to navigate social, structural, and economic barriers to procure and prepare food, is a novel way of conceptualizing food and cooking skills. Food agency interventions seek to develop food and cooking skills and self-efficacy that will enable individuals to cook and consume healthy diets. Understanding of the importance of cooking skills and practices for food security, diet quality, and diet related disease prevention has grown in recent years. Community cooking classes, including some that take a food agency approach, have attracted interest and funding. But how effective are cooking skills and food agency interventions for improving dietary quality and addressing diet related health outcomes? This talk will critically examine the growing interest in cooking skills as a public health intervention approach for improving dietary quality and

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preventing diet related chronic diseases. Background and context for the importance of considering cooking skills and practices in efforts to improve diet quality and for utilizing a food agency framework for food and cooking skills will also be discussed. Finally, the talk will address key considerations for community cooking and food agency interventions, particularly regarding study design, implementation, and measurement of such a complex behavior and the implications for evaluating impact of such interventions.

TS03.03

Are supermarket provided monetary top-ups of Healthy Start vouchers associated with increased purchases of fruits and vegetables in UK families with young children?

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Introduction: Alarming health and dietary inequalities exist among UK children. Diet inequalities are associated with all forms of malnutrition, including obesity. The UK government provides the Healthy Start (HS) voucher scheme (now digitalised cards), exchangeable for milk, formula, pulses, fruit, and vegetables to help support low-income families with a child under four years old and pregnant women. In 2021 Sainsbury's supermarkets offered £2 top-up coupons to HS customers, redeemable against fruit and vegetables in subsequent shopping visits. This study explores whether Sainsbury's HS top-up scheme shifted customers towards healthier purchasing patterns.
Methods: Pseudonymised transaction data from 2019 to 2021 were provided for regular customers who redeemed ≥1 HS top-up coupon during a 28-week period from February to August 2021; from four UK regions - Yorkshire and the Humber, East Midlands, West Midlands, and the South East. Fruit and vegetable and discretionary food purchases were compared between the 2021 top-up period and 2019 baseline period, using before and after design, utilising the Eatwell Guide as dietary reference; and between top-up redeeming and non-redeeming baskets within the top-up period.
Results: Over the top-up period, 1,383 customers recorded 4,212 HS top-up redeeming shops. Customers' fruit and vegetable portions increased from a median of 3.2 portions/day in 2019, to 4.2 portions/day (P<0.001). During the top-up period, the median top-up redeeming basket bought 13.4 more portions of fruits and vegetables than the median of all other non-redeeming baskets (31.4 portions, IQR=35.8 versus 18.0, IQR=29.0; P<0.001). When comparing breakdown of purchased foods by Eatwell segment, redeeming baskets showed a 5.9% higher proportion of fruits and vegetables and 3.7% lower proportion of discretionary foods.
Conclusion: Providing HS top-up coupons was associated with significantly increased purchasing of fruit and vegetables, in absolute terms and as a proportion of total baskets. Increased purchasing of fruit and vegetables was associated with reductions in the share of the basket given to discretionary foods. These findings demonstrate the capacity for industry-led initiatives to support low-income families to achieve healthier diets. They additionally highlight the huge potential for the HS scheme to reduce dietary inequalities were the UK Government to respond to calls to increase the scheme's value, and reach, in light of rising food prices.

TS03.04

The impact of the cost of living crisis and food insecurity on food purchasing behaviours and food preparation practices in people living with obesity: insights from the FIO Food project

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Introduction: Lower income households are at greater risk of food insecurity and poor diet quality. In high-income countries, food insecurity is associated with higher levels of obesity, and the global cost of living crisis is likely to have exacerbated existing dietary inequalities for people living with obesity (PLWO) and food insecurity. However, there is a paucity of research on the impact of the cost of living crisis on food purchasing and food preparation practices for PLWO and food insecurity.
Method: Using an online survey (N = 583) of adults residing in England or Scotland with a body mass index (BMI) of ≥ 30kg/m^2, participants self-reported on food insecurity, diet quality, perceived impact of the cost of living crisis, and their responses to this in terms of food purchasing behaviours and food preparation practices.
Results: Regression analyses found that participants more impacted by the cost of living crisis reported greater experiences of food insecurity. Additionally, food insecurity was associated with greater use of specific purchasing behaviours (i.e., use of budgeting, use of supermarket offers) and food preparation practices (i.e., use of energy-saving appliances, use of resourcefulness). Exploratory analyses indicated that greater impact of the cost of living crisis and use of budgeting were associated with poorer diet quality, whereas greater use of meal planning was associated with better diet quality.
Conclusion: These findings highlight the fragility of food budgets and the coping strategies used by PLWO and food insecurity during the cost of living crisis. Policy measures and interventions are urgently needed that address the underlying economic factors contributing to food insecurity, to improve access to and affordability of healthier foods for all.

TS04 – Guidelines and Future Perspectives of MAFLD

TS04.01

Treating Obesity for Treating MAFLD

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Non-alcoholic fatty liver disease (NAFLD), recently renamed metabolic dysfunction-associated steatotic liver disease (MASLD), has an estimated overall global prevalence of 32.4% among the adult population. The strongest risk factors for MAFLD are obesity, insulin resistance and type-2 diabetes. Prospective studies have shown people with obesity have a 3.5-fold increased risk of developing MASLD compared to those with normal weight. Obesity has also been repeatedly demonstrated to be an independent risk factor for the occurrence of and mortality from primary liver cancer. Other well-established key lifestyle factors associated with MAFLD include lack of physical activity, high sedentary behavior, and low-quality dietary intake. Current strategies for treating MAFLD include weight reduction achieved by diet and physical activity supported by behavioral therapy. It has been repeatedly demonstrated in clinical trials that weight

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reduction achieved by caloric restriction, either with or without increased physical activity, leads to improvements in MAFLD biomarkers, including liver enzymes, liver fat, metabolic-dysfunction associated steatohepatitis (MASH), and fibrosis. There is a dose-dependent association between the amount of weight loss and the extent of improvement in liver damage. There are multiple beneficial dietary approaches to lose weight and improve MAFLD. Hypocaloric low-carbohydrate diets and low-fat diets appear to be similarly effective in reducing liver fat and related biomarkers. However, the Mediterranean diet seems to have an added value for liver fat reduction and cardiometabolic health and may be easier to maintain in the long term. Time-restricted eating (TRE), also called intermittent fasting, is a new diet strategy in which calories are consumed in a defined time window. There is currently very little evidence for a beneficial effect of TRE over that of a regular caloric restriction on hepatic fat in MAFLD patients, but it seems as another effective dietary method that can be used according to the patient's preferences. The type of diet can be chosen taking into consideration the patient's preferences, clinical, and economic characteristics, to maximize long-term adherence. Beyond obesity, there is clinical importance to diet quality. A large number of studies have been conducted to assess the relationship between MAFLD and dietary patterns, suggesting saturated fatty acids, and added fructose [mainly in the form of sucrose which is the table sugar and high-fructose corn syrup] as major risk factors. Among the leading sources of these nutrients in the modern diet are ultra-processed foods and drinks (UPF), made of contents derived from foods and additives, undergoing multiple industrial processes, and accounting for over 50% of mean energy intake in some countries in Europe and the United States. High UPF consumption is associated with the development of obesity and type-2 diabetes, and in recent years has been shown to be related to MASLD. Therefore, the talk will cover the most up-to-date studies on the treatment of MASLD with various weight reduction diets as well as the importance of the diet quality by itself.

Monday, 13 May 2024

TS05 – Liver Phenotypes in Obesity

TS05.01

Personalized Proteomics Signature of Obesity and Type 2 Diabetes

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Proteins, the molecular machines of life, play a pivotal role in the pathophysiology of metabolic diseases such as obesity and Type 2 Diabetes (T2D). Skeletal muscle and adipose tissue plays an important role in metabolic homeostasis. Building on this understanding, our work leverages cutting-edge proteomics technology to dissect the intricate molecular signatures within adipose tissue and skeletal muscle from normal glucose tolerant (NGT), Obese and T2D individuals.

We established the proteome signature of white adipose tissues from NGT, Obese and T2D individuals and found that the most regulated proteins displayed progression in markers of dysfunctional white adipose tissue from NGT to obese to T2D individuals and were highly correlated with clinical measures such as insulin sensitivity and HbA1c. This comprehensive analysis provides insights into the molecular landscape of adipose tissue dysfunction across the metabolic spectrum. In a parallel study, we mapped the proteome and phosphoproteome of skeletal muscle in over 120 men and women with NGT or T2D, with varying degrees of insulin sensitivity. Leveraging deep in vivo phenotyping, our finding reveal that the fasting proteome and phosphoproteome signature strongly predict insulin sensitivity. Importantly, insulin-stimulated phosphoproteome revealed both dysregulated and preserved signaling nodes even in individuals with pronounced insulin resistance. While substantial sex-specific differences were identified in the proteome and phosphoproteome, molecular signatures of insulin resistance remained remarkably consistent between men and women. These findings underscore the need for precision medicine approaches in type 2 diabetes care, acknowledging disease heterogeneity.

TS05.02

Circadian Clocks in Hepatocytes Affect Metabolism

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The synchronization of circadian clock depends on a central pacemaker located in the suprachiasmatic nuclei. However, the potential feedback of peripheral signals on the central clock remains poorly characterized. To explore whether peripheral organ circadian clocks may affect the central pacemaker, we used a chimeric model in which mouse hepatocytes were replaced by human hepatocytes. Liver humanization led to reprogrammed diurnal gene expression and advanced the phase of the liver circadian clock that extended to muscle as well as the entire rhythmic physiology. Similar to clock-deficient mice, liver-humanized mice shifted their rhythmic physiology more rapidly to the light phase under day feeding. Our results indicate that hepatocyte clocks can affect the central pacemaker and offer new perspectives to apprehend pathologies associated with altered circadian physiology.

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TS05.03

Pentraxin-3 as the marker of inflammation in steatohepatitis (MASH) in older adult population – results from the PolSenior2 substudy

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Introduction: Pentraxins are a superfamily of acute-phase reactants. Their characteristic feature is a cyclic multimeric structure. The C-reactive protein (CRP) and serum amyloid P-component (SAP) are well-known short pentraxins, while pentraxin 3 (PTX-3) is the long one. In a middle-aged population, plasma PTX-3 levels above 2.45 ng/mL were shown to discriminate patients with metabolic dysfunction-associated steatohepatitis (MASH) from population without MASH with 91.1% sensitivity and 71.4% specificity. Furthermore, plasma PTX-3 levels correlated with NAFLD fibrosis score and histologically verified fibrosis stage and steatosis grade. In another study, it was also found that plasma PTX-3 levels were significantly higher in stages 3-4 than in participants with 0-2 NAFLD and PTX-3 correlated with stages of liver fibrosis. In a population of adolescents with obesity, PTX-3 concentrations above 3.03 ng/mL were shown to differentiate fatty liver and MASH with 89% sensitivity and 86% specificity. Currently, there is no study on the relationship between plasma PTX-3 levels and MASH in older adults. Therefore, our study aimed to assess the relationship between plasma PTX-3 levels and potential diagnosis of MASH based on blood tests including FIB-4 and NAFLD fibrosis scores in older adults.
Methods: The subanalysis included 2397 older adults (60 years and older) with metabolic risk factors of MASLD and assessed PTX-3, participants of the population-based PolSenior2 study. The men and women were divided into two subgroups according to FIB-4 values (<2.67 and > 2.67) and three subgroups according to the NAFLD fibrosis scores values (F0-F2, Indetermined, and F3-F4).
Results: The FIB-4 values over 2.67 had 29.5% of men and 20.9% of women and plasma PTX-3 levels were significantly higher in these subgroups ($p < 0.001$). The empirical cut-off point in ROC curve analysis for PTX-3 levels as a marker of liver fibrosis was 2.11 ng/mL (area under the curve [AUC] 0.58, sensitivity [Se] 51.9%, specificity [Sp] 60.6%, positive predictive value [PPV] 30.6%, negative predictive value [NPV] 79.0%). Moreover, participants with PTX-3 levels above the cut-off point had 66% higher odds of liver fibrosis according to FIB-4 (OR = 1.66 [95% CI: 1.38 – 2.00]) and almost twice higher odds according to NAFLD score (F3-F4 vs F0-F2: OR = 1.97 [95% CI: 1.36 – 2.85]). NAFLD fibrosis scores corresponding to F3-F4 fibrosis had 50.4% of men and 41.3% of women. Plasma PTX-3 levels were significantly higher in these subgroups ($p < 0.001$). The empirical cut-off point in ROC curve analysis for PTX-3 levels as a marker of F3-F4 liver fibrosis was 2.08 ng/mL (AUC 0.58, Se 51.1%, Sp 65.5%, PPV 92.1% and NPV 14.5%).
Conclusion: Our study suggests that plasma PTX-3 levels are not sensitive enough to be used as a nonspecific marker of liver fibrosis in older adults.

TS05.04

A formulation of N-acylethanolamines and phenolic compounds dampens liver metabolic and oxidative damage in high-fat diet fed mice with obesity: in vivo and in vitro studies

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Introduction: Gluco- and lipotoxicity play a key role in the development of metabolic dysfunction-associated fatty liver disease (MAFLD) (1) characterizing obesity. When free fatty acids exceed, lipotoxic metabolites were produced contributing to hepatic oxidative stress and inflammation (2) which cause insulin resistance and glucose intolerance (3). The N-acylethanolamine palmitoylethanolamide (PEA) and some phenolic compounds, such as rutin and hydroxytyrosol (HT), have shown different metabolic, anti-inflammatory and antioxidant effects (4-6). This study aimed at evaluating the beneficial activity of a formulation containing PEA co-micronized with rutin and associated with HT, named NORM3, in counteracting hepatic damage and metabolic alterations occurring during obesity in high-fat diet (HFD)-fed mice.
Methods: Male C57Bl/6J mice received standard chow diet or HFD for 19 weeks; a HFD group administered NORM3 (PEA 10 mg/kg/die-Rutin 2 mg/kg/die, HT 0,5 mg/kg/die per os) from week 12 up to week 19. Metabolic and hepatic damage were evaluated by both biochemical, histological, and molecular analyses.
Results: First, NORM3 limited body weight gain of mice with obesity (MwO), already after 3 weeks of treatment, and reduced fat mass. NORM3 improved HFD-altered insulin sensitivity reducing HOMA index, and normalized systemic leptin/adiponectin ratio, as predictive value of adipocyte dysfunction. In liver, morphological analysis showed that NORM3 reduced macro- and microvacuolar steatosis caused by HFD. Consistently, NORM3 counteracted lipid dysmetabolism of MwO, activating AMPK, a key sensor of both glucose and lipid homeostasis, and normalizing the expression of carnitine palmitoyl-transferase (CPT)1, a rate-limiting enzyme of fatty acid β-oxidation, and other genes involved in fatty acid homeostasis. Contextually, we demonstrated the anti-inflammatory and antioxidant potential of NORM3 in liver of MwO (reduced inflammatory mediators/cytokines and ROS, and increased transcription of detoxifying factors). Finally, in HepG2 cells challenged with an oxidative damage that mimics the main features of insulin resistance and obesity in vivo, we proved the synergistic effect of the single components (PEA-Rut and HT) of NORM3 not only in reducing cellular ROS production and associated inflammation but also increasing antioxidant defense.
Conclusion: Taken together, our findings identify NORM3 as a potential hepatoprotective approach in dampening the hepatic dysmetabolism and associated oxidative stress in MAFLD and obesity

TS06 – Behavioural and Nutritional Consequences of Next-Generation Pharmacotherapy

TS06.01

Current and Emerging Obesity Medications: Behavioural Mechanisms of Action - What We Know and What We Don't

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Pharmacotherapy provides and aid to behaviour modification in the management of obesity. There are several medicines that have FDA approval, EMA approval / backing, or both. Each of these has a different (psycho) pharmacological mechanism of action. For example, Semaglutide and Liraglutide are Glucagon-like 1 (GLP1) receptor agonists, Tirzepatide

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has combined actions on GLP1 and glucose-dependent insulinotropic polypeptide (GIP), Bupropion/Naltrexone is a combination of a catecholamine reuptake inhibitor and an opioid receptor antagonist. Presumably different medicines that have different mechanisms of action can produce different effects on eating behaviour. This talk will provide an overview of what we know and what we don't know about the behavioural specificity (impacts on satiety, liking, wanting, inhibitory control, brain activity) of current and emerging obesity medications, to gain a greater understanding of which medicines will benefit which patients (personalised treatment).

TS06.02

Overcoming obesity: the discovery of multi receptor drugs

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Helmholtz Munich, Technical University of Munich, Germany

On our mission to overcome the obesity pandemic by discovering highly effective medicines, we hypothesized that chemistry based on more than one endocrine factor may be required to significantly reduce body fat without causing severe side effects. We selected combinations of afferent gut hormones acting in the CNS as the most likely path toward efficacy comparable to bariatric surgery benefits. Over the last 20 years, we combined advanced in vivo preclinical biology with state-of-the-art peptide chemistry to achieve such synergistic gastrointestinal hormone pharmacology. What proved successful was the unprecedented approach of fully integrating two and three mechanisms of biological action at a potency that matched the individual native hormones into single molecules. The resulting peptides are analogous to master keys, structurally nearly identical to natural gut hormones, but delivering multiple metabolic action profiles. We discovered multiple dual and triple hormone-like chimeric peptides from a set of intestinal hormones and chemically refined these for medicinal purposes to possess suitable time action and physical properties to support infrequent subcutaneous dosing. This new class of drugs was then validated by showing unprecedented improvements in glycemic control and body weight reduction in multiple rodent models of obesity and insulin resistance. Aiming at efficient translation into clinical medicine, we designed and supervised the validation of the rodent observation with first-generation forms of these poly-agonists in non-human primate studies and subsequently in the first clinical trials. The results triggered numerous pharmaceutical interests and led to multiple competitive dual and triple agonist versions now advancing in mid and late-stage clinical trials, reflecting medicinal importance of the discovery and validating the reproducibility of their pioneering science. Tirzepatide/Mounjaro/Zepbound (Eli Lilly & Co) represents one of the initial members of the newly discovered class of dual agonist drugs and was FDA-approved last year for treating type 2 diabetes. It synergistically integrates GIP and GLP-1 receptor agonist pharmacology into a single molecule, as we had first discovered and reported in 2013. The GIP/GLP-1 dual agonist Tirzepatide/Mounjaro/Zepbound has been approved for treatment of obesity and diabetes by the regulatory agencies and achieves an average of 22.5% weight loss in clinical obesity, a milestone achievement previously thought to be impossible. Multiple other versions of such dual and triple agonist classes of drugs are successfully underway including several in clinical phase III trials.

TS07 – Overview of Paediatric Obesity Treatment Guidelines

TS07.01

Overview of Paediatric Obesity Treatment Guidelines. Italian Consensus Statement

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In Italy, the prevalence of childhood and adolescent living with obesity is one of the highest in the world. Unfortunately, COVID 19 epidemic has contributed to a further increase in the incidence of the disease. The perception of obesity as a disease is low in the country both among the general population and among pediatricians and healthcare workers Furthermore, treatment is usually started when the level of overweight is quite high, thus reducing the chances of effectiveness. Therefore, adequate information on obesity offered to caregivers of children and adolescents living with obesity and advanced training programs on obesity management offered to healthcare professionals are urgent needs to be met. In an attempt to respond to this need, in 2018, the Italian Society of Pediatric Endocrinology and Diabetology and the Italian Society of Pediatrics published a joint consensus position statement on the diagnosis, treatment, and prevention of pediatric obesity. However, the recent availability of new tools for the treatment of obesity also in children and adolescents has led to the provision of a new inter-society consensus statement specifically focused on the treatment of obesity. In this consensus published in 2023, it has been remarked that obesity is not a homogeneous disease but is rather a complex, multifactorial condition with multiple determinants that respond variably to a given intervention. The lifestyle intervention is the first step of treatment. In children older than 12 years, the addition of drugs to lifestyle therapy is the second step, and bariatric surgery the third, in selected cases. New drugs been approved in adolescents and have demonstrated their effectiveness in promoting weight loss and safety. A real-life study is currently underway on the use of the first GLP-1 RA approved in Italy for children older than 12 years living with obesity. The results of this study will help to better define the advantages and limitations of the use of this drug in the clinical setting. Currently, an obstacle to taking the prescribed drug is its cost, which is non-reimbursable by the national health care system. There are several international randomized control trials with other drugs in older children and adolescents, and it is likely that some of them will become available in the future. Finally, other drugs have been approved for the treatment of some monogenic or syndromic obesities, which offer truly interesting perspectives for the treatment of these serious diseases. The increasing portfolio of treatment options for pediatric obesity holds promise for more effective treatment. Further research with long-term follow-up is necessary to assess durability of body weight improvement obtained with different treatments. Moreover, new longitudinal studies will contribute to identify potential predictors as well as test the efficacy of pharmacotherapy in children younger than 12 years, for whom there are not yet drugs approved for treatment.

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TS08 – Obesity in Women across the Lifespan

TS08.01

Physiology and Obesity During the Woman's Lifespan

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There is an intricate relationship between female physiology and adipose tissue dynamics across a women lifespan. Women undergo dynamic physiological changes from adolescence through menopause, which are both influenced and able to influence adipose tissue mass and function. Additionally, women face unique challenges during pregnancy, breast feeding and post-partum adaptation. This inevitably impacts on the susceptibility to obesity and related health conditions.

This presentation will discuss the interplay between sex hormones, metabolic regulation, and adipose tissue distribution, elucidating how these factors contribute to regulate body corpulence in health. A special emphasis will be placed on the metabolic shifts and sex hormone dynamics induced by obesity and how to which extent can these be reversed or modified by weight loss interventions, including bariatric surgery.

By exploring the physiological underpinnings of obesity within the context of the female lifespan, this lecture seeks to empower healthcare professionals to recognize the risks for excessive weight gain and address overweight and obesity in a timely and effective manner across different stages of a woman's life, ultimately improving health outcomes and quality of life.

TS08.02

Obesity in women: across the lifespan

Suliman, S.

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This talk offers a comprehensive exploration of the multifaceted issue of obesity in women throughout their lifespans from childhood to post-menopause, and indeed the effect of maternal obesity on future generations. We examine the evolving nature of obesity prevalence, causes, consequences and how best to assess and treat obesity.

It provides an overview of the complex interplay of genetic, environmental, hormonal, and socio-cultural factors contributing to weight gain and obesity onset in women. Moreover, we discuss the unique challenges women face in managing their weight across different life stages, including adolescence, pregnancy, and menopause, and how these challenges impact their overall health and well-being.

In addition, it addresses the psychological, reproductive, mechanical and metabolic implications of obesity, highlighting the importance of early intervention and preventive measures as well as treatment of established advanced obesity stages. Through a holistic understanding of obesity in women across the lifespan, we aim to empower healthcare professionals, policymakers, and communities to implement effective strategies for obesity prevention, treatment, and support tailored to the specific needs of women at each stage of life.

Tuesday, 14 May 2024

TS09 – Skeletal Muscle Alterations in Obesity

TS09.01

The role of stress-induced FGF21 and GDF15 in obesity

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Obesity is associated with significant disruptions in endocrine function, manifesting in changes of hormone secretion and resistance that affect many organ functions in our body. Fibroblast growth factor 21 (FGF21) and growth differentiation factor 15 (GDF15) are stress-responsive cytokines impacting energy balance and therefore body weight development. Their overexpression, gene therapy as well as pharmacological administration under obesogenic conditions results in improved metabolic health, including fat loss and improved glucose homeostasis. Furthermore, increased endogenous levels can be beneficial for metabolism too, as shown by several genetically modified mouse models with mitochondrial dysfunction that resist diet-induced obesity. However, paradoxically, FGF21 and GDF15 serum levels serve as biomarkers for obesity and related comorbidities in both humans and mice, underscoring the nuanced role and impact of these cytokines in metabolic regulation. Our laboratory investigates the role of endogenous FGF21/GDF15 signalling in stress-induced obesity resistance across various mouse models with mitochondrial alterations in skeletal muscle or adipose tissue. Using transgenic mice with compromised skeletal muscle-specific mitochondrial OXPHOS capacity via respiratory uncoupling (HSA-Ucp1-TG mice) we explored the metabolic impact on obesity progression of FGF21 and GDF15 as myokines. Furthermore, we are studying mice with a mitochondrial defect in brown adipose tissue (UCP1 KO mice) to evaluate the metabolic impact of both cytokines when secreted from brown fat.

Collectively, we hope that our results will shed new light on the physiological role and potential synergistic interaction of endogenous FGF21 and GDF15 in the development of obesity, thereby opening new opportunities for the therapeutic use of cytokines for drug development.

TS09.02

MyoScreen™: a high-content-based discovery platform to model key metabolic processes in human skeletal muscle

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Introduction & Objective: Loss of muscle mass and function are now recognized as early and common abnormalities in a wide range of chronic diseases especially obesity, diabetes and cardiomyopathies. However, relevant *in vitro* screening models mimicking human physiological processes in muscles are still lacking.

Method: Using MyoScreen, a high-throughput and robust skeletal muscle drug discovery platform derived from human primary-myoblasts (Young *et al.*, 2018), we have developed a panel of predictive *in vitro* image-based functional assays combined with newly developed image analysis scripts, that recapitulate key metabolic disease hallmarks such as autophagy, lipid accumulation, muscle atrophy and mitochondrial health.

Results: Dose dependent accumulation of LC3b spots (puncta) (EC50= 20.77 µM for CQ, Chloroquine, EC50= 3.9 nM for BafA1, Bafilomycin) and area of vesicles positive for LC3b (EC50= 25.97 µM for CQ, EC50= 6.1 nM for BafA1) can be monitored in fixed starved (8h) cells following inhibition of autophagy flux. Co-labeling of LAMP1-LC3b follows the autophagic flux and autophagolysosome formation (EC50= 23.17 µM for CQ, EC50= 2.7 nM for BafA1). Oversupply of FAs (fatty acids) increases mitochondrial fragmentation and the relative area of LDs (lipid droplets) in myotubes by 13-23%: This accumulation can be modulated by siRNA

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treatment approach. MyoScreen™ demonstrated the ability to distinguish phenotypic properties related to stimulatory or inhibitory effects of hypertrophic (IGF-1 EC50=95.5 pM for fusion index) or atrophic (TNF-α IC50=15.9 pM for fusion index) signaling compounds.
Conclusion: The MyoScreen platform brings new prospects for drug discovery in metabolic disorders facilitating a predictive research strategy for identifying and validating novel targets, understanding mechanism of action, and supporting preclinical development to select innovative drug candidates targeting key aspects of muscle metabolic function.

Reference
Young J, Margaron Y, Fernandes M, et al. MyoScreen, a High-Throughput Phenotypic Screening Platform Enabling Muscle Drug Discovery. SLAS Discov. 2018;23(8):790–806. doi:10.1177/2472555218761102.

TS09.03

HS235, a Precision-Engineered Activin and GDF Ligand Trap, Is A Novel Lean Mass-Preserving Treatment for Obesity

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Introduction: HS235 is an activin receptor ectodomain-based (ActR) Fc-fusion protein that has been rationally designed for optimal inhibition of ligands involved in controlling lean body and fat mass as well as glucose handling in obesity. Activins and growth differentiation factors (GDFs), which are members of the TGF-beta superfamily, are validated targets controlling body composition and metabolism. Specifically, blockade of activins and GDFs has anabolic effects in metabolically active tissues such as skeletal muscle and brown adipose tissue, while reducing white adipose tissue mass. Therefore, specific and selective blockade of activins and GDFs represents a novel anti-obesity treatment strategy which can act orthogonally to incretins. Although incretin mimetics have revolutionized the pharmacotherapy of obesity and type 2 diabetes, incretins also reduce body mass in a non-selective manner. Specifically, incretin treatment leads to undesirable loss of lean body mass (LBM), accounting for ~40% of overall weight loss. The preservation, and potentially increase, of LBM is therefore a desirable treatment goal for obesity and overall cardiometabolic health. Here, we evaluate treatment effects of HS235 alone as well as in combination with incretin therapy.
Methods: A structure-assisted rational molecular engineering approach coupled with cell-based potency screening was employed to design HS235. To validate the anti-obesogenic potential of HS235, diet-induced obese (DIO) mice were injected with HS235, tirzepatide, or a combination of both. Body weight, fat and lean body mass (LBM) were assessed throughout the study. Muscle weights, hepatokine expression and biomarker readouts were assessed at the end of study.
Results: In cell-based assays, HS235 potently and selectively neutralized activins and GDFs implicated in body composition. In a DIO mouse model, both HS235 and tirzepatide significantly improved metabolic parameters and decreased fat mass. Only HS235 treatment increased LBM, while tirzepatide treatment led to significant LBM loss. Importantly, the addition of HS235 to tirzepatide led to an 18% increase in fat loss compared to tirzepatide alone and prevented the loss of LBM induced by tirzepatide.
Conclusion: Potent and selective inhibition of activins and GDFs by HS235 represents a novel LBM preserving weight loss strategy. HS235 delivers fat-exclusive weight loss which is orthogonal to incretin mimetics. Collectively, these data support the development of HS235 as a novel anti-obesity agent alone and as a complement to incretin-based medications to improve quality of weight loss.

TS10 – Mental Health, Disordered Eating, and Physical Activity

TS10.01

Integrated treatment for obesity and binge eating disorder

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The majority of those who seek treatment for binge eating disorder also have accompanying obesity or overweight. The best available psychological treatments for binge eating disorder produce good and lasting outcomes with regard to control over eating but virtually no weight loss, yet control over eating and weight loss are both critical and valued goals of those who seek treatment. A model of the processes maintaining both binge eating and the overweight or obesity that occurs in many patients with binge eating disorder who seek treatment has been designed. The model draws on previous research findings to highlight and integrate the factors maintaining disordered eating and the accompanying overweight or obesity. The new treatment based on the proposed model explicitly addresses the twin goals of cessation of binge eating and weight loss in an integrated fashion. The proposed treatment incorporates and integrates elements from two previously tested evidence-based interventions, enhanced cognitive behavioural therapy for eating disorders shown to reduce binge eating and cognitive behaviour therapy for obesity, which produces healthy weight loss. The treatment can also be associated with new weight loss drugs in a subgroup of patients. Should this treatment be successful, the goals of many patients who seek binge eating disorder treatment are more likely to be met.

TS10.02

Programme-led and focused interventions for eating disorders

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The co-presentation of obesity and binge eating is increasingly recognised. Binge eating disorder (BED) is present in some 5-30% of people living with obesity who are seeking weight management. Without post-binge compensatory or purging behaviour the consequence of binge eating is weight gain. Binge eating may therefore be a barrier to effective weight management.
Although BED became a formal diagnostic category in 2013, it continues to be the "Cinderella" eating disorder. Specialist eating disorder services are less likely to recognise or prioritise BED. Consequently, health professionals, including eating disorder staff, are less familiar with BED and may lack confidence in how to treat it. Compounding this, there is a reluctance of those with BED to seek treatment.
Guided self-help (GSH) is widely used in the treatment of a range of psychological disorders. Traditionally labelled as 'low intensity' and 'brief', these labels can be problematic as they imply the problem is mild and that patients are receiving a low level or sub-optimal intervention. 'Programme-led' and 'focused' are preferred alternatives.
In the NICE guidance for eating disorders, the recommended first line of treatment for adults with BED is a GSH programme. The Guide in GSH is what distinguishes 'guided' self-help from 'pure' self-help. Guides help a patient work around a self-help resource, facilitate engagement, motivate, and help review patients' progress. The Guide is central to engagement and adherence.
A recent overview of these interventions outlined a number of important features. They are suitable for different types of eating disorder presentations and can be delivered by a workforce trained and supervised in their use. They therefore offer the possibility to close the demand-capacity gap. With their capacity as personalised according to patient characteristics and preferences, they also align with patient-centred care.

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This presentation will summarise the outcomes of a number of short-term studies in which we have evaluated GSH for BED to people with overweight. In a UK dietetic-led, community weight management service, 24 adults with obesity completed the 3-month intervention. There was a significant improvement in eating disorder psychopathology, mood, and a reduction in loss of control over eating. In an audit of a new clinical service, we monitored two groups of adults with obesity and binge eating. Eleven of the 13 participants who completed the GSH intervention reduced their binge eating. Six had ceased binge eating altogether by the end of the intervention. In a third study with people with Type 2 diabetes, the proportion with binge eating fell to 41% at the end of the intervention. None of the twelve at 12-week follow-up were binge eating. In process evaluations, we have interviewed clients living with obesity (and/or diabetes) and their Guides. Emergent themes include the importance of having a Guide and the commitment needed by patients to complete GSH interventions.

TS10.03

Associations of anxiety, insomnia and their comorbidity with weight variation and incident obesity

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Introduction: Anxiety, short sleep, and poor sleep quality have been studied independently in relation to weight status. However, these conditions are highly comorbid. The main aim was to assess the prospective association between anxiety-insomnia comorbidity, body mass index (BMI) variation and obesity risk among adults recruited from the general population.
Methods: We selected participants from the ongoing NutriNet-Santé cohort with available BMI data who had completed the trait anxiety subscale of the Spielberger State-Trait Anxiety Inventory (STAI-T, 2013-2016) and a sleep questionnaire (2014). Participants were assigned to 4 morbidity groups: neither insomnia nor anxiety (reference), chronic insomnia only (defined with established criteria), high trait anxiety only (STAI-T ≥ 40), comorbid anxiety and insomnia. Associations between these morbidity groups and changes in BMI during follow-up were assessed using linear mixed models. Associations with obesity risk were assessed using Cox proportional hazards models.
Results: In total, 27,785 participants (mean age at baseline = 56 ± 13; mean BMI at baseline = 24.4 ± 4.5; 71% women) were included in the analyses (mean follow-up: 6.5 ± 2.7 years). Overall, 27% had anxiety only, 8% had chronic insomnia only, and 12% had both conditions. After adjustment for potential sociodemographic and lifestyle confounders, we observed a positive association between anxiety-insomnia comorbidity and an increase in BMI (men: β time (in years) x anxiety-insomnia comorbidity = 0.14, $p < 0.001$; women: β = 0.09, $p < 0.001$). Anxiety-insomnia comorbidity was also associated with a higher risk of obesity only in men (men: n = 207 incident obesity cases; HR = 1.71; CI: 1.06-2.76; women: n = 526 incident cases; HR = 1.00; CI: 0.77-1.30). We observed no associations between insomnia alone or anxiety alone with incident obesity.
Conclusion: This large prospective study revealed a positive association between anxiety-insomnia comorbidity and weight gain, in both men and women, as well as a higher risk of obesity in men. Future prospective studies using clinical measures of insomnia and anxiety, and focusing on gender differences and abdominal obesity, could confirm the findings.

Conflict of Interest: The authors have no relevant financial or non-financial interests to disclose.

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TS10.04

Adherence to the Mediterranean diet and risk of anxiety and depression in people with obesity: a cross-sectional analysis

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Introduction: Anxiety and depression are common mental disorders worldwide. Recently, excess body weight and obesity have been associated with psychopathological traits, and several data reported the existence of a bidirectional relationship between increased BMI and risk of anxiety and depression. It has been suggested that diet may be implicated in the onset and modulation of these disorders. While some evidence reported an inverse association between the adherence to high-quality dietary patterns and risk of depression in the healthy population, little evidence supports the relationship between adherence to the Mediterranean diet (MedDiet) and risk of anxiety and depression in the population with obesity. Therefore, the purpose of this study was to evaluate the association between adherence to the MedDiet and the risk of anxiety and depression in a large sample of people with obesity.
Methods: A cross-sectional study was conducted on 4957 participants with obesity (63.1% female, median age: 49 years, interquartile range (IQR): 40-58, median BMI: 33.6 kg/m², IQR: 31.6-36.9) recruited at the International Center for the Assessment of Nutritional Status (ICANS, University of Milan). Medical history, chronic drug therapies, socio-demographic and lifestyle information such as physical activity and smoking habits were investigated. Anthropometric measurements (weight, height, waist circumference and body fat by skinfolds) were taken. All participants completed a series of questionnaires to assess adherence to the MedDiet diet (14-item MEDAS questionnaire) and the presence of anxiety (20-item STAI2 questionnaire) and depressive symptoms (24-item QD questionnaire). STAI2 and QD scores ≥ 95th percentile of the reference population or a previous physician-made diagnosis of anxiety and depression were defined as clinically significant for the presence of anxiety and depression.
Results: The median STAI2 score was 39 (IQR: 33-47) while QD median score was 4 (IQR: 2-8). According to the criteria specified above, 11.9% of participants were found to be positive for anxiety and 11% for depression. Median MEDAS score was 6 (IQR: 5-8). Multivariate linear regression models adjusted for sex, age, BMI, waist circumference, body fat, education, marital status, smoking, physical activity, and antidepressant/anxiolytic drugs, showed a reduction of -0.18 points in the STAI2 questionnaire score for each 1-point increase in the MEDAS questionnaire (β: -0.18,

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95%CI: -0.33, -0.03, p=0.018) and a reduction of -0.10 points in the QD questionnaire score for each 1-point increase in the MEDAS questionnaire (β: -0.10, 95%CI: -0.16, -0.03, p=0.01). Moreover, multivariate logistic regression models adjusted for the same confounders showed that the risks of anxiety and depression were both significantly reduced by 7% for each 1-point increase in MEDAS score (OR = 0.93, 95%CI: 0.89; 0.98, p=0.008 and OR = 0.93, 95%CI: 0.88; 0.98, p=0.01).
Conclusions: Mediterranean diet is associated with a lower risk of anxiety and depression in people with obesity. Longitudinal studies should be carried out to understand the existence of a cause-effect relationship.

TS11 – Intergenerational Transmission

TS11.01

Parental lifestyle patterns in the prenatal period and risk of childhood obesity

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Introduction: High prevalence of overweight and obesity in preschool children suggests the involvement of early-life risk factors. The first 1,000 days, from conception to two years of age, represent a unique window of opportunity to implement child obesity prevention strategies and increase future health benefits. Most studies so far have evaluated the effects of early-life factors separately, with only a few investigating the combined and potentially synergistic effect of parental lifestyle factors on childhood obesity.
Objective: Our objective was to identify parental lifestyle patterns in the preconception and pregnancy periods and to assess their association with childhood overweight (including obesity, OW-OB) after 5 years.
Methods: We harmonised and interpreted data from four European mother–offspring cohorts participating in the EndObesity Consortium [EDEN and Elfe, France; Lifeways, Ireland; and Generation R, Netherlands] with data available for ~1,900, ~18,000, ~1,100, and ~9,500 families, respectively. Lifestyle factors were collected using questionnaires and included parental diet, smoking, body mass index (BMI), gestational weight gain (GWG), physical activity (PA), and sedentary behaviour. We applied principal component analyses to identify lifestyle patterns in preconception and pregnancy. Their association with child risk of OW-OB (as defined by the International Task Force reference) between the ages of 5 and 12 years were assessed using cohort-specific multivariable logistic regression models (adjusted for confounders, including parental age, education level, employment status, country of birth, parity, and household income).
Findings: We identified various parental lifestyle patterns with great consistency between countries. The two that better explained variance were characterised by "high parental smoking, low maternal diet quality (and high maternal sedentary behaviour or low PA in some cohorts)", and by "low parental BMI and high GWG" in pregnancy. A one-SD increase in the first pattern was associated with higher risk of child OW-OB at 5 years in Elfe [OR (95%CI) = 1.31(1.23;1.40)] and in Generation R [OR (95%CI) = 1.12 (1.06;1.18)]. The second pattern was consistently associated with lower risk of OW-OB in children at any age in most cohorts. Overall, we observed that patterns characterised by high parental BMI, smoking, low diet quality, or sedentary lifestyle during pregnancy (but also from the preconception period) were associated with higher risk of OW-OB in children aged 5–12 years.
Conclusion: Our study represents a significant contribution to the knowledge of how parental lifestyle factors during the prenatal period are associated with the risk of childhood obesity. These findings highlight the importance of early family-based and multi-behavioural childhood obesity prevention interventions. The future direction of this work includes the study of the social determinants of identified parental lifestyle patterns, including socio-economic position, migration status, urban environment, psychosocial factors and access to health care.

TS11.02

Intergenerational effects in the associations between childhood BMI trajectories and adult coronary heart disease

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Introduction: It is well-known that offspring of individuals with cardiovascular disease have higher risks of developing cardiovascular disease. Evidence also supports that body size in early life indicates later disease risks, whereas less is known about familial influences on these associations. Therefore, we examined if parental coronary heart disease (CHD) history modified the associations between offspring childhood body mass index (BMI) trajectories and adult CHD risks.
Methods: The study included 58,071 girls and 60,850 boys from the Copenhagen School Health Records Register, born 1952-1996 who had both parents identified in the Danish Civil Registration System. Offspring weight and height were measured regularly at school health examinations at ages 6-15 years. Five sex-specific childhood BMI trajectories were identified using latent class trajectory modelling. Information on offspring and parental CHD diagnoses (≥25 years) were obtained from the Danish National Patient Register between 1977 and 2022. Sex-specific hazard ratios (HR) and corresponding 95% confidence intervals (CI) were estimated using Cox regressions. Potential intergenerational effects between parental CHD history and childhood BMI trajectories on the risk of offspring CHD risks were evaluated using interaction tests.
Results: During a median of 18.3 years of follow-up, among the offspring, 1043 women and 1999 men were diagnosed with CHD. Among the parents, 13,594 mothers and 25,185 fathers were diagnosed with CHD. Most offspring had the average BMI trajectory (35.7% girls, 37.6% boys) in childhood, and fewer had the below-average (22.3% girls, 23.1% boys), above-average (24.6% girls, 24.0% boys), overweight (12.4% girls, 11.3% boys), or obesity (4.9% girls, 4.1% boys) childhood BMI trajectories. There were no interactions between parental CHD and childhood BMI trajectory on the risks of CHD in the offspring (P(women)=0.65, P(men)=0.72). In models adjusted for parental CHD, among female offspring childhood BMI trajectories at the levels of above-average (HR=1.29, 95% CI: 1.09-1.53), overweight (HR=1.51, 95% CI: 1.23-1.86) and obesity (HR=1.90, 95% CI: 1.39-2.60) had increased risks of CHD compared with women with the average childhood BMI trajectory. The corresponding estimates for men were HR=1.16 (95% CI: 1.03-1.31), HR=1.40 (95% CI: 1.19-1.64), and HR=1.97 (95% CI:1.51-2.56), respectively. No associations were found with the below-average BMI trajectory.
Conclusion: Parental CHD history did not modify the associations between offspring childhood BMI trajectories and CHD risks. Childhood BMI trajectories above average were adversely associated with adult CHD risks compared with the average childhood BMI trajectory, even after accounting for parental CHD history. These findings underscore the importance of childhood BMI as an indicator of CHD risks, independent of the intergenerational transmission of CHD risk.

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TS11.03

Maternal smoking, breastfeeding, and their interaction effect on children's BMI: The GECKO Drenthe and PIAMA birth cohorts

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Objective: Great emphasis has been placed on the negative impact of maternal smoking during pregnancy on the offspring, while breastfeeding (BF) is beneficial for both mothers and children. Breast milk plays a nutritional and immunological role in early life of children. However, it remains unknown if BF can counteract the negative effect of smoking on children. Therefore, the purpose of this study is to investigate the short-term and long-term effects of maternal smoking, BF, and especially to investigate if BF can modify the negative effect of maternal smoking during pregnancy, on children's BMI.

Method: In this study, we included 2142 and 3854 mother-child pairs from the Dutch GECKO Drenthe cohort and PIAMA cohort, respectively. Maternal smoking and BF data were based on multiple questionnaires for mothers and midwives. Birth outcomes such as birth weight, height and head circumference were measured by Well Baby Clinic nurses in the GECKO Drenthe cohort, and they are questionnaire based in PIAMA. Overweight and obesity of children were classified by International Obesity Task Force (IOTF) criteria.

Linear and logistic regression analyses, adjusted for relevant confounders, were used to investigate the effect of maternal smoking, BF, and their interaction at ages 3, 12 and 14 months, and 3/4, 5/6, 10/11 years for BMI Z-scores and at ages 3/4, 5/6, 10/11 years for overweight/obesity (OV/OB).

Results: For GECKO and PIAMA respectively, 20.7% and 20.3% mothers smoked during pregnancy. Maternal smoking during pregnancy was associated with lower birth weight and length (GECKO Drenthe study: β:-0.22 kg (95%CI: -0.28;-0.16), β:-0.68 cm (95%CI: -1.03;-0.33), respectively; PIAMA study: β:-0.13 kg (95%CI: -0.18;-0.09), β:-0.47 cm (95%CI: -0.71;-0.23), respectively). The prevalence of OV/OB is 17.8% at 10/11 years of age in GECKO Drenthe and 12.1% at 11 years of age in PIAMA. Maternal smoking during pregnancy was associated with higher BMI Z-scores and OV/OB across childhood (e.g. adjusted OR for OV/OB: 2.29 (1.54;3.41) at 10/11 years in GECKO Drenthe; aOR for OV/OB: 1.54 (1.09;2.17) at 11 years in PIAMA).

The prevalence of ever BF within 14 months was 74.6% in GECKO Drenthe and BF in the first 4 months was 82.1% in PIAMA. BF was not consistently associated with BMI Z-scores and OV/OB during childhood in both cohorts.

Significant interactions between maternal smoking during pregnancy and BF on children's BMI Z-scores and OV/OB were observed at age 5/6 in PIAMA (Interactions for BF 1-3 months x smoking, BMI Z-score: β -0.33, 95%CI: -0.60;-0.06), β for BF>3 months x smoking, BMI Z-score: -0.35, 95%CI: -0.62;-0.07), aOR for BF 1-3 months x smoking, OV/OB: 0.33, 95%CI: 0.13;0.86), aOR for BF>3 months x smoking, OV/OB: 0.27, 95%CI: 0.10;0.75). Interactions in GECKO Drenthe were found at 10/11 years (β for BF 1-3 months x BMI Z-score: -0.44, 95%CI: (-0.77;-0.07); aOR for BF 1-3 months x smoking, OV/OB: 0.33, 95%CI: 0.12;0.90).

Conclusion: Maternal smoking during pregnancy has short-term and long-term effects on children's growth, while BF may attenuate the negative impact of maternal smoking during pregnancy on children's BMI during childhood.

Tab. 1. Table main effect and interaction effects

	BMI Z-score		Overweight/obesity	
	GECKO Drenthe study	PIAMA study	GECKO Drenthe study	PIAMA study
3 months of age				
Smoking	**0.28 (0.03;0.53)**	0.004 (-0.13;0.13)		
BF<3 months	0.04 (-0.07;0.15)	**-0.13 (-0.22;-0.04)**	NA	NA
Interaction Smoking*BF<3 months	-0.15 (-0.41;0.12)	0.07 (-0.13;0.27)		
12/14 months of age				
Smoking	**0.51 (0.19;0.82)**	0.15 (-0.04;0.34)		
BF<3 months	**0.21 (0.08;0.35)**	0.01 (-0.11;0.13)		
BF≥3 months	0.13 (-0.01;0.25)	**-0.13 (-0.25;-0.02)**	NA	NA
Interaction Smoking*BF<3 months	-0.10 (-0.44;0.24)	-0.002 (-0.24;0.232)		
Interaction Smoking*BF≥3 months	0.02 (-0.30;0.35)	-0.11 (-0.35;0.13)		
3/4 years of age				
Smoking	**0.40 (0.05;0.75)**	**0.28 (0.08;0.48)**	**3.54 (1.13;11.15)**	1.71 (0.88;3.30)
BF<3 months	**0.20 (0.05;0.35)**	**0.13 (-0.01;0.25)**	**1.99 (1.03;3.83)**	1.22 (0.80;1.85)
BF≥3 months	0.10 (-0.04;0.24)	0.08 (-0.03;0.20)	1.36 (0.71;2.61)	1.04 (0.68;1.57)
Interaction smoking*BF<3 months	-0.27 (-0.63;0.10)	-0.21 (-0.45;0.03)	0.43 (0.10;1.79)	0.81 (0.37;1.79)
Interaction smoking*BF≥3 months	0.09 (-0.26;0.44)	-0.18 (-0.42;0.07)	1.06 (0.28;3.98)	0.81 (0.36;1.95)
5/6 years of age				
Smoking	**0.29 (0.02;0.55)**	**0.43 (0.21;0.65)**	**4.23 (1.73;10.35)**	**3.47 (1.62;7.43)**
BF<3 months	**0.13 (0.01;0.24)**	0.09 (-0.05;0.22)	1.68 (0.92;3.07)	1.69 (0.98;2.91)
BF≥3 months	**0.12 (0.01;0.23)**	0.11 (-0.02;0.24)	1.55 (0.87;2.75)	1.52 (0.88;2.60)
Interaction Smoking*BF<3 months	-0.24 (-0.52;0.05)	**-0.33 (-0.60;-0.06)**	0.30 (0.09;1.03)	**0.33 (0.13;0.86)**
Interaction Smoking*BF≥3 months	0.08 (-0.19;0.34)	**-0.35 (-0.62;-0.07)**	0.83 (0.29;2.39)	**0.27 (0.10;0.75)**
10/11 years of age				
Smoking	0.29 (-0.04;0.62)	**0.39 (0.14;0.63)**	**4.18 (2.02;8.68)**	**2.20 (1.12;4.32)**
BF<3 months	**0.16 (0.02;0.30)**	0.06 (-0.09;0.20)	1.35 (0.85;2.15)	0.86 (0.55;1.35)
BF≥3 months	0.07 (-0.06;0.20)	0.12 (-0.02;0.26)	1.38 (0.89;2.13)	0.88 (0.57;1.37)
Interaction Smoking*BF<3 months	**-0.44 (-0.77;-0.07)**	-0.18 (-0.48;0.12)	**0.33 (0.12;0.90)**	0.63 (0.26;1.50)
Interaction Smoking*BF≥3 months	-0.09 (-0.42;0.25)	-0.21 (-0.51;0.10)	0.55 (0.22;1.34)	0.62 (0.26;1.49)

BF<3m: breastfeeding less than 3 months; BF≥3m: breastfeeding 3 months or more; Smoking*BF: interaction effect. Data are presented as β (95% CI lower level; upper level) or aOR (95% CI lower level; upper level).

Main effect and interaction effects of maternal smoking during pregnancy and breastfeeding on future BMI and overweight/obesity of children in GECKO Drenthe and PIAMA cohorts

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TS12 – Tailored Pharmacologic Therapy for Obesity

TS12.01

Tirzepatide for the treatment of obesity reduced body weight across body mass index categories: post hoc analysis of the SURMOUNT 1-4 trials

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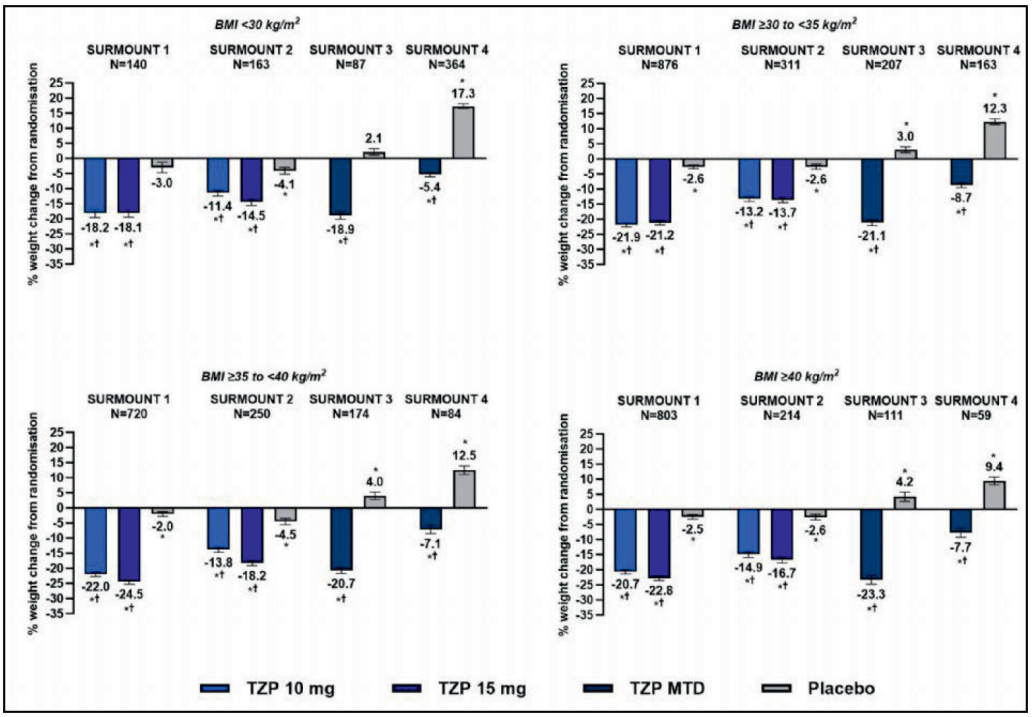
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Introduction: Treatment with the once-weekly glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptor agonist tirzepatide for the disease of obesity, induced significant and clinically meaningful weight reduction in the SURMOUNT 1-4 trials. This analysis examined the impact of baseline body mass index (BMI) category on weight reduction in these trials.

Methods: The SURMOUNT phase 3 program examined the efficacy and safety of tirzepatide versus placebo in people with a BMI ≥30 or ≥27 kg/m^2 with ≥1 weight-related comorbidity without type 2 diabetes (SURMOUNT-1, 72 weeks), with type 2 diabetes (SURMOUNT-2, 72 weeks), and without type 2 diabetes after a 12-week intensive lifestyle intervention (SURMOUNT-3, 72 weeks from randomisation) or after a 36-week open label tirzepatide lead-in (SURMOUNT-4, 52 weeks from randomisation). In this post hoc subgroup analysis, BMI subgroups were defined by <30, ≥30 - <35, ≥35 - <40, and ≥40 kg/m^2. We examined the percent change in body weight from randomisation to week 72 (SURMOUNT-1, -2, and –3) or week 88 (52 weeks after randomisation; SURMOUNT-4), as well as the proportions of participants achieving the weight reduction targets of 5, 10, and 15%. The analyses included participants in the modified intention-to-treat population, defined as all randomized participants who received at least one dose of study drug (tirzepatide or placebo), excluding data after premature discontinuation of study drug (efficacy analysis set).

Results: Across SURMOUNT 1-4, tirzepatide treatment resulted in significant body weight reductions relative to placebo, irrespective of the BMI subgroup (Figure). In addition, more participants randomised to tirzepatide than placebo achieved the body weight reduction targets of 5, 10, and 15%. Across the BMI subgroups, up to 100% of tirzepatide-treated participants achieved weight reduction of ≥5% vs. 30% with placebo in SURMOUNT-1, up to 93% vs. 43% in SURMOUNT-2, and up to 97% vs. 15% in SURMOUNT-3. The respective proportions achieving body weight reduction of ≥10% were up to 93% vs. 16% in SURMOUNT-1, up to 76% vs. 14% in SURMOUNT-2, and up to 92% vs. 8% in SURMOUNT-3. Furthermore, up to 85% of participants achieved weight reduction of ≥15% with tirzepatide vs. 7% with placebo in SURMOUNT-1, up to 60% vs. 3% in SURMOUNT-2, and up to 78% vs. 4% in SURMOUNT-3. In SURMOUNT-4, during the 36-week open-label tirzepatide treatment, the mean body weight reduction was 20.9%. After this lead-in period, further weight reductions of ≥5, ≥10, and ≥15% were achieved by up to 70%, 39%, and 22%, respectively, of participants treated with tirzepatide vs. 2%, 2%, and 0% with placebo.

Conclusion: Regardless of baseline BMI, tirzepatide consistently reduced body weight versus placebo in people with a BMI ≥27kg/m^2 across the SURMOUNT 1-4 trials.



Data are least squares mean (standard error). Data were analysed from randomisation to primary endpoint (72 weeks in SURMOUNT-1, -2 and -3 and 52 weeks in SURMOUNT-4). *p<0.05 from randomisation and †p<0.05 for TZP vs. placebo. BMI=body mass index; MTD=maximum tolerated dose (10 or 15 mg); N=number of participants who were randomly assigned and received at least 1 dose of the study drug; TZP=tirzepatide.

Fig. 1. Percent weight change from randomisation in BMI subgroups at the primary endpoint of the SURMOUNT 1-4 trials.

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TS12.02

Long-term weight loss in the SELECT trial: semaglutide 2.4 mg vs placebo over 208 weeks in a global population of 17,604 participants

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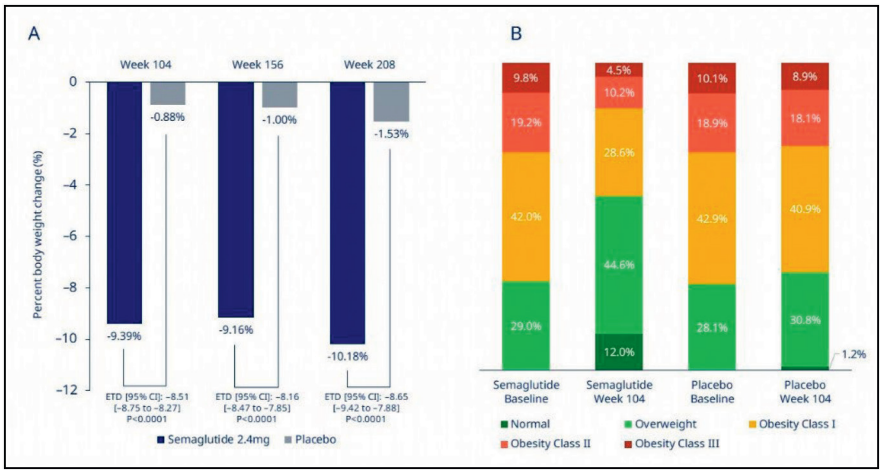
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Introduction: The SELECT cardiovascular (CV) outcome trial provided the opportunity to study weight and anthropometric effects of semaglutide vs placebo over 4 years of intervention in a large, geographically and racially diverse population of individuals with body mass index (BMI) ≥27 kg/m² and pre-existing CV disease, without type 2 diabetes.

Methods: SELECT, a multicentre, randomised, double-blind, placebo-controlled, event-driven superiority trial, enrolled 17,604 patients aged ≥45 years. Patients were randomly assigned to receive once-weekly subcutaneous semaglutide 2.4 mg or placebo in addition to standard of care recommendations for secondary prevention of CV disease, including healthy lifestyle counselling without specific weight-loss instruction. This prespecified, as-treated analysis examined the effect of semaglutide and placebo on weight change, anthropometric measures and subgroups based on baseline demographics, weight-related and glycaemic measures. We assessed the following measures: change in body weight (%); change in waist circumference (WC, cm); change in WC/height ratio (WHtR) and change in BMI category.

Results: With semaglutide, weight loss continued to week 65 and then weight was sustained for the rest of the study. Mean percent weight losses with semaglutide 2.4 mg vs placebo at years 2, 3 and 4 are shown (Figure 1A). At 208 weeks, semaglutide was associated with robust and sustained weight loss (average −10.18%), reduced WC (average −7.73 cm) and improvement in average WHtR (−6.85%) as compared with placebo at the same time points (−1.53%, −1.34 cm and −0.99%, respectively; p<0.0001 for all comparisons vs placebo). These improvements were seen across both sexes and all categories of race, age, baseline glycaemic status and degree of adiposity. We analysed change in BMI category at week 104 (Figure 1B). More patients in the semaglutide-treated group (52.4%) experienced improvement in BMI category compared with those receiving placebo (15.7%). In the semaglutide group, 12% reached a BMI <25 kg/m² compared with 1.2% for placebo.

Conclusion: In SELECT, use of once-weekly subcutaneous semaglutide 2.4 mg produced clinically significant and durable weight loss and improvements in anthropometric measurements over 4 years in individuals with BMI >27 kg/m² and pre-existing CV disease from diverse racial and geographic backgrounds and with varied body anthropometrics.



Panel A: If the data point could potentially be observed, missing data were multiple imputed (n=500) by randomised treatment arm at weeks 104, 156 and 208, irrespective of treatment status. Panel B: Observed data from the in-trial period. BMI categories: Normal (BMI <25 kg/m²), Overweight (25 to <30 kg/m²), Obesity class I (30 to <35 kg/m²), Obesity class II (35 to <40 kg/m²), Obesity class III (BMI ≥40 kg/m²). BMI, body mass index; CI, confidence interval; ETD, estimated treatment difference.

Fig. 1. Estimated percentage change in body weight at weeks 104, 156 and 208 (A) and change in BMI weight category from baseline at week 104 (B).

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Wednesday, 15 May 2024

TS13 – Gut Feelings in Obesity

TS13.01

Role of the Gut Microbiota on Energy Homeostasis

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More than 20 years ago, studies comparing germ-free mice and conventional mice and subsequently using fecal transfer experiments from conventional mice to germ-free recipients have proven that the microbiota was involved in weight storage within the adipose tissue. Since then, human data have confirmed that during obesity, gut microbiota underwent substantial dysbiosis. More interestingly, data has accumulated to better understand how gut microbiota was involved in energy homeostasis. Yet mechanisms, have not been fully elucidated. This talk will review how during obesity, altered gut microbiota and its associated metabolites contribute to the progression of the disease by disrupting energy homeostasis, promoting lipid synthesis and storage, modulating central appetite and feeding behavior, as well as triggering chronic inflammation. Gut microbiota-diet interactions seem to interfere in nutrient sensing and signaling from the gut to the brain, where the information is processed to control energy homeostasis. This gut microbiota-brain crosstalk is mediated by metabolites, mainly short chain fatty acids, secondary bile acids or amino acids-derived metabolites and subcellular bacterial components, all of which could activate gut-endocrine and/or neural-mediated pathways or pass to systemic circulation and then reach the brain and impact energy homeostasis.

TS13.02

Metabolic Activity of the Microbiota: Turning the Invisible into Visible

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Metabolic diseases have pandemic proportions, which continue to rise, despite huge investments and successful drug discovery. The control of blood glucose and other targets remains suboptimal, with enormous suffering. It is of paramount importance to identify sources of inter-subject variability to recommend best management for each person. Each person has a unique microbiota, which is considered a valid preventive-therapeutic candidate in the field. Recently reviewed publications on faecal microbiota transplantation (FMT) relating to obesity, prediabetes and type 2 diabetes rule in favour of a direct and clinically potent action of the microbiota to regulate the glucometabolic and inflammatory profile, beyond body weight. To date, the human intestinal microbiota and its products are characterized ex vivo, most commonly in samples of faecal material, which oversimplifies the concept of gut-organs axes. The combination of microbiota assessment and in vivo imaging could support advancements in the characterization of microbiota activity and effects. Our work focuses on the use of positron emission tomography, a non-invasive imaging technology, utilizing radiotracers to visualize molecular biology and pharmacokinetics in 4D in situ, in combination with other techniques to measure texture and morphology. The use of these technologies can help visualize features and activities that are inherent or consequent to the microbiota. Recent studies on FMT from donor children to recipient mice, undergoing organ-specific imaging, highlight durable actions of remarkable magnitude, with inter-organ response differences. The feasibility and proof-of-concept for functional imaging of microbiota in situ in relation to composition and metabolic response will be addressed.

TS13.03

Gain and Loss of Glucose-dependent Insulinotropic Polypeptide Receptor Signaling Modifies Gut Inflammation in Mice

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Introduction: Glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide 1 (GLP-1) are incretin hormones that potentiate insulin secretion. GLP-1 and GIP also act on the brain to suppress appetite and promote weight loss (1). The clinical development of GIP receptor (GIPR)–GLP-1 receptor (GLP-1R) co-agonists, exemplified by Tirzepatide, and emerging GIPR antagonist-GLP-1R agonists such as Maridebart cafraglutide (AMG 133) has increased interest in the extra-pancreatic actions of these hormones. GLP-1R agonism alleviates systemic and gut inflammation, demonstrating an added potential benefit of this drug, since a leaky and inflamed gut and ensuing systemic inflammation may contribute to obesity-associated complications. In contrast, less is known about the actions of GIP on inflammation. The GIPR has been localized to bone marrow (BM)-derived myeloid cells (3), and GIPR agonism reduces adipose tissue inflammation through mechanisms involving BM-derived Gipr+ macrophages (4). Although GIP is produced in the gut, the role of GIPR signaling in the regulation of gut inflammation remains unknown. We hypothesize that GIP attenuates gut inflammation, actions potentially mediated by bone-marrow derived *Gipr*+ myeloid cells.
Methods: The immune response to gut inflammation induced by 5-fluorouracil (5-FU) was assessed in: i) C57BL/6 wild-type (WT) mice treated with or without a GIPR agonist, (ii) mice with or without global *Gipr* deletion, (iii) WT mice transplanted with bone marrow from *Gipr*+/+ or *Gipr*-/- mice, and (iv) *Gipr*+/+ or *Gipr*-/- mice transplanted with BM from WT mice. Intestinal tissue biometry, H&E histology, plasma, gene and protein expression of proinflammatory cytokines were measured in the small bowel. Localization of *Gipr* expression was assessed in gut immune and non-immune cells.
Results: GIPR agonism alleviates 5-FU-induced gut inflammation whereas genetic deletion of *Gipr* exacerbates the proinflammatory response to 5-FU in the murine small bowel. BM-derived *Gipr*-expressing cells suppress 5-FU-induced gut inflammation in the context of global *Gipr* deficiency. Within the gut, analyses using cell fractionation, *Gipr* reporter mice, and single cell RNA-seq localized *Gipr* to non-immune cells, specifically stromal CD146+ cells.
Conclusion: Gain and loss of GIPR signaling modifies the extent of small bowel inflammation, findings with potential translational relevance for clinical strategies modulating GIPR action in people living with obesity and/or type 2 diabetes.

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Conflict of Interest: None directly related to these studies.

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TS13.04

Effect of uroguanylin and guanylin on the improvement of pancreas steatosis and β-cell function after bariatric surgery in an experimental model of diet-induced obesity

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Introduction: Pancreas steatosis contributes to the inflammation and dysfunction of β-cells, ultimately leading to the onset of insulin resistance and type 2 diabetes. Bariatric surgery reduces pancreatic fat accumulation and improves insulin resistance, but the underlying mechanisms remain unknown. We sought to evaluate whether guanylin (GUCA2A) and uroguanylin (GUCA2B), two gut hormones involved in the regulation of food intake and adiposity, participate in the amelioration of pancreas steatosis following bariatric surgery in a preclinical model of diet-induced obesity.

Methods: Pancreas steatosis and inflammation were measured in male Wistar rats with diet-induced obesity (n=125) subjected to surgical (sham operation and sleeve gastrectomy) or dietary (pair-fed to the amount of food eaten by gastrectomized animals) interventions. The tissue distribution and the expression of the guanylin system were evaluated in rat pancreata by real-time PCR, Western-blot and immunohistochemistry. The effect of guanylin and uroguanylin on factors involved in insulin secretion and lipogenesis was determined in vitro in RIN-m5F β-cells exposed to lipotoxic conditions.

Results: Sleeve gastrectomy reduced pancreas steatosis and inflammation as well as improved insulin sensitivity and synthesis (all $P<0.05$). An upregulation (all $P<0.05$) in mRNA and protein expression of GUCA2A and the receptor of guanylin peptides GUCY2C, but not GUCA2B, was observed in the pancreata from rats with diet-induced obesity one month after sleeve gastrectomy. Treatment with guanylin or uroguanylin decreased the lipotoxicity in palmitate-treated RIN-m5F β-cells, evidenced by lower intracellular triacylglycerol content and the downregulation of the lipogenic factors Srebf1, Mogat2 and Dgat1 (all $P<0.05$). Both guanylin peptides diminished insulin synthesis (Ins1 and Ins2) and secretion from RIN-m5F β-cells, but only guanylin upregulated Wnt4, a factor involved in β-cell proliferation and function (all $P<0.05$).

Conclusion: Sleeve gastrectomy ameliorated pancreatic steatosis and β-cell function. Several mechanisms, including the reduction of inflammation and lipogenesis as well as the upregulation of GUCA2A in the pancreas, might explain this beneficial effect of bariatric surgery.

Conflict of Interest: None disclosed.

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TS14 – Ultra-Processed Foods: Fact or Fad

TS14.01

Why is UPF so controversial?

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The transition towards a modern food system is characterized by increased consumption of processed foods. Partly this is a positive development, as food processing assures food safety and offers many opportunities to improve diet quality. According to a well-known classification (NOVA, Monteiro 2011) ultra-processed foods (UPF) are foods that modified by physical, biological and chemical processes and made into ready-to-eat foods and drinks. UPF are generally high in energy, sugar, saturated fat and salt, and are associated with obesity and diet-related diseases, such as cardiovascular disease, type 2 diabetes, and certain forms of cancer. Recently, association with e.g. depression or asthma also have been reported.

However, most of the disease-related data have been obtained from observational studies with self-reported intake data. That is a first limitation which needs to be discussed: which food is UPF and which food is not, and can we assess its intake reliably? Several studies have shown that classification using e.g. NOVA, is difficult. This not only hampers the quality and interpretation of epidemiological results, but also poses a difficulty for implementation of UPF in food-based dietary guidelines (FBDG). For example, whole grain bread is regarded as UPF in most studies, while obviously is it part of a healthy diet and included in many FBDG across the globe.

A second limitation of the UPF concept in health are the findings so far. Studies investigating sub-groups of UPF generally report that not all UPF are detrimentally associated with health outcomes, but findings are mostly limited to sugar-sweetened beverages (SSB) and processed/red meat, and not to other food groups. Again, for whole grain bread and cereals often a beneficial association is observed, as expected based on nutritional knowledge.

A third issue is the suggestion that UPF are unhealthy because of the content of additives, incl. non-nutritive sweeteners, emulsifiers, etc. Interestingly, a RCT (Hall, 2019) showed that UPF diets induce higher energy intake and subsequently body weight compared to a nutrient-matched unprocessed diets. But results so far suggest that this is due to faster eating rate (due softer texture) rather than to specific compounds. On the other hand, we should look at the UPF discussion from a more global perspective. The main drivers of UPF usage are increased prosperity, structural transformation of the economy, and rapid urbanization. Additionally, the use of UPF is highly influenced by the power of transnational food and beverage companies (TFBCs), which is also affecting the supply chain and government policies. From the viewpoint of a public health officer in a low- or middle income country (LMIC) it is understandable that the shifts of dietary patterns from a traditional diet towards a more 'westernized' diet is not regarded as beneficial. Hence activities to limit this transition are logical. However, these activities should be based on solid science, and not by creating a food category based on fear of chemicals or industrialization (or even political conviction?): the credibility of nutrition and health science is at stake.

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TS14.02

Ultra-processed foods: from a concept to epidemiological evidence

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Poor diets now contribute to the largest burden of disease worldwide, and our food systems are likely to have brought about growing epidemics of ill health with profound societal implications. Recently, rapidly growing evidence linking ultra-processed foods (UPFs) to major health conditions has drawn attention to the public health significance of industrial food processing, challenging the traditional predominantly nutrient-centric health focus. Prompted by emerging evidence, major health organisations have endorsed the UPF concept, and some countries have introduced policies to reduce its consumption and/or prevent further rise. However, the UPF concept and evidence have been subject to extensive policy and research interest and debate.

In this presentation, I aim to outline the emerging evidence linking diets high in ultra-processed foods to unhealthy weight and cardiometabolic disorders, examine the evidence and discuss considerations around the need for public health policy interventions.

In the first part of the presentation, I will talk about the Nova food processing classification system, and discuss the importance of the 'purpose of industrial processing' element of the concept, and its significance regarding driving ultra-processing. Many different types of food processing are essential and carry great benefits for health and societies. However, UPF dietary patterns differ in many ways from those based on traditional processing techniques. I will talk about the importance of UPF characteristics at food and dietary levels, and the importance of conceptualising individual food products in the context of dietary patterns and food systems.

In the second part of the presentation, I will examine epidemiological evidence linking UPF dietary patterns to adverse cardio-metabolic outcomes. I will draw on recently emerging epidemiological evidence. The United Kingdom is one of the highest UPF consumers on a global scale, and I will present examples of our own research from the United Kingdom in this field in adults and children. Finally, I will talk about the need for policy interventions to rebalance dietary patterns and food systems.

TS14.03

'Disentangling Brain Responses to Unprocessed and Processed Foods'

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The question of why humans are the only species to cook their food centers around an event approximately 1.5 million years ago when fire was first harnessed for cooking, leading to significant physical and cognitive changes (known as "cooking hypothesis"). My previous research, utilizing state-of-the-art neuroscience techniques, revealed that the brain rapidly assesses the level of food processing (as early as 130ms post-stimulus presentation). Unlike our ancestors, who made decisions while fasting in food-scarce and high-risk environments, our modern food context differs significantly. In an effort to comprehend the intricacies of food cognition within the framework of today's obesogenic settings, we introduced the FEED framework. This framework explicates how evolutionary adaptive brain mechanisms play a pivotal role in shaping our responses to food in the modern environment, including food preferences towards foods high in fat and sugar and psychological traits such as food neophobia. Our recent investigations have delved into the impact of food processing levels on safety evaluations in adults, providing noteworthy insights into the dynamic interplay between cognitive processes and the modern food landscape.

TS15 – Immunomodulation

TS15.01

Gut microbial metabolites in control of body weight and insulin sensitivity

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Evidence is accumulating that the gut microbiome is involved in the aetiology of obesity and obesity-related complications such as insulin resistance and type 2 diabetes mellitus (T2DM). The gut microbiota is able to ferment indigestible carbohydrates, thereby yielding important metabolites such as short-chain fatty acids and succinate. Numerous animal studies and a handful of human studies suggest a beneficial role of these metabolites in the prevention and treatment of obesity and its comorbidities. Interestingly, the more distal colonic microbiota primarily ferments peptides and proteins, as availability of fermentable fibre, the major energy source for the microbiota, is limited here. This proteolytic fermentation yields mainly harmful products such as ammonia, hydrogen sulfide and branched-chain fatty acids, which can be detrimental for host gut and metabolic health. Therefore, a switch from proteolytic to saccharolytic fermentation could be of major interest for the prevention and/or treatment of metabolic diseases.

TS15.02

Obesity and Infection: a two way street

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Infection is the commonest reason for a child to be admitted to hospital, consult a general practitioner and have an operation. Antimicrobials are among the commonest prescribed drugs across the lifespan. This presentation will provide an overview of the epidemiological and mechanistic data showing a link between infection and its treatment and the development of obesity and metabolic dysfunction across the life course. It will also explore the emerging data, highlighted by the COVID-19 pandemic, of the increased risks of poor outcomes with some infections in those with obesity and/or type 2 diabetes.

TS15.03

Alterations in maternal nutritional and metabolic status only partially explain fetal growth restriction after sleeve gastrectomy and Roux-en-Y-gastric bypass

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Introduction: Evidence is still lacking as to whether the nutritional and metabolic status of pregnant women undergoing Roux-en-Y-gastric bypass (RYGB) or sleeve gastrectomy (SG) affects fetal growth (FG). The aim of this study is to evaluate the relationships between maternal nutritional and metabolic parameters after both procedures and FG.

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Methods: Women with a singleton pregnancy who had at least one second-trimester nutrition assessment at our institution between 2006 and 2022 were included. We assessed birth weight (BW), BW Z-score (adjusted for sex and term) and nutritional deficiencies according to standard and pregnancy-specific norms (Abbassi Ghanavati, 2009). Small-for-gestational-age (SGA) was defined as a BW Z-score <10th percentile.
Results: One hundred and forty-three women had 169 pregnancies during the study period: 79 after RYGB and 90 after SG. Mean BW were similar after RYGB and SG (3068±673 g vs. 3198±515 g), as were BW Z-score (-0.36±1.08 vs. -0.38±1.02) and the proportion of SGA (25% vs. 24% respectively). Weight loss before pregnancy was significantly higher after RYGB than after SG (35% vs. 30%, p=0.002) and was negatively correlated with BW Z-score only after SG (R=-0.287, p=0.007). Mean maternal weight and maternal body mass index before pregnancy were similar after both procedures, as were maternal age, parity and time from surgery to pregnancy; these parameters were not correlated with BW Z-score. Weight gain during pregnancy was significantly higher after SG than after RYGB (10.8±6.8 vs. 8.5±6.1 kg, p=0.03) but was not associated with BW Z-score.
The number of nutritional deficiencies in the second trimester was similar after both procedures (3.7±1.9 vs. 3.2±1.9 with pregnancy norms) but women after RYGB took more multivitamins, more oral supplements and more injectable vitamin B12. Among nutritional parameters, albumin-corrected calcium and total lipids-corrected vitamin E were significantly lower after RYGB than after SG, but were not associated with FG. All serum iron parameters were inversely correlated with BW Z-score after RYGB, but not after SG. Urinary urea was positively correlated with BW Z-score after RYGB (R=0.297, p=0.04) but not after SG. Among metabolic parameters, fasting insulin and LDL-cholesterol were significantly lower after RYGB than after SG, as expected. Fasting blood glucose and insulin were positively correlated to BW Z-score after RYGB (R=0.315, p=0.006, and R=0.325, p=0.004, respectively), but not after SG. In contrast, LDL-cholesterol was positively correlated with BW Z-score after SG (R=0.221, p=0.04) but not after RYGB.
Conclusion: In our study, BW Z-score was similar after RYGB and SG, but the nutritional and metabolic parameters influencing fetal growth differed. Fetal growth restriction may be partly explained by maternal nutritional or metabolic changes following RYGB, but less so following SG. Other maternal parameters should be investigated to explain fetal growth restriction after bariatric surgery.

TS15.04

Maternal high-fat feeding drives CCR2 monocyte infiltration into the offspring's hypothalamus

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Introduction: A high-fat diet (HFD) triggers a coordinated pro-inflammatory response in the hypothalamus, mediated by intricate crosstalk between cytokines and chemokines, accompanied by the recruitment of peripheral immune cells, such as CCR2 monocytes, that express the receptor for monocyte chemoattractant protein-1 (CCL2). A recent study from our research group unveiled a distinct sexual dimorphism in the transcriptomic signature of hypothalamic CCR2 monocytes in HFD-fed mice, raising questions about the influence of maternal programming on the establishment of CCR2 transcriptome in offspring.
Methods: To address this question, we used CCR2-RFP mice, which express a red fluorescent protein (RFP) sequence replacing the coding sequence of the Ccr2 gene. Six-week-old CCR2-RFP female mice were divided into two groups: one fed on a standard diet (SD), the other fed on an HFD for four weeks, and then all females were bred to CCR2-RFP males. Offspring were weaned at post-natal day 21 (P21), separated by gender, and weighed. Glycemia was measured after a 6-hour fast, and blood samples were collected for biochemical analyses. Offspring brains were designated for CCR2 monocyte visualization by confocal microscopy, with retroperitoneal white adipose tissue harvested for adiposity assessment. The experimental protocol was approved by the Committee on Ethics in Animal Use (CEUA 6312-1/2023) of the University of Campinas.
Results: On the weaning day (P21), male and female littermates from HFD-fed dams displayed increased body and fat mass, along with higher plasma levels of total cholesterol and triglycerides compared to the offspring from SD-fed dams, and no significant differences were observed in fasting glycemia. Confocal microscope analysis revealed a substantial presence of CCR2 monocytes in the hypothalamic parenchyma and lining the third ventricle of male and female littermates from HFD-fed dams, which was not observed in the offspring from the SD-fed dams.
Conclusion: Collectively, our findings solidify the link between maternal HFD and offspring metabolic reprogramming, affecting their energy metabolism and accelerating the trafficking of CCR2 monocytes to the hypothalamus. In forthcoming analyses, we aim to investigate the hypothalamic chemokine profile in these offspring and characterize the transcriptome of CCR2 monocytes derived from their blood samples. Our objective is to elucidate the key target genes and signaling pathways modulated by fetal metabolic programming.

TS16 – Nutrition Management and Physical Activity in Sarcopenic Obesity in the NCDs Era

TS16.01

Nutritional Intervention and Skeletal Muscle Preservation During Weight Loss

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Evidence shows that weight loss induced by several causes, including hypocaloric diets, bariatric surgery, medications, and chronic diseases involves the loss of both fat and muscle mass, as well as muscle function.
Certain treatment strategies for obesity may be harmful for sarcopenia or vice-versa: intentional weight loss in older adults with obesity has been shown to improve morbidity and physical function, but weight loss may also lead to loss of muscle mass, which may worsen sarcopenia and hamper physical function.
Further research should focus on the identification of effective strategies, including combinations of exercise and nutrition interventions, to counteract muscle mass loss during weight loss and to prevent excessive fat mass weight gain or prevent the development
of sarcopenic obesity during weight regain. The preservation of muscle mass and function during weight loss is particularly relevant, since muscle is needed to adopt and implement exercise as an intervention against fat regain, such as in the case of visceral fat accumulation after bariatric surgery.
The efficacy of proposed approaches to treat obesity (notably caloric restriction, physical activity, pharmacological and psychological protocols, bariatric surgery) should probably be combined with strategies aimed at preventing/treating sarcopenia [exercise and functional rehabilitation, adequate protein intake (including the most appropriate amount, timing and type of protein in the diet and its interactions with exercise), nutrient supplementation (e.g. Vitamin D, whey protein, branched chain amino acids), pharmacological treatment].

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TS16.02

Exercise is Medicine

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Obesity and related chronic conditions, such as diabetes, cardiovascular disease, and cancer, are major public health challenges that affect millions of people worldwide. Physical activity and exercise are effective strategies for preventing and treating obesity and its complications, they can improve body composition, energy balance, cardio-metabolic health, and reduce inflammation. Physical activity refers to any bodily movement that requires energy expenditure, while exercise is a planned, structured, and repetitive subset of physical activity. For individuals with obesity, it is recommended to suggest and prescribe both these activities individually, based on a comprehensive clinical evaluation. This evaluation should include measurements of functional capacity, muscle strength, flexibility and balance. It will allow for a customized prescription that considers the individual's needs, capacity, limitations, health status and preferences. The FITT model should be used to specify the frequency, intensity, duration, and the type of the exercise to be performed. When dealing with people with obesity, it is important to consider both their cardiorespiratory and muscular fitness. It is crucial to balance the potential positive effects of exercise with the risk of adverse events or injuries. Furthermore, the American Heart Association has defined the assessment of functional capacity by means of a cardiopulmonary exercise tests a "clinical vital sign", i.e. a parameter of fundamental prognostic importance that should be measured "on a regular basis" in individuals with chronic diseases (AHA, 2016). It was precisely in pursuit of the goal of making physical activity assessment and promotion a standard clinical care that the Exercise is Medicine (EIM) initiative was founded. EIM is a global health initiative managed by the American College of Sports Medicine (ACSM) that connects healthcare with evidence-based physical activity resources for people of all abilities and health conditions. EIM has regional chapters in different countries, including Italy. EIM encourages physicians and other healthcare providers to include physical activity when designing treatment plans and to refer patients to exercise programs and qualified exercise professionals. EIM also supports research, education, and advocacy on the benefits of exercise for optimal health and disease prevention.

TS16.03

Brown adipose tissue is associated with reduced weight loss and risk of cancer cachexia up to one year after diagnosis

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Introduction: Brown adipose tissue (BAT) has been mostly investigated as a potential target against cardiometabolic disease, but it has also been linked to cancer-related outcomes. However, the relationship between BAT and cancer cachexia remains currently unclear in humans. The purpose of this study was to examine the interrelationship between BAT, changes in body weight, and cachexia in patients with cancers of different origins up to one year after diagnosis.

Patients And Methods: We conducted a retrospective cohort study comparing the weight trajectories and incidence of cancer cachexia (defined as: i) weight loss greater than 5% over past 6 months, or ii) weight loss greater than 2% if body mass index is lower than 20 kg/m^2) for up to a year in patients with detectable BAT (BAT+ group, n = 57) and patients without evidence of BAT (BAT- group, n = 73) on fluorodeoxyglucose positron emission tomography-computed tomography imaging (18F-FDG-PET-CT) conducted for cancer diagnosis and/or staging. Follow-up data at 3-, 6-, and 12-months after cancer diagnosis were retrieved from the patient electronic medical records. The two groups were a priori matched for demographic, anthropometric, such as height and weight, and disease-related characteristics at the time of diagnosis, as well season and outdoor temperature at the day of the PET-CT scan. Repeated measures Poisson regression analysis was fitted to estimate relative risk (RR) among BAT+ compared to BAT- patients for developing cancer cachexia over the 1-year follow-up.
Results: The BAT+ group did not experience the weight loss observed in the BAT- group during the 1-year follow-up (p = 0.012 for interaction between BAT status and time interaction). The incidence of cancer cachexia in the overall follow-up period was lower in the BAT+ group compared to the BAT- group (46.6% vs. 66.1%, p=0.03). The relative risk (RR) for developing cachexia was 39% lower in the BAT+ than the BAT- group, after statistically adjusting for age, sex, race, weight at diagnosis and cancer site (RR 0.61, 95% Confidence Interval: 0.39- 0.97).
Conclusions: Evidence of BAT on 18F-FDG-PET-CT imaging at cancer diagnosis was associated with body weight maintenance and lower risk for developing cancer cachexia up to one year after cancer diagnosis. Larger, prospective studies and mechanistic experiments are needed to expand and identify causal factors of our observations.

Conflict of interest: Nothing to declare.

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TS16.04

Comprehensive Multidisciplinary Weight Loss intervention for Patients with Severe Obesity: A Comparative Analysis in the Presence and Absence of Sarcopenia

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Introduction: A weight loss program can lead to alterations in body composition with a decrease in both fat mass and fat-free mass (FFM), including skeletal muscle mass (SMM). Traditional weight loss in individuals with obesity and sarcopenia face an elevated risk of experiencing additional loss of SMM, exacerbating their condition and potentially leading to increased disability
Methods: Patients aged 18 to 80 yrs with obesity (BMI >30kg/m^2) enrolled in a four-week multidisciplinary program underwent screening for sarcopenic obesity (SO). The assessment included handgrip test (HGs) for muscle strength and bioelectrical impedance analysis (BIA) for skeletal muscle mass (SMM). Comparative analyses were conducted between patients with and without SO, considering parameters such as body weight and BMI, body composition, the presence of clinical comorbidities, and

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Quality of Life (QoL). All variables were assessed at baseline and upon completion of the weight loss program.
Results: We assessed 3,205 patients who completed a multidisciplinary program between 2018 and 2023, consisting of a hypocaloric diet (75% of basal metabolic rate with a Mediterranean pattern) and aerobic physical activity (15 minutes, 3 times/day, 5 days/week). Sarcopenia was identified in 10,5% of the sample. At the program's conclusion, 1,145 individuals (36%) demonstrated a weight reduction >5% of their initial weight, categorizing them as "good responders". The mean age was 53 yrs, and 44% were women. In the baseline condition, individuals with SO (6% of good responders) exhibited significant differences compared to those without sarcopenia (No SO): age (60±11 yrs vs. 52±14 years, p=0.0002), body weight (109±22 kg vs. 121±21 kg, p=0.0001), fat-free mass (59±13 kg vs. 65±14 kg, p=0.0011), muscle mass (32±7 kg vs. 37±9 kg, p=0.0001), and HGs (16±5 kg vs. 36±11 kg, p<0.0001). The SO pts exhibited a higher frequency of poor clinical conditions in the PGWBI questionnaire (57% vs. 33%). Although BMI did not differ significantly between groups (42±6 kg/m² vs. 43±6 kg/m², p=0.0738), preliminary findings indicated a significant modification in body weight for SO compared to No SO (delta -6.64±2.23 kg vs. -7.56±1.86 kg, p<0.0001) and HGs (delta 3.33±4.60 kg vs. 0.74±3.57 kg, p<0.0001). However, the phase angle (PhA) showed no significant difference (delta 0.05±0.76° vs. 0.02±0.85°, p=0.773).
Conclusion: A weight loss program incorporating multidisciplinary interventions yields varied outcomes in individuals with SO. This specific condition shows a diminished response among patients achieving a "good response" in terms of weight loss. However, despite beginning with a suboptimal clinical condition regarding nutritional status (as indicated by PhA) and muscle strength (HGs), there is a greater potential for improvement in these deficits. Our recommendation is to tailor therapeutic programs specifically designed to address the challenges posed by sarcopenic obesity.

Conflict of Interest: Nothing to disclose

Funding: The present work was funded by Italian Ministry of Health.

ABSTRACT SESSION

Sunday, 12 May 2024

AS01 – Immunometabolism and Inflammation

AS01.01

Increased levels of netrin-1 in obesity promote visceral adipose tissue inflammation and are associated with insulin resistance

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Introduction: Netrin (NTN)-1 is a secreted laminin-like protein with pro- and anti-inflammatory roles in different settings, playing important roles in the obesity-associated low-grade chronic inflammation. The aim of this study was to determine the impact of NTN-1 on obesity and obesity associated-type 2 diabetes as well as its role in visceral adipose tissue (VAT) inflammation.
Methods: Plasma NTN-1 and its receptor neogenin (NEO)-1 was measured in 91 participants [18 normalweight (NW) and 73 with obesity (OB)] and the effect of weight loss was evaluated in patients with OB undergoing bariatric surgery (n=23) or caloric restriction (n=14). Gene expression levels of NTN1 and NEO1 were assessed in human VAT, liver and peripheral blood mononuclear cells. In vitro studies in visceral adipocytes were performed to study the impact of inflammation-related mediators on NTN1 expression levels as well as the effect of NTN-1 on inflammatory markers.
Results: We found that the increased (P<0.001) circulating levels of NTN-1 in patients with obesity decreased (P<0.05) after diet-induced weight loss, being also associated with a reduction in glucose (P<0.01) and insulin (P<0.05) levels. Gene expression levels of NTN1 and NEO1 were upregulated in the VAT (P<0.05) from patients with obesity. In comparison to adipocytes, stroma-vascular fraction cells (SVFC) from patients with OB exhibited higher mRNA levels of NTN1 (P<0.001) and NEO1 (P<0.05). NTN1 was significantly enhanced (P<0.01) under hypoxic conditions and by the inflammatory factors LPS and TNF-α in adipocytes. The treatment with NTN-1 promoted the upregulation (P<0.05) of pro-inflammatory (IL1B and IL18) and chemotactic molecules (CCL2) as well as its receptor NEO1 in visceral adipocytes.
Conclusion: Findings of our study suggest that NTN-1 is an inflammatory factor with increased circulating concentrations in patients with obesity mainly secreted by the SVFC from the VAT that favours chronic inflammation and insulin resistance in obesity.

Conflict of Interest: There is no conflict of interest.

Funding: Funded by Instituto de Salud Carlos III-FEDER (project PI19/00785, PI20/00080, PI20/00927 and PI22/00745) and CIBER Fisiopatología de la Obesidad y Nutrición (CIBEROBN), an initiative of the Instituto de Salud Carlos III, Spain.

AS01.02

B cell-derived Nociceptin Contributes to Metabolic Dysregulation in Obesity

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Introduction: Obesity imposes a heavy burden on healthcare systems worldwide. Individuals with obesity face a heightened risk of developing insulin resistance and type 2 diabetes. The chronic low-grade inflammation in metabolic tissues associated with obesity is one of the major drivers of these conditions. Neuropeptides play a crucial role in the regulation of diverse physiological responses, including metabolism and inflammation. Interestingly, specific neuropeptides, such as neuropeptide y (NPY), neuropeptide FF (NPFF) and neurotensin have shown to influence inflammatory processes in adipose tissue. Further understanding of how this peripheral neuropeptide signaling contribute to chronic inflammation could help identify potential therapeutic targets to help mitigate obesity-related inflammation. Nociceptin, also known as orphanin FQ (N/OFQ), is a 17 amino acid neuropeptide with diverse physiological roles. N/OFQ activates the nociceptin/orphanin FQ (N/OFQ) peptide receptor (NOP) and this peptide–receptor system has been implicated in a diverse range of biological functions including pain, cardiovascular control, and immune function. Regarding the immune system, studies have reported increased monocyte chemotaxis and T-cell proliferation in response to

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N/OFQ treatment, further underscoring the multifaceted impact of this neuropeptide-receptor system. In this study, we characterized the immunomodulatory role of nociceptin in the context of diet-induced obesity.
Methods: Our preliminary studies indicate the expression of the nociceptin gene Pnoc in B cells. To specifically study the effects of peripheral nociceptin signaling in the development of metabolic inflammation, we developed a Pnoc conditional knockout model. Therefore, we generated a transgenic mouse line with a loxP-flanked Pnoc locus. By crossing this line with a B cell specific Cre mouse line (Cd19-Cre), we were able to create a B cell-specific Pnoc knockout model *PnocΔCd19*, allowing us to assess the role of Pnoc in the context of diet-induced obesity. Additionally, in vitro models were used to further investigate the molecular mechanisms of nociceptin on immune cell trafficking.
Results: While *PnocΔCd19* fed a normal chow diet (NCD) showed no difference to Cre-transgenic littermate controls, *PnocΔCd19* mice fed a 16 weeks high-fat diet (HFD) displayed an overall enhanced metabolic profile with significant improved insulin sensitivity and glucose tolerance. Moreover, *PnocΔCd19* mice showed increased energy expenditure, improved adipose tissue function and reduced markers of visceral adipose tissue inflammation. Interestingly, these results align with our in vitro data indicating a dose-dependent effect of nociceptin on macrophage mitochondrial bioenergetics and immune migration.
Conclusion: Our studies suggest a role for B cell-derived nociceptin in modulating immune cell crosstalk in the development of obesity and insulin resistance. Understanding the effect that nociceptin is having on immune cell migration and macrophage polarization provides valuable insights into potential therapeutic targets aimed at mitigating the effects of metabolic inflammation.

AS01.03

Modulating Adipose Tissue Dysfunction and Insulin Resistance in Obesity through SVEP1 Peptide-Mediated Inhibition of Macrophage-Driven Inflammation

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Adipose tissue dysfunction, characterized by surpassed storage limits and consequent metabolic imbalances, leads to systemic inflammation. The extracellular matrix, essential in the tissue microenvironment, modulates its function through interactions with adipocytes and immune cells, particularly myeloid cells, thus driving dysfunction progression and representing a potential therapeutic target. We report that a peptide from Sushi, Von Willebrand Factor Type A, EGF, and Pentraxin Domain Containing 1 (SVEP1), an extracellular matrix component, effectively blocked its integrin α9β1 receptor, resulting in improved obesity-induced adipose dysfunction and insulin resistance by diminishing inflammation via reduced pro-inflammatory macrophage activity. Detailed analysis of integrin α9β1, the SVEP1 receptor, showed specific expression in myeloid cells, especially in adipose tissue macrophages of dysfunctional tissues. In silico predictions affirmed the peptide's integrin affinity and its potential to block other ligand interactions, indicating an extensive functional range. Lipopolysaccharide (LPS)-activated bone marrow-derived macrophages (BMDM) treated with the peptide exhibited decreased adhesion and mobility on decellularized matrices from adipocytes.
Moreover, the peptide notably suppressed pro-inflammatory activation in cells and tissues, as demonstrated by inhibited MAPK and NF-κB pathways, altered BMDM inflammatory-related transcriptomics, and reduced cytokine production in macrophages in adipose tissue extracts from mice with obesity (ex vivo) following incubation with the peptide. Epididymal adipose tissue local peptide administration in high-fat diet fed mice decreased body and epiWAT weight, improved glucose sensitivity and hepatic function, and lessened adipose inflammation through a modulated macrophage phenotype and metabolism. Bulk and single cell transcriptomic analyses indicated downregulated pro-inflammatory response, improving adipocyte metabolic status, insulin sensitivity, and thermogenic capacity due to the anti-inflammatory state of the tissue's macrophages and upregulated mitochondreal activity. We demonstrate the peptide's role as a significant regulator of macrophages in obesity by its capacity to mitigate inflammation and restore glucose homeostasis. This project will contribute substantially to understanding potential metabolic and immune mediators in adipose tissue and serve as a basis for future therapeutics.

AS01.04

The inflammatory process triggers post-translational modifications of α7nAChR in hypothalamic cells, leading to an impairment in the response to endoplasmic reticulum stress

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Introduction: Inflammatory processes play an important role in the development of metabolic disorders associated with hypothalamic activity. Alpha7 Nicotinic acetylcholine receptors (α7nAChR) are widely expressed in the central nervous system and studies show that activation of leads to signal transduction pathways that result in inhibition of transcription of inflammatory cytokines. The intake of a short-term high-fat diet impairs the expression of α7nAChR, rendering the hypothalamus more susceptible to inflammatory damage. However, the specific cellular mechanisms underlying these impairments have yet to be elucidated.
The impairment in α7nAChR expression holds the potential to negatively impact critical cellular processes, culminating in α7nAChR accumulation of misfolded proteins and disruption of energy balance regulation. Our research aims to explore whether exposure to inflammatory conditions triggers cellular mechanisms that impair α7nAChR expression, leading to damage in cellular processes.
Methods: In the analysis of the ubiquitin-proteasome system (UPS), BV-2 microglia and mHypoA-POMC/GFP neuronal cell lines were subjected to treatment with lipopolysaccharide (LPS) or pre-treatment with bortezomib, followed by exposure to LPS. In the experiments involving endoplasmic reticulum stress, the mHypoA-POMC/GFP neuronal cell line underwent treatment with LPS, palmitic acid (PA), or pre-treatment with PNU-282987 (an α7nAChR agonist) followed by exposure to LPS or PA.
Results: Following the inflammatory stimulus, there was a decrease in *Chrna7* expression accompanied by an increase in pro-inflammatory cytokines, a trend that was reversed through pretreatment with PNU. We investigated the involvement of the ubiquitin-proteasome system using bortezomib, an inhibitor of this system. After LPS stimulation, the protein content of α7nAChR and ubiquitin-binding proteins decreased and increased, respectively. After treatment with bortezomib, we observed an even greater increase in ubiquitinated proteins given the blockage of the degradation process by the proteasome and the increase of α7nAChR, suggesting that its degradation was reduced. We also investigated the expression of genes related to the reticulum stress. In the neuronal cell line, LPS and PA increased the expression of *Atf4*, *Atf6* and *Eif2α*, which was reversed by PNU pretreatment.
Conclusion: These findings suggest the potential involvement of post-translational mechanisms, particularly through the activation of the Ubiquitin-proteasome system, in the downregulation of α7nAChR expression. Furthermore, they highlight the role of this receptor in preventing endoplasmic reticulum stress induced by inflammatory conditions.

Conflict of interest: None disclosed.

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AS01.05

Recruited CXCR3 immune cells to the hypothalamus protect against high-fat diet-induced body mass gain and metabolic dysfunction

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Introduction: Studies in rodents and humans have demonstrated that a high-fat diet (HFD) rapidly induces hypothalamic inflammation, leading to metabolic dysfunction development. This inflammatory response involves the release of proinflammatory cytokines and chemokines by neurons and glial cells, resulting in the recruitment of peripheral immune cells, such as CCR2+ monocytes, to the hypothalamic parenchyma. However, the specific chemokine signaling pathways underlying this recruitment and the contribution of recruited immune cells to metabolic dysfunction remain unclear.
Methods: We utilized 8-week-old male and female CX3CR1GFP/+CCR2RFP/+ mice fed either a chow diet or an HFD (45% of energy from fat) to investigate the transcriptomic signature of CX3CR1+ microglia and CCR2+ infiltrated monocytes. Hypothalamic CX3CR1+ and CCR2+ cells were isolated using fluorescent-activated cell sorting (FACS) for RNA sequencing. RNA samples were subjected to low input RNA-Seq library preparation (Takara SMART-Seq v4) followed by Illumina NovaSeq S2 PE150 sequencing.
Results: Bioinformatics analysis of the hypothalamic transcriptome revealed significant sex-based dimorphism in CCR2+ monocyte gene expression, with 1,598 genes upregulated and 1,676 downregulated in males compared to females. This pattern was absent in CX3CR1+ microglia. Investigating CXCR3 as a therapeutic target, 8-week-old CCR2RFP/- mice were treated with AMG487 (CXCR3 antagonist) or vehicle (5mg/kg, IP) every 48 hours for 4 weeks alongside an HFD. While AMG487 reduced hypothalamic CCR2+ cell infiltration, it unexpectedly worsened energy and glucose dysfunction, suggesting a potential protective role for CCR2+ monocytes in HFD-induced inflammation, warranting further investigation.
Conclusion: Our data elucidate transcriptomic signature differences between CX3CR1+ microglia and CCR2+ monocytes in the hypothalamus of chow- and HFD-fed mice. Blocking CXCR3+ cells attenuated CCR2+ monocyte recruitment to the hypothalamus in HFD-fed mice but accelerated the development of metabolic dysfunction. These findings suggest that CCR2+ monocytes may play an anti-inflammatory and protective role during HFD-induced hypothalamic inflammation.

Conflict of interest: The authors have no conflict of interest to declare.

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AS01.06

Nutritional ketosis modulates the methylation of cancer-related genes in patients with obesity and in breast cancer cells

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Introduction: Obesity is a chronic recurrent disease that acts as a gateway to other diseases such as cancer. Scientific evidence demonstrates that a very low-calorie ketogenic diet (VLCKD) is effective and beneficial in the treatment of obesity, capable of reversing the methylome associated with obesity and has immunomodulatory capacity. This effect is in part promoted by nutritional ketosis. The aim of this study was to evaluate the effect of nutritional ketosis on the methylation of genes related to tumor processes in patients with obesity and in breast cancer cells.
Methods: Based on gene ontology (GO) analysis of methylome data (Infinium MethylationEPIC BeadChip, Illumina) from patients with obesity treated with a VLCKD for weight loss (n=10; n=5 women, age=48.8±9.20 years, BMI=32, 9±1.4 kg/m^2), genes belonging to cancer-related pathways were specifically evaluated. Likewise, a STRING analysis was performed to obtain the gene-protein interaction network of these genes and the most relevant ones were identified. A global DNA methylation array was also performed on MDA-MB-231 (triple negative) and MCF7 (RE positive) breast tumor cells pretreated for 72 h with β-OHB, the main ketone body, and secretome from visceral and subcutaneous adipose tissue of patients with obesity, and methylation data (β values) of cancer-related genes previously identified in the DNA of leukocytes from patients with obesity treated with VLCKD were extracted from the analysis.
Results: VLCKD-induced nutritional ketosis promoted changes in the methylation of 1239 CpGs sites corresponding to 920 unique genes. GO analysis showed that of these 920 unique genes, 18 genes (20 CpGs; 17 hypomethylated, 3 hypermethylated) belonged to cancer-related pathways. The majority of genes (77%) regulated by methylation belonged to a network significantly enriched in protein interactions ($p<0.001$), according to STRING analysis, with the MAPK10 gene showing the highest number of interactions. Furthermore, a more comprehensive analysis identified 5 genes that had the highest methylation changes (>4%), which were MAPK10, CCN1, CTNNA2, LAMC3 and GLI2. A similar pattern was observed in the breast cancer cell line MDA-MB-231 treated with β-OHB, while an inverse pattern was observed in the breast cancer cell line MCF7. MDA-MB-231 cells presented lower methylation levels of selected genes when treated with β-OHB and with obesity TAS secretome, whereas higher methylation levels were observed with obesity TAV secretome than un-treated cells.
Conclusions: VLCKD-induced nutritional ketosis modulates the methylation of cancer-related genes in patients with obesity. This effect was further reflected in vitro in breast cancer cell lines. These results highlight

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the potential role of VLCKD as an adjuvant to anticancer treatment in groups more susceptible to the development of cancer such as patients with obesity, exerting epigenetic regulation through nutritional ketosis and weight loss.

AS02 – Environment and Policy

AS02.02

The extent and nature of digital food marketing via videogame livestreaming platforms and its impact on eating behaviour in young people

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Introduction: Videogame livestreaming platforms (VGLSPs) are a growing form of digital media where individuals can watch streamed videogame footage and communicate via a live chat. The top VGLSPs globally are Twitch (77% of the market share by hours watched), YouTube Gaming (15%), and Facebook Gaming Live (7%). VGLSPs are popular with young people and present an opportunity for brands seeking to engage with this demographic. This body of work aimed to examine the extent and nature of food marketing via VGLSPs, and its impact on eating behaviour in young people.
Methods: In study 1, content analysis methods were used to examine the extent and nature of food cues displayed in Twitch videos (n = 52, 52h) by influencers popular with adolescents. In study 2, systematic review and meta-analytic methods were used to examine the evidence for a relationship between exposure to digital game-based or influencer food marketing (two key techniques used on VGLSPs), and food-related outcomes in young people (≤ 18 years). In study 3 (n = 490, mean age = 16.8y), questionnaire methods and structural equation modelling were used to explore associations between recall of food marketing on the top VGLSPs, and relevant food-related outcomes. In study 4 (n = 91, mean age = 17.8y), a lab-based between-subjects randomised controlled trial was used to explore associations between HFSS food marketing via a mock Twitch stream and subsequent snack intake.
Results: In study 1, it was found that food cues on Twitch (2.6/hour, 20 minutes/cue) were predominantly HFSS (70.7%), branded (80.5%), energy drinks (62.4%), and not accompanied by an advertising disclosure (97.7%). Forms of influencer (e.g., product placement, 44% of food cues), and digital game-based marketing (e.g., looping banners, 40.6% of food cues) were common, and several adolescent-appealing features (e.g., tie-ins, logos, offers, slogans) were used. Study 2 revealed that digital game-based marketing was associated with more positive attitudes and greater preferences toward marketed food brands and products (twice as likely to prefer). Additionally, influencer and digital game-based marketing were associated with increased HFSS food consumption (~37 additional kcals). In study 3, recall of HFSS food marketing on VGLSPs was associated with more positive attitudes towards HFSS foods, and in turn purchase and consumption of marketed HFSS foods. Finally, in study 4, acute exposure to HFSS food marketing in a mock Twitch stream was not associated with immediate consumption. However, greater habitual use of VGLSPs was associated with increased marketed snack intake.
Conclusion: This body of work provides important new information on the extent, nature, and impacts of HFSS food marketing via VGLSPs on young people's eating behaviour. These findings build on existing knowledge, provide a basis for additional research, and could help to inform public health policy deliberations in this area.

Conflict of Interest: None disclosed.

Funding: This research formed R.E.'s PhD work, which is funded by the University of Liverpool.

AS02.03

The association between children's self-reported exposure to food marketing in community sports settings and their views of food company sponsorship of children's sports

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Introduction: Food marketing is known to shape children's dietary preferences and intake. The sponsorship of children's sports is one way food companies market their brands to children. The purpose of this study was to examine the association between children's self-reported exposure to food marketing in community sports settings and their views of food company sponsorship of children's sports.
Methods: 1020 children aged 10-17 years living in two Canadian provinces completed an online survey in Feb-April 2023. Those who reported playing on a sports team outside of school in the last year (n=439) were asked whether they had been exposed to sponsorship-related food marketing in this setting including i) branded awards ii) branded uniforms and equipment provided by their teams iii) signs iv) free food and v) coupons/gift certificates. Views of food company sponsorship of children's sports were measured using 3-point Likert scales assessing children's level of agreement with various statements. Associations between exposure to each type of food marketing (exposed/not exposed) and views of sponsorship (1-agree 0-don't know/disagree) were examined using logistic regressions. Models were adjusted for age, race, sex, and perceived income adequacy.
Results: 71% of children reported exposure to at least one type of food marketing when playing sports. About half of children reported exposure to branded uniforms/equipment (56%) and signs (54%), a third reported exposure to branded prizes (35%) and the receipt of free food (29.7%) and a quarter reported receiving coupons/gift certificates (26.4%). Most children agreed that food companies sponsor or give money to children's sports teams to help them out (79%) or to encourage people to buy their products (79%). 72% and 68% agreed that food companies who sponsor or give money to children's sports teams are generous and cool, respectively. 58% agreed that they would want to buy a product from a food company if they sponsored or gave money to their sports team. Self-reported exposure to each type of food marketing was significantly associated with higher odds of agreeing that food companies sponsor children's sports to help them out. Conversely, exposure was not associated with the view that food companies sponsor children's sports to encourage purchasing. Self-reported exposure to branded prizes, branded uniforms/equipment and signs and the receipt of free food was significantly associated with higher odds of agreeing that sponsoring companies are cool and generous. Self-reported exposure to branded prizes and uniforms/equipment and the receipt of free food and coupons/gift certificates were significantly associated with higher odds of agreeing with the statement expressing a desire to buy products from sponsoring food companies.
Conclusion: Findings suggest children's exposure to sponsorship-related food marketing is associated with viewing sponsoring companies favorably and increased purchase intentions (which are precursors of consumption). This is concerning as companies who sponsor children's sports in Canada and other countries are often associated with unhealthy food (e.g. fast-food restaurants).

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AS02.04

Viewpoints on national food environment policies in the Dutch newspaper discourse: an interpretative media content analysis

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Background: National food environment policies can contribute to the reduction of overweight and diet-related non-communicable diseases. Yet, their adoption and implementation in the Netherlands remains low. It has been hypothesized that media outlets can play a pivotal role in inducing spikes in policy attention, thereby shaping political action. This is because media outlets and actors represented in the media can select or emphasize specific aspects to shape the understanding of the topic (i.e., framing) which may influence the collective attitude towards an issue of food policy. The aim of this study was to examine the discourse on national food environment policies in Dutch newspaper articles between 2000-2022, by analyzing arguments used by actors.
Methods: A systematic search in Nexis Uni was used to identify newspaper articles that covered national-level Dutch food environment policies and that were published in seven Dutch national newspapers between 2000-2022. Covered food environment policies were classified into domains of food composition, labeling, promotion, prices, provision and retail and into stages of the policy cycle; policy formulation, decision-making, implementation, and evaluation. An interpretive content analysis was performed, until data saturation was met, to determine the actors, viewpoints and arguments regarding the food policy.
Results: We identified 896 relevant newspaper articles. The coverage of food policies in Dutch newspapers was initially low but peaked in more recent times, especially in 2018/2021/2022. The majority of the newspaper articles reported on pricing policies and were discussed in the stage of policy formulation. There were no clear differences in argumentation between newspapers. Stakeholders of the food industry were least often cited (in 4.8% of the articles) and predominantly opposed the discussed policies. Supportive arguments were centered around human health (e.g., prevention), ideological (e.g., responsibility), societal (e.g., health inequalities), whereas opposing arguments were centered around ideological (e.g., paternalism), practical (e.g., infeasibility) or human health (e.g., ineffectiveness).
Conclusions: Shared arguments between food environment policies were about who bears responsibility for the prevention of diet-related diseases, whether certain policies are effective and whether it is feasible to implement them. Public health advocates may use these insights to fact-check certain arguments or align their line of reasoning with.

AS02.05

Knowledge and opinions about overweight and health in the Danish population 2023: a population-based cross-sectional study

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Introduction: Obesity increases the risk of several diseases, but awareness of the link between obesity and disease varies considerably in Denmark. The underlying causes of obesity are both numerous and complex, and it is unknown to which extent the Danish public is aware of the different roles of e.g., behavioural, structural, and commercial determinants. This study aimed to measure knowledge and opinions on several obesity and health related topics among the Danish population.
Methods: A nationally representative cross-sectional survey of the Danish population was conducted in 2023. The survey included 5.220 men and women 18 years or older, and data was representative in terms of gender, age, geographical region, and education length. The study included 18 questions covering topics like: knowledge of the causes of obesity; the association between obesity and disease; opinions on the scope of the challenges posed by the rising prevalence of overweight and obesity in Denmark; weight prejudice; weight stigma; prevention and treatment; and perceptions of own body weight.
Results: Most respondents know that obesity increases the risk of type 2 diabetes (81%), and CVD (76%). Only 28% pinpoint the risk of cancer and significant health literacy inequity is observed. Mental health parameters like reduced well-being and quality of life (70%), and depression or other psychosocial challenges (54%) were also mentioned. Most respondents pointed unhealthy dietary habits (92%) and insufficient physical activity (89%) as contributors to the development of obesity. However, many respondents are also aware that structural conditions – such as easy access to high salt, fat or sugar foods and drinks (80%), and environments that limit physical activity in everyday life (70%) – also play a role. 75% of all respondents agree that genetics and heredity play a significant role, and 83% believe that certain social and psychological aspects, such as reduced well-being or reduced quality of life, are also of significance for the development of obesity. More results will be presented at the conference since data from the study is extensive and covers several important topics.
Conclusion: Danes are aware that both genetics, behaviour, and structural conditions play a role in the development of overweight and obesity. Obesity is vastly perceived by Danes as both an individual and a societal challenge. However, most Danes think that people living with obesity should live healthier and lose weight. Also, respondents perceive obesity prevention and obesity treatment/management more as an individual responsibility than as a responsibility of commercial actors or decision-makers. Danes support lower prices on healthy foods as a tool for promoting healthier choices and have positive opinions on given examples of structural prevention initiatives aimed towards children and youth.

AS02.06

Providing a common language for obesity: The European Association for the Study of Obesity obesity taxonomy

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Introduction: The basis for a high performing and resilient healthcare system is one where there is a common, precise, and scientifically accurate language used amongst and across all stakeholder groups. However, such a common language is lacking in the case of obesity. Therefore, the European Association for the Study of Obesity undertook a taxonomy initiative to provide standardised language for obesity which is derived from the language used by policy-prioritised non-communicable diseases.
Methods: An online Delphi consensus study was conducted, involving a panel of experts representing relevant stakeholder groups of healthcare professionals, patient advocates, policymakers and researchers. The study included 54 statements that were distributed across six themes: Definition of obesity, Causes, onset and progression, Obesity prevention, Screening and early diagnosis, Treatment and management, and Obesity consequences. Delphi participants engaged in three rounds of surveys in which they responded about the suitability of the definition, context, and scope of these statements. Consensus was defined a priori as agreement rates ≥75% and no dissenting free text comments.

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Results: Of the 194 invited experts, 70 (36%) participated in round one, with subsequent participation of 63 (33%) and 58 (30%) experts in rounds two and three, respectively. Consensus was achieved on 70% of the proposed definitions after round one, 94% after round two and 100% after round three.
Conclusion: The resulting taxonomy represents a contemporary evidence-based language that is relevant for education, advocacy, communication and can be used by policymakers, health practitioners, health advocates, people living with obesity and the general public.

AS03 – Treatment of Obesity in Children and Adolescents

AS03.01

The effectiveness and feasibility of early childhood obesity treatment: A randomised controlled trial for overweight and obesity in three countries, the STOP project

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Background: Treating childhood obesity is difficult and very few countries use standardized treatments. Therefore, effective approaches that are feasible for both health care providers and families are needed. Especially important is to investigate early treatment. Still, few studies have assessed the effects of treatment starting at an early age. The aim of this multicountry randomised controlled trial was to assess the effectiveness of a parent support program followed by an app-based mHealth intervention in a socially diverse population of families with preschool-aged children.
Methods: The parents of children aged 2-6 years with overweight and obesity, from Romania, Spain and Sweden, were randomized to the More and Less (ML) parent group (PG) or to standard treatment (ST). The ML program consisted of 10 weekly group sessions which focused on evidence-based parenting practices, followed by the previously validated MINISTOP app for 6 months as a continuous support for healthy eating and physical activity behaviours. The primary outcome was child weight status (BMI SDS) after 9 months. Secondary outcomes were BMI and waist circumference. Imputation was done using MICE with Random Forest method (m=5). Linear mixed modelling was utilised for the primary and secondary outcomes and interactions with sociodemographic variables were explored. The final model was adjusted for individual heterogeneity, country, sex, parental income, and education.
Results: A total of 304 2-to 6-year-old children and their parents participated in the study. The dropout rate was 19%. Mean (SD) age of the children was 5.0 (1.2) years, mean BMI SDS was 3.0 (1.0), 64% were girls, 53% had severe obesity, 23% obesity, and 24% overweight. For the entire sample, at 9 months, a larger decrease in BMI SDS was seen in PG (-0.16, SD 0.28; from 0.511 at 3-months to 0.3 at 9-months) compared to ST (-0.10, SD 0.28; from 0.628 at 3-months to 0.528 at 9-months) ($p<0.001$). The secondary outcomes, BMI and waist circumference, were not different over time between PG and ST (n.s.). Interactions with sociodemographic variables showed no clear direction.
Conclusions: The culturally adapted intervention (ML parent program and MINISTOP app) was conducted in families from various sociodemographic settings in three countries: Romania, Spain, and Sweden. Our results show that the intervention was effective in improving weight status in young children in all countries.

AS03.02

Family-based behavioral treatment of children with obesity – Results from the FABO study

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Background: Few studies have evaluated the effect of family-based behavioral treatment (FBT) in real-world health-care settings.
Aims: To evaluate the effectiveness of family-based behavioral social facilitation treatment (FBSFT), an enhanced FBT program, for pediatric obesity, compared with treatment as usual (TAU); to assess for perceived barriers to treatment participation in families, as well as differences in sleep behaviors among children with severe obesity, compared to peers with normal weight; and to examine the relationship between sleep and other behavioral factors known to cause obesity in children.
Methods: This was a randomized controlled trial using a wait-list control design. A total of 114 children (mean age 12.6 years) with severe obesity were recruited from the Obesity Outpatient Clinic, Haukeland University Hospital. A matched group of children with normal weight (n = 85) were also recruited for case-control comparison of sleep behaviors. Measurements included objectively measured weight-related outcomes, objective sleep/physical activity measures, the Dutch Eating Behavior Questionnaire self-report, and the Barriers to Treatment Participation Scale parent-report.
Results: A significantly greater decrease in BMI standard deviation scores was achieved from pre- to posttreatment in FBSFT, compared to TAU, with a between-group difference of 0.19 units ($p <0.001$). Participants who did not complete FBSFT reported significantly more barriers to participation related to stressors and obstacles ($p = 0.010$) and perceived relevance of treatment ($p <0.001$), compared to completers. Children with severe obesity had significant later sleep timing compared to peers with normal weight ($p <0.001$). Later sleep timing was also associated with more screen time ($p = 0.030$) and less time in moderate-to-vigorous physical activity ($p = 0.015$).
Conclusion: Significantly greater improvement in weight-related outcomes were found among participants in FBSFT compared to TAU. Families were more likely to terminate FBSFT prematurely when facing stress-related barriers or when treatment was not meeting their expectations/needs. In addition, sleep timing could represent an independent risk factor for pediatric obesity. The study results here support a more widespread implementation of FBSFT. Further, they emphasize the importance of investigating barriers to participation to enhance retention rates and addressing multidimensional sleep health, including sleep timing, among youth.

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AS03.03

Barriers and Facilitators for Paediatric Obesity Management in Healthcare: Health Professional and Health Leader Perspectives

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Background: Worldwide, there are differences in how child and adolescent obesity is treated compared to other clinical paediatric conditions (1). Recent findings from a cross-sectional survey of 184 health professionals in Ireland indicated a multitude of barriers and facilitators to providing paediatric obesity care (2). This qualitative study aimed to gain detailed insight on which barriers and facilitators should be prioritised and how they could be viably addressed within the existing health system in Ireland.
Methods: Twenty-two semi-structured focus groups were conducted with 90 health professionals (HPs) who provide care to children in Ireland and 16 clinical leaders/managers. The Nominal Group Technique (NGT) was used to encourage brainstorming and equal contribution amongst the group, in order to identify problems, facilitate discussion and generate solutions from the participant's perspectives. Stata 17 and Microsoft Excel were used to calculate mean scores and percentage frequencies for the identified priorities. Focus group interviews were recorded and transcribed verbatim. Data were analysed using Thematic Analysis. Themes were mapped to the Consolidated Framework for Implementation Research (CFIR) (3) so that barriers and facilitators could be addressed and prioritised for recommendations to improve paediatric obesity care.
Results: Key priorities identified from the NGT were the need to: develop a care pathway including signposting and referrals; enable access to training for HCPs; better resourcing for HCPs and families; provision of greater contact time with routine growth monitoring; reduction in waiting times and the need to ensure patients with obesity are not de-prioritised compared to other conditions. Five overarching themes were developed from the data, including a need for: i) resources ii) diverse understanding and perceptions iii) a pathway of care, iv) optimal communication, and v) an awareness of politics.
Conclusions: Perspectives from our participants indicated that treatment of obesity requires clinical prioritisation, adequate resourcing and implementation. Results provide a guide on how best to implement improvements in the existing health system and will form the next step in this project.
Ethical approval was granted from RCSI (REC 202105027).
Informed digital consent was received by all participants.
Presented on behalf of the LANDSCAPE project team: www.rcsi-landscape.eu

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AS03.04

Associations of childhood BMI, general and visceral fat mass with metabolite profiles at school-age

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Introduction: Childhood obesity increases metabolic disease risk. Underlying mechanisms remain unknown. We examined associations of body mass index (BMI), total body fat mass and visceral fat mass with serum metabolites at school-age, and explored whether identified metabolites improve identification of children at risk of a metabolically unhealthy phenotype.
Methods: We performed a cross-sectional analysis among 497 children aged 10 years, participating in a population-based cohort study. We measured BMI, total body fat mass using DXA, and visceral fat mass using MRI. Serum concentrations of amino-acids, non-esterified-fatty-acids, phospholipids, and carnitines were determined using LC–MS/MS. Children were categorized as metabolically healthy or metabolically unhealthy, according to blood pressure, lipids, glucose and insulin levels.
Results: Higher BMI and total body fat mass were associated with altered concentrations of branched-chain amino-acids, essential amino-acids, and free carnitines. Higher BMI was also associated with higher concentrations of aromatic amino-acids and alkyl-lysophosphatidylcholines (FDR-corrected p-values<0.05). Strongest associations were present for Lyso.PC.a.C14.0 and SM.a.C32.2 (FDR-corrected p-values<0.01). Higher visceral fat mass was only associated with higher concentrations of 6 individual metabolites, particularly Lyso.PC.a.C14.0, PC.aa.C32.1, and SM.a.C32.2. We selected 15 metabolites which improved prediction of a metabolically unhealthy phenotype, compared to BMI only (AUC: BMI: 0.59 [95% CI 0.47,0.71], BMI + Metabolites: 0.91 [95% CI 0.85,0.97]).
Conclusion: An adverse childhood body fat profile, characterized by higher BMI and total body fat mass, is associated with metabolic alterations, particularly in amino-acids, phospholipids, and carnitines. Fewer associations were present for visceral fat mass. We identified a metabolite profile that improved identification of impaired cardiometabolic health in children, compared to BMI only.

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AS03.05

Long-term effects of childhood obesity management – a 6-year follow-up of The HOLBAEK Model

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Introduction: Evidence is sparse regarding effects of non-surgical and non-pharmalogical long-term (over three years) childhood obesity management. This study aims to evaluate the effect of up to six years of childhood obesity management, in accordance with national guidelines, in a chronic care, family-oriented, person-centered protocol in a hospital setting.

Methods: We included 3–18-year-old children and adolescents with obesity (body mass index (BMI) z-score > 1.28) referred to a public childhood obesity management clinic from 2008 to 2023, including all comorbidities and medications use. BMI and body fat content (by dual-energy X-ray absorptiometry (DXA) scan) were assessed at outpatient visits during clinical treatment.

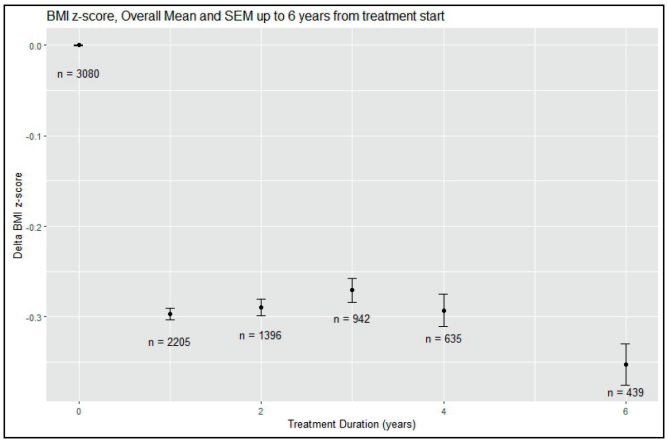
Results: At entry, 3,080 children and adolescents (1,658 girls) with obesity with a median age of 11.4 years, a median BMI z-score of 3.0 (range 1.3–9.7) started treatment. 1,341 (43%) of the study participants exhibited medicines use or comorbidities that were not obesity-related.

The follow-up BMI z-score reduction obtained at 1-year (median change of -0.23, n=2,205) was sustained through to the 6-year follow-up (median change of -0.28, n=439) during growth and development. *See figure 1*

After a median 1.5 (range: 0.1, 6.0) years of treatment, BMI z-score changed by a median of -0.22 (95% confidence interval (CI): -0.21, -0.24, p<0.0001). Boys exhibited a greater reduction in BMI z-score than girls (-0.31 vs -0.16, p<0.0001). *See figure 2*

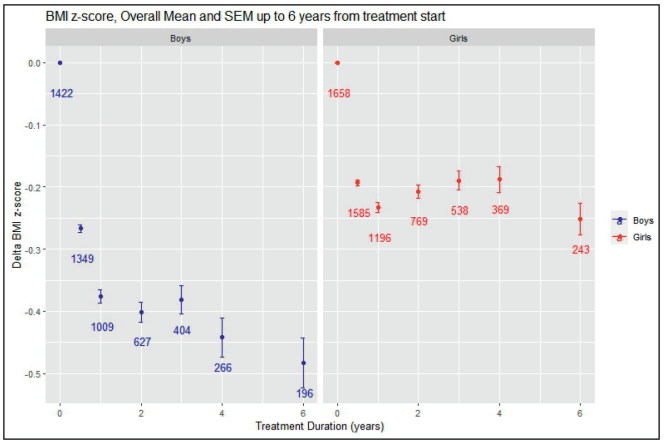
For children and adolescents with at least one year of follow-up from treatment start (n=2,105), BMI z-score changed by a median -0.28 (95% CI: -0.25, -0.30, p<0.0001) after a median 2.4 (range: 1.0, 6.0) years of treatment. Boys exhibited a greater reduction in BMI z-score than girls (-0.38 vs -0.19, p<0.0001). Overall, BMI z-score was reduced in 71%. Reductions in BMI z-score were independent of socioeconomic status (Adjusted for age, sex, and baseline BMI z-score). A subset of 1,350 children and adolescents with obesity and a median age of 11.4 years (range 8.0–18.9) was assessed by DXA scan: The median fat mass z-score was 1.6 (range: -0.9, 3.0) at baseline and changed by -0.17 (95% CI: -0.14, -0.20, p<0.0001) after a median 2.3 (range: 0.4, 6.0) years of treatment. The median body fat percentage decreased from 43.5% to 41.7% alongside an increase in lean mass of a median 8.8 kg (95% CI: 8.4, 9.3, p<0.0001) across both sexes. Fat mass z-score was reduced in 60%, while 94% exhibited an increase in lean mass. There were no significant differences in changes in BMI z-score (p=0.15) and fat percent z-score (p=0.06) between participants with and without comorbidities or medicines use, although the latter group was younger (14.3 vs 13.0 years, p<0.0001).

Conclusion: In a large group of clinically unselected children and adolescents with obesity, reductions in BMI and fat mass z-scores were obtained alongside a substantial increase in lean mass. The decrease in the degree of obesity was sustained through up to six years of obesity management.



BMI z-score trajectory during 6 years of childhood obesity mangement in 3,080 children and adolescents (age: 3-18 years). Values are shown as mean with standard errors of the mean (SEM).

Fig. 1. *Trial Registration*
The Danish Childhood Obesity Biobank (ClinicalTrails.gov ID-no: NCT00928473).



BMI z-score trajectories during 6 years of childhood obesity mangement in 1,422 boys and 1,658 girls (age: 3-18 years). Values are shown as mean with standard errors of the mean (SEM).

Fig. 2.

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AS03.06

Sex differences in depression and eating disorders in adolescents participating in a weight management trial: Fast Track to Health

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Introduction: Depression and eating disorder risk are heightened during adolescence and both were exacerbated during COVID-19 lockdowns. This analysis reports sex differences in the change in self-reported symptoms of depression, eating disorders and binge eating during the Fast Track to Health trial.
Methods: Fast Track to Health was a 52-week multi-site randomised-controlled trial, conducted 2018-2023 in Australia, comparing intermittent (IER) and continuous energy restriction (CER) in adolescents with obesity and ≥1 associated comorbidity. At baseline and weeks 4, 16 and 52 symptoms of depression (Centre for Epidemiologic Studies Depression Scale-revised 10-item version for adolescents, CESDR) eating disorders (Eating Disorder Examination Questionnaire, EDE-Q) and binge eating (Binge Eating Scale, BES) were assessed. Linear mixed models, retaining all data consistent with intention-to-treat analysis, were used to estimate the change in outcomes from baseline to week-52 by intervention group and sex. Adolescents were monitored for change in self-reported disordered eating during consults.
Results: 141 (70 girls) adolescents were enrolled and 97 (48 girls) completed the trial. At baseline, there were no differences between groups, however, girls had higher scores on the EDE-Q (girls mean [SE] 2.64 [0.13], boys 2.07 [0.13], p=0.002) and the CESDR (girls 12.76 [0.76], boys 7.59 [0.76], p<0.001) than boys. There was no sex difference in BES (girls 12.40 [0.93], boys 10.89 [0.92], p=0.25).
Over the 52-week intervention EDE-Q and CESDR decreased (p<0.05) with no difference between groups. The decrease in EDE-Q was greater (p=0.007) in girls compared to boys, change in estimated marginal means [SE], -0.69 [0.17] and -0.49 [0.18], respectively. CESDR scores reduced for girls (-4.39 [1.08], p<0.001) and boys (-2.24 [1.08]), p=0.04) with no sex differences. Between baseline and 52-weeks adolescents in the IER group reduced their BES score (-3.72[1.27]); the CER group had no change (-0.38 [1.19], p=0.75) and there was no significant difference in change between sexes.
At baseline, girls had higher scores on the shape, weight and eating concern subscales of the EDE-Q compared to boys. All decreased over the 52-week with no difference between groups. There were no differences by sex for shape concern, but girls had a greater reduction in weight concerns compared to boys (p=0.04). Eating concern reduced for girls (-0.57 [0.20], p=0.004). There was no change in dietary restraint between baseline and 52 weeks. Seven girls were provided with additional support for disordered eating.
Conclusion: Adolescents presenting for obesity treatment may have psychosocial comorbidity. In this study, girls had more self reported symptoms of depression and disordered eating than boys. Symptoms reduced for most adolescents during the intervention, despite the increases seen in community samples during COVID-19. Some girls required additional support to address their disordered eating. Screening and monitoring for changes in depression and eating behaviours are important to ensure early intervention for adolescents, and in particular in girls.

AS04 – Novel Treatments

AS04.01

Safety and Efficacy of Combined Activin A and Myostatin Blockade in Healthy Volunteers: A Phase 1 Trial

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Introduction: Myostatin and activin A have been shown to be prominent negative regulators of muscle mass in preclinical studies, with combined blockade of these ligands leading to pronounced hypertrophy. Trevogrumab is a human monoclonal antibody (mAb) that specifically binds to and blocks myostatin signalling, while garetosmab is a fully human immunoglobulin G4 (IgG4) mAb that specifically binds to and blocks the signalling of activins A, AB and AC. This study evaluated the safety and efficacy of trevogrumab and garetosmab mAbs, administered alone or in combination, on body composition in healthy participants.
Methods: This two-part, doubleblind, placebocontrolled, phase 1 clinical trial randomized healthy males and females (postmenopause) into either the singledose or multipledose part of the study. In the single-dose part, females received: trevogrumab 6 mg/kg (n=6); garetosmab 10 mg/kg (n=6); combined trevogrumab 6 mg/kg + different ascending garetosmab doses (1 mg/kg, n=6; 3 mg/kg, n=6; 10 mg/kg, n=12) or placebo (PBO; n=12). In the multiple-dose part, females received: garetosmab 10 mg/kg every 4 weeks (Q4W; n=6) or PBO (n=2); combined trevogrumab 6 mg/kg + garetosmab 10 mg/kg every 2 weeks (Q2W; n=6) or PBO (n=4). In the multiple dose part, males received garetosmab 10 mg/kg Q4W (n=8) or PBO (n=8). The primary outcome was to assess the incidence and severity of treatment-emergent adverse events (TEAEs) through weeks 16 and 40 for the single and multiple-dose studies, respectively.
Results: Overall, all subjects receiving treatment experienced mild to moderate TEAEs, with no observable trends in body weight; no clinically significant safety concerns were identified in any active treatment groups. Following multiple-doses of combination trevogrumab + garetosmab, headache was the most frequently reported TEAE in all groups of healthy females. One serious TEAE of diverticulitis occurred after week 28 in a participant with a prior history of diverticulosis (not considered related to treatment). Following a single dose, thigh muscle volume (TMV) increased at week 8 from baseline by 3.5% (nominal p=0.16 versus placebo), 6.2% (nominal p=0.0056 versus placebo) and 7.7% (nominal p<0.001 vs placebo) for the combination trevogrumab 6 mg/kg + garetosmab 1, 3 and 10 mg/kg groups, respectively. In the trevogrumab 6 mg/kg only group, TMV increased by 4.6% (nominal p=0.047 vs placebo) from baseline. Similar trends in total lean mass and appendicular lean body mass were observed. In the multiple-dose part, trevogrumab 6 mg/kg + garetosmab 10 mg/kg led to increases in TMV from baseline up to week 12 but decreased to similar levels as the PBO group by week 28. No changes in total lean mass or appendicular lean body mass were observed compared with PBO.
Conclusion: Administration of combined trevogrumab and garetosmab was well tolerated. Combination blockade of myostatin and activin A led to greater-than-additive increases in muscle mass.

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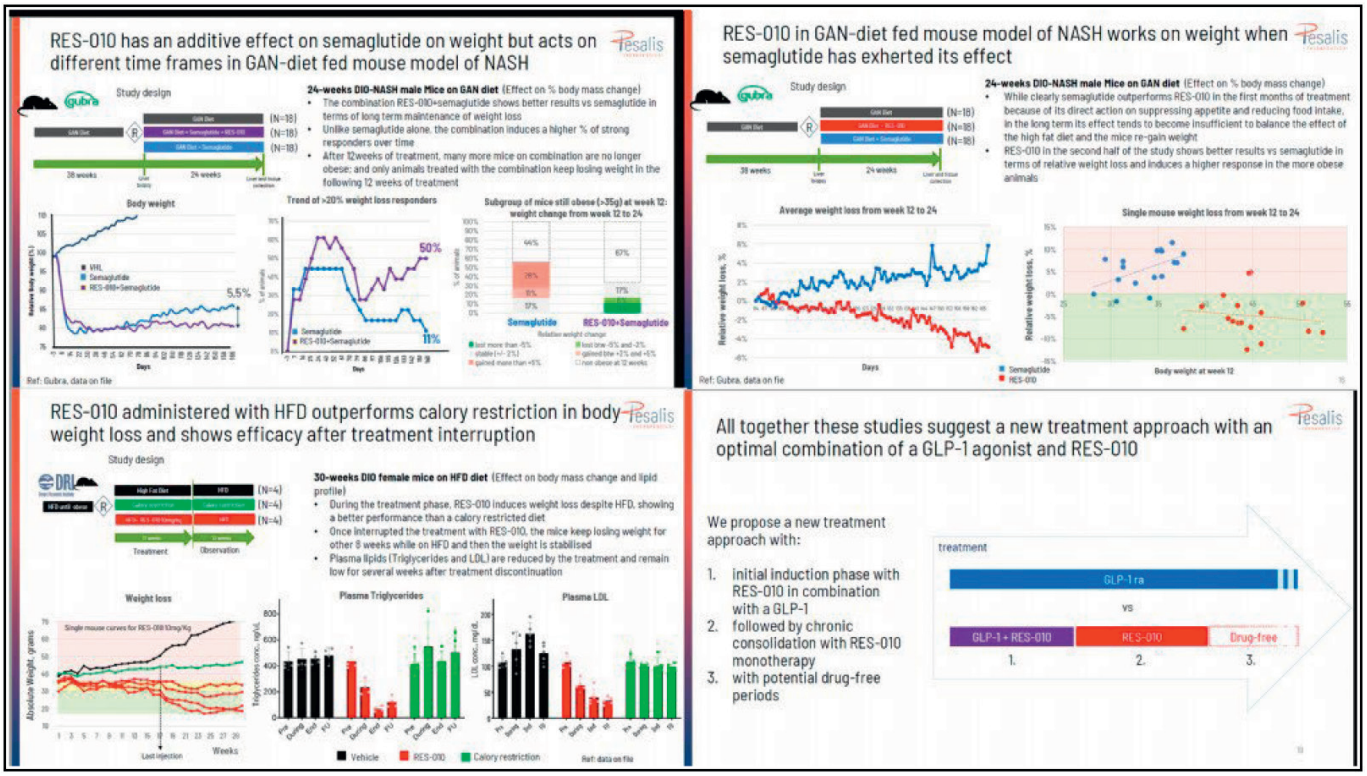
AS04.02

Increasing GLP1-RA efficacy by targeting non-coding RNA: a combinatory approach to develop a more effective therapeutic paradigm

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Introduction: Obesity, affecting nearly 2 billion people globally, is a significant public health issue linked to type 2 diabetes, cardiovascular disease, MAFLD, and cancer. We've identified miR-22 as a key regulator in lipid homeostasis. Our anti sense oligonucleotide (ASO) therapy inhibits miR-22 (RES-010), protects against obesity in mice. Unlike GLP-1 RA, RES-010 works independently of food intake. Our hypothesis is that combining GLP-1 RA and miR-22 inhibition enhances positive effects. Data support a therapeutic paradigm: induction phase with GLP1-RA with RES-010, followed by RES-010 in monotherapy followed by drug-free periods.
Methods: C57BL/6 mice on GAN or HFD were treated with vehicle, Semaglutide, miR-22 ASO (RES-010) or Semaglutide + RES-010. Weight, food intake, blood, and liver biochemistry were monitored for 24 weeks of treatment and for an additional 13 weeks of drug-free periods to assess sustained effects.
Results: Mice treated with Semaglutide experienced a rapid 20% initial body weight (BW) loss, followed by significant regain between weeks 12 and 24, mainly in still-obese mice. RES-010-treated mice initially showed no BW decrease, but metabolic rewiring induced weight loss between week 12 and 24 (additional 6% on average, up to 10%). Heavier mice lost more weight on RES-010. Withdrawal of RES-010 in monotherapy maintained metabolic benefits for over 7 weeks, stabilizing weight despite a high-fat diet. RES-010 also reduced plasma triglycerides and LDL cholesterol, which were sustained even after discontinuation.
Combining GLP1-RA with RES-010 resulted in an initial BW drop, followed by stabilization due to miR-22 inhibition, preventing regain seen in GLP1-RA monotherapy. Single-mouse analysis showed ongoing weight loss in combo-arm overweight/obese mice between weeks 12 and 24, highlighting miR-22 inhibition's potential for fat mass loss. At the end of treatment, 50% in the combo arm lost at least 20% BW, compared to 11% in the semaglutide alone. After 24 weeks, 70% in the combo arm remained non-obese, with ongoing weight loss, while only 44% on GLP1-RA monotherapy were non-obese.
Conclusion: The data support a novel therapeutic paradigm for obesity, combining GLP1-RA and miR-22 inhibition (RES-010). GLP1-RA induces immediate BW loss, while RES-010 causes gradual metabolic rewiring, impacting key pathways without affecting food intake or lean mass. RES-010 reduces lipid biosynthesis, increases mitochondrial biogenesis, and induces white adipose tissue brownization. Unlike GLP1-RA's immediate effect, RES-010's metabolic changes take time. Proposed therapeutic phases include an initial combination, followed by RES-010 monotherapy for persistent fat loss, and a drug-free period before restarting.
Reducing GLP1-RA usage time efficiently addresses side effects and improves patient compliance. The combinatory treatment allows GLP1-RA discontinuation, leveraging RES-010's prolonged efficacy on excessive fat mass for substantial patient benefits and more efficient obesity therapy.



The figures show an overview of the results and conclusions presented in the abstract.

Fig. Overview.

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AS04.03

Survodutide, a glucagon receptor/glucagon-like peptide-1 receptor (GCGR/GLP-1R) dual agonist, improves metabolic risk factors in adults living with obesity: analysis of a placebo-controlled, randomised phase 2 trial

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[7]Boehringer Ingelheim International GmbH, Biberach, Germany

Introduction: Survodutide is a GCGR/GLP-1R dual agonist under investigation for chronic weight management in people living with obesity. In a multinational phase 2 clinical trial in individuals with obesity without diabetes (NCT04667377), survodutide elicited up to 18.7% mean reduction in body weight after 46 weeks (the primary endpoint) according to actual treatment. We explored the effect of survodutide on metabolic parameters in this trial cohort.
Methods: In this double-blind trial, 387 people aged ≥18 to <75 years with body mass index (BMI) ≥27 kg/m² without diabetes were randomised 1:1:1:1:1 to once-weekly subcutaneous placebo or survodutide 0.6, 2.4, 3.6 or 4.8 mg for 46 weeks, comprising 20 weeks of dose escalation (when dose could also be adjusted for gastrointestinal [GI] tolerability) then 26 weeks' maintenance. We evaluated changes in waist circumference and fasting plasma glucose (FPG) according to baseline glycated haemoglobin (HbA1c) levels (post hoc), as well as changes in disease stage according to the Edmonton Obesity Staging System (EOSS) and the Cardiometabolic Disease Staging (CDMS) system (pre-specified). We analysed data descriptively for all participants receiving ≥1 dose of study drug with data for ≥1 efficacy endpoint, i.e. the full analysis set (FAS), according to doses received during the maintenance period (i.e. actual treatment) and those assigned at randomisation (i.e. planned doses) using on-treatment data.
Results: In the FAS (n=384), baseline demographic and clinical characteristics were similar across treatment groups: overall mean age was 49.1 years, BMI 37.1 kg/m², and waist circumference 113.4 cm, while 262 (68.2%) were female, 301 (78.4%) white, 40 (10.4%) Asian and 37 (9.6%) black. At baseline, 251 (65.4%) and 132 (34.4%) had HbA1c <5.7%

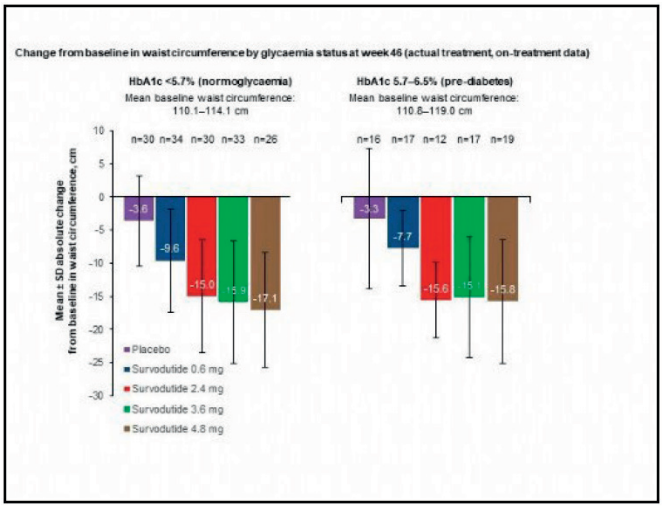


Fig. 1.

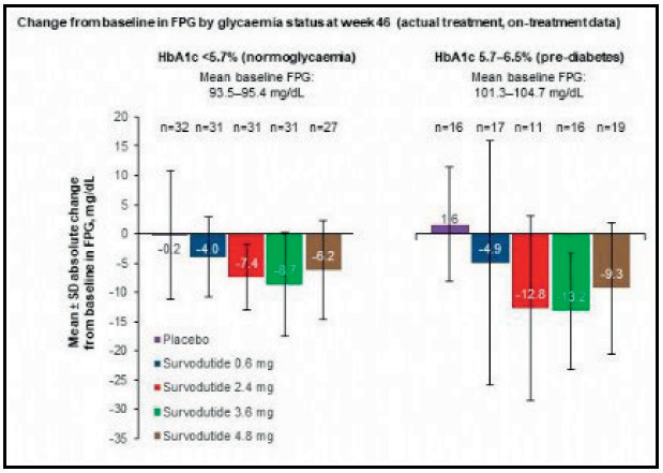


Fig. 2.

(normoglycaemia) and 5.7–6.5% (pre-diabetes), respectively. Survodutide was associated with reductions in waist circumference of up to 17.1 cm from baseline at week 46 by actual treatment, which were similar regardless of HbA1c level (Figure 1). Survodutide was also associated with reductions in FPG of up to 13.2 mg/dL (0.73 mmol/L), which were numerically larger in participants with HbA1c 5.7–6.5% versus <5.7% (Figure 2). Reductions in waist circumference and FPG were similar when treatment groups were analysed by planned doses. In general, individuals in the placebo group had lower stages of EOSS and CDMS at baseline, while more individuals in the survodutide groups shifted to lower stages at week 46. Overall, adverse events occurred in 90.9% and 75.3% of survodutide and placebo recipients, respectively (mainly GI: 75.1%, 41.6%). No survodutide recipients developed diabetes and more had HbA1c reduced from 5.7–6.5% to <5.7% versus placebo recipients, e.g. 17 of 21 survodutide 4.8 mg recipients (81.0%) and 4 of 14 placebo recipients (28.6%).
Conclusion: In people with obesity, treatment with the GCGR/GLP-1R dual agonist survodutide was associated with clinically meaningful reductions in waist circumference and FPG in those with normoglycaemia or pre-diabetes, as well as improvements in stage of obesity.

AS04.04

Treatment with HS200, a Novel Co-formulation of a GLP-1 Receptor Agonist with a Potent Activin and GDF Inhibitor, Results in Fat-Selective Weight Loss

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Introduction: HS200 is a novel co-formulation of a Glucagon-like peptide 1 receptor agonist (GLP-1 RA) and a potent Activin and GDF ligand trap. Activins and GDFs are transforming growth factor beta (TGF-beta) superfamily ligands that are genetically validated targets in cardiometabolic disease. Preclinically, targeting this biology has proven efficacious in models of left heart and cardiopulmonary disease, as well as in obesity. Clinically, fat-selective weight loss and improved glucose handling has been achieved by blocking Activin receptor-mediated signaling (Heymsfield et al, 2021). GLP-1 RAs have proven efficacious in patients at inducing profound weight loss as well as a secondary prevention of improving CV outcomes and HFpEF symptom burden. Therefore, HS200 has potential to be best-in-class cardiometabolic treatment improving both the heart failure phenotype as well as delivering fat exclusive weight loss. Here, we explored the efficacy of HS200 in a diet-induced obesity (DIO) model.
Methods: The effect of HS200 on improving body composition and inducing fat-selective weight loss was assessed in a DIO model: DIO mice

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at 28 weeks of age and ~50g of body weight were injected with the Activin and GDF ligand trap alone, GLP-1 RA alone, or both for three weeks. Body weight, fat and lean body mass (LBM) were assessed throughout the study. Muscle weights, hepatokine expression and biomarker readouts were assessed at the end of study.
Results: In cell-based assays, HS200 neutralized activins and GDFs including myostatin with the same potency as the Activin and GDF trap alone. Similarly, HS200 activated the GLP-1 receptor with the same potency as the GLP-1 RA alone. The HS200 co-formulation was stable including under accelerated conditions as indicated by monomer content and unchanged potency. In a DIO mouse model, both HS200 and the GLP-1 RA improved metabolic parameters and decreased fat mass. Importantly, HS200 provided increased fat loss compared to the GLP-1 RA alone. This indicates a synergistic effect of Activin and GDF inhibition in combination with GLP-1 receptor agonism. Uniquely, HS200 increased LBM, while the GLP-1 RA treatment led to LBM loss. Overall, HS200 treatment resulted in superior quality weight loss as measured by improved lean-to-fat mass ratio and metabolic biomarker profile.
Conclusion: HS200 represents a novel fat-selective weight loss strategy. HS200 preserves lean mass while providing enhanced fat loss compared to GLP-1 receptor agonism alone. Collectively, these data support the development of HS200 as a novel cardiometabolic agent.

AS04.05

CagriSema driven weight loss in diet-induced obese rats depends on counter-regulation of weight loss associated reduction in energy expenditure

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Background: CagriSema (CS), a combination of long-acting analogues of amylin (cagrilintide) and glucagon-like peptide-1 (semaglutide), is in clinical development for treatment of obesity and type-2-diabetes. CS induces weight loss by suppressing food intake, but it is unknown whether counteracting actions on metabolic adaptation (MA; weight-independent suppression of energy expenditure (EE) during weight loss) are involved.
Methods: We studied, by indirect calorimetry, the effects of CS on MA in diet-induced obese (DIO) male rats (Sprague Dawley, (~750 g)), receiving daily treatment for three weeks (2 nmol/kg of each). To separate effects driven by weight loss from CS treatment effects, a group of weight matched (WM) rats was included. Weight loss was in this case driven by calorie restriction which was adjusted daily to match the trajectory of weight loss in the CS group. In a separate study, using a similar protocol, cagrilintide or semaglutide was administered individually as monotherapies at doses to produce a weight loss on par with CS. Total energy expenditure (TEE) data are reported non-adjusted (kcal/h).
Results: CS treated rats and WM rats lost ≈11% body weight (vehicle adjusted, n=10-11). Cumulative food intake by treatment end was ≈50% lower than in the vehicle group (P<0.0001). Keeping the WM rats on pair with CS rats in terms of body weight required supply of ≈15% fewer calories. Consistently, average TEE during treatment was ≈21% lower in WM rats than in vehicle rats (WM: 2.54±0.10 kcal/h; vehicle: 3.21±0.10 kcal/h, P<0.001), whereas TEE in CS rats was not different from vehicle (CS: 2.93±0.13 kcal/h; vehicle: 3.21±0.10 kcal/h, P=0.20). The reduction in TEE in WM rats was driven by reduced EE during both the inactive phase (~23%) and the active phase (~19%), and occurred instant and before weight loss. Body composition was similar between WM and CS rats by end of treatment, indicating that the reduction in TEE in WM rats was driven by active downregulation of TEE (MA). As increases in TEE may increase body core temperature (Tb), we repeated the study and measured Tb in addition to TEE. Confirming the first study, CS counteracted the MA observed in the WM group, but without increasing Tb (P=0.67 between vehicle and CS). Mono-treatment with cagrilintide and semaglutide also counteracted MA (P≥0.73 compared to vehicle) whereas TEE again was reduced in WM rats (~10%, P<0.01). By the end of study, the plasma concentration of triiodothyronine (T3) was elevated in CS rats compared to WM rats but was not different from vehicle. Ex vivo liver mitochondrial proton leak (a major component of resting EE) was higher in CS rats than WM rats but was not different from vehicle.
Conclusion: CS counteracts MA associated with weight loss. This effect is appear to be mediated by both cagrilintide and semaglutide, as both can counteract MA. The underlying pathways mechanisms could involve elevation of circulating T3 as well as increased EE in skeletal muscle and liver tissue. Human trials are needed to determine if the counteracting actions of CS on MA observed in rats also occur in humans.

AS04.06

Impact of setmelanotide on metabolic syndrome risk in patients with Bardet-Biedl syndrome

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Background: Patients with Bardet-Biedl syndrome (BBS), a rare syndrome associated with obesity and hyperphagia, commonly manifest traits of metabolic syndrome, including abdominal obesity, impaired fasting glucose, low high-density lipoprotein cholesterol, hypertriglyceridemia, and hypertension. Setmelanotide treatment results in significant improvement in weight, hunger, and quality of life in these patients and may improve measures associated with metabolic syndrome development. We evaluated the metabolic syndrome Z score based on body mass index (MetS-Z-BMI), a measure of long-term risk for developing cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM). Each 1.0-point increase in MetS-Z-BMI increases the odds of future CVD and T2DM by 9.8 and 2.7, respectively, when assessed in children and by 2.4 and 2.8, respectively, when assessed in adults.
Methods: Data from a Phase 3 trial of patients with BBS (NCT03746522) were used to calculate MetS-Z-BMI score after 1 year of setmelanotide. Patients who achieved a meaningful response of ≥10% weight loss (if ≥18 years old) or ≥0.3-point BMI Z score reduction (if <18 years old) were compared with patients who did not meet those thresholds.
Results: Of 32 patients with BBS enrolled, 22 were evaluable (59% female, 10-44 years old). Setmelanotide was associated with reduced mean (SD) MetS-Z-BMI score after 52 weeks in patients with a meaningful weight response (n=16; −0.54 [0.56]). Patients not meeting weight thresholds (n=6) had an increase in MetS-Z-BMI (+0.17 ([0.50]; between-group difference, −0.71, P=0.129). MetS-Z-BMI change was generally comparable between females and males.
Conclusions: In addition to reduced hyperphagia and improved quality of life with setmelanotide, meaningful reductions in weight-related outcomes are associated with decreases in MetS-Z-BMI score in patients with BBS. These data suggest that early treatment initiation may lead to reduction in future risk of T2DM and CVD development.

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AS05 – Adipose Tissue

AS05.01

Sex differences in subcutaneous adipose tissue transcriptome in obesity – a study of monozygotic twin pairs discordant for BMI

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Background: Differences in adipose tissue distribution and risk factors for cardiometabolic diseases between sexes are well established in the clinical setting, but the molecular mechanisms underlying these differences are not yet fully understood. Here, we aim to study the sex-specific subcutaneous adipose tissue (SAT) transcriptome, the sex-specific differences in SAT transcriptome in obesity and its implications for systemic low-grade inflammation.
Materials/Methods: We selected 37 monozygous BMI-discordant twin pairs (delta BMI > 2.5 kg/m^2; n = 21 female and 16 male pairs) from national twin registry cohorts (N = 8349) and characterized them in detail for metabolic health. We first analyzed, for sex differences, the SAT transcriptomics with linear mixed modeling followed by pathway identification with Ingenuity Pathway Analysis (IPA). We then determined if the obesity-associating transcriptome profiles were different between the sexes. Next, we calculated standardised mean scores for these obesity-associating pathways that were different between the sexes. We subsequently determined, using plasma Olink-proteomics (inflammation and cardiovascular panels, 92 cytokines), whether these scores associated with plasma inflammation.
Results: Our results show 513 differentially expressed genes (FDR-p < 0.05) between the sexes pointing to upregulated white adipose tissue browning and various altered signaling pathways (e.g., AMPK, DHCR24, LXR/RXR) in males. When investigating the effect of acquired obesity in both sexes, we found 391 genes to be similarly associating with BMI, while 1943 and 1264 genes were unique for females and males, respectively. Moreover, we found that 534 genes were sex-specifically significantly differentially associated with acquired obesity (e.g., up in females and down in males). Pathways related to inflammatory responses, intracellular signaling, and mitochondrial metabolism were different between sexes in obesity. Next, in line with our hypothesis that these pathway differences may contribute to systemic low-grade inflammation in obesity, we found sex-specific effects in genes associated to mitochondrial membrane transporters (*ABCB6, MICU1*) and fatty acid synthesis (*CYB5R2, ACOT2*). Namely, the strength of the association of these genes to inflammation was lower in males than in females.
Conclusions: Our findings suggest a differential sex-specific regulation of SAT transcriptome in obesity, particularly related to inflammation and mitochondrial metabolism. The top pathway findings associate with sex differences in the measured plasma Olink proteins. Thus, our findings of differentially regulated SAT transcriptome connect to systemic measures. The interplay between adipose tissue and other tissues in obesity and its differences between sexes requires further studying, and has potential to offer valuable insights into mechanistic targets for tailored, sex-specific approaches to obesity treatment.

AS05.02

Adipose Cellularity Predicts Long Term Weight Changes

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Introduction: Fat cell volume (FCV) and number (FCN) are the major determinants of the mass of adipose tissue. Their long-term impacts on long term changes in body weight (BW), body mass index (BMI) and total body fat (BF) are not known and were presently examined.
Methods: Abdominal subcutaneous FCV and FCN were determined in 260 subjects (30% men) with mean (range) of 44 (21-72) years in age and 32 (18-53) kg/m² in BMI. They were examined a second time after 15 (5-28) years for determination of BW, BMI, and BF. Changes in the latter measures were related to initial FCV/FCN by single or multiple regression analyses. Persons undergoing bariatric surgery or receiving anti-obesity drugs (n=69) were excluded from the analysis.
Results: Initial FCV and FCN were significantly related to changes over time in BW/BMI/BF (r=0.29-0.26, p<0.0001 for FCV and r=0.19-0.23, p=0.002-0.01 for FCN) so that many large fat cells correlated with decreases over time in BW/BMI/BF and few, but small fat cells correlated with increases in these anthropological measures. The relationships remained being statistically significant (p<0.05) when the subjects were subdivided into having obesity (BMI> 30 kg/m²) or not initially. The impacts of FCV and FCN were additive and explained together 32-35 % of the variations in changes over time in BW/BMI/BF (p<0.0001). In a multiple regression model including FCV, FCN, initial age and physical activity, observation time, and sex only FCV among the two adipose cellularity measures remained as a significant regressor for the longitudinal changes in BW/BMI/BF (partial r=0.27-0.36; p=0.0001-0.002).
Conclusion: The initial cellularity of subcutaneous adipose tissue has a strong influence on long term changes in parameters related to body weight among adults. Having many large fat cells is associated with decrease in body weight, BMI and total body fat whereas having few but small fat cells is linked to increase in the afore mentioned anthropometric measures. However, only FCV is independently correlated with the changes in BW, BMI, and BF over a long period of time. Early measures of FCV may be clinically important for managing body weight in adult life, at least in subjects not undergoing bariatric surgery or pharmacotherapy against obesity.

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AS05.03

Adipocyte-specific ROR alpha invalidation favors adipocyte hypertrophy in obesogenic conditions

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Introduction: Obesity is a major risk factor for type 2 diabetes and cardiovascular diseases. In obesity, excess energy is stored in white adipose tissue (WAT) which expands by increasing adipocyte size (hypertrophy) and/or number (hyperplasia). While hypertrophy favors metabolic complications, hyperplasia seems protective. Heterogeneous responses are also observed depending on the depot's anatomical location: subcutaneous WAT (scWAT) vs visceral WAT (vWAT). Identifying the factors controlling WAT plasticity and heterogeneity is crucial to limit the deleterious effects of obesity and its complications. We propose that the nuclear receptor ROR alpha (RORa) could play a role in these processes. RORa regulates whole-body glucose and lipid homeostasis but its role in mature adipocytes is unclear.
Methods: To test the role of RORa in adipocyte functions and systemic energy metabolism, we developed an adipocyte-specific RORa knockout (RoraAdKO) mouse model. RoraAdKO were generated by crossing Rorafl/fl mice with Adiponectin-cre+/- mice. Male RoraAdKO and littermate controls (Rorafl/fl) were fed a low fat (LF) or obesogenic high fat (HF) diet for 16 weeks. Metabolic parameters were evaluated, and transcriptomic, lipidomic and histological profiles of both inguinal scWAT and epididymal vWAT depots were analyzed.
Results: RoraAdKO mice display a 35 to 70% decrease in Rora gene expression in scWAT and vWAT compared to control mice. This decrease in Rora expression resulted from decreased expression in isolated mature adipocytes, without any change in the stroma vascular fraction, validating the adipocyte-specific invalidation of RORa. Under obesogenic conditions, HF-fed RORaAdKO mice displayed increased scWAT adiposity without any change in body weight, food intake, energy expenditure or vWAT adiposity, compared to HF-fed controls. No major differences were observed in glucose tolerance, insulin sensitivity, plasma lipid levels and circulating adipokines (leptin, adiponectin) levels. Transcriptomic analysis revealed that scWAT expansion in RoraAdKO mice is characterized with increased expression of hypertrophic markers (Leptin, Mest) and altered expression of several lipid metabolism genes (Apoe, Pla2g5, Acoxl, Lpgat1, Ces1d, Enpp2). Histological analyzes confirmed scWAT-specific adipocyte hypertrophy in HF-fed RORaAdKO mice. WAT lipidomic analysis also revealed changes in some lipids species, notably an alteration of the phosphatidylcholine (PC) / phosphatidylethanolamine (PE) ratio in HF-fed RoraAdKO mice..
Conclusion: Overall, our results indicate that adipocyte-specific RORa invalidation impacts WAT in a depot-specific manner, favoring hypertrophy and adipocyte fat storage exclusively in inguinal scWAT depot during obesity. The nuclear receptor RORa may participate in adipocyte plasticity in obesogenic conditions, and further molecular studies are needed to dissect the mechanisms of these observations.

No conflict of interest: to declare

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AS05.04

How does Di(isononyl) cyclohexane-1,2-dicarboxylate (DINCH) effects adipogenesis and metabolism *in vivo*?

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Studies have shown that lipophilic xenobiotics, such as the phthalate alternative DINCH, can be stored in adipose tissue. This suggests that there may be an impact on adipocyte biology and the development of metabolic disruptions, such as insulin resistance and obesity. Furthermore, in vitro experiments have revealed the activation of PPARg in adipocytes by DINCH. To clarify the effects of DINCH, a feeding study was conducted. A total of 144 C57BL/6NTac mice (72 ♀ and 72 ♂) were randomly assigned to four groups, each receiving different dietary interventions: standard chow, high-fat diet (HFD), and HFD supplemented with 4,500 ppm and 15,000 ppm DINCH. *Ad libitum* access to diets was granted to the animals for 16 weeks. A subgroup of 80 animals transitioned to standard diet for an extra 10 weeks to investigate potential washout effects post-initial intervention. The study incorporated regular assessments, such as body weight, blood glucose, insulin tolerance, and body composition (fat mass/lean mass). Analysis of energy metabolism using metabolic chambers occurred at the study's culmination, and tissues were examined at molecular and histological levels following euthanization.
The study found that mice on the HFD-DINCH diet had lower body weights compared to the standard HFD group. There were modest changes in fat and lean mass distribution. The DINCH-fed animals showed increased insulin resistance and dyslipidemia, which reversed during the washout phase. These findings suggest a need to re-evaluate the assumed effects of DINCH on adipocyte differentiation and lipid accumulation, providing new insights into the link between DINCH exposure and metabolic responses in mice.

AS05.05

Activation of a non-neuronal cholinergic system in visceral white adipose tissue of mice and humans with obesity

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Introduction: The project was designed to evaluate the presence of acetylcholine (ACh)-producing cells in mouse and human visceral white adipose tissue (WAT), a tissue that lacks parasympathetic cholinergic innervation and to establish whether a non-neuronal cholinergic system becomes activated in enlarged and inflamed visceral WAT.

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Methods: Mouse epididymal WAT (eWAT) and human omental fat were studied in healthy partecipants and in partecipants with obesity. The expression of the key molecules involved in cholinergic signaling was evaluated with molecular techniques (qRT-PCR and western blotting) and morphological techniques (immunohistochemistry, confocal microscopy and RNA in situ hybridization). ACh levels were measured by liquid chromatography/tandem mass spectrometry. The cellular effects of ACh were assessed in cultured human multipotent adipose-derived stem cell (hMADS) adipocytes.

Results: The expression of cholinergic molecular components was significantly affected by diet-induced obesity conditions and the expression of choline acetyltransferase (ChAT), the ACh-synthesizing enzyme, was significantly higher in hypertrophic eWAT. Interstitial macrophages, macrophages forming crown-like structures (CLSs), and multinucleated giant cells (MGCs) were positive both for ChAT protein and mRNA. The stromal vascular fraction of obese mouse eWAT contained significantly higher levels of ACh and choline than that of control mice. ChAT was undetectable in omental fat from healthy partecipants, whereas it was expressed in a number of interstitial macrophages, CLSs and MGCs from some partecipants with obesity. In hMADS adipocytes stressed with tumor necrosis factor α, ACh, alone or combined with rivastigmine, significantly blunted monocyte chemoattractant protein 1 and interleukin 6 expression, and partially but significantly, restored adiponectin and GLUT4 expression and promoted glucose uptake.

Conclusion: In mouse and human visceral WAT, obesity induces activation of a macrophage-dependent non-neuronal cholinergic system capable of exerting anti-inflammatory and insulin-sensitizing effects on white adipocytes.

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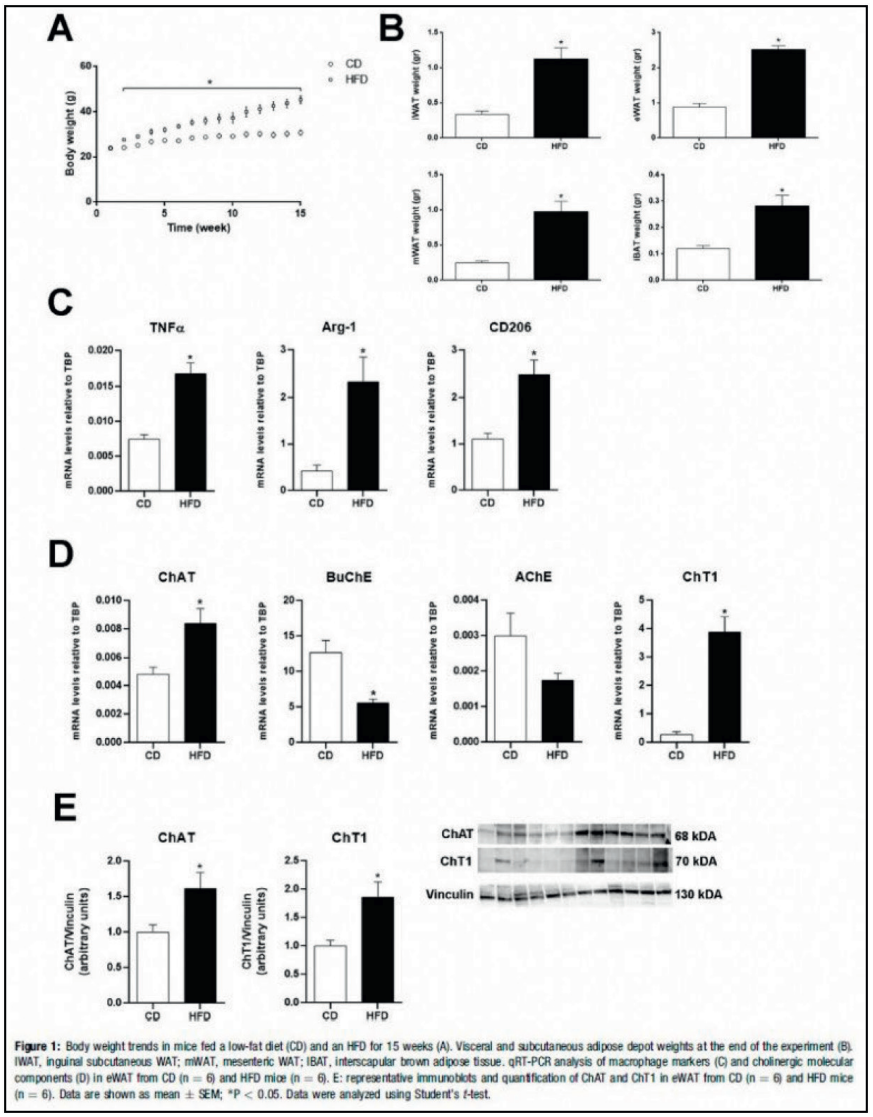


Figure 1: Body weight trends in mice fed a low-fat diet (CD) and an HFD for 15 weeks (A). Visceral and subcutaneous adipose depot weights at the end of the experiment (B). IWAT, inguinal subcutaneous WAT; mWAT, mesenteric WAT; IBAT, interscapular brown adipose tissue. qRT-PCR analysis of macrophage markers (C) and cholinergic molecular components (D) in eWAT from CD ($n = 6$) and HFD mice ($n = 6$). E: representative immunoblots and quantification of ChAT and ChT1 in eWAT from CD ($n = 6$) and HFD mice ($n = 6$). Data are shown as mean ± SEM; $^*P < 0.05$. Data were analyzed using Student's *t*-test.

Fig. 1. Molecular data in mice.

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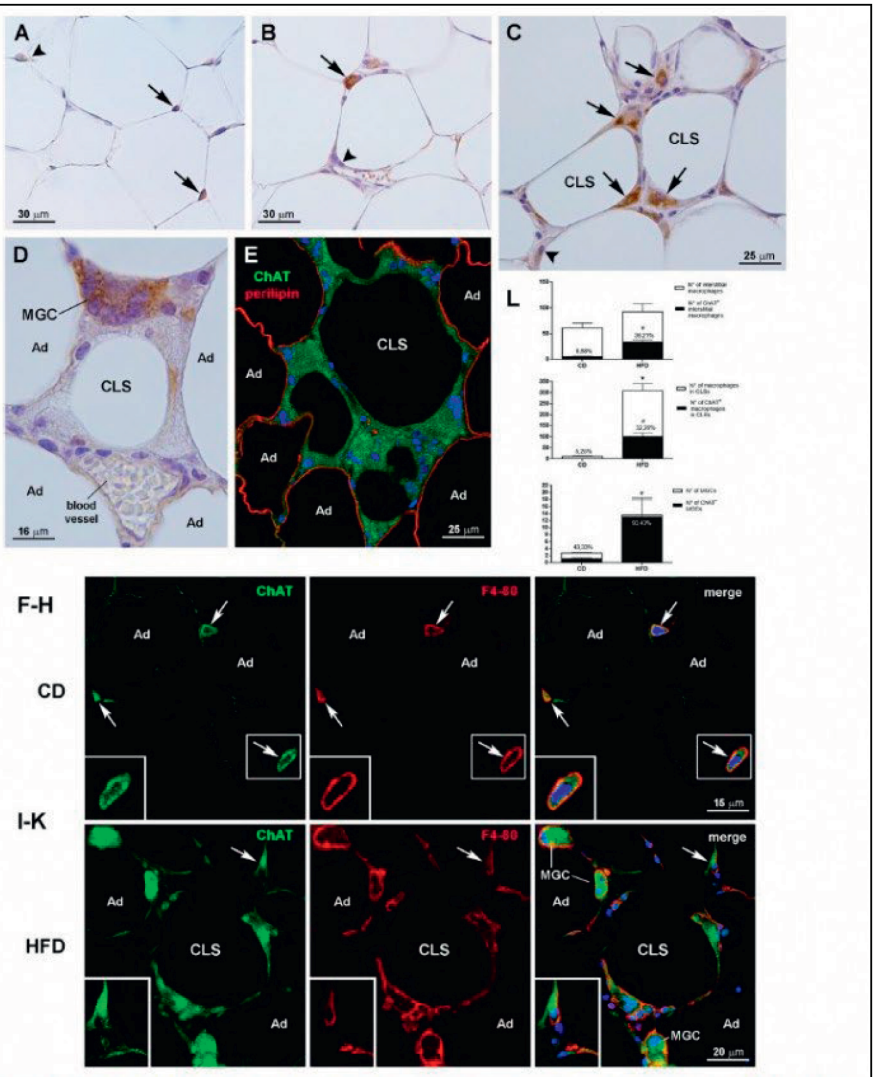


Figure 2: Immunohistochemical detection of ChAT in mouse eWAT from CD and HFD mice. Immunoperoxidase: in CD mice, ChAT staining is barely detectable in two non-adipose cells found among white adipocytes (A, arrows), whereas in HFD mice ChAT is clearly expressed by an infiltrating cell located among the hypertrophic adipocytes (B, arrow), by some cells forming CLSs (C, arrows) and by an MGC (D). Arrowheads in A, B and C indicate negative interstitial cells. By double-staining and confocal microscopy (E), perilipin-positive adipocytes (red) from an HFD mouse do not express ChAT; note the absence of perilipin staining in the CLS depicted in the image, which is formed by intensely ChAT-positive cells (green). Confocal microscopy: in a CD mouse (F–H), three ChAT-positive infiltrating cells (green, arrows) are also positive for the pan-macrophage marker cell surface F4-80 (red, arrows); the inset is the enlargement of the framed area. In an HFD mouse (I–K) specific ChAT staining (green) is detected in an F4-80-positive infiltrating cell (red, arrow) and in F4-80-positive macrophages forming a CLS and three MGCs; the cell on the upper right corner is enlarged in the inset. Ad, adipocyte. L: percentages of F4-80-positive interstitial macrophages, macrophages forming CLSs and MGCs that are also positive for ChAT in eWAT of CD ($n = 5$) and HFD mice ($n = 5$). Data are shown as mean ± SEM; *$P < 0.05$ comparing F4-80-positive cells in CD *vs* HFD mice, #$P < 0.05$ comparing F4-80-positive cells also positive for ChAT in CD *vs* HFD mice. Data were analyzed using Student's *t*-test.

Fig. 2. Morphological data in mice.

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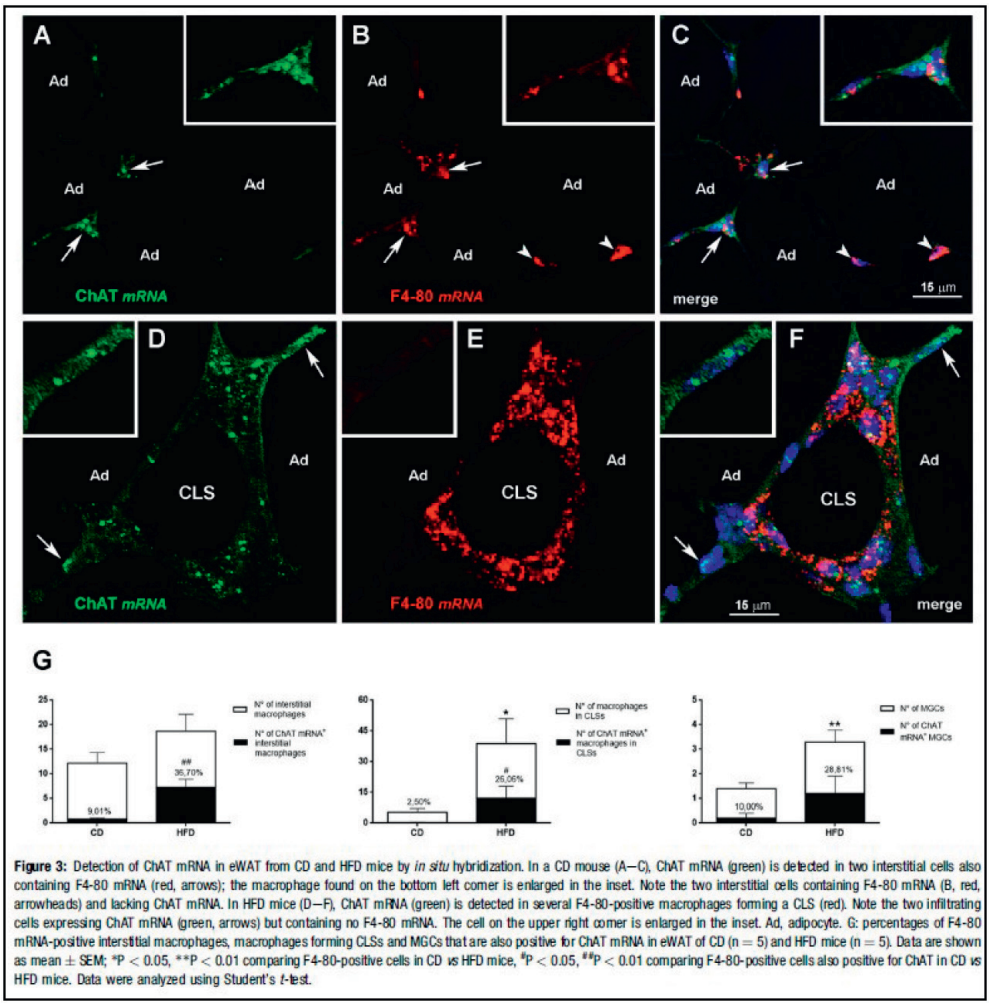


Figure 3: Detection of ChAT mRNA in eWAT from CD and HFD mice by *in situ* hybridization. In a CD mouse (A–C), ChAT mRNA (green) is detected in two interstitial cells also containing F4-80 mRNA (red, arrows); the macrophage found on the bottom left corner is enlarged in the inset. Note the two interstitial cells containing F4-80 mRNA (B, red, arrowheads) and lacking ChAT mRNA. In HFD mice (D–F), ChAT mRNA (green) is detected in several F4-80-positive macrophages forming a CLS (red). Note the two infiltrating cells expressing ChAT mRNA (green, arrows) but containing no F4-80 mRNA. The cell on the upper right corner is enlarged in the inset. Ad, adipocyte. G: percentages of F4-80 mRNA-positive interstitial macrophages, macrophages forming CLSs and MGCs that are also positive for ChAT mRNA in eWAT of CD ($n = 5$) and HFD mice ($n = 5$). Data are shown as mean ± SEM; $^{*}P < 0.05$, $^{**}P < 0.01$ comparing F4-80-positive cells in CD *vs* HFD mice, $^{\#}P < 0.05$, $^{\#\#}P < 0.01$ comparing F4-80-positive cells also positive for ChAT in CD *vs* HFD mice. Data were analyzed using Student's *t*-test.

Fig. 3. mRNA mice.

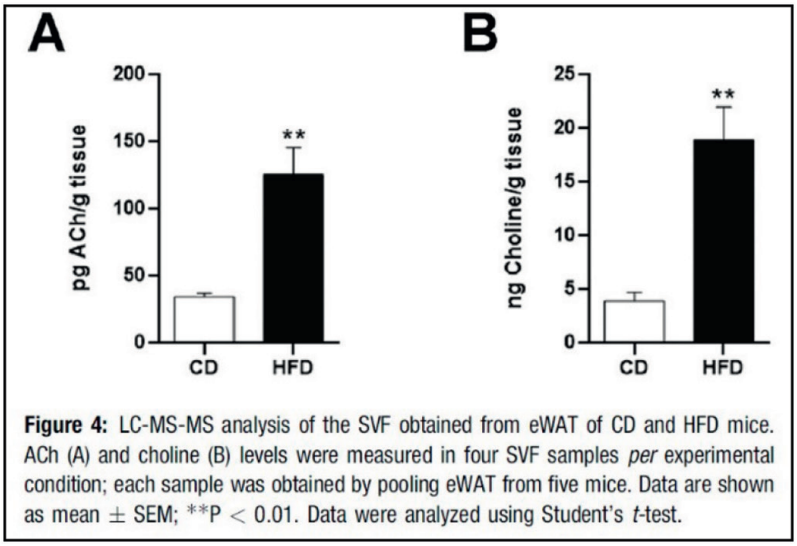


Figure 4: LC-MS-MS analysis of the SVF obtained from eWAT of CD and HFD mice. ACh (A) and choline (B) levels were measured in four SVF samples *per* experimental condition; each sample was obtained by pooling eWAT from five mice. Data are shown as mean ± SEM; $^{**}P < 0.01$. Data were analyzed using Student's *t*-test.

Fig. 4. LC-MS mice.

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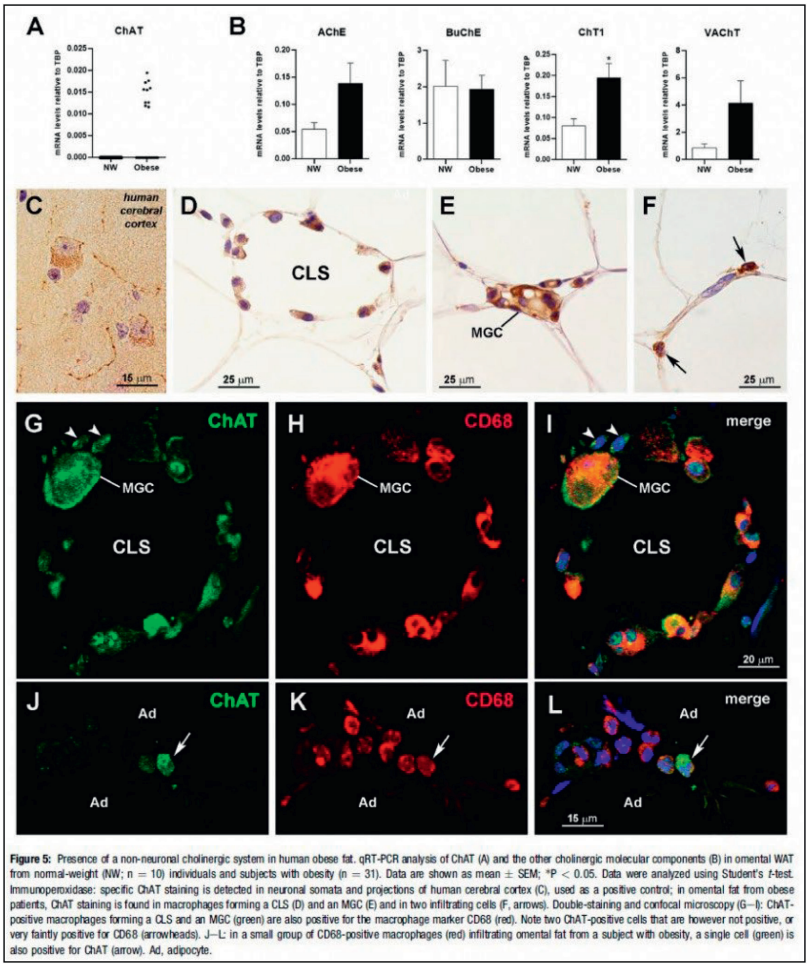


Figure 5: Presence of a non-neuronal cholinergic system in human obese fat. qRT-PCR analysis of ChAT (A) and the other cholinergic molecular components (B) in omental WAT from normal-weight (NW; n = 10) individuals and subjects with obesity (n = 31). Data are shown as mean ± SEM; *P < 0.05. Data were analyzed using Student's *t*-test. Immunoperoxidase: specific ChAT staining is detected in neuronal somata and projections of human cerebral cortex (C), used as a positive control; in omental fat from obese patients, ChAT staining is found in macrophages forming a CLS (D) and an MGC (E) and in two infiltrating cells (F, arrows). Double-staining and confocal microscopy (G–I): ChAT-positive macrophages forming a CLS and an MGC (green) are also positive for the macrophage marker CD68 (red). Note two ChAT-positive cells that are however not positive, or very faintly positive for CD68 (arrowheads). J–L: in a small group of CD68-positive macrophages (red) infiltrating omental fat from a subject with obesity, a single cell (green) is also positive for ChAT (arrow). Ad, adipocyte.

Fig. 5. Human data.

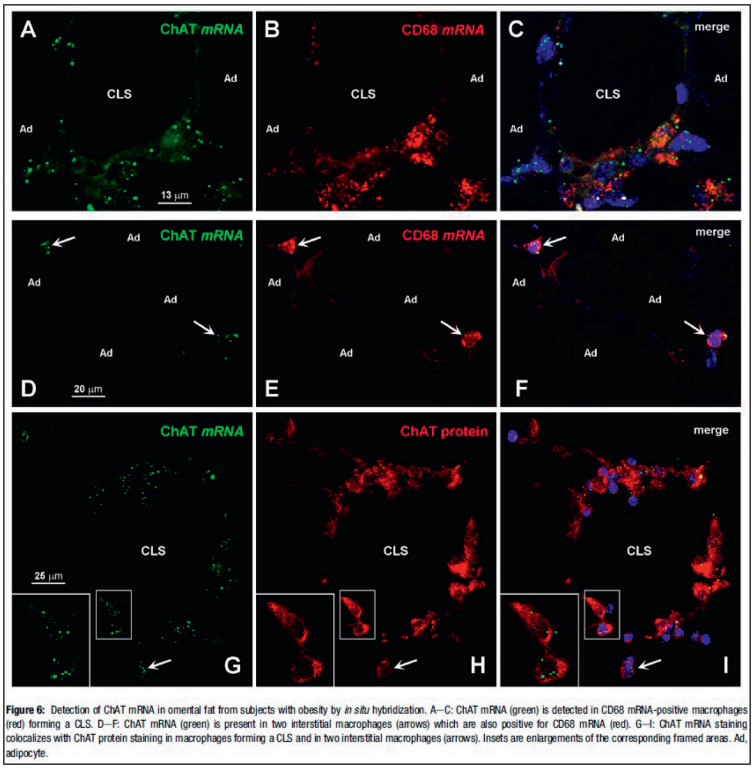


Figure 6: Detection of ChAT mRNA in omental fat from subjects with obesity by *in situ* hybridization. A–C: ChAT mRNA (green) is detected in CD68 mRNA-positive macrophages (red) forming a CLS. D–F: ChAT mRNA (green) is present in two interstitial macrophages (arrows) which are also positive for CD68 mRNA (red). G–I: ChAT mRNA staining colocalizes with ChAT protein staining in macrophages forming a CLS and in two interstitial macrophages (arrows). Insets are enlargements of the corresponding framed areas. Ad, adipocyte.

Fig. 6. mRNA human.

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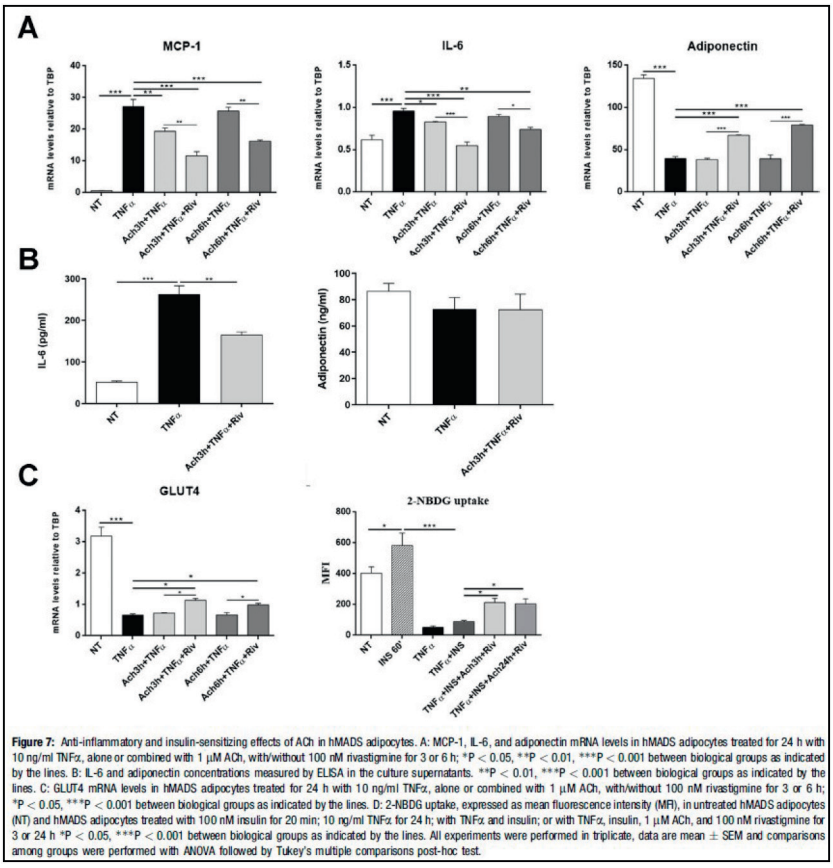


Figure 7: Anti-inflammatory and insulin-sensitizing effects of ACh in hMADS adipocytes. A: MCP-1, IL-6, and adiponectin mRNA levels in hMADS adipocytes treated for 24 h with 10 ng/ml TNFα, alone or combined with 1 μM ACh, with/without 100 nM rivastigmine for 3 or 6 h; $^{*}P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$ between biological groups as indicated by the lines. B: IL-6 and adiponectin concentrations measured by ELISA in the culture supernatants. $^{**}P < 0.01$, $^{***}P < 0.001$ between biological groups as indicated by the lines. C: GLUT4 mRNA levels in hMADS adipocytes treated for 24 h with 10 ng/ml TNFα, alone or combined with 1 μM ACh, with/without 100 nM rivastigmine for 3 or 6 h; $^{*}P < 0.05$, $^{***}P < 0.001$ between biological groups as indicated by the lines. D: 2-NBDG uptake, expressed as mean fluorescence intensity (MFI), in untreated hMADS adipocytes (NT) and hMADS adipocytes treated with 100 nM insulin for 20 min; 10 ng/ml TNFα for 24 h; with TNFα and insulin; or with TNFα, insulin, 1 μM ACh, and 100 nM rivastigmine for 3 or 24 h $^{*}P < 0.05$, $^{***}P < 0.001$ between biological groups as indicated by the lines. All experiments were performed in triplicate, data are mean ± SEM and comparisons among groups were performed with ANOVA followed by Tukey's multiple comparisons post-hoc test.

Fig. 7. cells.

AS05.06

Role of Thromboxane A2 in the whitening/browning of adipocytes

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Introduction: The adipose tissue (AT) has a fundamental role in the gesture of energy resources. The white AT (WAT) is specialized in storing and releasing lipids, and the brown AT (BAT) is specialized in heat production (thermogenesis). Within the WAT, thermogenic adipocytes, called "brite adipocytes", can appear through the differentiation of dedicated progenitor cells, or through a conversion of existing white adipocytes. The formation and activation of brown and brite adipocytes, referred to as "browning", has beneficial effects on metabolism and insulin resistance, and is an interesting strategy to alleviate obesity and its comorbidities. However, obesity leads to a remodeling associated with a whitening of the AT, which thus loses its thermogenic capacities. To develop efficient therapeutic strategies using the AT browning, we need to understand its regulation. Studies showed that some metabolites of polyunsaturated fatty acids are involved in the regulation of thermogenesis. We have identified that a metabolite derived from arachidonic acid, thromboxane A2 (TXA2) inhibits the expression of the main marker of thermogenesis (UCP1).
We aim to determine the role of the TXA2 in the regulation of the AT whitening/browning.
Methods: We assessed the effects of two different stable analogs of the TXA2 (CTA2 and U466) on adipocyte browning *in vitro*, using human adipose-derived stem (hMADS) cells and human as well as murine SVF cells differentiated into white adipocytes, and then converted into brite adipocytes. We examined the expression of thermogenic and adipogenic markers and analyzed the signaling pathways involved using RT-qPCR, western-blot and reporter gene assays. We also studied the link between the AT whitening, analyzed by histology, and the TXA2 levels in the BAT of mice with genetic obesity (ob/ob mice) and diet induced obesity (mice fed a high fat diet or a chow diet).
Results: In various adipocyte models (hMADS cells, human and murine SVF), two TXA2 analogues inhibit the expression of the thermogenic marker, UCP1 (Uncoupling Protein 1), without affecting that of PPARγ, a nuclear receptor known to regulates the expression of several genes involved in the thermogenic phenotype, especially UCP1. TXA2 analogues did not appear to be direct antagonists of PPARγ. However, TXA2 analogues increase ERK activity in hMADS cells. As PPARγ is a known target of ERK kinase, which inhibits its activity by phosphorylation, it is tempting to hypothesize that TXA2 targets PPARγ phosphorylation. TXA2 therefore appears to induce adipocyte whitening *in vitro*. We wanted to test, *in vivo*, whether obesity and whitening were associated with elevated tissue TXA2 levels. In mice on a high-fat diet, and in ob/ob mice, TXA2 proportion in BAT increases, compared with their respective controls.
Conclusion: Thus, our work suggests that TXA2 probably acts as a brake on browning through mechanisms yet to be identified. By pointing the importance of fatty acid metabolites such as TXA2 in controlling the thermogenic capacities of the AT, our work contributes to develop new therapeutic strategies to alleviate obesity and associated disorders.

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AS06 – Early Life Risk Factors for Obesity

AS06.01

Maternal Exposure to Endocrine-Disrupting Chemicals: Analysis of Their Impact on Infant Gut Microbiota Composition

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Introduction: Endocrine Disruptors (EDCs) are chemicals that interfere with the endocrine system; EDCs exposure may contribute to the development of obesity, type 2 diabetes, and cardiovascular diseases by impacting the composition of an infant's gut microbiota during the first 1000 days of life. In this contest, human breast milk (HBM) is one of the most important sources of EDCs exposure for newborns, since these chemicals – metabolized and accumulating in the human body – have been detected in the mother's milk, serum, hair, and placenta. As a consequence, the entero-mammary circle is believed to facilitate the transfer of these chemicals, as certain EDCs can traverse the gut barrier, enter the bloodstream, and be transported to the mammary glands, appearing in HBM and potentially influencing the gut microbiota of the newborn.
Methods: To explore the relationship between maternal urinary levels of Bisphenol- A and phthalates (UHPLC-MS/MS), and the composition of the infant gut microbiota (16S rDNA) aged at 12 months (T3) and, retrospectively, at birth (T0), 1-month (T1), and 6-months (T2). Stool samples from 20 infants who were breastfed at least once/day were analysed. The microbial metataxonomic relative abundances were correlated with EDCs values. Based on median Bisphenol- A levels, infants were assigned to the over-exposed group (O, n=8) and the low-exposed group (B, n=12).
Results: The B-group exhibited higher gut colonization of the Ruminococcus torques group genus; the O-group showed higher abundances of Erysipelatoclostridium and Bifidobacterium breve. Additionally, infants were stratified into high-risk (HR, n=12) and low-risk (LR, n=8) exposure to phthalates, depending on the presence of at least three phthalates with concentrations exceeding the cohort median values; no differences were observed in gut microbiota composition. A retrospective analysis of gut microbiota (T0-T2) revealed a disparity in β-diversity between the O-group and the B-group. Considering T0-T3, the Linear Discriminant Effect Size indicated differences in certain microbes between the O-group vs. B-group and the HR-group vs. LR-group.
Conclusion: Although our results partially reproduce those provided by previous studies, these cannot be considered conclusive due to different limitations that can have influenced the present research. One of the most important limitations is the lack of concrete EDCs quantification in infants' biological fluids. However, our findings underscore the promising role of microbial communities as reliable biomarkers for high EDCs exposure, signifying a pivotal step in environmental health diagnostics. It is noteworthy that, these initial results are just the beginning; comprehensive, longitudinal studies are imperative to fully establish their predictive validity and utility in public health interventions.

Conflict of Interest: None Disclosed.

Funding: Project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4 - Call for tender No. 3138 of 16 December 2021, rectified by Decree n.3175 of 18 December 2021 of Italian Ministry of University and Research funded by the European Union – NextGenerationEU; Award Number: Project code CN_00000033, Concession Decree No. 1034 of 17 June 2022 adopted by the Italian Ministry of University and Research, CUP: F13C22001210007. Project title "National Biodiversity Future Center - NBFC."

AS06.02

Ambient air pollution and body mass index from infancy to later childhood in 10 European birth cohorts

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Introduction: Exposure to ambient air pollution may contribute to childhood obesity through various mechanisms, such as the decrease of glucose utilization by skeletal muscles, disruption of the endocrine system, and individual behavior changes, but few large longitudinal studies have explored this. This study aimed to examine associations between pre- and postnatal exposure to air pollution and child body mass index z-scores (zBMI) across European birth cohorts.
Methods: This study included mother-child pairs from 10 birth cohorts within the EU Child Cohort Network (n=57,997). Exposure to nitrogen dioxide (NO2) and fine particulate matter (PM2.5) was estimated at the home address during pregnancy and in the year before outcome assessment. We derived child age-and-sex standardized zBMI in four age periods (0-2, 2-4, 4-9, and 9-12 years). Associations between air pollution exposure and zBMI were estimated separately for each cohort using linear longitudinal mixed effects models followed by the combination of risk estimates via random-effects meta-analysis. Analyses performed across all age-periods, stratified by age-period, and by European region (Western: cohorts in the Netherlands and France; Northern: cohorts in the UK, Denmark and Norway; Southern Europe: cohorts in Spain, Italy and Greece). Models were adjusted for sex, child age, individual- and area-level socioeconomic status, and analyses were conducted in DataSHIELD.
Results: Meta-analysis results showed no robust associations between NO2 and PM2.5, and BMI z-scores. There was considerable heterogeneity between cohorts in all meta-analyses (I2 range: 66.5-91.9%), with some cohort-specific associations observed in both positive and negative directions; e.g., pre- and postnatal PM2.5 exposure showed to be associated with lower zBMI across all age-periods in a Dutch cohort, while a positive association was found in a UK cohort. When stratifying analyses by European region, we found that every 10μg/m3 increase in PM2.5

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exposure during pregnancy was associated with an increase of zBMI (β(95%CI) 0.12(0.04;0.20)) across childhood in Western Europe, but not in Southern (-0.04(-0.18; 0.09) or Northern Europe (-0.13(-0.26; 0.00). Associations did not differ by child sex or area-level and individual-level socioeconomic status.
Conclusions: In this large European meta-analysis there was no evidence for an association between prenatal or childhood exposure to ambient air pollution and childhood BMI, although considerable differences between cohorts and European regions are noted.

AS06.03

Associations between exposure to perfluoroalkyl substances at preconception and BMI z-scores in children from Singapore

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Background-Aim: Prenatal exposure to perfluoroalkyl substances (PFAS) is associated with adverse metabolic health outcomes in children, but research examining preconception PFAS exposure as a fetal programming mechanism is lacking. Therefore, we assessed the associations between maternal preconception PFAS concentrations and early childhood BMI z-scores in a preconception mother-child cohort
Methods: We measured plasma concentrations of seven PFAS at preconception in 233 women who participated in the Singapore Preconception Study of Long-Term Maternal and Child Outcomes (S-PRESTO). We used the weight and length/height of their children (132 boys, 101 girls) measured at ten follow-up visits from birth through four years of age (at birth, week 3, week 6, month 3, month 6, month 12, month 18, month 24, month 36, and month 48) to calculate age- and sex-specific BMI z-scores using the 2006 WHO Growth Standards. We assessed associations between individual PFAS concentrations and repeated BMI z-scores using linear mixed-effect regression models. We assessed the overall PFAS mixture association with BMI z-scores using mixed-effect Bayesian weighted quantile sum regressions. All analyses were adjusted for confounders.
Results: We observed significant positive associations between maternal preconception PFAS concentrations and child BMI z-scores at the later ages assessed: a quartile increase in preconception perfluorohexanesulfonic acid (PFHxS) concentrations was associated with greater BMI z-scores at month 18 (β=0.139, 95% CI 0.012, 0.266) and month 48 (β=0.123, 95% CI 0.002, 0.244). We observed consistent directionality at month 48 for perfluorooctanesulfonic acid (PFOS) (β=0.122, 95% CI -0.003, 0.247) and perfluorooctanoic acid (PFOA) (β=0.119, 95% CI -0.006, 0.244). The strongest PFAS mixture association was observed with respect to BMI z-score at month 48 (β=0.168, 95% CI -0.014, 0.365), where PFOA was the major contributor to the mixture. For most PFAS, including PFHxS (β=0.009, 95% CI -0.014, 0.032) and PFOA (β=0.010, 95% CI -0.013, 0.033), we observed a trend of non-statistically significant positive associations between maternal preconception PFAS concentrations and annual change in child BMI z-scores from birth to four years of age.
Conclusions: Higher maternal preconception PFAS concentrations are associated with higher BMIs in early childhood. These findings support emerging hypotheses for the obesogenic role of early-life PFAS exposures.

AS06.04

Pediatric obesity increases the risk of early Multiple Sclerosis: A prospective cohort study

Hagman, E.; Putri, R. R.; Danielsson, P.; Marcus, C.

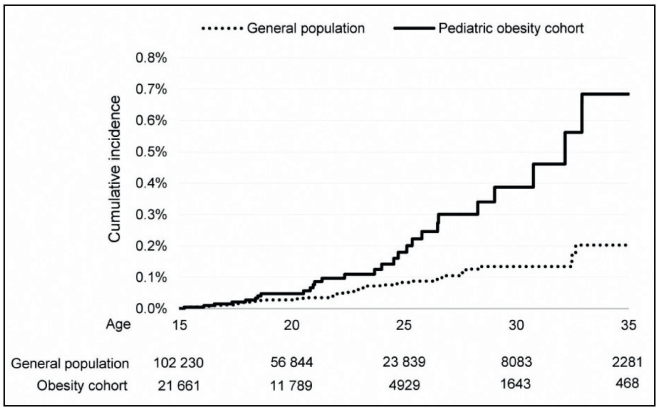
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Introduction: Emerging evidence implies a link between high BMI in adolescence and an increased risk of Multiple Sclerosis (MS). Yet, most studies evaluating this association are cross-sectional, have retrospective design with self-reported data, have used solely genetic correlations, or use pediatric weight data before the obesity epidemic. Therefore, we aimed to prospectively evaluate the risk of developing MS in a large cohort of patients with pediatric obesity and general population comparators.
Methods: We included patients aged 2 – 19 with obesity enrolled in the Swedish Childhood Obesity Treatment Register (BORIS) between 1995 – 2020, and a matched comparison group from the general population. Matching criteria included sex, year of birth, and residential area. Exclusion criteria were secondary obesity, genetic syndromes, and MS diagnosis before 15 years of age. MS was identified through the ICD-10 code G35 in the National Patient Register. Individuals were followed from obesity treatment initiation, or from 15 years of age if treatment was initiated earlier, until MS diagnosis, death, emigration, or August 2023, whichever came first. We estimated crude incidence rate and conditional Cox proportional hazard ratio (HR), adjusted for parental MS and with attained age as time scale.
Results: We included 21 661 patients from the pediatric obesity cohort with a median age of obesity treatment initiation of 11.4 (Q1: 9.0, Q3: 13.9) years and 102 230 general population comparators. The median follow-up time was 5.6 (Q1: 3.0, Q3: 9.6) years, corresponding to 20.8 (18.0, 24.9) years of age. Parental MS was present in 0.99% in the obesity cohort and 0.68% in the general population comparators, p<0.0001.
During follow-up, 0.13% (n=28) developed MS in the obesity cohort, whereas the corresponding number in the general population was 0.06% (n=58), p=0.0002. The mean (SD) age of MS diagnosis was comparable between the groups; 23.4 (5.0) years in the obesity cohort versus 22.8 (5.9) years in the general population comparators, p=0.64.
The crude incidence rate (95% CI) of MS per 100 000 person years was 19.3 (13.3 – 27.9) in the obesity cohort and 8.3 (6.4 – 10.7) in the general population comparators, p<0.001. Analyses adjusted for heredity (which was more prevalent in the obesity cohort) revealed that the risk of developing MS was more than twice in the pediatric obesity cohort, HR=2.29 (95% CI 1.40 – 3.56), p<0.001.
Conclusion: Despite the limited follow-up time, our findings highlight that obesity in childhood increases the susceptibility of early-onset MS more than two-fold. Given that pediatric obesity is prevalent, it is likely to serve as a critical etiological contributor to the escalating prevalence of MS. Pediatric obesity is associated with several autoimmune diseases and the leading hypothesis is that the persistent low-grade inflammatory state, typically observed in obesity, is mediating the association. Understanding these pathways is crucial for developing targeted prevention and intervention strategies to normalize the risk for MS in children and adolescents with obesity.

Conflict of Interest: None

Funding: Åke Wiberg foundation

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Cumulative incidence of multiple Sclerosis from 15 to 35 years of age. Number of individuals at each age are displayed for each group below the graph.

Fig. 1. Cumulative incidence.

AS06.05

Formula feeding as a Response to Early Infant Weight Gain: Insights from the Gemini Twin Study

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Background: Rapid weight gain (RWG) is common among formula-fed (FF) infants. Paradoxically recent studies report slower weight gain amongst infants fed with formula milk. This is therefore the first study to test the hypothesis that formula milk is introduced in response to slower weight gain, or higher concern for slower weight gain in early infancy, using epidemiological analyses and a discordant twin design.
Methods: Data were from Gemini, a population-based birth cohort of n=4804 British twins born in 2007. Mothers reported weight measurements across infancy, and infant feeding methods (IFM; breast- and formula-feeding) at ~3 months of age. For between-family analyses, logistic regressions tested whether slower infant weight gain (measured by weight for age z-scores) during exclusive breastfeeding (IV) increased the odds of formula milk introduction (DV) (n=480). Analyses were repeated using higher concern for low weight gain from 0-3 months as the IV (n=585). Analyses adjusted for clustering of twins in families, and potential family and infant confounders. Discordant twin analyses tested if co-twin differences in weight gain (IV) or maternal concern for weight gain (IV) led to discordance in IFMs (DV) (n=139 pairs). Alpha was set at <0.05.
Results: Infants with faster early weight gain were less likely to be introduced to formula milk (OR=0.37; 95%CI=0.24–0.57; p<0.01). For each 1 SD increase in weight z-score during exclusive breastfeeding, odds of subsequent introduction to formula milk reduced by 63%. There was a trend for higher maternal concern for low weight gain from 0-3 months to increase odds of being introduced to formula milk (OR=1.75; 0.97-3.14; p=0.06). The odds of being introduced to formula milk was 75% higher among mothers reporting high concern for low weight gain. Among twins discordant for IFM, maternal concern for low weight gain was more common for the twin fed with more formula or expressed breastmilk than their co-twin (29.4% vs 17.7%; OR=1.93; 1.05-3.5, p= 0.03).
Conclusions: Slower infant weight gain and higher maternal concern for low weight gain in early infancy may lead parents to introduce formula milk. Findings contribute to emerging evidence demonstrating parent-child reciprocity in parental feeding decisions. Caregiver concern about infant weight should be considered within interventions to support breastfeeding or healthy infant growth.

AS06.06

Associations of maternal lifestyle factors with inadequate pregnancy weight gain: findings from the baseline data of the LIMIT prospective cohort study

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Introduction: Gestational Weight Gain (GWG) plays a crucial role in the health of both the mother and the developing infant. Mothers exceeding or gaining below the optimal pregnancy weight gain ranges can cause short- and long-term health complications. Optimizing GWG is becoming a public health strategy that needs to be addressed for the health promotion of both the mother and infant. Maternal lifestyle factors before and during pregnancy were found to have a great influence on the management of GWG. This study aims to investigate the potential maternal lifestyle factors associated with inadequate GWG, with a focus on dietary habits, including Mediterranean Diet (MD) adherence and consumption of specific food items.
Methods: This cross-sectional analysis used baseline data from the ongoing LIMIT prospective cohort study1. One hundred and thirty-one pregnant women were enrolled during the pre-hospital care before birth at Fondazione IRCCS Policlinico San Matteo (Pavia), according to the inclusion/exclusion criteria. Sociodemographic characteristics, anthropometric data (height; pre-pregnancy weight and BMI; gestational weight gain, GWG), MD adherence, physical activity (PA) levels and smoking habits during pregnancy were retrospectively collected. The maternal MD adherence and PA level were investigated using validated questionnaires adapted for the target group (MEDI-LITE score questionnaire2; Turconi et al. 2003 questionnaire3, respectively). Participants were categorized into adequate (AGWG), excessive (EGWG), and low (LGWG) gestational weight gain groups, according to the IOM guidelines.
Results: A total of 109 pregnant women (aged 27-38) were eligible. Nearly half (48.6%) of the participants fell into the category of inadequate GWG (31.2% had LGWG; 17.43% had EGWG). The bivariate analysis showed a significant association between inadequate GWG and educational level (p=0.012); smoking habits (p=0.039); pre-pregnancy BMI (p<0.001); PA level score (p=0.004), as well as the daily consumption of vegetables (p=0.001), and milk/milk products (p=0.004). No association was found between inadequate GWG and MD adherence (p=0.052). The multinomial regression analysis confirmed a significant association between higher educational level (RRR=0.125, p=0.052) and daily consumption of 1-1.5 portions of milk/milk products (RRR=0.049, p=0.025) with lower risk of EGWG, compared to the reference group of AGWG. On the other hand, higher pre-pregnancy BMI was found to be associated with a higher risk of EGWG (RRR=1.358, p=0.0003), compared to the reference group of AGWG. No significant association of any of the studied variables was detected in terms of LGWG, compared to AGWG.
Conclusion: These preliminary findings showed an alarming increase in inadequate GWG calling for the need to promote adequate lifestyle changes, before and during pregnancy, as a primary goal to improve the health outcomes for both the expecting mother and the infant.

Conflict of Interest: None Disclosed.

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AS07 – Clinical Obesity

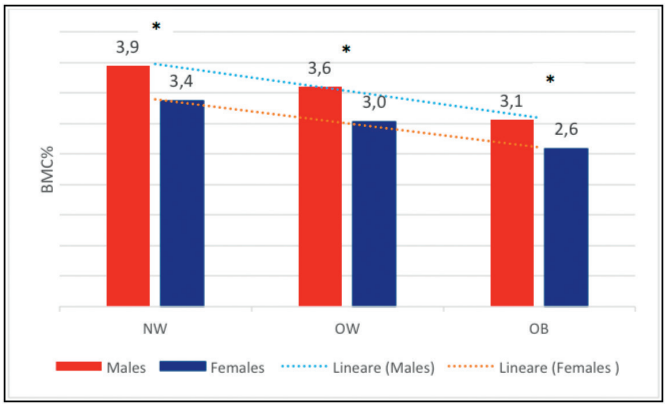
AS07.01

A New Paradigm that Contrasts with the Obesity Paradox: A Negative Association Between Obesity and Bone Mineral Content in Older Adults

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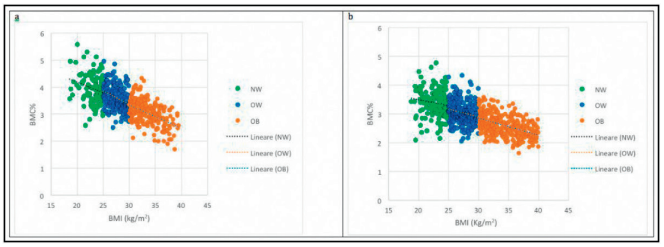
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Introduction: The relationship between body weight and bone mass status in the elderly is still unclear, and if obesity is to consider a protective factor is still arguable. For this reason, in the current study we aimed to assess firstly the association between body mass index (BMI) and bone mineral content (BMC), and secondly to test the validity of the obesity paradox in this context.
Methods: A cohort of 1404 older adults who aged ≥ 60 years were categorized according to the World Health Organization BMI cut-off points (i.e., ≥18.5– 24.9 kg/m², ≥25-29.9 kg/m², ≥30.0 kg/m² respectively) and completed a body composition measurement by means of a dual x-ray absorptiometry (DXA) scan as whole and regional compartments (arms, trunk, and legs) in terms of fat, lean, and bone mass. The BMC percentage (%) expressed the total amount of bone minerals in the total body mass. The trunk fat to appendicular lean mass ratio was used to create a combined variable that expresses the central fat distribution and muscle mass in the extremities.
Results: Individuals with obesity displayed a lower mean BMC% (3.06±0.44%; 2.60±0.37%) when compared to those who were normal-weight (3.95±0.54%; 3.38±0.48%) and overweight (3.06±0.44%; 3.04±0.37%) in both genders, and linear regression analysis showed a negative association between BMI and BMC% in males (β=-0.09; p<0.001) and females (β=-0.06; p<0.001). Finally, among individuals with obesity and after adjusting for age, the linear regression models revealed a significant decrease of 0.75% and 0.28% in BMC% for every one-unit increase in the trunk fat/appendicular lean mass ratio in both men (β=-0.749; p<0.0001) and women (β=-0.281; p<0.001).
Conclusions: Our study found a negative association between body weight status and bone mass, as individuals with obesity appear to display the lowest BMC, especially those with a higher central fat deposition and lower appendicular muscle mass. This represents a new paradigm of the link between obesity and bone status, where the former does not appear to be a protective factor of the latter, especially in individuals with central obesity and low muscle mass.



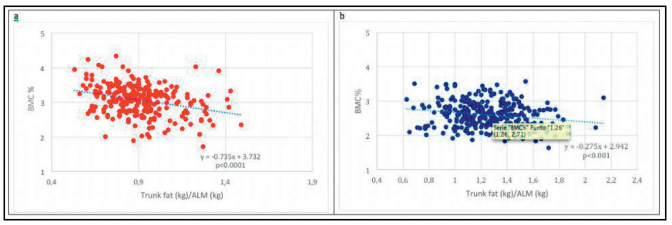
Mean BMC% within the three BMI categories (NW= normal weight; OW= overweight; OB= obesity) in males and females.

Fig. 1.



Association between BMI and BMC% by BMI category (NW= normal weight; OW= overweight; OB= obesity) in a) males b) females.

Fig. 2.



Association between Trunk Fat to ALM ratio and BMC% among participants with BMI≥ 30 kg/m² stratified by gender a) males b) females.

Fig. 3.

AS07.02

Changes in visceral adiposity modify the impact of weight loss on the 10-year risk of obesity-related complications: a population-based cohort study

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Introduction: Weight loss has been shown to reduce the risk of developing obesity-related complications (ORCs), but it is unclear how changes in visceral adiposity modify the association between weight loss and ORC risk. This study examined the association of changes in body mass index (BMI) and waist–height ratio (WHtR; surrogate for changes in visceral adiposity) with the 10-year risk of developing four ORCs and investigated the magnitude of BMI and WHtR changes needed to achieve a low reference risk of the ORCs.
Methods: This retrospective cohort study included individuals from the UK Clinical Practice Research Datalink (UK CPRD Aurum) aged ≥18–≤60 years with a BMI of ≥25 kg/m² at the index date (earliest date between 1 Jan 2010 and 31 Dec 2014 at which all inclusion and exclusion criteria were fulfilled). Changes in BMI and WHtR during the baseline period

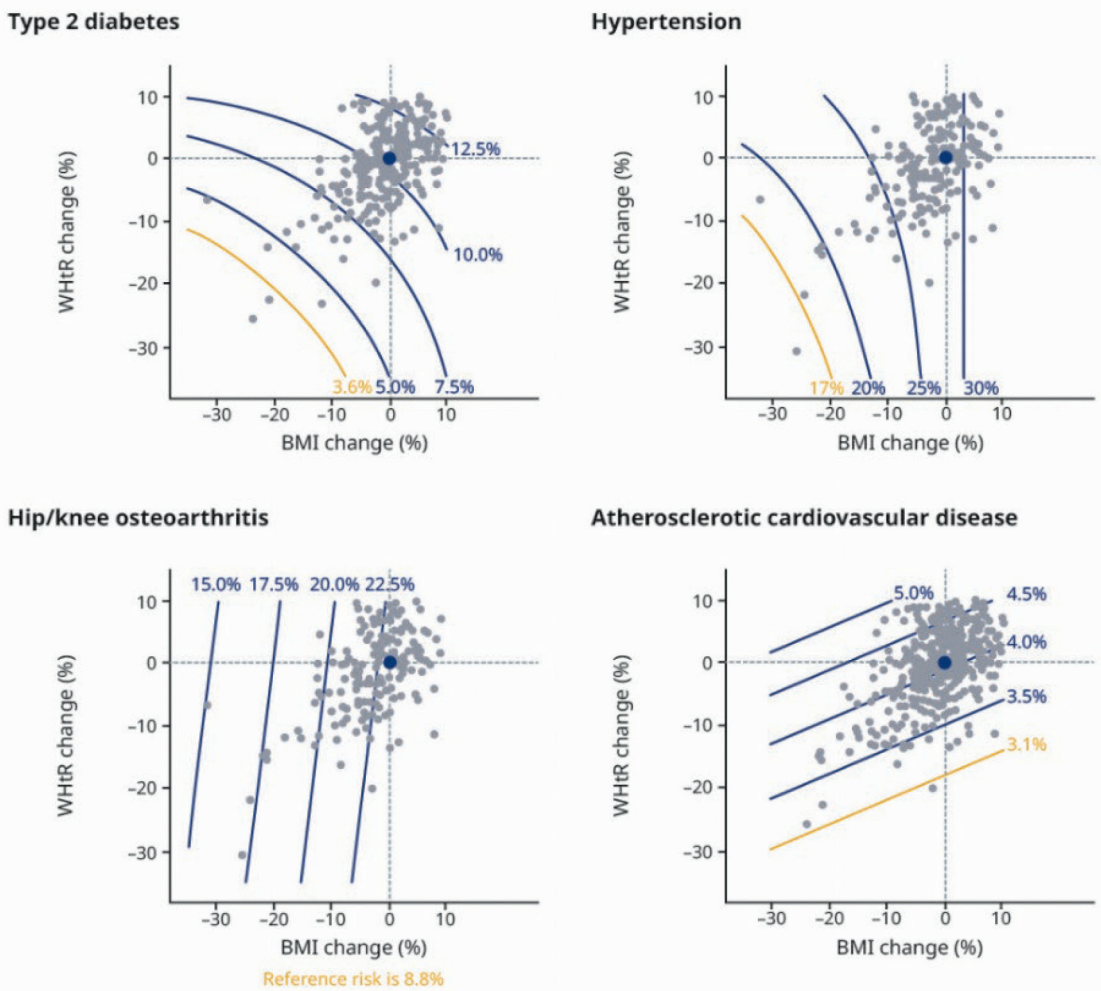
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(years 1–3) were calculated by comparing mean measurements in year 3 vs year 1. Individuals with a record of cancer, limb amputation, pregnancy or unintentional weight loss during the baseline period (identified using SNOMED CT codes) were excluded. ORCs evaluated were type 2 diabetes (T2D), hypertension, hip/knee osteoarthritis (OA) and atherosclerotic cardiovascular disease (ASCVD). Cox proportional hazard models were used to assess the association between BMI and WHtR change and 10-year ORC risk. The low reference risk calculated for the four ORCs was based on observed age- and sex-specific 10-year incidence in a reference cohort with BMI <30 kg/m².

Results: This study included 36,168 individuals; 45.2% were women, median age was 53 years, 59.1% were living with obesity, and few individuals were prescribed weight management medication (5.9%) or referred for bariatric surgery (0.4%; Table). Mean (± standard deviation) follow-up time was 6.3±2.3 years, during which there were 16.5, 40.5, 14.0 and 9.5 incident diagnoses per 1,000 patient-years of T2D, hypertension, hip/knee OA and ASCVD, respectively. The risk of developing the ORCs was reduced with different combinations of BMI and WHtR reductions (Figure). BMI and WHtR reductions were significantly associated with reduced risk of T2D, although the association was stronger with WHtR. BMI reductions were significantly associated with reduced risk of hypertension and hip/knee OA. WHtR reductions were significantly associated with reduced ASCVD risk. After weight loss, some individuals reached the low reference risk for T2D, hypertension and ASCVD; no individuals reached the low reference risk for hip/knee OA.

Conclusion: A reduced risk of ORCs can be achieved with different combinations of weight loss and reductions in visceral adiposity. WHtR reductions were more strongly associated with lowering the risk of T2D than BMI reductions, whereas only changes in BMI were associated with reduced hypertension and hip/knee OA risk, and only changes in WHtR were associated with reduced ASCVD risk. Considering the 10-year ORC risk and associated risk reductions observed in this cohort, changes in visceral adiposity could help inform individualised treatment goals in obesity management.

Figure: Pattern of 10-year risk of common obesity-related complications after weight loss in a target population of women aged 55 years



The observed 10-year risk of developing each ORC in the study cohort for women aged 55 years old with BMI of 33 kg/m² and WHtR of 0.61 at study start (before any weight has been lost) is represented by a blue dot. The pattern for 10-year ORC risk after weight loss is represented by the blue lines. The yellow lines show the low reference risk for each ORC for 55-year-old women with BMI <30 kg/m², calculated based on the observed age- and sex-specific 10-year incidence in a reference cohort. The low reference risk calculated for hip/knee osteoarthritis has been depicted as text to enable clear display of the data points.
BMI, body mass index; ORC, obesity-related complication; WHtR, waist–height ratio.

Fig. 1.

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Tab. 1.

Table: Baseline characteristics	
	All participants (N=36,168)
Women, n (%)	16,335 (45.2)
Age, years	53 (47, 59)
Weight, kg	90 (79, 103)
Body mass index, kg/m²	31.2 (28.1, 35.4)
Waist–height ratio	0.61 (0.56, 0.67)
Baseline weight status, n (%)	
Overweight	14,778 (40.9)
Obesity class I	11,721 (32.4)
Obesity class II	5,928 (16.4)
Obesity class III	3,741 (10.3)
Comorbidities at baseline, n (%)*	
Hypertension	20,073 (55.5)
Dyslipidaemia	16,934 (46.8)
Type 2 diabetes	16,633 (46.0)
Atherosclerotic cardiovascular disease	3,919 (10.8)
Hip/knee osteoarthritis	3,252 (9.0)
Weight loss interventions, n (%)	
Weight management medication	2,136 (5.9)
Referral for bariatric surgery	141 (0.4)

Data are median (interquartile range [quartile 1, quartile 3]) unless otherwise stated.

*Comorbidities were recorded at the start of the follow-up period (following the index date).

AS07.03

Perioperative kidney dysfunction in surgical patients with severe obesity and the impact of disability, functional capacity and co-morbidities

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Introduction: Obesity is a recognised risk factor for kidney disease. The impact of severe obesity on postoperative kidney function is not fully established. This study describes the frequency of postoperative acute kidney injury (AKI), chronic kidney disease (CKD), and kidney failure (KF) in a cohort of patients with severe obesity undergoing non-cardiac non-bariatric surgery. The secondary aim was to investigate the potential association between postoperative kidney impairment and preoperative variables of disability, functional capacity, and comorbidities.
Methods: This study retrospectively examined preoperative and postoperative kidney function in a cohort of patients with severe obesity undergoing non-bariatric surgery. Estimated glomerular filtration rate (eGFR) and serum creatinine were documented both preoperatively and postoperatively from the electronic medical record (eMR). Patient comorbidity data were collected prior to elective surgery and considered both individually and as a combined comorbidity score. Preoperative functional capacity was investigated as a Six Minute Walk Test (6MWT) distance of greater or less than 300m, and disability was defined by World Health Organisation Disability Assessment Schedule 2.0 (WHODAS) scores as either absent or clinically significant (score >= 25%).
Results: Two hundred and seventy four patients undergoing a wide range of non-bariatric operations were investigated. Their mean age was 58yr, mean BMI was 42 kg/m^2, mean 6MWD was 325m, and mean WHODAS score was 19%. Half were female. Forty six percent had normal baseline kidney function. Five percent of patients developed AKI at seven days, with twenty percent developing worsened chronic kidney function at three months postoperatively. Two patients developed new kidney failure. One quarter of patients with normal baseline kidney function developed worsened chronic kidney function at three onths.
Conclusion: Kidney disease may be widespread in surgical patients with obesity and may be under-recognised. Surgery appears to have a important effect on longer term kidney function in a significant number of people with severe obesity. High risk comorbidities, disability, and poor functional capacity did not influence the development of postoperative AKI or CKD in this population. Normal baseline kidney function did not protect against the development of chronic kidney impairment.

Tab. 1. Rates of kidney function levels at baseline (preoperatively).

GFR category	GFR range	Number (%)
Normal	>= 90 ml/min per 1.73 m^2	126 (46%)
Mildly reduced	60–89 ml/min per 1.73 m^2	114 (42%)
Moderately reduced	30–59 ml/min per 1.73 m^2	27 (10%)
Severely reduced	15–29 ml/min per 1.73 m^2	3 (1%)
Kidney failure	<15 ml/min per 1.73 m^2	4 (1.5%)

AS07.04

Disrupted circadian-related rhythms in body temperature are linked to obesity

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Introduction: Body temperature is a non-invasive technique to assess circadian-related alterations in individuals under free-living conditions. This study aims to a) analyze differences in the characteristics of the daily rhythms of body Temperature measured at the Wrist (WT) in people living with Obesity (OB), with OverWeight (OW), or with Normal Weight (NW) and b) to explore potential associations with several metabolic risk biomarkers. From WT daily rhythms, several variables are derived, such as the Interdaily Stability (IS), a measure of the constancy of the 24 h rhythmic pattern over days; the Intradaily Variability (IV), an indicator of the fragmentation of the rhythm; and the Relative Amplitude (RA), defined as amplitude of the cosine fit normalized to the average 24-h level, and a marker of the relative magnitude of the rhythm, and the derived Circadian Function Index (CFI), a numerical index based on IV, IS, and RA. Alterations in these three variables have been previously associated with cardiovascular risk and metabolic diseases.
Methods: In a Spanish cohort of 840 individuals (ONTIME-MT population, ClinicalTrials.gov NCT03036592), 7-day daily patterns of WT were measured using a wristwatch integrated with a temperature sensor (Thermochron iButton DS1921H, Maxim, Dallas, TX). We tested for correlations between derived variables (IS, IV, RA) and obesity/metabolic risk measurements. In addition, we divided the population into people living with Obesity (OB), OverWeight (OW), or Normal Weight (NW), and we performed ANCOVA analyses (adjusted by sex and age).
Results: Correlation analyses between BMI and temperature-derived variables showed significant results towards a decrease in IS (r= -0.144,

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P=0.002), RA (r= -0.145, P<0.0001), and CFI (r= -0.134, P<0.001), and an increase in IV (r= 0.103, P=0.004) with higher BMI. Similar results were found for body fat percentage and related metabolic risk factors, like total cholesterol, triglycerides, and HDL (the latter in an opposite direction) (P<0.05). Further ANCOVA analyses showed a less stable daily WT rhythm (lower IS, Mean±SEM=0.41±0.01) in people living with obesity (OB) than with overweight (OW; 0.45±0.01) or normal weight (NW; 0.47±0.01). Similarly, the group with OB had a more fragmented rhythm (higher IV, 0.22±0.01 in OB than in OW, 0.20±0.01 and NW, 0.18±0.01) and more flattened rhythm (lower RA, 0.36±0.02 °C in OB than in OW, 0.42±0.01°C and NW, 0.46±0.01°C). Consequently, the group with OB had lower CFI (0.55±0.01 in OB than in OW 0.59±0.01, and in NW 0.61±0.01) (all ANCOVA P<0.001).

Conclusion: Our study provides evidence that people living with obesity show disrupted circadian-related rhythms in body temperature towards a less stable, more fragmented, and more flattened rhythm than people with overweight and with normal weight. Further studies should explore whether clinical approaches focused on improving the daily patterns of behaviors (light exposure, timing of sleep, dietary intake, and physical activity) could reduce obesity risk.

AS07.05

Hybrid Closed Loop in obesity: to each his own (algorithm)!

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Introduction: Currently, patients with type 1 diabetes (T1D) have the option of being treated with Hybrid Closed Loop (AHCL) systems, which allow insulin delivery to be modulated according to glycemic values. These systems do not allow any kind of anthropometric or laboratory characteristics to be used to enhance the devices' capabilities. Thus, the aim of our study was to investigate the efficacy of AHCL systems in subjects with T1D and with obesity compared to normal-weight subjects in terms of metabolic control.

Methods: Forty-one subjects with T1D and normal weight (BMI 18.8-24.9 Kg/m^2) or obesity (BMI 30.3-36.6 Kg/m^2) were treated with AHCL and were enrolled in this retrospective observational study. BMI, fasting plasma glucose, Hba1c, lipid profile, creatinine, Time In Range 70-180mg/dl (TIR), Time above range with glycemia 180-250mg/dl (TAR 180-250), Time above range >250mg/dl (TAR>250), Time Below range with glycemia 70-54mg/dl (TBR 70-54), Time Below range <70mg/dl (TBR<54) and glycemic variability were assessed.

Results: We enrolled 112 subjects (57M/55F; age:47± 12 years; BMI: 26.8±5 kg/m^2; mean duration of T1D: 26 ± 12 years). Hba1c (8.9±1.3% vs 7.7±0.9 %, p=0.021) and TG (129±76mg/dl vs 77±45mg/dl, p=0.012) were shown to be significantly higher in patients with obesity when compared to normal weight subjects while there were no differences in terms of fasting plasma glucose, total cholesterol, HDL, LDL and creatinine. AHCL prediction algorithms showed different efficacy in patients with obesity when compared with normal weight patients: although the TIR (mean 60.3±17.2), TAR>250 (mean 9.1±10.5) and both TBR 70-54 (mean 1±1.2) and TBR<54 (mean 0,2±0.6) did not show statistically significant differences, patients with obesity when compared to normal weight patient showed higher TAR 180-250 (26±8.7% vs 29.3±9.4%, p=0.032) and higher prevalence of high (>36%) glycemic variability (38.9% vs 62% p=0.031).

Conclusion: T1D subjects with obesity had worse glycemic control, evidenced not only by laboratoristic parameters such as higher levels of Hba1c and triglycerides but also by the higher TAR 180-250 and greater presence of patients with high glycemic variability when compared with normal weight. This suggests that AHCL algorithms should also take into account the anthropometric characteristics of the subjects in order to better tailor insulin treatment.

AS07.06

Metabolic and coagulative response in septic patients with obesity: an observational-prospective study

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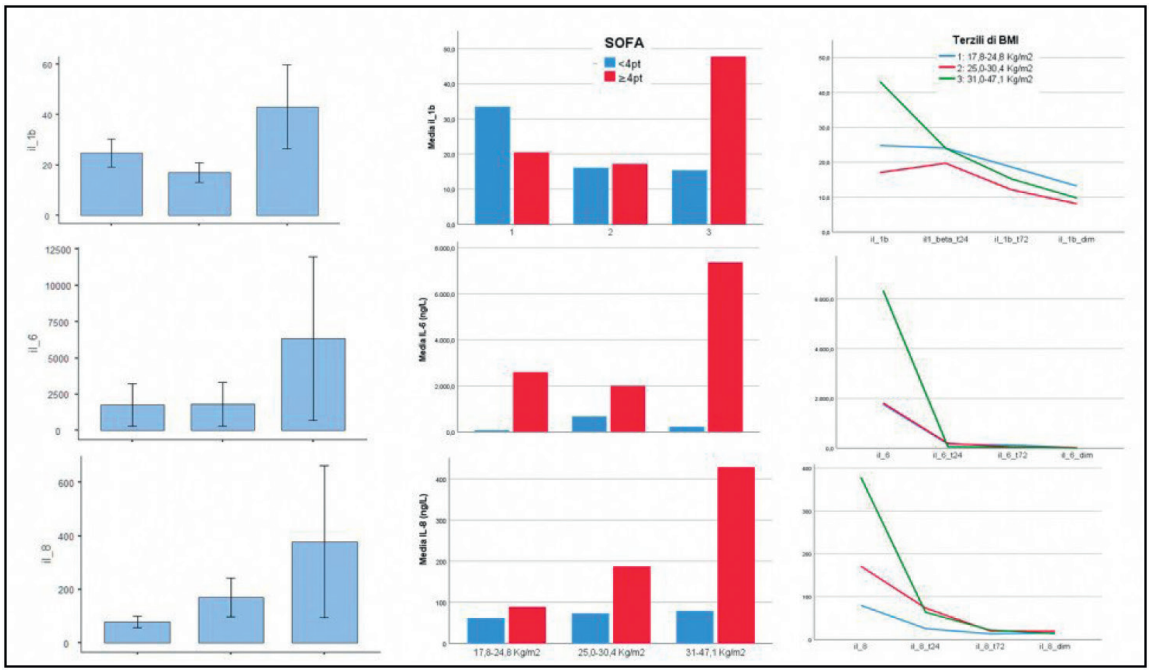
Introduction: Sepsis is the result of an acute inflammatory state caused by a dysregulated host response to infection. It is known that obesity is associated with a low-chronic inflammatory state, leading to major metabolic complications. In literature, few data corroborate the "obesity paradox" concept, which describes an association between obesity and higher survival rate during sepsis. We aim to verify the impact of obesity in terms of outcome in patients with sepsis.

Methods: we analyzed all consecutive septic patients referred to our Subintensive medical Unit. Patient's clinical data including history, comorbidities and clinical parameters were investigated. We collected anthropometric measurements (BMI, body circumference) and laboratory values such as coagulation parameters (clotting factors, VWF antigen and activity), metabolic (leptin) and inflammatory markers (interleukins, presepsin, procalcitonin). Furthermore, instrumental tests were conducted using thromboelastography (TEG), echocardiography, and venous echo-color Doppler. A mediation analysis was performed to identify potential mediators in the relationship between obesity, and mortality during sepsis. A three-month follow-up was conducted.

Results: 36 septic patients have been enrolled (52% men), mean age 73±13 years, and divided into tertiles based on BMI. No statistically differences were found in terms of in-hospital mortality (p=0.80), septic shock (p=0.88), transfer to ICU (p=0.39), and rehospitalisation (p=0.40). Leptin concentration remained significantly higher in patients with severe obesity compared to normal-weight individuals (p<0.001). During early stages of sepsis IL-1β, IL-6, IL-8 and TNF-α resulted to be increased compared to baseline values, particularly in the obesity group, however without reaching statistical significance (p>0.05). This trend seems to manifest only in severe sepsis (SOFA>4pt) for IL-6 and IL-8, although not statistically significant. Conversely, the trend of IL-1β doesn't appear to be influenced by the severity of sepsis. Regardless of the BMI class, the average values of TNF-α during the subacute phase of sepsis seem to correlate with the primary outcome (p=0.05). The coagulation profile tended towards a procoagulant state, showing an increase of fVIII, and VWF antigen, without statistically significant differences between the two groups (p>0.05). The whole blood rotation TEG analysis revealed prolonged extrinsic pathway activation exclusively in severe obesity (p=0.04). On the contrary, platelet aggregation exhibited an hypoaggregating trend independent of BMI, a characteristic restored at the end of sepsis. Otherwise, we didn't find discrepancies in terms of incidence of CID (p=0.51) or TEP (p=0.39).

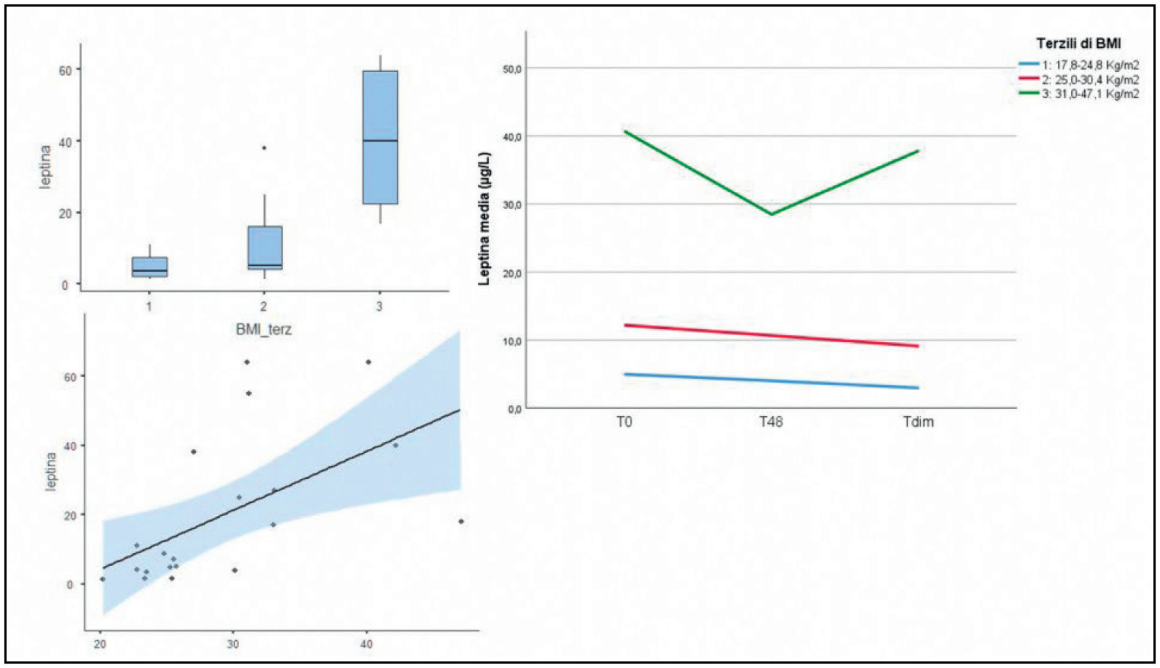
Conclusions: Despite multiple comorbidities and an unfavorable anthropometric profile, no higher in-hospital mortality and increased incidence of complications were recorded among patients with obesity. The inflammatory and coagulative response seems to differ during acute phases of sepsis in patients with obesity. Exploring the signaling pathways and identifying specific inflammatory markers could help to support the "obesity paradox".

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Cytokine concentrations during the acute phase of sepsis (histograms) and cytokines trend during the entire observation period.

Fig. 1. Cytokines trend.



On the left: scatter plot and histogram of relation between leptin and BMI. Leptin concentration remained significantly higher in patients with severe obesity compared to normal-weight individuals (p<0.001).

Fig. 2. Leptin profile.

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AS08 – Intrerorgan Cross-Talk

AS08.01

Transcriptomics on the Tip of Your Tongue: The contribution of salivary extra-cellular vesicles to taste-cell transcriptomics and eating behaviour in obesity

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Research Question: Extracellular vesicles (EVs) hold significant medical prospect as carriers of molecules like microRNAs for targeted therapeutic and diagnostic purposes on a cellular level. In the context of obesity research, EVs attract attention due to their capability in influencing eating behaviour and their contribution to physiological mechanisms underlying obesity-related changes in appetite, taste perception, and dietary choices.
Objectives: This study explores the correlation between metabolic changes in obesity and salivary EV distribution and composition. Therefore, 111 participants from the Obese Taste Bud (OTB) Study were enrolled for quantitative and qualitative analyses of salivary EVs and association analyses with parameters of obesity and factors of taste perception and eating behavior.
Methods: Using ÄKTA, a size- and molecular weight-based separation system, EVs were isolated from 2 ml saliva per participant with obesity. Nanosight technology and western blot analyses were performed for quantification and characterization of EVs. A standardized taste test was used to assess taste perception of study participants, while data on eating behaviour were obtained using standardized questionnaires. The study participants were extensively phenotyped for parameters such as body mass index, waist-to-hip circumference and further anthropometrics including data from bioimpedance analyses and clinically relevant parameters of obesity (e.g. blood pressure, lipid status, parameters of glucose and insulin metabolism, adipokine level in serum).
Results: The findings indicate a relationship between the EV size and markers of nutritional status (all $P<0.05$). Increased EV concentration is associated with lower adiponectin serum level ($P=0.017$). Furthermore, EV concentration correlates negatively with reduced arm ($P=0.025$) and calf circumferences ($P=0.035$), suggesting that body composition, rather than obesity per se, is related to EVs in saliva. The study successfully demonstrated the isolation of clean vesicles from saliva, confirmed by the presence of characteristic EV markers and the intriguing presence of PPARg, hinting at a possible origin of EVs from fat cells.
Conclusion: These findings provide first insights on the correlation of salivary EVs with parameters of obesity. Ongoing analyses on microRNA composition of salivary EVs might enlighten our understanding of how these particles may affect taste sensation on the level of taste buds and how this might be connected to obesity and eating behavior.

Conflict of Interest: The author declares that there is no conflict of interest associated with this work. No financial or personal relationships with any individuals or organizations that could influence the content or interpretation of the work have been disclosed.

Funding: This research was funded by the Else-Kröner-Fresenius Stiftung. The OTB Study is funded by the Helmholtz Institute of metabolism, obesity and vascular research (HI-MAG) in cooperation with the University of Leipzig. This collaborative effort has been enriched by the graduate schools SFB1052 and HELENA.

AS08.02

Changes in liver metabolic pathways demonstrate efficacy of the combined dietary and microbial therapeutic intervention in MASLD mouse model

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University of Eastern Finland

Objective: Metabolic dysfunction-associated steatotic liver disease (MASLD), formerly known as non-alcoholic fatty liver disease (NAFLD), is the most prevalent liver disease globally, yet no therapies are approved. MASLD is associated with comorbidities including obesity, type 2 diabetes, and cardiovascular diseases. The effects of Escherichia coli Nissle 1917 expressing aldafermin, an engineered analog of the intestinal hormone FGF19, in combination with dietary change were investigated as a potential treatment for MASLD.
Methods: MASLD was induced in C57BL/6J male mice by American lifestyle-induced obesity syndrome diet and then switched to a standard chow diet for seven weeks. In addition to the dietary change, the intervention group received genetically engineered E. coli Nissle expressing aldafermin, while control groups received either E. coli Nissle vehicle or no treatment. MASLD-related plasma biomarkers were measured using an automated clinical chemistry analyzer. The liver steatosis was assessed by histology and bioimaging analysis using Fiji (ImageJ) software. The effects of the intervention in the liver were also evaluated by RNA sequencing and liquid-chromatography-based non-targeted metabolomics analysis. Pathway enrichment studies were conducted by integrating the differentially expressed genes from the transcriptomics findings with the metabolites from the metabolomics results using Ingenuity pathway analysis.
Results: After the intervention, E. coli Nissle expressing aldafermin along with dietary changes reduced body weight, liver steatosis, plasma aspartate aminotransferase, and plasma cholesterol levels compared to the two control groups. The integration of transcriptomics with non-targeted metabolomics analysis revealed the downregulation of amino acid metabolism and related receptor signaling pathways potentially implicated in the reduction of hepatic steatosis and insulin resistance. Moreover, the downregulation of pathways linked to lipid metabolism and changes in amino acid-related pathways suggested an overall reduction of oxidative stress in the liver.
Conclusions: These data support the potential for using engineered microbial therapeutics in combination with dietary changes for managing MASLD and its related comorbidities.

AS08.03

The effects of LMK-235, an HDAC inhibitor, in diabetic skeletal muscle atrophy

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Aim/Hypothesis: Histone deacetylase (HDAC) has been identified as a significant pathogenic factor in the development of muscle atrophy. Recent studies indicate that some HDAC inhibitors can effectively mitigate muscle atrophy, insulin resistance, and diabetes. However, the effects of LMK-235 on diabetic skeletal muscle atrophy have not been sufficiently explored. This research investigates the preventative properties of LMK-235 and its underlying molecular mechanisms in diabetic muscle atrophy, using db/db mice as the experimental model.

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Method: To assess the impact of LMK-235 on diabetic muscle atrophy, db/db mice were randomly divided into three groups: a control group, a db/db group, and a db/db plus LMK-235 group. The mice received LMK-235 (10 mg/kg/i.p) for 4 weeks. The body weight of the mice was monitored. After euthanasia, muscle tissue was excised, dissected, and weighed. Hematoxylin and eosin stain was used for each section of muscle tissue. The cross-sectional area of these stained sections was analyzed using ImageJ software. To explore the molecular mechanisms of LMK-235, several muscle atrophy-related factors were examined using RT-PCR.
Results: LMK-235 administration in db/db mice effectively mitigated muscle weight loss and insulin resistance. MRI examination of hindlimb muscle mass and fat accumulation revealed that LMK-235 not only reduced fat accumulation but also ameliorated muscle loss. The Tibialis anterior muscle and gastrocnemius muscle showed significant atrophy in db/db mice. LMK-235 treatment prevented weight loss in these muscles and significantly restored muscle fiber size. Notably, LMK-235 significantly reduced the expression of atrophy-related genes such as MURF1 and Atrogin-1 in the Tibialis anterior muscle.
Conclusion: This study examined the impact of LMK-235 on diabetic muscle atrophy in db/db mice. LMK-235 demonstrated a mitigating effect on muscle atrophy by reducing the expression of atrophy-related genes. These findings suggest that LMK-235 could provide a basis for developing therapeutic drugs targeting muscular or metabolic diseases associated with atrophy.

AS08.04

Skeletal Muscle Fiber Types as Predictors of Insulin Resistance in Individuals with Varying Degrees of Adiposity

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Introduction: Increased body fat with obesity is associated with insulin resistance. This impairment has been mechanistically linked to the skeletal muscle fiber types, which are typically categorized based on their myosin heavy chain (MHC, i.e., MHC-I, MHC-IIa, or MHC-IIx) isoform content and exhibit varied degrees of insulin sensitivity. Human muscles contain different proportions of fiber types with large individual variability. In addition, hybrid muscle fibers, containing more than one MHC isoform, are common. Muscle homogenates, or fluorescent immunohistochemistry, cannot adequately differentiate between pure and hybrid muscle fibers. Furthermore, the use of muscle homogenates impedes our ability to measure these differences and establish specific relationships between distinct muscle fiber types and insulin resistance. Therefore, we sought to determine such relationships by analyzing single muscle fibers.
Methods: Muscle biopsies were collected from the vastus lateralis muscle from 13 study participants (7 females, 6 males) that were physically inactive and had a wide range of percent body fat (19 to 48%; mean±SD, 34±11) and age (19 to 53 years old; 29±10). Whole-body insulin resistance was assessed using the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) and ranged between 0.7 and 4.1 (1.9±1.0). Approximately 200 muscle fibers were isolated from each study participant under a microscope, and their MHC content was determined using SDS-PAGE. Muscle fibers were categorized as pure Type I, Type IIa, or Type IIx if contained a single MHC isoform; otherwise, they were classified as hybrids. A multiple regression analysis was performed to explore the predictive value of each distinct muscle fiber type on the HOMA-IR.
Results: The inclusion of hybrid fibers into the analysis resulted in a high degree of multicollinearity, indicating redundancy, and for that reason they were excluded from the analysis. The regression analysis containing the pure types of muscle fibers was significant (P = 0.02). The R-squared value, describing the proportion of variance in the HOMA-IR explained by the different types of muscle fibers, was 0.65, with an adjusted R-squared of 0.53. The percentage of pure Type IIa (β = -0.05, P = 0.03) and Type IIx (β = 0.11, P = 0.03), but not Type I (β = -0.007, P = 0.67), fibers in muscle exhibited a significant association with the HOMA-IR. Adding age, but not percent body fat, to the regression analysis improved the R-squared and adjusted R-squared values (0.89 and 0.82, respectively; P = 0.002).
Conclusion: These findings implicate a greater influence of muscle fiber type than adiposity on whole-body insulin resistance. More importantly, we show that across types of fibers in skeletal muscle, a lower percentage of Type IIa fibers and a higher percentage of Type IIx fibers (but not Type I) are linked with insulin resistance (elevated HOMA-IR).

AS08.05

Aerobic exercise improves metabolic dysfunction and exercise performance through regulation of FNDC5 and *Pgc1α* in obese mice: A study of exercise-induced skeletal muscle and adipose tissue adaptations

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Introduction: Obesity is a growing concern globally, leading to various metabolic disorders. Physical exercise is recognized as an effective countermeasure, and understanding the nuanced effects and molecular mechanisms of physical interventions is pivotal. This study aims to investigate the responses of skeletal muscle and white adipose tissue to swimming, an aquatic aerobic exercise, in high-fat diet-induced obese mice, with a focus on exploring potential muscle-adipose tissue crosstalk.
Methods: Male C57BL/6 mice were initially divided into a control group (CON) and a high-fat diet (HFD) group for obesity induction. After 8 weeks of obesity induction, HFD mice were further subdivided into sedentary (HFD) and swimming groups (HFD-S). Swimming exercises were conducted in 25°C water for 40 minutes, five times weekly, over eight weeks. Body weight, metabolic profiles, and exercise performance, including grip strength and endurance, were measured. Histological examinations of muscle and adipose tissue were performed. Additionally, analyses focused on key regulators of muscle and adipose tissue metabolism, such as mTOR, FNDC5, and *Pgc1-α*, were conducted to access exercise-induced tissue responses.
Results: Our study showed that swimming training exerts multifaceted beneficial effects on obese mice, including reduced body weight, improved lipid profile, fasting glucose, and glucose tolerance. Notably, increases in relative muscle mass, grip strength, and exercise exhaustion time were observed in the HFD-S group. Western blot analysis revealed increased mTOR and FNDC5 protein levels in the skeletal muscle of the HFD-S group. Concurrently, a significant reduction in adipocyte size and increased *Pgc1-α* expression in the epididymal fat pad (EFP) were observed, suggesting enhanced mitochondrial biogenesis and energy metabolism in the adipose tissue.
Conclusion: Aquatic aerobic exercise, specifically swimming, significantly ameliorated body weight, improved metabolic parameters, and enhanced exercise performance in obese mice. This was associated with the upregulation of mTOR and FNDC5 in skeletal muscle and *Pgc1-α* in adipose tissue, indicating a potential muscle-adipose tissue crosstalk. Further research is necessary to clarify this interplay, which may inform novel exercise mimetic therapeutic strategies for obesity management.

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AS08.06

Osteoarthritis and Obesity: Do Fibroblasts Matter?

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Introduction: Osteoarthritis (OA) is a disease with disabling joint that afflicts more than ~600 million people globally, imposing a substantial annual healthcare burden of approximately £1260 per patient. The rise in obesity, a hallmark of modern lifestyle, is widely recognised as a significant risk factor for both the onset and progression of OA. Nonetheless, the underlying pathogenic mechanisms connecting obesity and OA remain poorly understood, particularly at the single cell level.
Methods: In light of this, we employed the developed automated single cell RNA sequencing pipeline to analyse single cell RNA sequencing data from 12063 synovial fibroblasts derived from the synovium of patients with osteoarthritis.
Results: Overall, we identified three types of fibroblasts including $PRG4^{+}THY1^{+}$ lining layer fibroblasts, $CD34^{+}THY1^{+}$ and CD34-$THY1^{+}$ sub-lining layer fibroblasts. The population of $CD34^{+}THY1^{+}$ sub-lining fibroblasts was significantly reduced in patients with obesity and OA compared with patients living with OA. Pathways related to joint repair process like "response to wound" was significantly up-regulated in CD34+THY1+ fibroblasts in the response to obesity. In patients with obesity and OA, the diminished expression of CD34 activates hypoxia and impairs adipogenesis from $CD34^{+}THY1^{+}$ to $PRG4^{+}THY1^{+}$ fibroblasts trajectory path. Notably, ligand CD34 acts differently in the cell interactions from $CD34^{+}THY1^{+}$ to $PRG4^{+}THY1^{+}$ fibroblasts between normal weight and obesity niches, which can directly affect the activation of key target genes like PPARγ.
Conclusion: Taken together, our findings indicate an association between $CD34^{+}THY1^{+}$ fibroblasts and joint repair process. However, the decrease in $CD34^{+}THY1^{+}$ fibroblasts can contribute to hypoxia and lipid metabolism dysregulation in patients living with obesity and OA. Hence, strategic targeting of specific fibroblasts subtypes, particularly $CD34^{+}THY1^{+}$ fibroblasts, presents potential avenues for therapeutic interventions to address the onset and progression of obesity-related OA.

Conflict of Interest: None Disclosed

Funding: No funding to report

AS09 – Epidemiology and Population Studies

AS09.01

The effect of pre-conception weight loss on fertility outcomes in women with excess weight: A systematic review, meta-analysis, and meta-regression

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Introduction: The effect of weight loss before fertility treatment on treatment outcomes is unclear.
Methods: We searched Medline, CINAHL, EMBASE, and PsycINFO from 1980 through 21 March 2023. We included studies of any design, published in English, with at least one eligible arm that received an active weight loss intervention. Any weight loss intervention in adult women with body mass index ≥27 kg/m², seeking in vitro fertilisation and/or intracytoplasmic sperm injection, and, where relevant, any controls were eligible. Reviewers in pairs independently screened studies. One reviewer at a time extracted data, assessed risk of bias and study quality, and these were checked by a second reviewer. Primary outcomes were total (i.e. conceived naturally or with assisted conception) clinical pregnancy and live birth rates. Secondary outcomes included weight change, biochemical pregnancy rates, and adverse outcomes (miscarriage, ectopic pregnancy, congenital abnormality, still birth, neonatal death). Pooled rate ratios (RR) were obtained from randomised controlled trials (RCTs) using random-effects meta-analyses. Separate meta-regressions of RCTs and non-RCTs assessed the effect of the magnitude of weight loss on outcomes.
Results: Thirteen RCTs with 2,009 participants, and 8 non-RCTs involving 1,027 participants were included. In RCTs, interventions led to a weight change of -3.7 kg (95% confidence interval [CI] -5.8, -1.7; I^2 = 94.98%; 11 studies), compared to controls, and an increase in total clinical (RR 1.24, 95% CI 1.01, 1.53; I^2 = 67.00%; 12 studies), and naturally-conceived clinical pregnancies (RR 1.57, 95% CI 1.06, 2.31; I^2 = 15.59%; 9 studies). We found no significant differences in live births (RR 1.18, 95% CI 0.88, 1.59; I^2 = 70.57%; 9 studies), but there was substantial heterogeneity. Data on other outcomes were sparse, but showed no association with weight loss. We found no association between the magnitude of weight loss and reproductive outcomes.
Conclusion: Most studies were small and led to modest weight loss. Nonetheless, weight loss before fertility treatment increased the chances of becoming pregnant. Larger, high quality trials are required to ascertain effects of weight loss on other important clinical outcomes, including live birth rates, in women with excess weight due to undergo fertility treatment.

Conflict of Interest: None Disclosed

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AS09.02

Duration of being breastfed in infancy and risks of coronary heart disease in adulthood

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Introduction: It is well-established that a higher body mass index (BMI) in adulthood is associated with a higher risk of coronary heart disease (CHD). Furthermore, breastfeeding may have protective effects against obesity later in life. Thus, it is possible that breastfeeding reduces the risk of CHD in adulthood. Nonetheless, evidence on the possible protective effect of breastfeeding on risk of CHD in later life is scarce and inconsistent. Apart from one study, all others used self-reported breastfeeding information, and investigated populations exposed to under- rather than overnutrition. Therefore, the aim of this study was to examine the association between the duration of being breastfed in infancy and CHD risk in adulthood in a cohort from a high-income country with information on a range of potentially confounding variables.
Methods: We included 78,166 individuals (38,157 women) from the Copenhagen Infant Health Nurse Records born between 1959-67 in Denmark. They were examined regularly by infant health nurses, and the mother reported the duration of partial breastfeeding at 1 year of age and the infant feeding mode (predominant, partial or no breastfeeding) at age 2 weeks and 1, 2, 3, 4, 6, 9, and 12 months. We calculated the duration of predominant breastfeeding from this information. For categorical analyses, the duration of partial breastfeeding was divided it into five groups (≤0.5, >0.5–1, >1–2, >2–4, >4 months). CHD status (age ≥25 years) was obtained from the National Patient Register (n=4795, 1714 women). Hazard ratios (HR) and 95% confidence intervals (CI) for CHD risk were estimated by Cox proportional hazards regressions with adjustment for sex (basic model) and additionally for birth year, birthweight, maternal education, and the absence of information regarding the father (adjusted model).

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Results: The duration of predominant and partial breastfeeding were inversely associated with risks of CHD in adulthood in the basic model (HR=0.95 [95% CI: 0.93-0.97] & HR=0.97 [0.96-0.98] per month). These associations attenuated slightly but remained statistically significant in the adjusted model (HR=0.96 [0.94-0.98] & HR=0.98 [0.97-0.99] per month). In the categorical analyses, compared with individuals who were breastfed for ≤0.5 months, CHD risks were lower in individuals who were breastfed for longer periods; >0.5–1 (HR=0.85 [0.79-0.92]), >1-2 months (HR=0.77 [0.70-0.84]), >2-4 months (HR=0.82 [0.74-0.90]) and >4 months (HR=0.75 [0.68-0.82]). In the adjusted model, the results attenuated slightly, but remained significant (P<0.001). Individuals who were breastfed for >2-4 or >4 months had 15% and 20% reduced risks of CHD in adulthood (HR=0.87 [0.79-0.95], HR=0.80 [0.72-0.88]) respectively.
Conclusion: A longer duration and higher intensity of being breastfed in infancy is associated with a lower risk of CHD in adulthood, also when important CHD risk factors were accounted for. Thus, the results suggest that being breastfed for a longer duration has a protective effect against CHD. This association may potentially be explained through mediation by later body size, and this should be considered further.

AS09.03

Risk of fatal and non-fatal coronary heart disease in relation to obesity in childhood and young adulthood

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Introduction: We aimed to evaluate the impact of obesity in childhood and young adulthood for the risk of adult fatal and non-fatal coronary heart disease (CHD).
Methods: We included 57,466 men born 1945-1968 from the population-based BMI Epidemiology Study Gothenburg with data available on BMI in childhood (8 years) and BMI in young adulthood (20 years). Information on CHD diagnoses during follow-up was retrieved from Swedish high-quality national registers. Hazard ratios (HR) and 95% confidence intervals for the risk of fatal and non-fatal CHD were calculated using Cox regression models.
Results: During the 39.3 years follow-up, a total of 4,439 non-fatal and 764 fatal CHD were registered. Having obesity in childhood was associated with fatal but not non-fatal CHD (fatal CHD: HR 2.39 (95 % CI 1.19; 4.79); non-fatal CHD: HR 1.37 (95 % CI 0.94; 1.99)). Having obesity in young adulthood was associated with an increased risk of both fatal and non-fatal CHD (fatal CHD: HR 4.24 (95 % CI 2.77; 6.49); non-fatal CHD: HR 1.68 (95 % CI 1.53; 1.85)). In a model with both childhood and young adult obesity, only young adult obesity was significantly associated with increased risk of both fatal and non-fatal CHD. Men who developed their obesity during adolescence, and men who had obesity in both childhood and young adulthood, both had an increased risk of CHD compared to the reference group (HR 1.85 (95 % CI 1.39; 2.47) and 1.98 (95 % CI 1.12; 3.49) respectively). The risk for CHD did not differ between men who had obesity in childhood but normal weight at the age 20 and the reference group of men who had persistent normal weight (HR 1.10 (95 % CI 0.66; 1.83).
Conclusion: In conclusion, young adult obesity was an independent risk marker for fatal and non-fatal CHD in men, and childhood obesity was associated with increased risk of fatal CHD. These findings indicate that CHD may originate before adult age. We suggest that targeted prevention during the developmental years could reduce the life-course burden associated with coronary atherosclerosis.

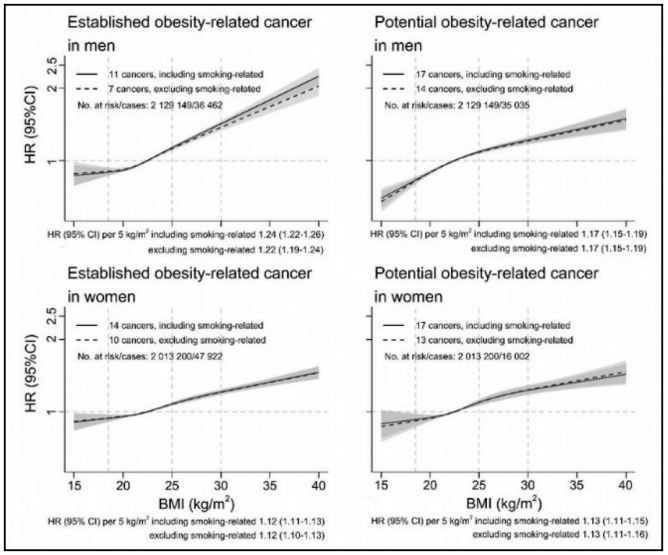
AS09.04

Body mass index and risk of over 100 cancer forms and subtypes in 4.1 million individuals in Sweden: a pooled cohort study aiming to identify further obesity-related cancers

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Introduction: Obesity, assessed by body mass index (BMI), is an established risk factor for 13 cancers (1). The previous largest prospective studies on BMI and cancer risk recorded around 200,000 incident cancers during follow-up, categorized into 22 and 26 cancers respectively (2, 3). In a large, pooled prospective study, we aimed to identify further potential obesity-related cancers, and to quantify their association with BMI relative to that of established obesity-related cancers.
Methods: We investigated BMI in 4,142,349 individuals in Sweden (mean age 27 years) with risks of 124 cancers grouped according to topography and morphology. We fitted Cox regression models to calculate hazard ratios (HRs) of cancer and regarded previously unestablished obesity-related cancers with a positive HR at an α-level of 0.05 for either obesity



Established obesity-related cancers include cancer of the oesophagus-adenocarcinoma, stomach-cardia, colon, rectum, liver/intrahepatic bile ducts, gallbladder, pancreas, meningioma, thyroid, multiple myeloma and renal cell carcinoma for both men and women, and additionally includes cancer of the postmenopausal breast, endometrium, and ovary for women. Potential obesity-related cancers include cancer of the nasal and paranasal sinuses, gastric-gastrointestinal stromal (excluding gastric-cardia), small intestine, biliary tract (excluding gallbladder), pancreatic islets, adrenal glands, parathyroid gland, pituitary gland, connective tissue, Hodgkin lymphoma, non-Hodgkin lymphoma, and leukemia for both men and women, and additionally includes cancer of the lip, tongue, penis, melanoma, and head and neck-adenocarcinoma for men and cancer of the oral cavity, melanoma-thinner nodular, vulva, head and neck-squamous cell carcinoma, and cervical adenocarcinoma for women. Smoking-related cancers include cancer of the oesophagus-adenocarcinoma, stomach-cardia, liver/intrahepatic bile ducts, pancreas, oral cavity, nasal and paranasal sinuses, head and neck-adenocarcinoma, head and neck-squamous cell carcinoma, and Hodgkin lymphoma.

Fig. 1. Hazard ratios of established obesity-related cancers and potential obesity-related cancers according to BMI level, with 95% CIs.

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(BMI ≥30 kg/m²) vs. normal weight (BMI 18.5-24.9 kg/m²) or per 5 kg/m² higher BMI level as potentially obesity-related.

Results: After 100 million person-years of follow-up, 332,501 cancer cases were recorded. We identified many potential obesity-related cancers: several head and neck cancers, gastrointestinal tract cancers (gastric gastrointestinal stromal, small intestine, biliary tract), melanoma, genital cancers (vulva, cervical adenocarcinoma, penis), several endocrine cancers, connective tissue cancer, and haematological cancers (Hodgkin lymphoma, non-Hodgkin lymphoma, leukemia). Amongst cancer subtypes, some were more strongly obesity-related such as small intestine neuroendocrine tumours and non-Hodgkin diffuse large B-cell lymphoma. The HR (95% confidence interval) of potential obesity-related cancers combined (n=51,037) per 5 kg/m² higher BMI level was 1.17 (1.15-1.20) in men and 1.13 (1.11-1.15) in women, as compared to 1.24 (1.22-1.26) and 1.12 (1.11-1.13), respectively, for established obesity-related cancers (n=84,384).

Conclusion: This study suggests a potentially large addition of obesity-related cancers to already established ones and provides further evidence for specific cancer subtypes driving some of the associations. Studies accounting for cancer-specific potential confounders are needed to confirm these findings.

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AS09.05

Sarcopenic obesity associated with all-cause mortality among older people: a population-based study

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Introduction: The prevalence of sarcopenia with obesity (sarcopenic-obesity, SO) and its association with early mortality in population-based settings is still limited.

Objective: to investigate the prevalence of SO and their association with all-cause mortality.

Methods: Baseline characteristics of the participants from the Rotterdam Study were collected and followed for a median of 9.9 years (interquartile range: 8.7-11.1). SO was defined according to the ESPEN/EASO Consensus and appropriate cut-offs were applied: BMI ≥30 kg/m² and low handgrip strength (measured by hydraulic dynamometer) plus 2 altered components of body composition (BC), i.e., low appendicular lean mass/weight (ALM/w) and high body fat percentage (fat %), measured by dual-energy X-ray absorptiometry (DXA). Association of SO with all-cause mortality was analyzed using Kaplan-Meier curves, and Cox proportional hazards confirmed with accelerated failure time models fitted for sex, age, and BMI.

Results: In all participants (n=5888, mean age 69.5±9.1 years, BMI 27.5±4.3 kg/m², 56.8% female), SO with only low HGS or low HGS plus 1 or 2 altered components of BC was present in 7.5% [95% CI: 6.8; 8.2], 5.0%[95%CI: 4.4; 5.6] and 0.8%[95%CI: 0.6; 1.0], respectively. An increased risk of all-cause mortality was observed in participants with SO with only low HGS (HR=2.15 [95%CI:1.85; 2.50]) plus 1 (HR=1.91 [95%CI:1.58; 2.30]) or 2 altered components of BC (HR=2.78 [95%CI:1.93; 4.02]) compared to those participants without SO. Among participants with BMI ≥ 30 kg/m² (n=1391), 2.5 %(95%CI:1.7; 3.3) had low HGS only, 9.0%(95% CI:7.5; 10.5) had low HGS plus 1, and 1.5% (95%CI: 0.9; 2.2) plus 2 altered components of BC. Participants with obesity and low HGS, low HGS and 2 altered components of BC had a significantly higher risk of early all-cause mortality than participants with obesity and normal muscle function (HR=1.94 [95%CI: 1.18; 3.20] and HR=2.10 [95%CI:1.09; 3.93], respectively.

Conclusion: SO is a prevalent phenotype in older people and is associated with all-cause mortality. Additional alterations of body composition amplify this risk, independently of age, sex, and BMI. Using low muscle strength as a first step may early identify older people at risk of premature death.

AS09.06

Sarcopenic-obesity phenotype and its associated factors based on a sex-specific z-score tool

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Introduction: Aging and its health consequences burden related to sarcopenic obesity (SO) warrant early detection especially when risk factors are identified. Adults with obesity and early manifestations of risk factors

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are not reflected by the current definitions of SO. We hypothesized that a continuous grading tool involving the three main diagnostic components of SO would better categorize and predict health outcomes in adults.
Objectives: To determine a sex-specific SO z-score (SOz) and its accuracy for all-cause mortality prediction, and to explore association of SOz with clinical and lifestyle-related factors.
Methods: All participants from the Rotterdam Study were included in a cross-sectional analysis, with a median follow-up of 9.9 years [interquartile range: 8.7-11.1] for the longitudinal analysis. SO was defined using muscle strength measured by handgrip (HGS), muscle mass (ALM/weight), and body fat percentage (BF%) by dual-energy X-ray absorptiometry (DXA) as recommended by the ESPEN/EASO consensus. 27 potential clinical and lifestyle-related factors were identified from the literature review of sarcopenic obesity and risk factors. In addition, we created a sex-specific z-score for all participants with standardized means of HGS, BF%, and ALM/weight, and cross-validated the area under the curve (AUC) for the best SOz cut-off values to predict all-cause mortality. Cox regression models were adjusted for age, comorbidities, and smoking status. The predicted models were validated in a second data set (33% of the total population, n=2002). Linear and logistic regression analyses provided the clinical and lifestyle-related factors associated with this SOz (continuous and categorical).
Results: In all population (n=5888, age 69.5±9.1, BMI 27.5±4.3, 56.8% female) receiver-operating characteristic curve analysis revealed an optimal SOz cutoff value of -2.0 for predicting all-cause mortality (AUC: 0.77, sensitivity:78%, specificity:79%). Compared with participants with SOz >0, those who had a SOz between 0 to -2.0 and below -2.0 had 18% and 45% higher risk of all-cause mortality (HR=1.18 [95%CI: 1.02; 1.37] and HR=1.45 [95%CI: 1.19; 1.76]). Five factors associated positively with SOz were BMI, age, steatosis, lower levels of physical activity, and higher triglyceride-glucose index in males and females. In addition, higher systemic immune-inflammatory index was associated with higher SOz, and lower protein intake was associated with intermediate SOz in both sexes.
Conclusion: Beyond the classical definition of SO from ESPEN/EASO consensus, a continuous SO z-score is able to detect an increased risk of early all-cause mortality, suggesting that progressive changes in muscle strength and body composition may gradually affect health outcomes. Risk of low SOz was associated with aging, higher BMI, metabolic and inflammatory profile, lower levels of physical activity and protein intake, and low quality of life. These data may help to define a specific population at risk of SO-associated health outcomes.

AS10 – Perspectives in Paediatric Obesity

AS10.01

The association between early childhood dietary trajectories and later childhood weight status in Dutch children

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Introduction: Recent evidence suggests that the establishment of dietary patterns likely occurs before the age of 3. The aim is to study how strong the consumption of healthy and unhealthy food groups are tracking at preschool age, whether these trajectories are related to the development of overweight and obesity and herein explore the role of siblings.
Methods: Data from 2523 participants in the GECKO cohort of Dutch children were analyzed. Height and weight were measured by nurses. Dietary trajectories were categorized based on daily food intake reported by participants' parents through questionnaires and a food frequency questionnaire at 3 years of age. Latent class analysis identified distinct trajectories using children's food intake or food preference at up to seven time points between ages 7 months and 3 years. Associations with weight status at 10/11 years of age were explored using Chi-square test (overweight/obesity) or One-way ANOVA (BMI Z-score and waist circumference).
Results: Three dietary trajectories were identified for bread type: "Mainly white," "Mainly brown," and "Mainly wholegrain." For fruit, vegetable, sugar-sweetened beverages (SSB), pizza, pancakes, and French fries (PPP), savory snacks, and sweet snacks, three distinct dietary trajectories emerged: "(Relatively) Poor intake," "(Relatively) Moderate intake," and "(Relatively) High intake." With increasing age, the consumption of healthy food groups declined and the consumption of unhealthy food groups increased.
No clear association was observed between most food trajectories and BMI Z-score at 10/11 years, apart for "Moderate intake (and gradually decreasing)" trajectory of fruit and of vegetable, and "Moderate intake (and suddenly increasing)" trajectory of savory snacks. These trajectories were associated with higher BMI Z-score: (+0.17, P=0.03) compared to "Poor intake" fruit trajectory, (+0.20, P=0.04) compared to "High intake" vegetable trajectory, (+0.22, P=0.02) compared to "Poor intake" savory snacks trajectory. "Moderate intake (and gradually decreasing)" trajectory of fruit was also related to a higher risk of being overweight or having obesity (+5.3%, P=0.03) and increased waist circumference (+1.5cm, P=0.01) compared to "Poor intake" trajectory.
Furthermore, having siblings may impact early life feeding practices. The associations between fruit and vegetable trajectories were mostly seen in those children with siblings at birth. Furthermore, a trend for "High intake (and gradually increasing)" trajectory of sweet snacks with BMI Z-score became significant. Finally, the association between "High intake (and slightly increasing)" trajectory of savory snacks with the highest BMI Z-score was most strong in those without siblings at birth.
Conclusion: Children's dietary habits over time were characterized by a decline in healthy and an increase in unhealthy food consumption. Especially trajectories of fruit, vegetable and savory snacks are related to future BMI and/or overweight. Studying the trajectories rather than single moment assessments may have potential implications for recommendations aiming to prevent overweight in children from a very young age.

AS10.02

Prediabetes and cardiometabolic risk in Danish children and adolescents with obesity

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Introduction: Increased levels of cardiometabolic risk factors are prevalent among children and adolescents with obesity and/or prediabetes1,2. Thus it is important to test the performance of clinical screening tools for prediabetes to detect increased cardiometabolic risk, especially among children and adolescents with obesity. This study aims to investigate how four different prediabetes definitions (1. by fasting plasma glucose, 2. by HbA1c, 3. by fasting plasma glucose or HbA1c, or 4. by fasting plasma glucose and HbA1c) impact estimates of prediabetes prevalence and

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associate with cardiometabolic risk in a Danish cohort of children and adolescents referred to outpatient tertiary childhood obesity treatment.
Methods: This cross-sectional study includes 5–19-year-olds with BMI SDS above 1.28 and a blood sample within 30 days from inclusion to obesity treatment. Anthropometric measurements, blood pressure, and blood samples were obtained and prediabetes prevalence and associated odds ratios for hypertension, dyslipidaemia, and abdominal obesity were calculated.
Results: Among the 2,570 eligible children and adolescents, the prevalence of prediabetes was 11.7%, 6.4%, 16.1%, and 2.0% when applying the four definitions (fasting plasma glucose-, HbA1c-, fasting plasma glucose or HbA1c-, and fasting plasma glucose and HbA1c), respectively. Hypertension, dyslipidaemia, and abdominal obesity were common among study participants, and the prevalence was increased among individuals with prediabetes.
The prediabetes definitions based on fasting plasma glucose and fasting plasma glucose or HbA1c were associated with hypertension and abdominal obesity. The prediabetes definition based on HbA1c was associated with dyslipidaemia. The strongest risk factor association across all combinations was observed between the prediabetes definition based on fasting plasma glucose and hypertension.
Conclusions: Fasting plasma glucose identified more individuals with prediabetes compared to HbA1c. Further, children and adolescents with prediabetes defined from either fasting plasma glucose or HbA1c exhibited a high burden of hypertension, dyslipidaemia, and abdominal obesity. No diagnostic test proved superior, as each test associated with different combinations of cardiometabolic risk factors.

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AS10.04

Identifying primary healthcare professionals' training needs for continuing professional development to support early childhood obesity prevention

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Introduction: Primary healthcare professionals (PHPs) internationally have reported many barriers to embedding early childhood obesity prevention in practice, such as a lack of knowledge and skills to support preventive care. Thus, this study aimed to identify the training needs of Australian PHPs regarding obesity prevention in early childhood (0-5 years).
Methods: Between August 2022 and July 2023, Australian PHPs were recruited to participate in a 20-item online survey. Descriptive analysis of relevant survey items was conducted.
Results: 227 PHPs participated in the survey (95% female, 46% Maternal, Child and Family Health Nurses).
Twenty-three percent of participants had not participated in any previous professional education regarding early childhood obesity prevention and related health behaviours. Among those who had attended previous training, the most common topics included breastfeeding (49%), the introduction of solids (28%) and healthy eating for young children (23%).
Ninety-three percent of PHPs reported interest in participating in online professional development regarding promoting healthy eating in early childhood. Topics of most interest to PHPs included fussy eating (60% expressed interest), allergies and intolerances (56%), and providing culturally appropriate nutrition advice and support to families (50%).
When asked to rate the importance of various features of professional development programs, the use of case studies, self-paced learning, and live interactive discussion were given ratings of high importance by the largest proportion of participants (37-46% rated as highly important). In comparison, quizzes were perceived to be of low importance by the greatest proportion of participants (15% rated to be of low importance).
Conclusion: Our findings indicate an interest among PHPs in further training to support obesity prevention in early childhood. Professional preferences should be considered in the design of relevant training programs, with priority given to interactive and flexible modes of learning.

AS10.05

Misperception of body size and association with body size dissatisfaction among early primary school children

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Background: Misperception of weight status is common among children across all weight categories, with children's overweight status seeming particularly difficult to perceive, and may have both negative and positive implications for children's health. However, its association with body dissatisfaction is not fully understood.
Objectives: To explore body size misperception across body mass index (BMI) categories and its association with body size dissatisfaction in 8–9-year-old children.
Methods: Objectively measured BMI and a visual child-friendly method were used to assess two dimensions of body image; body size misperception (BSM) and body size dissatisfaction (BSD). Nine body figure silhouettes, ranging from figure 1 (underweight) to figure 9 (severe obesity), were used to estimate children's perceived and ideal body size figures. BSM was calculated as the discrepancy between the children's perceived and measured body size figure (perceived-measured), and body size dissatisfaction (BSD) as the discrepancy between perceived and ideal body size figure (perceived–ideal). Multiple logistic regression was used to assess the association between BSM and BSD, adjusting for gender, BMI, socioeconomic status, ethnicity, and residency.
Results: The participants were 209 children (51% boys) aged 7.9-9.3 years from the general population, including 6.2% children estimated with underweight, 76.1% with average weight, 16.3% with overweight, and 1.4% with obesity. The children's mean perceived body size figure (4.11) was close to their ideal figure (4.06), but significantly higher than their objectively measured body size figure (3.23). Most children misperceived their current body size, as indicated by a 62% overestimation and 14% underestimation of body size figure. Boys were more likely to overestimate their body size (OR 2.32, [95% CI 1.11, 4.85]) compared to girls, and children with overweight/obesity had significantly higher odds of underestimating body size figures (OR 13.17, [95% CI 3.88, 44.77]) than children with average weight. No significant association was found between BSM and BSD for either underestimation (OR 1.87, [95% CI 0.17, 1.64]) or overestimation (OR 1.03, [95% CI 0.44, 2.45]) of body size figure.
Conclusions: Most children misperceived their body size in the direction of average weight, with high rates of underestimation among children with overweight/obesity. However, there was an overall bias towards overestimation of body size, which was unrelated to body size dissatisfaction and the desire to have a thinner body. Hence, this study found

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no evidence to suggest negative health implications associated with BSM. More research is needed to further explore the association between BSM and BSD in young children.

Tab. 1. Mean values of measured, perceived, and ideal body size figures according to anthropometric and demographic characteristics of the participants.

	Measured body size figure	Perceived body size figure	Ideal body size figure
Body size dissatisfaction (BSD)	3.23 (1.20)	4.11 (0.86)[a]	4.06 (1.10)[b]
Gender Boys Girls	 3.26 (1.24) 3.22 (1.17)	 3.90 (0.76) 4.31 (0.90)***	 3.86 (1.00) 4.24 (1.17)*
Body mass index (BMI) Underweight Normal weight Overweight/ Obesity	 1.00 (0.00)*** 2.97 (0.81)*** 5.08 (0.28)***	 4.18 (0.98) 4.03 (0.81) 4.41 (0.99)*	 4.18 (2.09) 3.98 (1.04) 4.38 (0.99)
Socioeconomic status (SES) Low Medium/high	 3.26 (1.19) 3.07 (1.31)	 4.38 (0.94) 4.07 (0.84)	 4.55 (1.62)** 3.98 (0.98)
Ethnicity Western Non-Western	 3.10 (1.42) 3.26 (1.17)	 4.03 (0.94) 4.12 (0.84)	 3.97 (1.32) 4.07 (1.07)
Residence Urban Rural	 3.45 (1.23) 3.16 (1.19)	 4.19 (0.74) 4.08 (0.89)	 4.19 (0.90) 4.01 (1.16)

Results are presented as mean (SD). Paired samples t-test was used to assess the difference between measured, perceived, and ideal body size. [a] Significant difference between (measured-perceived) body size. [b] Significant difference between (measured-ideal) body size. Independent Samples T-tests were used to assess differences within gender and demographic variables. ANOVA was used to assess differences between weight categories. Level of significance: *** p<0.001, ** p<0.01 and * p<0.05.

Tab. 2. Multiple logistic regression analyses for the association between body size misperception and body size dissatisfaction.

	Underestimation OR [95% CI]	Overestimation OR [95% CI]
Body size dissatisfaction (perceived-ideal)	1.78 [0.45, 7.01]	1.03 [0.44, 2.45]
Gender	0.52 [0.17, 1.64]	2.32 [1.11, 4.85] *
BMI Overweight	13.17 *** [3.88, 44.77]	0.07 *** [0.02, 0.26]
Socioeconomic status	4.83 [0.61, 38.11]	0.29 [0.07, 1.12]
Ethnicity	1.62 [0.34, 7.75]	1.22 [0.45, 3.33]
Residency	2.27 [0.63, 8.16]	1.04 [0.45, 2.39]

Dependent variable: Body size misperception (underestimation and overestimation) compared to correct estimation. Independent variables: Body size dissatisfaction (reference: no BSD). Confounders: Gender (reference: girls), BMI overweight (ref average weight), SES (reference: med-high SES), ethnicity (reference: Western), and residence (reference: urban). Numbers are presented as Odds ratio with 95% confidence intervals: OR [95%CI]. Level of significance: * p<.05, ** p<0.01 and *** p<.001. BMI, body mass index; BSD, body size dissatisfaction; SES, socioeconomic status.

AS10.06

The associations of sugar intake and its food sources in early childhood with children's body weight

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Introduction: A poor diet quality in general is related to weight gain in young children(1). More specifically, excessive sugar intake is considered as a significant risk factor for childhood overweight and obesity, but less is known about sugar intake in very young children. Furthermore, while children are being advised to consume less sugar-rich foods, they are also encouraged to eat more fruits and unsweetened dairy products which contain abundant intrinsic sugars. Therefore, the aim is to investigate the association between total sugar intake and sugar intake from specific food sources in relation to weight gain and the development of overweight in early childhood.
Methods: In the GECKO Drenthe birth cohort, dietary intake was derived from a validated 71-item food frequency questionnaire designed for children aged 2 to 12 years, filled in by parents, when children were 3 years old. Both the sum of daily sugar intake and daily sugar intake in 13 different food groups were calculated. BMI Z-score, the change in BMI Z-score between 3 and 10/11 years, and weight status (overweight/obesity) were derived from the height and weight measured by trained nurses. Weight status was defined by International Obesity Task Force 2012 criteria.
Results: 936 children were included in the analytical sample. The mean daily sugar intake was 112 ± 34 grams (mean±SD), which related to 32.2 energy percent (en%) of total energy intake (1390±293 kcal). The main food sources for sugar intake included fruits (13.0 (9.4;20.9) median (25th;75th percentile), 4.2 en%), dairy products (18.7 (12.4; 27.7), 5.6 en%), sugar-sweetened beverages (41.8 (27.4; 61.3), 12.4 en%), and sugary snacks (13.1 (9.4; 17.6), 3.9 en%) grams per day. At 10/11 years of age (10.6 ± 0.4 years), 149 children had overweight/obesity. Total sugar intake was not related to BMI Z-score, weight gain or weight status. A higher intake of sugar from sugary snacks was related to a higher BMI Z-score (β = 0.015(0.006,0.025)) and higher risk of developing overweight/obesity (OR=1.024(1.001,1.048)). In contrast, a higher daily sugar intake from fruits was related to a lower BMI Z-score (β =-0.009 (95% CI -0.017, -0.002)) and less weight gain (β=-0.011 (-0.017,-0.004)) but not weight status at 10/11 years. Also a higher sugar intake from dairy was related to a lower odds for overweight/obesity (OR=0.983(0.968,0.999)).
Conclusion: Overall, the type of sugar-containing product consumed seems more important than sugar intake itself in relation to the development of overweight in early childhood. Future studies may need to investigate the difference between added and intrinsic sugars, as well as the role of different types of sugars (glucose, lactose, fructose).

Reference

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AS11 – Nutritional Intervention

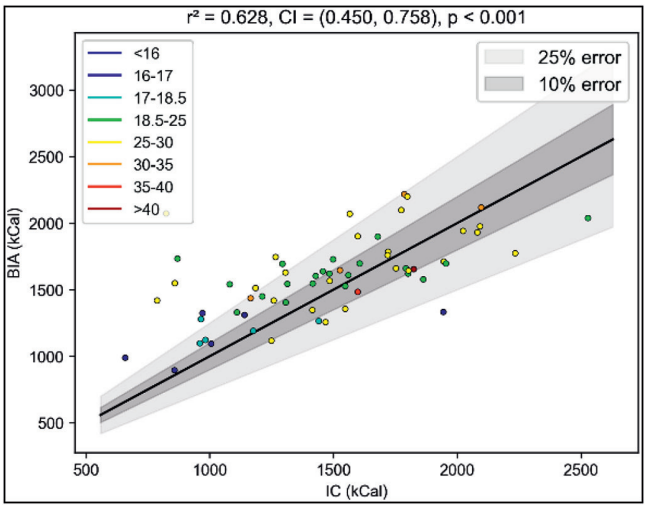
AS11.01

Resting energy expenditure estimation using CT body composition analysis by means of an automatic software coupled with artificial intelligence

Palmas, F.[1]*; Guerra, R.*[2]*; Melian, J.*[2]*; Zabalegui, A.*[1]*; Mucarzel, F.*[1]*; Comas, M.*[1]*; Burgos, R.*[1]*; Simo, R.*[1]*; Ciudin, A.*[1]

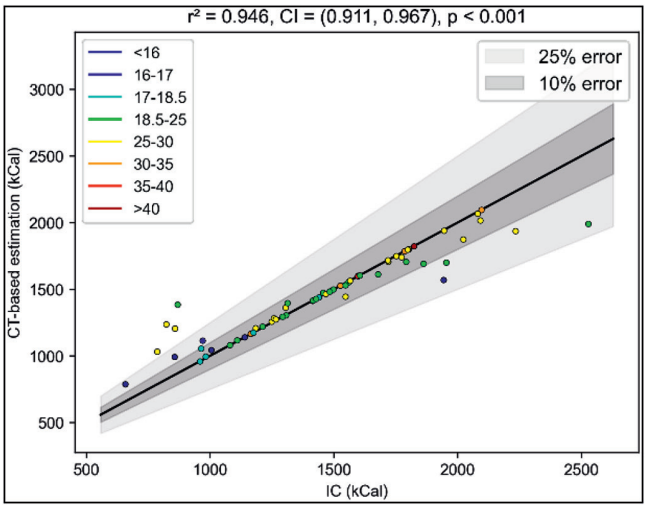
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Background: Body mass in humans is strongly associated with the rate of heat production as defined by resting energy expenditure (REE). Furthermore, the REE is related to the body composition (BC) especially the fat-free mass. Currently, the reference method for REE measurement is indirect calorimetry (IC). However, IC is not widely available due to the price of the device and the need of trained personnel and special conditions for its performance. Bioimpedance (BIA) is an easily accessible tool for the BC assessment in the clinical practice and includes algorithms with models that estimate the REE. In recent years, computed tomography (CT) has emerged an accurate tool for BC assessment. Nevertheless, currently the is no data regarding the use of CT-scan for REE estimation based on BC assessment.
Objective: a) To create a model of REE measurement using a skeletal CT-scan image based on automatic software coupled with artificial intelligence; b) to compare REE values obtained by the new method with IC and BIA.
Material-Methods: A single-centre observational cross-sectional pilot study was performed at the Vall d'Hebron University Hospital between January and June 2022, as "proof of concept". All the subjects underwent complete medical history, bioquemical analysis, anthropometry, IC, BIA and a skeletal CT-scan at L3 vertebrae level. The CT-scan image was analysed using the FocusedON automatic software created by our group.
Results: A total of 63 subjects were recruited, with a mean age of 60.49±16.46years, 61% men and mean BMI 24.24±5.76kg/m^2. Data on REE obtained from the CT-scan image analysed with the FocusedON software showed a correlation obtained IC of r^2=0.946, p value <0.001, with a low level of dispersion (0.911-0.967). In exchange the correlation between BIA and IC was significantly lower (r^2=0.628, p value <0.001) and the dispersion is higher (0.450-0.758).
Conclusion: In the present study, we showed for the first-time a model based on abdominal CT image data to estimate the subjects' REE in a very precise manner. These results have the potential of opening new possibilities in nutritional and metabolic assessment by providing data on BC and REE "at a glance" based on a skeletal CT-scan image.



Correlation between REE from BIA at different BMI levels, with Indirect calorimetry.

Fig. 1. Comparison between REE obtained by IC and BIA.



Comparison between REE obtained by IC and CT-scan, with differentiation between different BMI levels.

Fig. 2. Comparison between REE obtained by IC and CT-scan.

AS11.02

Intuitive Eating as a Predictor of Weight Loss in Semaglutide 2.4 mg Treatment: Insights from a Cohort Study

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Introduction: The approach to obesity treatment has evolved significantly, shifting from moderate-effect dietary methods to pharmacological interventions. GLP-1 receptor agonists, particularly semaglutide 2.4 mg, have shown substantial progress, offering an important alternative to bariatric surgery, though not yet rivaling its efficacy (1). While research has confirmed semaglutide's effectiveness in general obesity (2) and in type 2 diabetes (T2D) associated obesity (3), the influence of specific factors on weight loss remains underexplored. This study addresses this critical gap, enhancing our understanding of personalized obesity treatment.
Objective: The primary objective of our study was to identify and analyze the key demographic, clinical, behavioral and biological factors that can predict weight loss outcomes in individuals treated with semaglutide 2.4mg/week over a one-year period.
Methods: In this retrospective study, we evaluated patients undergoing obesity treatment with semaglutide 2.4mg from May 2022 to December 2023. The regimen started at 0.25mg/week, incrementally reaching the maintenance dose of 2.4mg/week. We analyzed demographic data (age, sex, baseline BMI), lifestyle factors (alcohol or tobacco use), medical history (bariatric surgery, cardiovascular complications), and biological parameters (renal function, lipid profile, FIB4 score, fatty liver index). Additionally, patient responses to questionnaires on diet and eating behavior, mental health, sleepiness and sleep and physical activity (IES-2, Binge Eating Scale, HAD, Epworth, Morin, Ricci & Gagnon) were included. Data analysis employed univariate and mixed models.

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Results: The study involved 102 patients with a BMI ≥ 40 kg/m². After 52 weeks of treatment, the average weight loss was 14.2%. Univariate analysis identified negative associations with weight loss including T2D (p=0.002), treatment with metformin (p=0.05), SGLT2 inhibitors (p=0.05), and insulin (p=0.04), as well as fasting blood glucose (p=0.01). Positively, the Intuitive Eating Scale (IES-2) score was predictive of weight loss (p=0.002). In multivariate analysis, only type 2 diabetes and a higher IES-2 score remained significant predictors, correlating respectively with an average 1.9% lower weight loss (p<0.01) and an increase of 0.8% in weight loss per additional IES-2 point (p=0.01).
Conclusion: This study confirms the reduced weight loss effect of semaglutide 2.4mg/week in T2D patients and reveals that pre-treatment intuitive eating enhances weight loss. These findings suggest incorporating intuitive eating into obesity treatment protocols may improve pharmacological efficacy, warranting further investigation.

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AS11.03

Economic evaluation of NHS England's low-calorie total diet replacement intervention for adults living with obesity and type 2 diabetes: evidence from real-world data and patient simulation modelling

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Introduction: The 'Type 2 diabetes Path to Remission programme' is a major investment by NHS England to support diabetes remission among adults living with BMI>25kg/m² (>27 if White) and a recent diabetes diagnosis. Piloted since 2020, the 12-month intervention is currently being scaled-up nationwide. Following a referral from primary care, service users receive 900 kcal/day diet replacement products (soups, bars and shakes) for up to 12 weeks to initiate rapid weight loss, followed by professional support to reintroduce healthy solid foods, increase physical activity levels and sustain weight loss.
Methods: An intention-to-treat, cost-utility analysis with a time horizon of a lifetime was conducted from NHS England's perspective as part of the 'Re:Mission' study. Real-world data from pilot areas, including weight and Hba1c collected by commercial service providers and in primary care, was linked to National Diabetes Audit data and cost data (including service user out-of-pocket expenses obtained from surveys and focus groups). A commercially available, pre-built patient-level simulation model (UKPDS Outcomes Model) utilised data collected pre-referral and at 12 months to predict health economic outcomes for the service users at 24 months and annually until death. Additionally, a counterfactual scenario portraying potential outcomes for the same service users without the intervention was generated utilising only pre-referral data. Various assumptions regarding HbA1c and weight regain trajectories among service users at 24 months onwards, relative to the counterfactual scenario, were examined. Decision uncertainty was depicted using incremental cost/QALY scatter plots and cost-effectiveness acceptability curves.
Results: T2DPR is cost-effective against a £20,000/QALY threshold if HbA1c and weight trajectories remain below those in the counterfactual scenario for at least six to seven years (£19,759.80/QALY assuming 7 years) and against a £30,000/QALY threshold if those trajectories remain apart for four to five years (£27,625.99/QALY assuming 5 years). Unlike a comparable intervention evaluated in the UK Diabetes Remission Clinical Trial (DiRECT), T2DPR was not cost-saving. Our sample was larger (n=838 vs. 149 in the DiRECT intervention arm) and more sociodemographic diverse. At baseline, mean HbA1c was comparable, but mean weight was higher than in DiRECT (+10kg). At 12 months, mean HbA1c reduction was smaller (2.3 vs. 9.8 mmol/mol) and mean weight loss was comparable (9.9kg vs. 10.6kg in DiRECT), and these varied by gender, ethnicity and, to a lesser extent, area-level deprivation. Although service-users might save on grocery expenses, potentially offsetting intervention costs, this was deemed unlikely to be an appropriate consideration in NHS commissioning decisions.
Conclusions/Interpretation: Given potentially high demand, due to high T2D incidence among eligible adults, and the unlikelihood of being cost-saving, the T2DPR may improve population health whilst also having large impacts on national healthcare budgets.

AS11.04

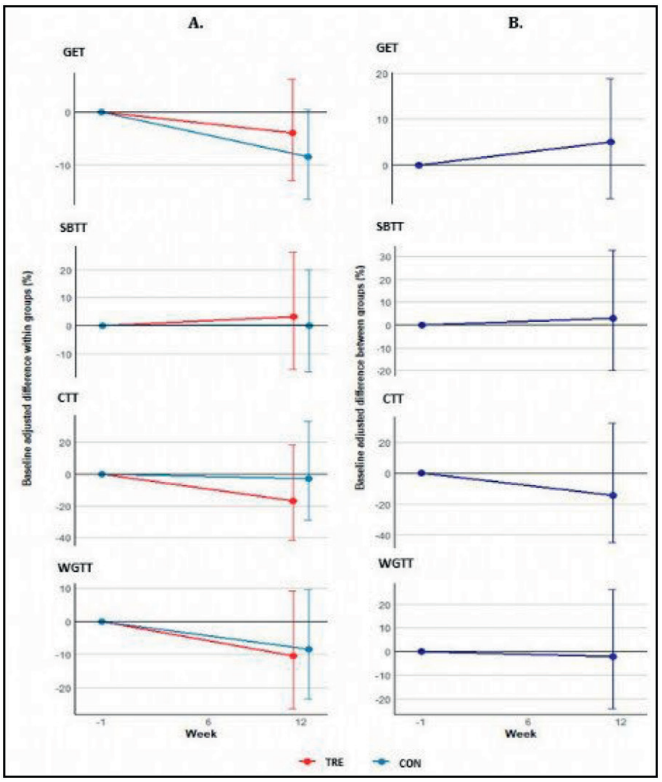
Effect of three-months 10-hour time-restricted eating on gastrointestinal transit in individuals at high risk of type 2 diabetes – the RESET randomized controlled trial

Jensen, M. M.[1]; *Færch, K.*[2]; *Ekblond, T. S.*[1]; *Pedersen, H. E.*[3]; *Clemmensen, K. K.*[4]; *Blond, M. B.*[1]; *Brock, C.*[5]; *Quist, J. S.*[6]

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Introduction: Time-restricted eating (TRE) has been suggested as a strategy to lose weight and improve cardiometabolic health by aligning food intake with the circadian rhythm of the body. The gastrointestinal tract plays an important role in regulating appetite and glycemia and gastrointestinal functions show circadian rhythmicity. The aim of the analysis was to investigate the effect of a three-month TRE intervention on gastric emptying and gastrointestinal transit in individuals at high risk of developing type 2 diabetes.
Methods: In a subgroup of this randomized controlled trial, 52 adults (TRE: n=27, CON: n=25) with (a) overweight (BMI≥25 kg/m²) with concomitant prediabetes (HbA1c 39–47 mmol/mol) or (b) obesity (BMI≥30 kg/m²) were randomized in a 1:1 ratio to three months of TRE (self-selected 10-hour eating window placed between 6 AM and 8 PM) or control (CON, habitual living). Gastric emptying time, small bowel transit time, colonic transit time, and whole gut transit time were measured using a wireless motility capsule, which was ingested together with a standardized mixed meal (498kcal, 34E% fat, 49E% CHO, 17E% protein) at baseline and after three months. To estimate the effect of treatment on gastric emptying and gastrointestinal transit times, we used a baseline adjusted linear mixed model with fixed effects for group and the interaction between group and visit.
Results: ~90% of the participants completed the intervention and the follow-up period, and participants randomized to TRE adhered to the intervention on average 91% of the intervention days. Three months of TRE did not alter gastric emptying time (5% (95% CI: -7, 19), p=0.432), small bowel transit time (3% (-20, 33), p=0.815), colonic transit time (-15% (-45, 33), p=0.475), and whole gut transit time (-2% (-24, 26), p=0.810) compared with CON.
Conclusion: Three months of 10-hour TRE did not change gastric emptying or gastrointestinal transit times in individuals at high risk of type 2 diabetes. Future studies should investigate the effects of TRE in individuals with impaired gastrointestinal function.

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A. Estimated relative baseline adjusted within-group mean difference (95% CI) for gastrointestinal transit times in TRE (red) and CON (blue) from baseline to post-intervention. B. Estimated relative baseline adjusted mean difference (95% CI) between TRE and CON for gastrointestinal transit times from baseline to post-intervention. Abbreviations: CON, control; CTT, colonic transit time; GET, gastric emptying time; SBTT, small bowel transit time; TRE, time-restricted eating; WGTT, whole gut transit time.

Fig. 1. Estimated changes for gastrointestinal transit times.

AS11.05

The Roczen Programme - real world data of digitally-enabled, time restrictive eating programme on health outcomes in people with type 2 diabetes in the United Kingdom

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Introduction: Type 2 diabetes (T2D) remains a major global health challenge. Effective weight management can improve T2D and lead to remission in some patients with T2D. Time-restricted eating (TRE) has been shown to be an alternative method for weight loss but limited data exists about its efficacy in patients with T2D in real-world settings. Roczen is a digital clinical service and technology designed for people with obesity and other complications. The aim was to assess the impact of the programme on HbA1c, weight and other health-related outcomes at 12 and 24 weeks.
Method: Participants were enrolled in a TRE, low-carbohydrate, moderate protein plan which was delivered by a clinical team with MDT support via an App. Participants received dietary guidance, goal setting, feedback, and social support via peer mentoring. We conducted a retrospective service evaluation of 85 adults with T2D who were on the programme for at least six months (54.1% were male, 54.1% White ethnicity, 16.5% were Black ethnicity and 21.2% were South Asian). Mean age 53.6±9.2yrs, mean BMI 34.3±6.5kg/m^2, HbA1c 58.4±8.9mmol/mol. 7.1% (n=6) of patients were treated with insulin, 7.1% (n=6) were treated with GLP-1 agonist therapy, 62.4% (n=53) were managed with oral medications alone. Median duration of T2D was 3.0 years (range 0-22 years). Available data were analysed at 12 and 24-weeks and reported using mean±standard deviation.
Results: Mean HbA1c reduction at 12 and 24 weeks was -13.6±10.0 mmol/mol [p<0.0001] and -11.5±12.0 mmol/mol [p<0.0047], respectively. 37.3% (n=28) reduced HbA1c to pre-diabetes levels (average duration of 32 weeks on plan) and 9.3% (n=7) reduced HbA1c to normal levels (average duration of 40 weeks on plan). At 12 and 24 weeks, weight loss was -7.8±5.1 kg [8.0%; p-<0.0001] and -10.2±6.9 kg [10.9%; p<0.0001] respectively. Waist circumference decreased by -9.2±8.5 cm [7.8%; p<0.0001] and -10.3±7.6cm [9.8%; p<0.0001].
Conclusions: Evaluation of the Roczen programme, delivered in the real-world and in a diverse population with T2D, demonstrated a significant reduction of HbA1c. Just under half of patients achieved a HbA1c within the normal or pre-diabetes range. Additionally, there were significant reductions in body weight and waist circumference. Further evaluation is required to assess long term outcomes.

AS11.06

Lower thiamine status and higher LDL cholesterol in adults voluntarily following low-carbohydrate diets versus those with higher carbohydrate intake: a cross-sectional comparative study

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Background: Low-carbohydrate diets (LCD) have become popular but evidence on their safety is scarce.
Aims: To assess cardiometabolic biomarkers, thiamine and magnesium intake and status, in self-reported LCD followers.
Methods: A cross-sectional study was conducted (2018-2020) in 49 self-reported LCD followers and 49 controls. Diets were assessed using EPIC-Norfolk FFQ. Plasma magnesium, and red-blood-cell thiamine diphosphate (TDP) were analysed. Homeostatic Model of Insulin Resistance (HOMA-IR) was calculated.
Results: Among LCD followers (BMI 24.2kg/m^2) 80% were white, five had diabetes managed without medication. Among controls (BMI 23.1kg/m^2), 51% were white. Median macro-nutrient intakes for LCD vs. control groups were: carbohydrate 16 vs.50%Energy (E); protein 25 vs.19%E; and fat 55 vs.34%E (saturated fat 18 vs.11%E).
Forty-three percent LCD followers failed to meet the thiamine RNI (vs.14% controls, p=0.002). Red-blood-cell TDP was lower in LCD followers than controls (393 vs.601 ng/gHb, p<0.001). Three LCD followers were thiamine-deficient vs. one control. Magnesium intake and status did not differ between groups, but 20% LCD followers had hypomagnesaemia (<0.75mmol/l) vs.12% controls (p=0.24).
HbA1c was not different between groups. LCD followers had lower HOMA-IR (0.72 vs.0.86, p=0.018) than controls, but higher total-cholesterol (4.52 vs.4.10mmol/l, p=0.038) and LDL (2.54 vs.2.10mmol/l, p=0.015). In exploratory analysis, log-HOMA-IR was not associated with carbohydrate intake, whereas total- and LDL-cholesterol were positively associated with saturated fat intake, after adjusting for age, sex, BMI, and ethnicity.
Conclusions: Adults who voluntarily follow LCDs have greater saturated fat intake, higher plasma LDL, and lower thiamine status. These data do not support following LCDs without appropriate guidance.

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AS12 – News in Obesity Management Medications

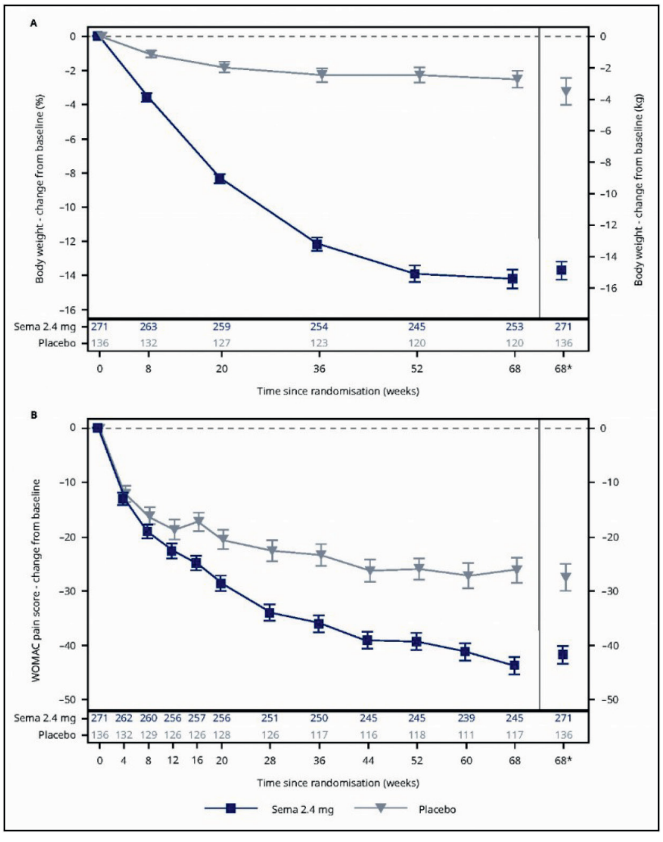
AS12.01

Semaglutide 2.4 mg efficacy and safety in people with obesity and knee osteoarthritis: results from the STEP 9 randomised clinical trial

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Introduction: The aim of this trial was to confirm the superiority of once-weekly (OW) subcutaneous (s.c.) semaglutide 2.4 mg vs. placebo regarding weight reduction, knee osteoarthritis (KOA)–related pain and physical function among participants (pts) with obesity and KOA.



*Data points are estimated means. Error bars show the standard error of the mean. Numbers above the x axis are the numbers of participants contributing to the mean. Data are for the full analysis set during the in-trial period, analysed according to the treatment policy strategy. Sema, semaglutide; WOMAC, Western Ontario and McMaster Universities Arthritis Index.

Fig. 1. Mean change from baseline in body weight (A) and WOMAC pain score (B) over time.

Methods: This double-blind, placebo-controlled trial (NCT05064735) randomised pts with obesity (2:1) to OW s.c. semaglutide 2.4 mg or placebo over 68 weeks in addition to a reduced-calorie diet and increased physical activity. Pts (≥18 years) had a body mass index (BMI) ≥30 kg/m², a clinical and radiographical diagnosis of KOA and KOA-related pain (Western Ontario and McMaster Universities Osteoarthritis Index numerical rating scale [NRS] 3.1 [WOMAC] pain score ≥40). Pts underwent pain medication washout (72 hours) before pain assessments and were instructed to record their daily pain intensity and use of pain medication in a pain diary. Primary endpoints were the percentage change in body weight (BW) and absolute change in WOMAC pain score, both measured from baseline to week 68. Confirmatory secondary endpoints included change in WOMAC physical function score, assessed from baseline to week 68. WOMAC scores were normalised and expressed on a 0–100 scale; higher scores reflected worse outcomes. Primary and secondary endpoints incorporated the full analysis dataset and the treatment policy strategy; observed data were for the in-trial period (time from randomisation to last site visit). Continuous endpoints were analysed by analysis of covariance, and categorical endpoints by logistic regression. Use of pain medication was analysed descriptively. Safety outcomes focussed on serious adverse events (SAEs), adverse events (AEs) leading to treatment discontinuation, and other selected AEs.
Results: A total of 407 pts were randomised to semaglutide 2.4 mg (n=271) or placebo (n=136). Of these, 90.8% (n=246) and 89.7% (n=122) of pts completed the study in the semaglutide and placebo groups, respectively. Pts were mostly female (81.6%) and White (60.9%), and most had a BMI ≥35 kg/m² (75.4%). Pts also had a mean (standard deviation) age of 56 (10) years, BW of 108.6 (24.2) kg, BMI of 40.3 (7.2) kg/m², and WOMAC pain score of 70.9 (16.0). Compared with placebo, the semaglutide group had a significantly greater reduction from baseline in mean BW (−13.7% vs. −3.2%), with an estimated treatment difference (ETD) of −10.5% (95% confidence interval [CI], −12.3, −8.6; p<0.0001) at week 68. Also compared with the placebo group, the semaglutide group experienced a greater decrease from baseline in WOMAC pain score (−41.7 vs. −27.5), with an ETD (95% CI) of −14.1 (−20.0, −8.3; p<0.0001) (Figure). Compared with the placebo group, the semaglutide group experienced greater improvement in WOMAC physical function score, with changes at week 68 of −41.5 and −26.7, respectively (ETD [95% CI], −14.9 [−20.4, −9.3]; p<0.0001). The safety profile of semaglutide was consistent with previous studies of GLP-1 receptor agonists without new safety concerns.
Conclusion: Semaglutide 2.4 mg was superior to placebo in reducing BW and KOA-related pain, and improving KOA-related physical function.

AS12.02

STEP 10 trial: semaglutide 2.4 mg provided a superior reduction vs placebo in body weight and reversion to normoglycaemia in participants with obesity and prediabetes

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Introduction: People with obesity and prediabetes have increased risk of type 2 diabetes (T2D), adiposity-related comorbidities and mortality, and hence, may benefit from weight loss treatment. STEP 10 compared the effect on body weight and reversion to normoglycaemia of semaglutide 2.4 mg (sema) vs placebo (pbo) as an adjunct to lifestyle intervention in

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participants (pts) with obesity and prediabetes. Effect on glucose metabolism and cardiometabolic risk factors was also assessed.

Methods: This randomised, double-blind, parallel-group, multicentre trial (NCT05040971) enrolled pts aged ≥18 years with body mass index (BMI) ≥30 kg/m² and prediabetes according to NICE criteria (glycated haemoglobin [HbA1c] 6.0–6.4% or fasting plasma glucose [FPG] 5.5–6.9 mmol/L) without T2D. Pts were randomised 2:1 to once-weekly s.c. sema or pbo and had diet and physical activity counselling for 52 weeks (wks). During the subsequent 28-wk off-treatment period, pts had standard healthy lifestyle counselling as per local guidelines. Primary endpoints were body weight change (%) and proportion of pts reverting to normoglycaemia (HbA1c <6.0% and FPG <5.5 mmol/L) at wk 52. Secondary endpoints included change in HbA1c (%), FPG (mmol/L), waist circumference (cm), body weight (kg), systolic blood pressure (mmHg), lipid ratios vs baseline, and categorical weight loss at wk 52. Exploratory endpoints included body weight change (%) and reversion to normoglycaemia at wk 80. Results for all randomised pts addressing the treatment policy estimand were analysed using linear regression (analysis of covariance) and logistic regression. Safety was also assessed.

Results: In total, 207 pts were randomised to sema (n=138) or pbo (n=69); most were female (71.0%) and White (88.4%). At baseline, mean age was 53 years, body weight 111.6 kg, BMI 40.1 kg/m², waist circumference 120.1 cm, HbA1c 5.9%, and FPG 5.9 mmol/L. Reduction in body weight was significantly greater with sema vs pbo at wk 52 (–13.9% vs –2.7%; estimated treatment difference [95% CI]: –11.2% [–13.0, –9.4]; p<0.0001) (Fig. 1). Greater proportions of pts receiving sema vs pbo achieved categorical weight loss (Fig. 2). Greater proportions of pts reverted to normoglycaemia at wk 52 with sema (81.1%) vs pbo (14.1%) (odds ratio [95% CI]: 19.8 [8.7, 45.2]; p<0.0001). From baseline to wk 52, treatment with sema vs pbo resulted in improvement for most secondary endpoints; after the off-treatment period, improvements in weight, HbA1c and FPG were attenuated (Table). At wk 80 vs baseline, 44.2% vs 18.3% of pts receiving sema vs pbo reverted to normoglycaemia. Of pts with normoglycaemia at wk 52 and with a wk 80 assessment, 45.4% and 57.1% regressed to prediabetes.

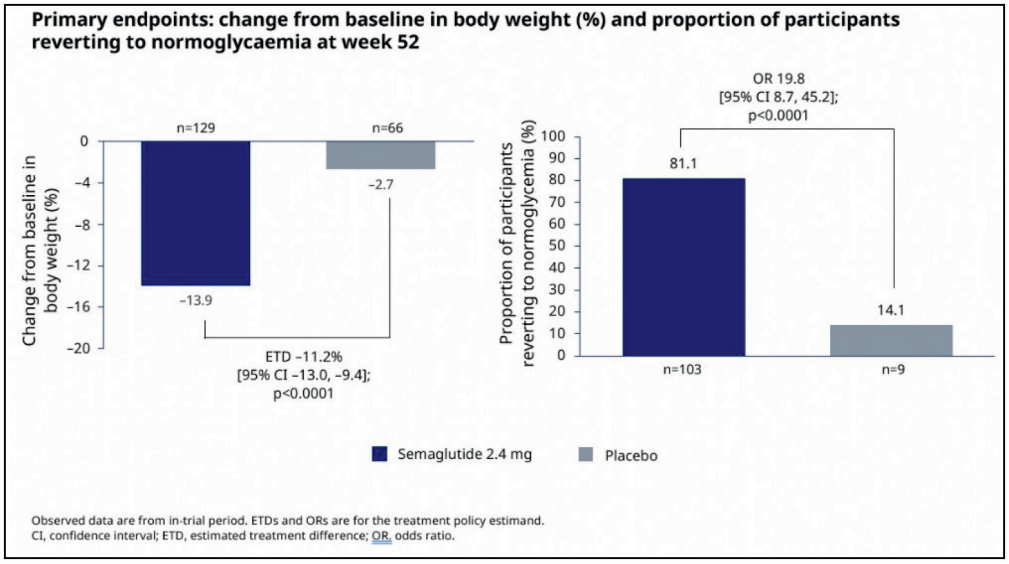


Fig. 1.

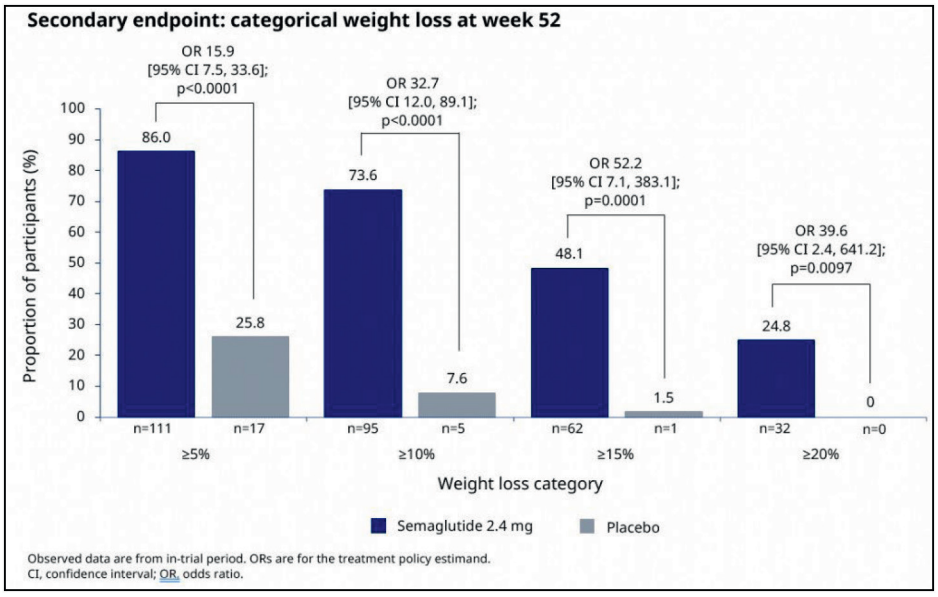


Fig. 2.

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Serious adverse events (AEs) occurred in 8.7% of pts in both groups. AEs leading to treatment discontinuation occurred in 5.8% of pts in the sema group vs 1.4% in the pbo group. No new safety signals were reported.
Conclusions: In STEP 10, sema provided a superior reduction in body weight and reversion to normoglycaemia vs pbo in pts with obesity and prediabetes. The safety and tolerability profile of sema was consistent with previous studies and the GLP-1 RA class.

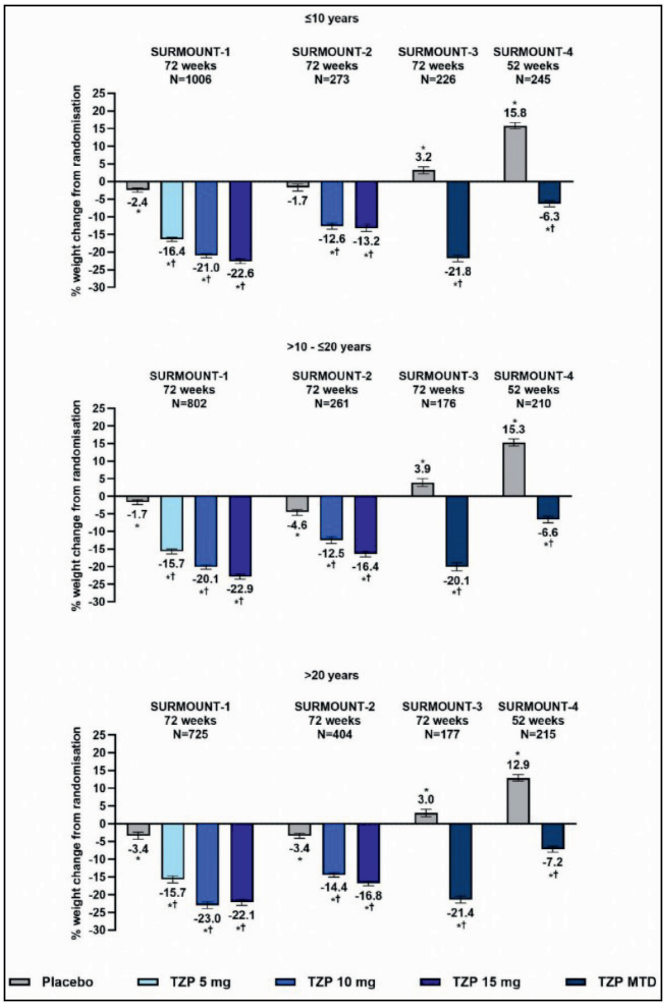
AS12.03

Tirzepatide reduced body weight and waist circumference in people with overweight or obesity regardless of disease duration: post hoc analysis of the SURMOUNT 1-4 trials

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Introduction: In the SURMOUNT-1 to -4 trials, the once-weekly glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptor agonist tirzepatide has demonstrated significant and clinically meaningful reductions in body weight in people living with obesity or overweight with weight-related comorbidities. In this post hoc subgroup analysis, we examined the impact of disease duration on weight reduction and waist circumference within each trial.
Methods: The SURMOUNT phase 3 trials evaluated tirzepatide versus placebo in people with obesity or overweight with ≥1 weight-related comorbidity without type 2 diabetes (SURMOUNT-1, 72 weeks), with type 2 diabetes (SURMOUNT-2, 72 weeks), and without type 2 diabetes after a 12-week intensive lifestyle intervention (SURMOUNT-3, 72 weeks from randomisation) or after a 36-week open label tirzepatide lead-in (SURMOUNT-4, 52 weeks from randomisation). In this post hoc subgroup analysis, participants in each study were grouped based on overweight/obesity disease duration at baseline (≤10, >10-≤20, and >20 years, determined by patient report). Percent body weight change, the proportions achieving weight loss targets of 5, 10, 15, 20, and 25%, and the change in waist circumference were examined using the efficacy estimand.
Results: Participants randomised to tirzepatide achieved greater weight reductions compared to placebo at study endpoint regardless of the duration of disease (Figure). This was consistent across the different SURMOUNT studies, and the magnitude of reduction was generally similar across the disease duration categories. Generally, more tirzepatide-treated participants achieved the weight reduction targets of 5, 10, 15, 20, and 25% compared with placebo-treated participants, regardless of disease duration. Tirzepatide reduced waist circumference to a greater extent than placebo for each disease duration category in SURMOUNT-1 to -4 (Table). These reductions were consistent across disease duration subgroups.
Conclusion: Tirzepatide consistently reduced body weight and waist circumference in people living with obesity or overweight with weight-related comorbidities regardless of the duration of disease. These results are consistent with the overall findings from each study in the SURMOUNT program.



Data are least squares mean (standard error). Analyses included participants in the modified intention-to-treat population, defined as all randomised participants who received at least one dose of study drug (tirzepatide or placebo), excluding data after premature discontinuation of study drug (efficacy analysis set). Study duration is from randomisation to primary endpoint. *p<0.05 from randomisation and †p<0.05 for TZP vs. placebo. MTD=maximum tolerated dose (10 or 15 mg); N=number of participants who were randomly assigned and received at least 1 dose of the study drug; TZP=tirzepatide.

Fig. 1. Percent weight change from randomisation in participants with overweight/obesity for ≤10 years, >10-≤20 years, and >20 years in the SURMOUNT 1-4 trials.

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Tab. 1. Waist circumference (cm) change from randomisation in participants with overweight/obesity for ≤10 years, >10-≤20 years, and >20 years in the SURMOUNT 1-4 trials.

SURMOUNT-1	Placebo	TZP 5 mg	TZP 10 mg	TZP 15 mg
≤10 years	-3.4 (0.63)*	-14.7 (0.6)*†	-18.1 (0.66)*†	-19.1 (0.65)*†
>10-≤20 years	-2.8 (0.72)*	-14.8 (0.74)*†	-19.3 (0.69)*†	-20.3 (0.7)*†
>20 years	-4.2 (0.88)*	-14.2 (0.81)*†	-21.2 (0.79)*†	-20.6 (0.77)*†
SURMOUNT-2	**Placebo**	**TZP 10 mg**	**TZP 15 mg**	-
≤10 years	-2.4 (0.99)*	-10.2 (0.92)*†	-11.1 (0.98)*†	-
>10-≤20 years	-4.4 (0.82)*	-10.8 (0.91)*†	-13.9 (0.81)*†	-
>20 years	-3.3 (0.82)*	-12.2 (0.79)*†	-15.5 (0.82)*†	-
SURMOUNT-3	**Placebo**	**TZP MTD**	-	-
≤10 years	0.1 (0.92)	-17.4 (0.88)*†	-	-
>10-≤20 years	1.8 (1.11)	-15.9 (1.11)*†	-	-
>20 years	1.5 (1.02)	-17.0 (0.96)*†	-	-
SURMOUNT-4	**Placebo**	**TZP MTD**	-	-
≤10 years	9.0 (0.72)*	-4.4 (0.72)*†	-	-
>10-≤20 years	8.5 (0.76)*	-3.8 (0.76)*†	-	-
>20 years	7.1 (0.82)*	-5.5 (0.76)*†	-	-

Data are least squares mean (standard error). Analyses included participants in the modified intention-to-treat population, defined as all randomised participants who received at least one dose of study drug (tirzepatide or placebo), excluding data after premature discontinuation of study drug (efficacy analysis set). *p<0.05 from randomisation and †p<0.05 for TZP vs. placebo. MTD=maximum tolerated dose (10 or 15 mg); TZP=tirzepatide.

AS12.04

Tirzepatide and weight reduction in people with type 2 diabetes and overweight or obesity: a post-hoc analysis of the SURPASS trials

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Background: In the phase 3 SURPASS clinical trials, tirzepatide, a once-weekly GIP/GLP-1 receptor agonist, consistently demonstrated robust glycemic control and weight reduction in adults with type 2 diabetes (T2D). In this post-hoc analysis, we assessed the effect of tirzepatide on body weight reduction in a subset of participants of SURPASS-1 to -5 who had T2D and obesity or overweight (body mass index [BMI] ≥27 kg/m²).
Methods: The SURPASS trials were designed to evaluate the efficacy and safety of tirzepatide (5, 10, and 15 mg) for glycemic control in people with T2D for 40 or 52 weeks (primary endpoint). Eligible participants had inadequate glycaemic control and were either naïve to pharmacotherapy and treated with diet and exercise alone (SURPASS-1), treated with metformin alone (SURPASS-2), or in combination with an SGLT2 inhibitor (SURPASS-3), on any combination of metformin, sulfonylurea, or SGLT2 inhibitor (SURPASS-4), or on insulin glargine, with/without metformin (SURPASS-5). Participants continued their background antihyperglycaemic medication in each trial. In this post-hoc analysis, efficacy on body weight reduction was assessed in participants on treatment (efficacy estimand) who received at least one dose of study drug (tirzepatide, active comparator, or placebo). A mixed model for repeated measures assessed between-treatment differences in mean percent weight change from baseline to primary endpoint.
Results: Across the five SURPASS trials, 86% of participants had obesity or overweight with a mean BMI of 34 to 35 kg/m². Tirzepatide consistently resulted in significant weight reduction from baseline with mean weight reduction of >10% achieved with the 15 mg dose across all trials (figure 1). Participants treated with tirzepatide had significantly greater weight reduction at endpoint compared to active comparator or placebo (all p<0.001). In addition, more participants treated with tirzepatide versus active comparator or placebo achieved body weight reduction thresholds of ≥5%, ≥10%, ≥15%, and ≥20% at endpoint.
Conclusion: Although differences in study design and population prevent cross-trial comparisons, within each SURPASS trial all doses of tirzepatide provided clinically meaningful reduction in body weight in adults with T2D and obesity or overweight.

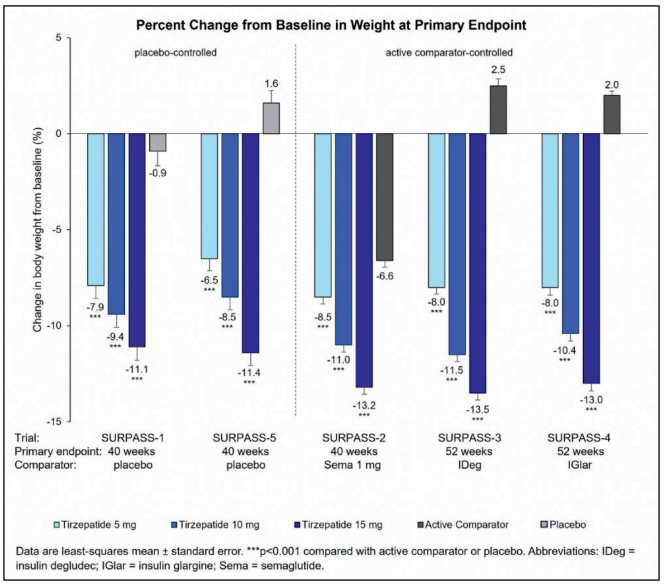


Fig. 1. Percent change from baseline in weight at primary endpoint in the SURPASS phase 3 trials in participants with type 2 diabetes and obesity or overweight.

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AS12.05

Once-weekly Triple Receptor (GIP/GLP-1/Glucagon) Agonist Retatrutide (LY3437943): Efficacy and Safety in a 48-week Obesity Phase 2 Trial

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Background and Aims: Nutrient-stimulated hormone-based pharmacotherapeutics are advancing the treatment of obesity. Retatrutide (RETA) is a novel triple-agonist of the GIP, GLP-1 and glucagon receptors. A phase 1b study of RETA demonstrated up to 9.0 kg placebo-adjusted weight reduction over 12 weeks in participants with type 2 diabetes. We aimed to examine the efficacy and safety of RETA versus placebo for weight reduction in adults with obesity.

Materials-Methods: This phase 2 trial randomly assigned adults aged 18-75 years with BMI ≥30 kg/m², or ≥27 kg/m² and ≥1 weight-related condition (type 2 diabetes excluded), to 48 weeks of once-weekly subcutaneous RETA (1, 4, 8 or 12 mg maintenance doses) or placebo. Gradual dose escalation was employed to improve tolerability; two starting doses (2 mg and 4 mg) were explored for doses greater than 1 mg. Primary outcome was % weight change vs. placebo from baseline to 24 weeks. Secondary outcomes assessed at 48 weeks included % change in body weight vs. placebo, % of participants reaching weight reduction targets and several additional measures relevant for cardiovascular risk. Differences in body weight change were explored in subgroups based on sex and BMI.

Results: Participants included 338 adults (48.2% female) with mean age 48.2 years and BMI 37.3 kg/m². The mean % change in weight at 24 weeks was −7.2 (RETA 1 mg), −12.9 (4 mg), −17.3 (8 mg), and -17.5 (12 mg) and −1.6 (placebo) (all p<0.001 versus placebo). The mean % change in weight at 48 weeks was −8.7 (RETA 1 mg), −17.1 (4 mg), −22.8 (8 mg), and −24.2 (12 mg) and −2.1 (placebo) (all p<0.001 versus placebo). At 48 weeks, weight reduction ≥10% and ≥15% was achieved in 91 and 75% (RETA 8 mg), and 93 and 83% (12 mg) and in 9 and 2% (placebo) of participants (all p<0.001 versus placebo). Trends for greater % weight reduction were observed for women compared to men and for participants with BMI ≥35 kg/m² compared to those with BMI <35 kg/m². Improvements in waist circumference, lipids, HbA1c, and blood pressure were observed with RETA. Most common adverse events were gastrointestinal (nausea, diarrhoea, vomiting), were mild-to-moderate in severity, occurred primarily during dose-escalation, and were mitigated by a lower starting dose (2 mg vs 4 mg). Dose-dependent increases in pulse rate (bpm) were observed at 48 weeks: 1.7 (RETA 1 mg), 3.1 (4 mg), 4.7 (8 mg), and 6.0 (12 mg) and 0.4 (placebo) (all except 1 mg group p<0.05 vs. placebo).

Conclusions: In participants with obesity, RETA was well-tolerated and provided substantial and clinically meaningful reductions in body weight and improvements in cardiovascular risk factors.

AS12.06

Effect of oral non-peptide GLP-1 receptor agonist orforglipron (LY3502970) in participants with obesity or overweight: A Phase 2 study

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[2]Texas Diabetes and Endocrinology, Austin, TX, USA
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Background and Aims: Orforglipron (OFG) is a novel once daily oral non-peptide GLP-1 receptor agonist (RA) which can be taken with or without food, in development for chronic weight management and type 2 diabetes. The aim of this study was to compare the efficacy, safety, and tolerability of OFG in patients with obesity or overweight with ≥1 weight-related comorbidity.

Materials-Methods: This randomized, double-blind, parallel, phase 2 study compared OFG against placebo (PBO). Participants were randomized to PBO or different OFG target doses (12, 24, 36, or 45 mg). OFG doses were increased to target using different dose escalation schemes in each arm to evaluate dosing regimens for tolerability. The primary endpoint was percent body weight (BW) change from baseline in OFG vs PBO at week 26. Secondary endpoints included change in percent BW from baseline in OFG vs PBO at week 36, change in BW (kg) from baseline at week 26 and 36, change from baseline in waist circumference (WC) and BMI, and the percentage of participants achieving ≥5 or ≥10% weight loss.

Results: This study randomized 272 participants with a mean BW of 108.7 kg, BMI of 37.9 kg/m², and 94% of participants had a BMI ≥30 kg/m² at baseline. The mean percentage change in BW from baseline ranged from -8.6% to -12.6% at week 26, and -9.4% to -14.7% at week 36 in a dose dependent manner, compared with -2.0% and -2.3% with PBO respectively. OFG showed statistically significant reductions in percent change from baseline in BW for all doses of OFG when compared with PBO, ranging from; -6.5% to -10.6%, all p <0.001 at 26-weeks, to -7.1% to -12.3%, all p<0.001 at 36-weeks. Statistically significant reductions were observed in BMI up to 4.6 kg/m² (all p<0.001) at 36 weeks and WC up to 9.6 cm, (all p<0.001) at 36 weeks for all groups vs PBO. At 36-weeks, all doses of OFG were statistically significantly more likely to achieve the

Tab. 1. Key Endpoints: change from baseline to 48 weeks.

Endpoint	PBO	RETA 1 mg	RETA 4 mg[1]	RETA 8 mg[1]	RETA 12 mg
Body weight (%)[2]: all subjects	-2.1 (0.7)	-8.7 (1.0)***	-17.1 (1.1)***	-22.8 (1.0)***	-24.2 (1.2)***
Women	-2.6 (1.1)	-9.6 (1.6)***	-19.5 (1.6)***	-25.7 (1.4)***	-26.6 (1.8)***
Men	-1.8 (0.9)	-7.8 (1.1)***	-14.4 (1.5)***	-20.6 (1.4)***	-21.9 (1.7)***
BMI <35 kg/m²	-2.7 (1.4)	-8.2 (1.2)***	-15.5 (1.2)***	-21.7 (1.3)***	-21.5 (1.9)***
BMI ≥35 kg/m²	-1.5 (0.8)	-8.9 (1.5)***	-18.7 (1.7)***	-23.7 (1.4)***	-26.4 (1.4)***
Waist circumference (cm)	-2.6 (1.0)	-6.5 (1.1)*	-14.7 (1.2)***	-18.5 (1.1)***	-19.6 (1.3)***
LDL-cholesterol (%)	-0.3 (2.4)	-4.7 (2.4)	-12.4 (2.5)***	-18.8 (2.0)***	-21.7 (2.8)***
Triglycerides (%)	1.4 (5.5)	-17.9 (3.6)***	-33.9 (3.3)***	-40.5 (2.5)***	-39.9 (3.5)***
HbA1c (mmol/mol)	<0.1 (0.4)	-2.1 (0.3)***	-3.0 (0.4)***	-4.9 (0.4)***	-4.9 (0.4)***
Systolic BP (mm Hg)	-2.3 (1.4)	-3.0 (1.6)	-9.2 (1.5)***	-11.5 (1.5)***	-11.0 (1.5)***
Diastolic BP (mm Hg)	-0.7 (1.1)	-1.3 (1.1)	-4.6 (1.0)**	-7.4 (1.0)***	-5.1 (1.2)**

Data are mean (SE). *p<0.05 vs. PBO **p<0.01 vs. PBO ***p<0.001 vs. PBO
[1]Arms with 2 mg and 4 mg starting doses were pooled
Body weight and lipid data are % change; data for other measures are absolute change
BMI=body mass index; HbA1c=glycated haemoglobin; LDL=low-density lipoprotein; RETA = retatrutide

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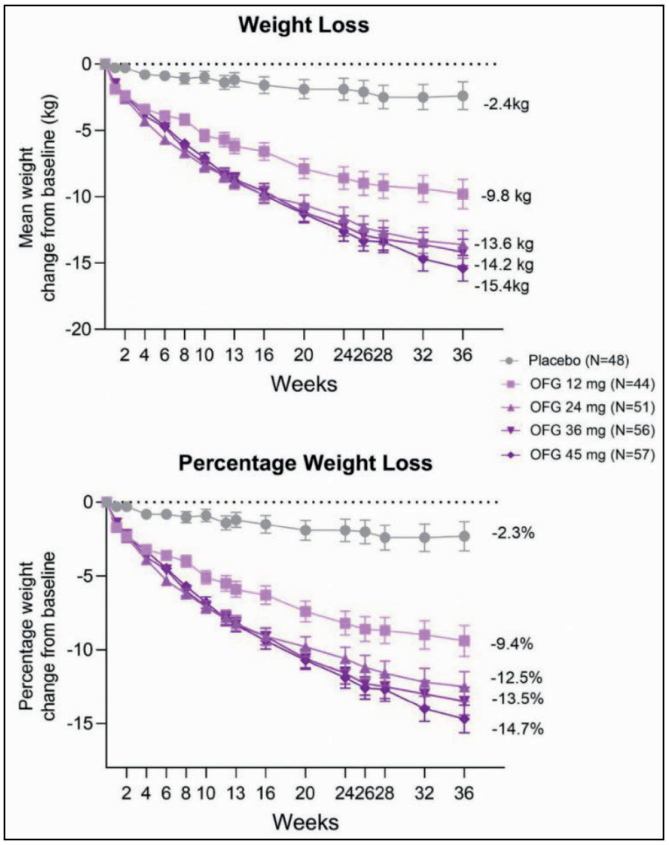


Fig. 1.

weight loss targets of ≥5%, ≥10% and ≥15% compared with PBO. The percentage of patients who reported AE was higher in the OFG groups (up to 90%) vs PBO (76%). The most frequently reported adverse events (AE) in participants on OFG were gastrointestinal (GI) (overall mean OFG 77%, PBO 36%) and were primarily mild to moderate in severity. The GI events occurred most frequently with drug initiation and dose escalation.
Conclusions: OFG, a novel non-peptide GLP-1 RA, which can be taken with or without food, led to greater reductions in BW, BMI, and WC compared with PBO and with a safety profile consistent with the GLP-1 RA class. These promising data support continued development of OFG as an oral treatment for chronic weight management.

Wednesday, 15 May 2024

AS13 – Metabolic Homeostasis and Gender

AS13.01

Effects of intrauterine growth restriction (IUGR) on the hypothalamic proteome profiling of adult offspring male rats

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Introduction: IUGR is linked to an elevated risk of later obesity and metabolic syndrome development. Obesity has multifactorial origins, involves biochemical changes in crucial organs, notably the hypothalamus, which plays a pivotal role in energy homeostasis regulation. This study posits that hypothalamic changes occur as a consequence of fetal exposure to maternal intrauterine malnutrition. Thus, it was aimed to investigate if IUGR alters hypothalamic proteome profiling in adult life.
Methods: Wistar female restricted rats (R) were fed with 50% of the food consumed by the control rats (C) on the same day of pregnancy. Control and restricted 90 days-old male offspring were euthanized and the hipothalami (N=4) were collected and immediately frozen at -80oC. Proteomics analyses were performed on an LTQ-Orbitrap Velos ETD coupled with an EasyII nano LC. The Rattus norvegicus proteome served as the reference list and pathway analysis was conducted using the Panther software with Reactome Pathways. Statistical analysis was performed by Student's t-test, followed by the Benjamini-Hochberg multiple testing correction, with a significance level set at FDR (False Discovery Rate) < 0.05.
Results: Among the 8 biological samples of hypothalamus, a total 665 proteins were selected after application of the inclusion criteria for the comparison between C and R groups. IUGR protocol altered hypothalamic proteins involved in the nervous system development pathway, as evidenced by the increased levels of neuromodulin and clathrin light chain A, while reducing the levels of clathrin heavy chain 1, neurofascin, transforming protein Rho A, AP2 complex subunit beta, Spectrin alpha chain, non-erythrocytic 1, Actin-related protein 2_3 complex subunit 2. In addition, proteins involved in the transmission across synapses pathway were also modified, as observed by the reduced levels of Guanine nucleotide-binding protein G(I)_G(S)_G(T) subunit beta-1, Heat shock cognate 71 kDa protein, Syntaxin-binding protein 1, Vesicle-fusing ATPase and AP2 complex subunit beta, and the upregulation of Band 4.1-like protein 1.
Conclusion: IUGR protocol promoted significant changes in the hypothalamic proteome profiling, including proteins involved in both neuronal development and transmission across chemical synapses pathways, shedding a light on possible mechanisms involved in the obesity-associated hyperphagia observed in late life. Further studies are necessary to better comprehend the involvement of these altered proteins on the hypothalamic processes, in special regarding the energy homeostasis regulation, under IUGR condition.

Conflict of Interest: None Disclosed

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AS13.02

Adipose insulin resistance differs between men and women with obesity

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Introduction: Insulin resistance is more prominent in men than women. If this involves adipose tissue is unknown and was presently examined in adult individuals
Methods: AdipoIR (in vivo adipose insulin resistance index) was measured in 2344 women and 787 men. In 259 of the women and 54 of the men, insulin induced inhibition of lipolysis (breakdown of triglycerides) and stimulation of lipogenesis (lipid synthesis from glucose) were determined in isolated subcutaneous adipocytes incubated in vitro. Half maximum effective insulin concentration (pD2) and maximum effect (responsiveness) of insulin were determined from concentration-response experiments with insulin. Because insulin acts through spare receptors pD2 reflects early hormone signal events and responsiveness mirrors later steps in hormone action.
Results: Men had higher AdipoIR values than women but only in individuals with obesity (p<0.0001). The latter sex dimorphism was found among physically active and sedentary people, in those with and without cardiometabolic disease and in people using nicotine and not (p=0.0003 or better). In individuals with obesity adipocyte insulin sensitivity (pD2) and maximal antilipolytic effect (responsiveness) were 10-fold and 10% lower, respectively, in men than women (p=0.005 or better). However, only pD2

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was independent of the afore mentioned cofactors. Responsiveness and pD2 for lipogenesis were similar in both sexes (r>0.17).
Conclusion: In individuals with obesity, adipose tissue insulin resistance is more pronounced in men than in women. The mechanism involves less efficient insulin-mediated inhibition of adipocyte lipolysis which is localized at early and receptor near hormone signaling events. In individuals without obesity there is no sex difference in adipose insulin resistance.

AS13.03

Obesity and Insulin resistance is associated with induction of PTEN translation in diet induced models of obesity and is reversed by PTEN inhibition

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Introduction: We have recently shown that PI3K signaling regulates the mTOR-dependent expression of PTEN, the major negative regulator of Insulin/PI3K signaling. This buffers the effects of physiologic or oncogenic inhibition or activation of the PI3K kinase pathway and is a strong determinant of homeostasis. Thus, insulin activation of PI3K signaling causes induction of PTEN that limits the amplitude and duration of the signal. Obesity is a metabolic disorder that is often associated with insulin resistance and Type 2 Diabetes. One of the major causes of these metabolic disorders is lifestyle and dietary changes of increased consumption of carbohydrates and fats. Insulin resistance is defined by reduced sensitivity of PI3K signaling to insulin, requiring increasing levels of insulin to activate the insulin receptor-PI3K-AKT signaling to stimulate glucose uptake by the liver, muscle and fat tissues. Therefore insulin resistance is characterized by hyperinsulinemia and hyperglycemia. While initially hyperinsulinemia maintains normoglycemia, with time and increasing insulin resistance, hyperglycemia ensues. We speculated that insulin resistance is due to induction of high levels of PTEN expression that prevent further increases in PI3K signaling.
Methods: C57BL/6J mice were fed either standard rodent chow or western diet (high fat/high carb) and their weights, blood parameters measured, and tissue collected for protein biochemistry at various times beginning from 2 days after start of the diet until 12 weeks. PTEN and mTORC1 inhibitors were administered either at the beginning of the western diet or after the mice had been fed on the western diet for 2 weeks.
Results: We found that mice on western diet gained weight, developed insulin resistance and type 2 diabetes associated phenotypes and was characterized by significant increases in PTEN protein in fat, muscle and liver tissues. Kinetics of the physiology and the signaling revealed that onset of hyperinsulinemia and PTEN induction begin quickly in fat, liver and muscle first and that is followed by hyperglycemia and severe glucose intolerance. Over long duration on high caloric diet hyperglycemia, hyperinsulinemia, and insulin resistance is maintained while the animals continue to gain weight, PTEN remains increased and phospho-AKT declines. This is accompanied by hepatic steatosis along with increased leptin levels. Treatment with a PTEN phosphatase inhibitor, VO-OHpic, from the beginning of fat diet consumption or after the onset of weight gain and insulin resistance prevents and reverses the obesity, hyperinsulinemia, hyperglycemia and insulin resistance. Inhibition of PTEN protein synthesis with a selective mTORC1 kinase inhibitor RMC-5552, also prevents and reverses the above phenotypes.
Conclusion: These data suggest that sustained induction of PTEN expression by increasing levels of insulin causes feedback inhibition of PI3K signaling that leads to obesity, insulin resistance and type 2 diabetes. The model is supported by the prevention or reversal of obesity and insulin resistance by inhibitor of PTEN phosphatase activity or an inhibitor of PTEN protein induction.

AS13.04

Maternal high-fat feeding triggers persistent hypothalamic CCR2 monocyte recruitment and long-term metabolic programming in offspring

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Introduction: A high-fat diet (HFD) induces gender- and time-dependent recruitment of CCR2+ monocytes to the hypothalamus via chemokine signaling. Maternal exposure to an HFD during gestation and lactation periods causes CCR2 monocyte chemotaxis to the offspring's hypothalamus at post-natal day 21 (P21). Further investigation is required to understand the long-term consequences of metabolic reprogramming in offspring and its potential exacerbation of HFD-induced hypothalamic CCR2 recruitment in adulthood.
Methods: To address this, we used CCR2-RFP mice, which express a red fluorescent protein (RFP) sequence replacing the coding sequence of the Ccr2 gene. Six-week-old female CCR2-RFP mice were fed a standard diet (SD) or an HFD for four weeks and subsequently bred with CCR2-RFP males. Offspring were weaned at P21, gender-separated, and weighed. From P21 to 9 weeks old, all progeny mice were exclusively fed SD, with their body mass recorded weekly. At 9 weeks, they underwent a glucose tolerance test and were then divided into two groups: one fed SD and the other exposed to HFD for 24 hours. Glycemia was assessed after a 6-hour fast, followed by brain harvesting designated for CCR2 monocyte visualization via confocal microscopy. The experimental protocol was approved by the Committee on Ethics in Animal Use (CEUA 6312-1/2023) of the University of Campinas.
Results: On weaning day (P21), male offspring from HFD-fed dams exhibited higher body mass compared to offspring from the SD-fed group, which normalized over development. At 9 weeks, adult female progeny displayed glucose intolerance and elevated fasting glycemia compared to progeny from the SD-fed group, without body mass differences. Following a 24-hour HFD challenge, adult offspring from HFD-fed mothers exhibited increased caloric intake compared to controls, suggesting impaired food intake regulation. Remarkably, regardless of their assigned diet (standard or 24-hour HFD), these offspring also showed increased recruitment of CCR2 monocytes to the hypothalamus. This finding highlights a potential long-term effect of maternal HFD on offspring immune programming in this critical brain region.
Conclusion: Maternal high-fat feeding shapes offspring's metabolism for life, leading to persistent metabolic dysfunction even in adulthood. This effect appears to involve the recruitment of CCR2 monocytes to the hypothalamus. Further investigation will analyze hypothalamic chemokines and blood CCR2 monocyte characteristics in adult offspring to understand this long-term programming.

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AS13.05

Untargeted analysis of circulating miRNAs profile before and after dietary weight loss interventions

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Introduction: Dietary weight loss interventions are the preferred option for prevention and treatment of obesity in the general population. However, heterogeneity in response to diet hinder the success of dietary recommendations. microRNAs (miRNAs), transcriptional regulators that are secreted and detectable in the circulation, have been proposed as biomarkers of physiological processes and treatment response. Thus, the aim of this study was to analyze changes in circulating miRNA profile in response to different dietary interventions.
Methods: RNAseq analysis of plasma miRNAs before and after 3 months of 4 different hypocaloric dietary interventions: Mediterranean Diet (control); 16h fasting and 8h feeding (16:8); normal protein and low carbohydrate ketogenic diet (KD); and Alternate Day Fasting intervention (ADF).
Results: All the interventions significantly decreased weight and body mass index (BMI). KD led to a decrease in glucose and glycated hemoglobin levels ($p<0.05$). 21 miRNAs were significantly modulated by the different interventions (Control, 3 miRNAs; 16:8, 6 miRNAs; KD, 6 miRNAs; ADF, 6 miRNAs). Among these miRNAs, *miR-23a-3p* negatively correlated with BMI ($p<0.01$), fat mass ($p>0.05$) and glucose and HbA1c levels ($p<0.01$), *miR-3138* positively correlated with glucose and HbA1c levels ($p<0.05$) and *miR-547-3p* negatively correlated with BMI ($p<0.05$). Target gene enrichment analysis showed a significant overrepresentation of biological processes related to catabolism, autophagy and cell response to nutrient starvation.
Conclusion: Plasma miRNAs are modulated by different dietary interventions and relate with the diet-induced changes in biochemical and anthropometrical variables, likely due to their implication in biological processes related to fasting.

Conflict of Interest: None Disclosed

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AS13.06

An essential amino acid-based diet improves metabolic health via sex-dimorphic mechanisms

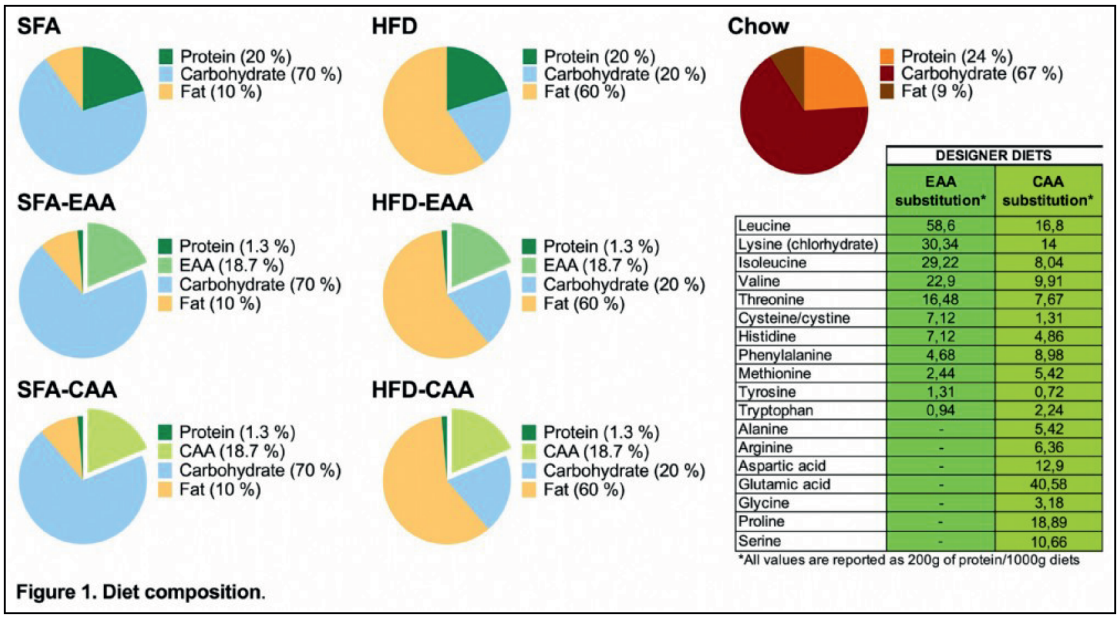
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Introduction: Obesity is considered a disorder of energy balance, and its management is related to the control of energy metabolism with a reduction of food intake ("eat less") and an increase in energy expenditure ("move more"). Modifying feeding habits represents the first line for obesity and type 2 diabetes (T2D) management. Indeed, new animal models have provided a conceptual framework for understanding how dietary components affect metabolism homeostasis and regulate multiple signalling pathways (Flier J Clin Invest. 2020). We demonstrated that an essential amino acid (EAA)-defined diet shows strong anti-obesity and anti-diabetic properties in male mice, stimulating energy expenditure via brown adipose tissue (BAT) activation (i.e., adaptive thermogenesis) and modulating the gut microbiota, in addition to prolonging health span (Ruocco et al. Diabetes 2020). Since sex is critical in metabolic response to diets (Ventura-Clapier et al. Clin. Sci. 2017), we extended our observations to female mice.
Methods: Male and female C57BL6/N mice (8-week-old) were fed with:
1) saturated fatty acid diet (SFA, 10% fat, half of which are saturated fatty acids) similar to a Western diet;
2) high-fat diet (HFD, 60 % fat);
3) EAA-substituted diets, in which the protein (casein) is substituted with EAA (SFA-EAA and HFD-EAA); 4) CAA-substituted diets, in which casein is substituted with free amino acids designed on casein profile (SFA-CAA, HFD-CAA), as additional controls.

All the conditions were compared with a standard chow diet (Fig.1).
Results: We found a marked sex-specific response to diets in both obesity models (SFA and HFD). The SFA-EAA prevents obesity and T2D development more efficiently in males, stimulating energy expenditure and BAT thermogenesis via sympathetic nervous system (SNS) activation. BAT of females seems resistant due to a lower SNS recruitment (Fig.2). Moreover, our data show that the modulation of body weight may also depend on the gut microbiome, influencing the sex-based susceptibility to diets. Our preliminary results on the HFD model show the same trend. In males, we confirm the anti-obesity and anti-diabetes efficacy of HFD-EAA diets via BAT activation. The HFD-EAA-fed females lose less weight than males and we observe a mild effect on glucose homeostasis and thermogenic program recruitment, confirming that a sex-dependent mechanism is also involved in controlling energy homeostasis in these obese mice (Fig.3).
Conclusion: Our data reveal that substituting the protein component with the specific EAA formula prevents body weight gain more markedly in males than in females, ameliorating insulin sensitivity via the BAT thermogenesis recruitment (Fig.4). The EAA-based diets in females failed to improve insulin sensitivity even in the presence of a significant body weight reduction, probably due to the lower SNS activity, already high under basal conditions. We are extending the observations on the HFD model, evaluating sex-dependent BAT thermogenic activation and metagenomic profile. With our results, we aim to propose a new gender-based view in obesity therapy, providing individualized guidance for human metabolic health.

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	DESIGNER DIETS	
	EAA substitution*	CAA substitution*
Leucine	58,6	16,8
Lysine (chlorhydrate)	30,34	14
Isoleucine	29,22	8,04
Valine	22,9	9,91
Threonine	16,48	7,67
Cysteine/cystine	7,12	1,31
Histidine	7,12	4,86
Phenylalanine	4,68	8,98
Methionine	2,44	5,42
Tyrosine	1,31	0,72
Tryptophan	0,94	2,24
Alanine	-	5,42
Arginine	-	6,36
Aspartic acid	-	12,9
Glutamic acid	-	40,58
Glycine	-	3,18
Proline	-	18,89
Serine	-	10,66

*All values are reported as 200g of protein/1000g diets

Figure 1. Diet composition.

Fig. 1.

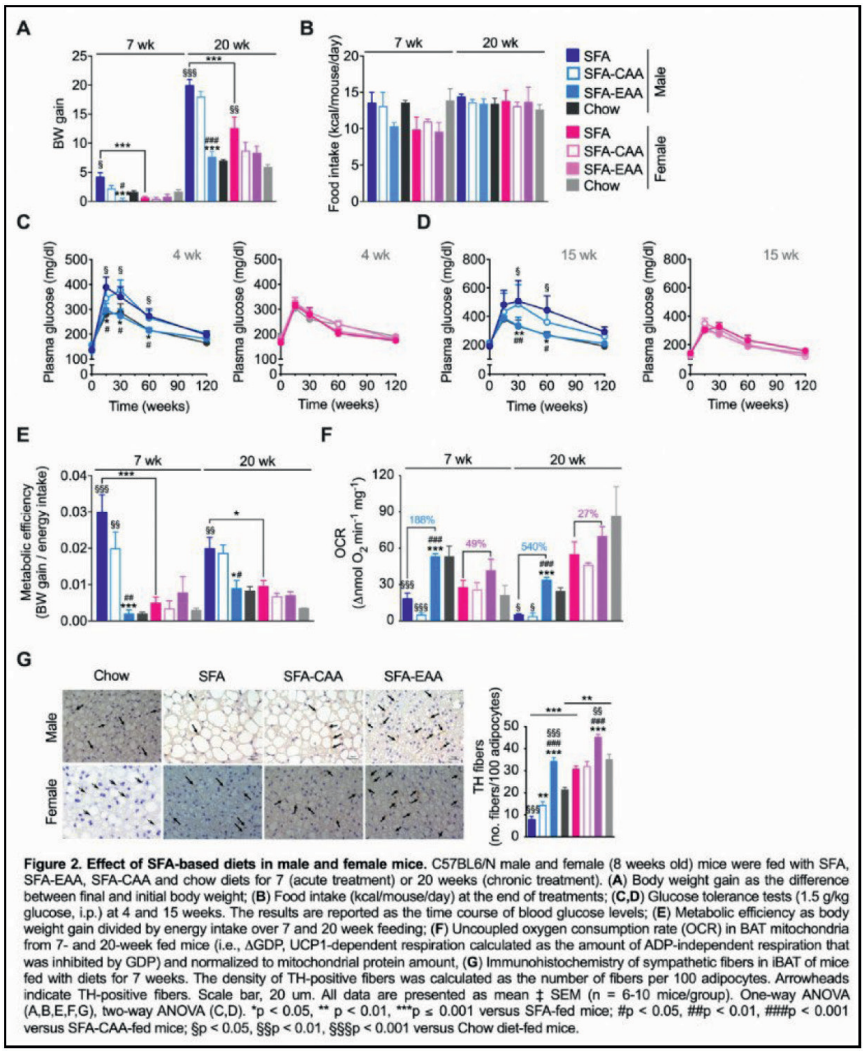


Figure 2. Effect of SFA-based diets in male and female mice. C57BL6/N male and female (8 weeks old) mice were fed with SFA, SFA-EAA, SFA-CAA and chow diets for 7 (acute treatment) or 20 weeks (chronic treatment). (**A**) Body weight gain as the difference between final and initial body weight; (**B**) Food intake (kcal/mouse/day) at the end of treatments; (**C,D**) Glucose tolerance tests (1.5 g/kg glucose, i.p.) at 4 and 15 weeks. The results are reported as the time course of blood glucose levels; (**E**) Metabolic efficiency as body weight gain divided by energy intake over 7 and 20 week feeding; (**F**) Uncoupled oxygen consumption rate (OCR) in BAT mitochondria from 7- and 20-week fed mice (i.e., ΔGDP, UCP1-dependent respiration calculated as the amount of ADP-independent respiration that was inhibited by GDP) and normalized to mitochondrial protein amount, (**G**) Immunohistochemistry of sympathetic fibers in iBAT of mice fed with diets for 7 weeks. The density of TH-positive fibers was calculated as the number of fibers per 100 adipocytes. Arrowheads indicate TH-positive fibers. Scale bar, 20 um. All data are presented as mean ‡ SEM (n = 6-10 mice/group). One-way ANOVA (A,B,E,F,G), two-way ANOVA (C,D). *p < 0.05, ** p < 0.01, ***p ≤ 0.001 versus SFA-fed mice; #p < 0.05, ##p < 0.01, ###p < 0.001 versus SFA-CAA-fed mice; §p < 0.05, §§p < 0.01, §§§p < 0.001 versus Chow diet-fed mice.

Fig. 2.

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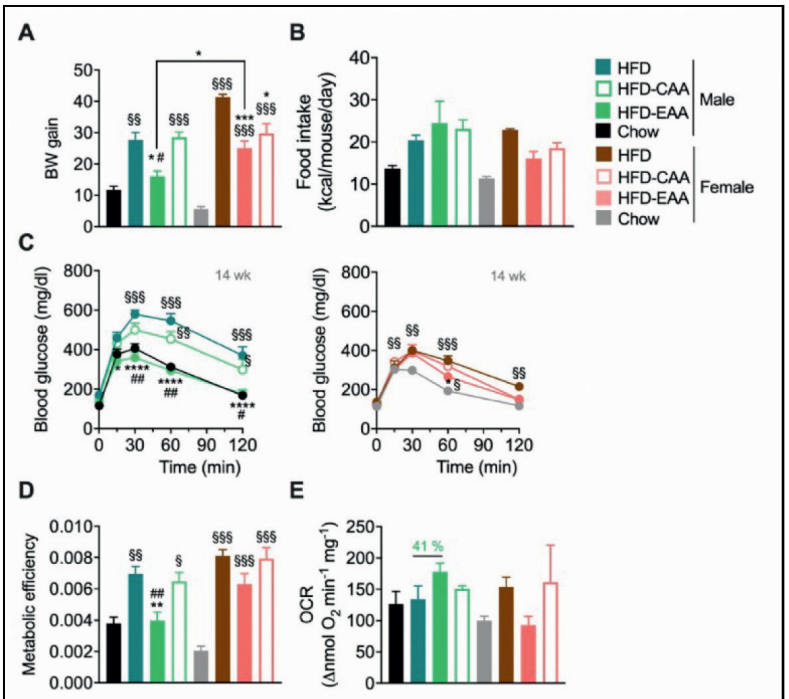


Figure 3. Effect of HFD-based diets in male and female mice. C57BL6/N male and female (8 weeks old) mice were fed with HFD, HFD-EAA, HFD-CAA and chow diets for 33 weeks (chronic treatment). (**A**) Body weight gain as the ditterence between final and initial body weight; (**B**) Food intake (kcal/mouse/day) at the end of treatments; (**C**) Glucose tolerance tests (1.5 g/kg glucose, i.p.) at 14 weeks. The results are reported as the time course of blood glucose levels; (**D**) Metabolic efficiency as body weight gain divided by energy intake over 33 week feeding: (**E**) Uncoupled oxygen consumption rate (OCR) in BAT mitochondria from 33-week fed mice normalized to mitochondrial protein amount. All data are presented as mean ± SEM (n = 5-10 mice/group). One-way ANOVA (A,B,D,E), two-way ANOVA (C). *p ≤ 0.05, ** p ≤ 0.01, ***p ≤ 0.001 versus HFD-fed mice; #p ≤ 0.05, ##p ≤ 0.01 versus HFD-CAA-fed mice; §p < 0.05, §§ < 0.01, §§§p < 0.001 versus Chow diet-fed mice.

Fig. 3.

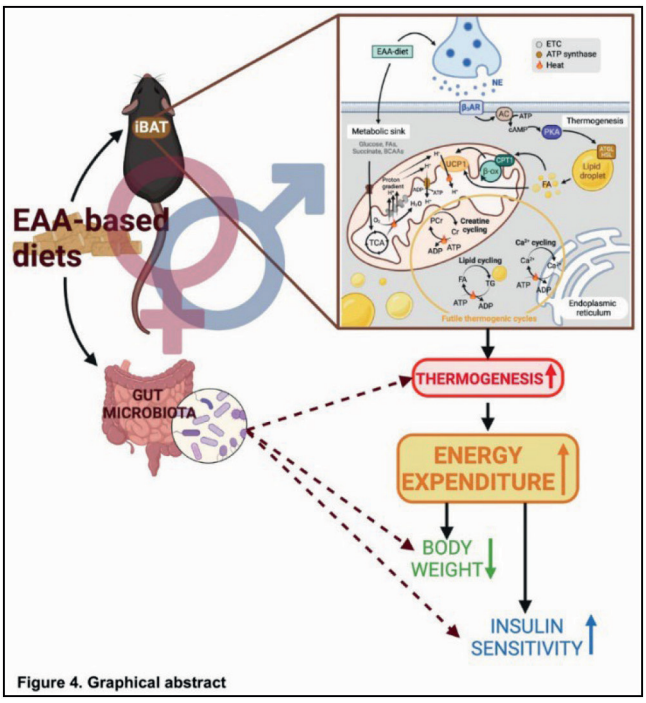


Fig. 4.

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AS14 – Obesity Costs & Inequalities

AS14.01

Modelling the economic burden of obesity onset in childhood and maintenance into adulthood from a cohort-perspective

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Institute for Advanced Studies

Introduction: In Austria, nearly every fourth child is affected by overweight or obesity as of 2020. These children are at high risk to continue to be affected by obesity over their lives. Thereby, obesity reduces health-related quality of life, affects school careers and a child's future income, and leads to a variety of diseases and lower life expectancy. So far, only few studies have investigated the long-term direct and indirect costs of childhood obesity from a cohort-perspective and no study has existed for Austria. The aim of our study was to develop a model to quantify Austria's economic burden of childhood obesity from a cohort-perspective considering obesity maintenance into adulthood.

Methods: We used obesity prevalence based on measurement data from the Austrian COSI study, Austrian candidates for conscription, and the German KIGGS study for children up to four years. We have drawn on disease-specific cost shares from the German cost-of-illness database and applied them to Austrian data on health expenditure by age and sex. We determined indirect costs as a result from income losses due to sick leave, disability, and premature mortality, and from a proportional income loss associated with the choice of school and profession, and discrimination in the labour market using gross income data and disease-specific data on entries into the disability pension scheme, deaths, and sick leave. We also included relative risk data in our model drawn from our systematic literature search regarding relative risks associated with obesity.

We estimated population-attributable fractions applying them to diagnosis-specific cost factors. Our model comprehended a discount rate of 3%, obesity-associated mortality, and future increases in health care costs. To estimate medical and indirect costs for all birth cohorts from 2000 to 2019, we used a forecast of obesity prevalence among 20- to 24-year-olds in Austria up to the year 2039. Based on results from international long-term studies, we assumed that about half of the 20- to 24-year-old population with obesity has a history of obesity during childhood.

Results: Consequently, we estimated that around 95,000 of all children and adolescents in 2019 will enter young adulthood with obesity, which leads to a cash value of € 9.2 billion or annual expenses of approximately €285 million (0.07% of GDP in 2019) over their lives. About 15% of costs arise from direct and 85% from indirect costs.

Conclusion: Our study adds a novel approach to quantifying the lifetime costs of childhood obesity from a cohort perspective to the existing literature. We highlighted the long-term economic burden of childhood obesity for Austria and conclude that public health programs addressing childhood obesity could relieve high costs not only for individuals, but also for society.

AS14.02

Estimated economic impact of modelled weight loss in an English population eligible for bariatric surgery

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Introduction: The prevalence of obesity in the UK is among the highest in Western Europe,[1] resulting in estimated annual costs of £58 billion.[2] In England, people with a body mass index (BMI) of ≥ 40 kg/m², or ≥ 35 kg/m² with an obesity-related complication (ORC), may be eligible for bariatric surgery (BaS), but most of those eligible do not undergo surgery.[3] We estimated the potential impact of weight loss on healthcare costs in this group.

Methods: This was a retrospective, open cohort study using Discover, a real-world database of linked primary and secondary electronic health records covering 2.7 million people in North-West London. Individuals aged ≥ 18 years were included if they had a BMI record ≥ 40 kg /m², or ≥ 35–39.9 kg/m² and an ORC diagnosis, indicating eligibility for BaS according to local guidelines. Index date was the date that all eligibility criteria were met during the study period (1 Jan 2010 to 31 Dec 2019). Individuals with BaS pre-index were excluded. The impact of 10%, 15%, 20% or 25% weight loss, maintained over 2 years, was estimated in individuals with ≥ 1 year of follow-up after becoming eligible for BaS. Weight loss was assumed to occur in the first year, with weight loss maintenance during the second year. Age-standardized healthcare costs (primary and secondary care plus prescription costs) were derived from 2019 Discover data, based on which it was assumed that comorbidity-adjusted costs would be 25% lower for obesity class I and 29% lower for overweight, relative to the BaS-eligible population.

Results: In total, 119,499 individuals were included, of whom 65% were in obesity class II and the remainder in obesity class III at population entry. Weight loss of 10% would result in 58% of the population transitioning to obesity class I, with only 12% remaining in obesity class III (Figure 1). This was estimated to result in cost reductions of 9.7% in the first year and 14.3% in the second year (Figure 2). Both the magnitude of BMI reduction and the resulting cost reductions increased with higher degrees of weight loss. Over the full 2011–2019 period, total estimated healthcare costs for this population were £397 million without weight loss; cost reductions associated with 10%, 15%, 20% and 25% weight loss were £48 million, £62 million, £74 million and £82 million, respectively.

Conclusion: Our analysis suggests that weight loss in individuals who are eligible for BaS but do not receive it would lead to reduced costs; 25% weight loss in this population over 2 years resulted in a 21% reduction in healthcare costs over the study period. This indicates that supporting weight loss in this under-treated group might have a favourable economic impact as well as clinical benefits.

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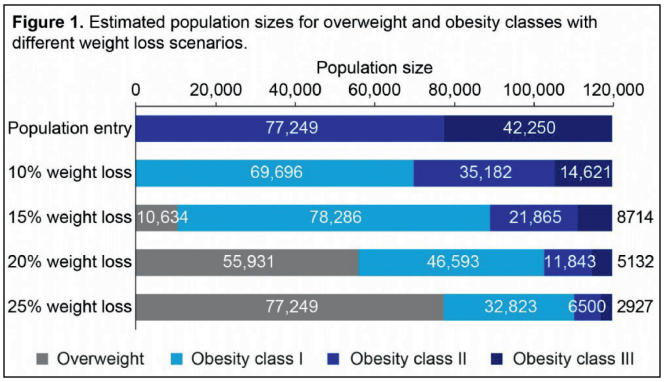


Figure 1. Estimated population sizes for overweight and obesity classes with different weight loss scenarios.

Fig. 1.

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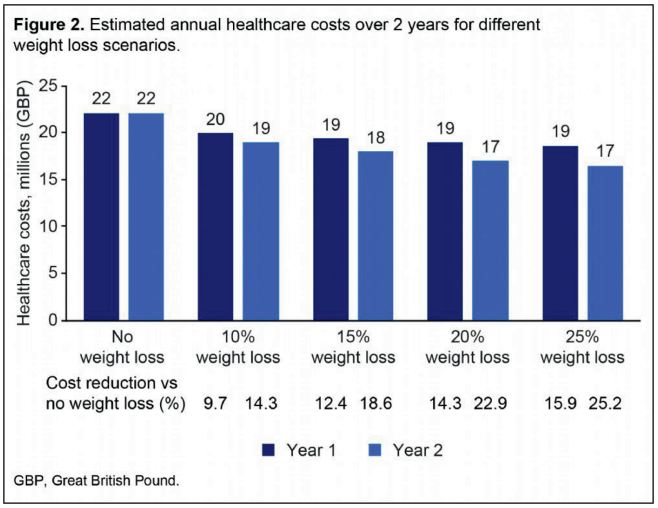


Fig. 2.

AS14.03

Economic evaluation of a simulated high-risk population based public health intervention against obesity using semaglutide

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Objective: Anti-obesity medication (AOM) therapy offers patients with obesity an additional treatment option, but because of uncertainties regarding their safety and effectiveness, relatively few patients have been taking advantage of AOM so far. Since mid-2021, the treatment with semaglutide has been offering a new treatment option with fewer side effects and longer half-life. Besides research showing the effectiveness of semaglutide, for the first time, we questioned how a broad high-risk-population treatment program with semaglutide as an adjunct to a lifestyle intervention program for patients with different degrees of obesity (and no diabetes) can reduce a country's obesity prevalence and obesity-related costs.
Methods: We modified prevalence data from the Austrian Health Interview Survey 2019 (n=15 461) using data of a randomized control trial about proportional weight reductions after the treatment with semaglutide as an adjunct to lifestyle intervention. We estimated the treatment effect on prevalence, medical and indirect costs using the population-attributable fraction approach and a life-cycle model. Direct medical costs included expenses for in- and outpatient diagnostics and treatment, medication, medical aids, long-term care, rehabilitation, and prevention. We determined indirect costs as a result from income losses due to sick leave, disability, and premature mortality using gross income data and disease-specific data on entries into the disability pension scheme, deaths, and sick leave. We used relative risk data regarding about 80 secondary diseases associated with different degrees of obesity. Using fractional polynomial regressions, we estimated relative risks per BMI unit for 23 cost-intensive diseases up to BMI values of 50. A placebo scenario (only lifestyle intervention) demonstrates the sensitivity of the effects only resulting from semaglutide.
Results: Treating 50% of patients with obesity class II and III, reduced the prevalence from 4% to 2.74% (95% CI 2.739-2.743) and from 1.45% to 0.97% (95% CI 0.969-0.997), respectively. Thereby, annual costs related to obesity class II and III went down by 12.9% (€108.7 million). Over the life cycle, obesity-related costs mainly depended on age, the degree of obesity, and on the applied discount rate. For instance, the treatment of patients in their early 30's with obesity class II or III yielded cost savings (r=3%) of up to €30 000 and €50 000 for women and men, respectively. In the placebo scenario, the decrease in prevalence and the reduction of expenses were about half.
Conclusion: Treating 50% of high-risk patients with obesity or achieving a comparable treatment adherence has a significant impact on obesity prevalence and obesity-related costs. Given the uncertainties about the treatment duration and future costs, our results can be interpreted as the maximum amount that can be invested in reducing obesity and maintaining lower weight. We, furthermore, highlight that AOM and lifestyle modification treatment programs are important at all stages of life.

AS14.04

Socioeconomic and life-course risk factors for internalized weight stigma in adulthood: evidence from an English birth cohort study

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Introduction: People living with obesity are highly stigmatized, with negative obesity-related stereotypes widespread across society. Internalized weight stigma (IWS; the self-attribution of these stereotypes) is linked to negative outcomes including poor mental health and disordered eating. Previous evidence examining risk of IWS has been based on small, non-representative samples. For the first time, we describe and quantify these risk factors in a large, general population birth cohort study.
Methods: In 4,060 participants of the Avon Longitudinal Study of Parents and Children (ALSPAC), we explored differences in IWS at age 31 by sex, ethnicity, socioeconomic factors, sexual orientation, and family and wider social influences during childhood, adolescence, and young adulthood, adjusting for measured body mass index (BMI) and confounders.
Results: In adjusted models, IWS was higher for females (by 0.54 S.D., CI: -0.60, 0.49, p<0.001), sexual minorities (0.17 S.D. higher, 95%CI: 0.10, 0.25, p<0.001), and less socioeconomically advantaged individuals (e.g., 0.18 S.D. higher (CI: 0.10, 0.25, p<0.001) for participants whose mothers had educational qualifications taken at age 16, or no qualifications, compared to a university degree). The social environment in adolescence and early adulthood was important; in adjusted models, IWS was higher for people who at age 13 had felt pressure to lose weight from family (by 0.13 S.D., CI: 0.04, 0.22, p=0.005), and the media (by 0.18, CI: 0.10, 0.25, p<0.001). IWS at age 31 was higher for people who had experienced bullying in childhood, adolescence, or adulthood, but associations were strongest for more recent bullying (in adjusted models, 0.26 SD, CI:0.18, 0.34, p<0.001 for bullying at age 23).
Conclusion: IWS in young adulthood differs substantially according to demographic factors. Risk is elevated for females, sexual minorities, and socioeconomically disadvantaged young adults, and this higher risk is not explained by differences in BMI. Pressure to lose weight from family and the media in adolescence may have long-lasting effects on internalized weight stigma. The findings of this study underscore the importance of IWS, with implications for policymakers, healthcare and wider society, given the increased focus and pressure relating to obesity and weight management, rising body dissatisfaction and disordered eating behaviour, and experiences of weight stigma and discrimination.

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AS14.05

The impact of overweight and obesity on absenteeism from work across 26 European countries: an analysis of EHIS 3 microdata

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Introduction: Understanding how economic costs and labour market outcomes are associated with living with overweight or obesity is important in light of the growing prevalence of obesity in Europe. Most studies on the subject refer to national survey data that cannot be compared directly between countries. The third wave of the European Health Interview Survey (EHIS 3) makes it possible to assess the impact of body mass index (BMI) on labor market outcomes across European countries with recent data. In this study, we estimate the impact of overweight (BMI ≥25 to <30) and obesity (class I: BMI ≥30 to <35, class II: BMI ≥35 to <40, class III: BMI ≥40) compared to BMI ≥18.5 to <25 on being absent from work and the number of days of absence due to health issues.
Methods: The EHIS 3 dataset comprises representative, standardised cross-sectional individual survey data for 29 European countries mainly from the year 2019. BMI is calculated from self-reported weight and height queried directly in the questionnaire. The main outcome of interest is represented by the item that asks whether one had been absent from work in the past 12 months due to health issues and, if yes, the number of days. We conducted survey-weighted generalised linear models to estimate the differences in the probability of being absent for people living with overweight or obesity (PwO). The estimated effect size was adjusted by age, sex, education, country, and economic sector of employment. An interaction term of BMI and country was included to estimate differences between countries. Further, subgroup analyses for individuals who reported being absent from work due to health issues were conducted.
Results: 129,386 weighted observations representing a population of about 155 million people with employment across 26 European countries were included in the main analysis and 41,469 weighted observations representing about 55 million people were included in the subgroup analysis. The probability for being absent from work is significantly increased for PwO compared to people with BMI ≥18.5 to <25 with an odds ratio(OR) for overweight of 1.17 (95%CI: 1.04, 1.32), for obesity I of 1.35 (95%CI: 1.13, 1.61), for obesity II of 1.66 (95%CI: 1.19, 2.30) and for obesity III of 2.85 (95%CI: 1.59, 5.11). Considering the impact on being absent from work more than 7 days in the subgroup that reported being absent, estimated OR are 1.22 (95%CI: 1.03, 1.33) for overweight, 1.31 (95%CI: 1.02, 1.67) for obesity I, 1.87 (95%CI: 1.22, 2.85) for obesity II and 4.05 (95%CI: 1.89, 8.70) for obesity III compared to BMI ≥18.5 to <25. Effect sizes differ between countries in both analyses but are not always statistically significant.
Conclusion: Results show that PwO have higher probability of being absent from work due to health issues and that it is more likely that the number of days absent is higher compared to people reporting BMI ≥18.5 to <25across all European countries. Overall, overweight and obesity have a significant impact in the working population and thus on productivity losses and increased economic burden.

AS14.06

Inequalities in healthcare costs according to comorbid obesity related complications in people living with obesity; a UK real world retrospective study

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Introduction: Living with obesity is associated with the development of a range of obesity-related complications (ORCs) which pose health and economic burdens for individuals and healthcare systems. We aimed to quantify inequalities in healthcare resource utilisation (HCRU) cost gap between the most and least affluent quintiles of people living with obesity and a range of ORCs.
Methods: This was a retrospective, open cohort study using Discover, a real-world database of linked primary and secondary electronic health records covering 2.5 million people residing in North-West London. The study cohort consisted of individuals aged ≥ 18 years living with obesity (BMI ≥ 30 kg/m^2). A normal BMI (BMI 18-24.9 kg/m^2) comparison group was also identified. The population was stratified into quintiles of deprivation according to the Index of Multiple Deprivation (IMD) which is the official measure of deprivation in England. The study period was 1 Jan 2016 – 31 Dec 2019 and individuals were grouped into non-mutually exclusive ORC prevalence groups covering 27 ORCs and ORC multimorbidity. Primary care costs were derived from the Personal Social Services Research Unit (2020), and secondary care costs from the Secondary Uses Service. Prescription drug costs were calculated using UK net ingredient

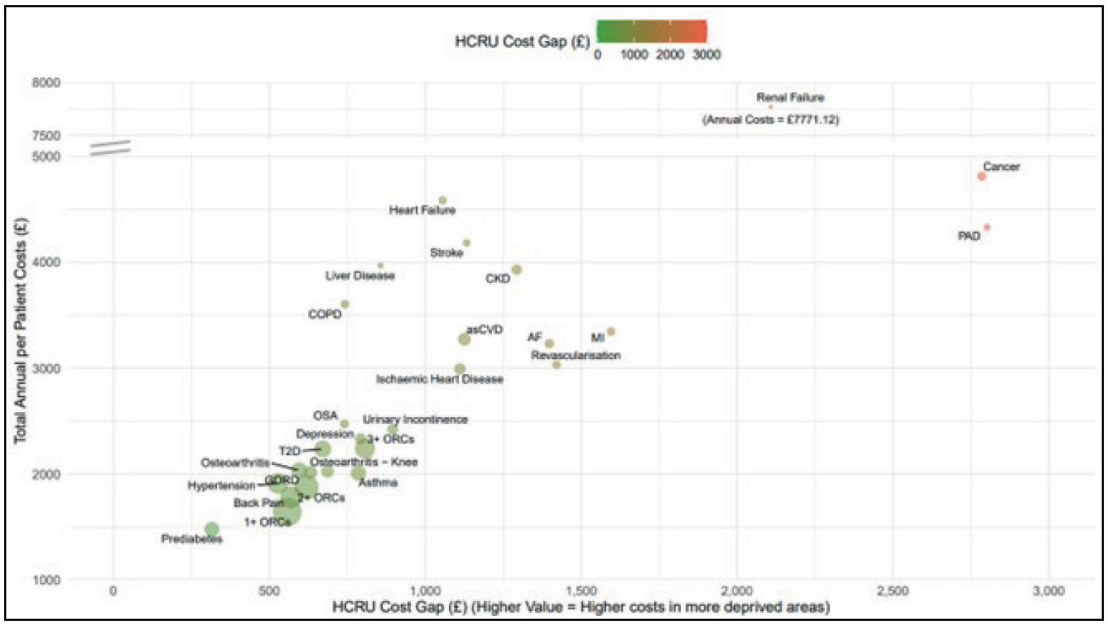


Fig. 1. HCRU cost gap by IMD in the obesity population for each comorbidity.

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Tab. 1. Baseline characteristics by BMI group.

Baseline characteristic		Healthy BMI	Obesity	Obesity BMI classes		
				Obesity I	Obesity II	Obesity III
Number of patients	Count, N	512,984	362,023	253,974	70,644	37,405
BMI	Mean (SD)	22.4 (1.8)	34.3 (5.0)	31.9 (1.4)	37.0 (1.4)	45.7 (6.4)
	Median (IQR)	22.6 (2.9)	32.7 (4.8)	31.6 (2.2)	36.8 (2.3)	43.5 (6.0)
Sex	Female, N (%)	273,729 (53.4)	203,273 (56.1)	134,409 (52.9)	43,845 (62.1)	25,019 (66.9)
	Male, N (%)	239,255 (46.6)	158,750 (43.9)	119,565 (47.1)	26,799 (37.9)	12,386 (33.1)
Age	Mean (SD)	37.9 (16.2)	43.5 (15.0)	44.7 (15.0)	41.6 (14.4)	39.3 (14.3)
	Median (IQR)	33.0 (23.0)	43.0 (22.0)	44.0 (22.0)	41.0 (21.0)	38.0 (21.0)
Ethnicity	Asian, N (%)	131,165 (25.6)	97,679 (27.0)	73,780 (29.1)	16,856 (23.9)	7,043 (18.8)
	Black, N (%)	33,207(6.5)	46,399 (12.8)	30,521 (12.0)	10,152 (14.4)	5,726 (15.3)
	Mixed, N (%)	15,279 (3.0)	11,638 (3.2)	7,827 (3.1)	2,371 (3.4)	1,440.0 (3.8)
	White, N (%)	281,082 (54.8)	174,821 (48.3)	119,265 (47.0)	35,332 (50.0)	20,224 (54.1)
	Other, N (%)	52,251 (10.2)	31,486 (8.7)	22,581 (8.9)	5,933 (8.4)	2,972 (7.9)
IMD	Q1, N (%)	74,352 (14.5)	64,866 (17.9)	43,843 (17.3)	13,541 (19.2)	7,482 (20.0)
	Q2, N (%)	165,038 (32.2)	124,348 (34.3)	86,415 (34.0)	24,644 (34.9)	13,289 (35.5)
	Q3, N (%)	143,470 (28.0)	97,001 (26.8)	69,000 (27.2)	18,456 (26.1)	9,545 (25.5)
	Q4, N (%)	89,615 (17.5)	51,218 (14.1)	36,836 (14.5)	9,494 (13.4)	4,888 (13.1)
	Q5, N (%)	40,509 (7.9)	24,590 (6.8)	17,880 (7.0)	4,509 (6.4)	2,201 (5.9)

BMI, body mass index; IQR, interquartile range; N, number; SD, standard deviation.

costs. HCRU cost gaps were estimated by calculating the difference in age-standardised HCRU per person per year cost of individual ORCs between IMD quintile 1 (most deprived) and 5 (most affluent). All outcomes were age-standardised to the European Standard Population.

Results: There were 362,023 individuals with obesity included in the population, with 64,866 in IMD quintile 1 and 24,590 in quintile 5. Demographic characteristics are outlined in Table 1. HCRU costs in the obesity population were greater in the most deprived quintile compared to the most affluent quintile for every ORC population. The largest HCRU cost gaps were seen in peripheral arterial disease (PAD) (£2,801 per person per year cost gap), cancer (£2,785), renal failure (£2,108), myocardial infarction (MI) (£1,595) and revascularisation (£1,421). The cost gaps were smallest in prediabetes (£316), hypertension (£528), back pain (£569) and osteoarthritis (£596) (Figure 1). Cost gaps increased with obesity class across several ORC groupings. This included back pain, chronic kidney disease (CKD), Gastro-oesophageal reflux disease (GORD), hypertension, osteoarthritis of the knee, coronary or arterial revascularisation and urinary incontinence. The cost gap was greatest in the obesity population compared to the normal BMI population for heart failure (£2,742 higher in the obesity population), PAD (£1,613), atrial fibrillation (AF) (£1,565), chronic obstructive pulmonary disease (COPD) (£1,564) and osteoarthritis (£1,215).

Conclusions: Substantial inequalities in HCRU costs exist between the most and least deprived quintiles of people living with obesity and comorbid ORCs. The largest cost gaps exist in cardiovascular conditions and cancers. Interventions targeted proportionate according to the variation in unmet need could achieve the dual aim of reducing healthcare costs and improve health equity.

AS15 – Trends in Obesity in Childhood

AS15.01

Trends in overweight and obesity in Portuguese primary school children: a one and half decade of the COSI/WHO Europe study (2008-2022)

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Introduction: In the WHO European Region, obesity poses an important Public Health challenge, with 1/3 of school-aged children living with this disease. The Childhood Obesity Surveillance Initiative (COSI) is a WHO European system that aims to measure trends in overweight and obesity in primary school aged children, every three years. Among 45 participating COSI countries, Portugal has been collecting data since 2008 (1st round). Here we present the trends on the prevalence of overweight and obesity among school-aged children (6 to 8 years old) from 2008 to 2022 (6th round), based on data from COSI Portugal.

Methods: COSI Portugal is based on descriptive epidemiology model and follows a two-stage cluster sampling design, where primary schools are the first unit of sampling. Based on the WHO COSI data collection procedures protocol, after parent's consent, COSI trained examiners collected anthropometric data and calculated the BMI-for-age Z-scores following WHO reference growth charts (5-19 years old). Children´s nutritional status was evaluated for 3765 children (first round), 4064 children (second round), 5935 children (third round), 6745 children (fourth round), 7096 children (fifth round), and 6205 children (sixth round).

Results: From 2008, Portugal showed a downward trend in the prevalence of overweight (including obesity) until 2019, which reversed in 2022. In the first COSI round, 37.9% of Portuguese children had overweight and 15.3% had obesity. This prevalence of overweight (and obesity) decreased on the upcoming years: 35.7% (14.7% of obesity) in 2010, 31.6% (13.9% of obesity) in 2013, 30.7% (11.7% of obesity) in 2016, and 29.7% (11.9% of

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obesity) in 2019. However, in the last COSI round an inverted trend from 2019 to 2022 was found, with a slight increase in the prevalence of childhood overweight (29.7% to 31.9%) and obesity (11.9% to 13.5%).
Conclusion: Following the goals of WHO, for the European Region, over the last decades, childhood obesity has remained a top priority at the public health arena. Along with the implementation of this robust Monitoring Initiative (COSI), Portugal implemented a comprehensive and multidisciplinary set of initiatives, such as the creation of the National Platform against obesity, the National Programmes for the promotion of physical activity and healthy eating, the development of media campaigns, the implementation of sugar sweetened beverages tax, the introduction of restrictions on food advertising aimed at children, the industry agreement to reformulate the sugar, salt and trans fatty acid levels in food products, the definition of food standards and community interventions in schools as well as the implementation of the nutritional risk assessment in hospitals and an integrated care model for the prevention and treatment of obesity in primary care. One might suggest that the successful trend seen until 2019, was interrupted partially due to COVID-19 pandemic, which might have put childhood obesity on the rise again. Therefore, this continuous monitoring system is crucial to inform policy and to better respond to this epidemic.

AS15.02

Impact of the COVID-19 pandemic on trends of incidence of overweight and obesity in children and adolescents in Catalonia, Spain

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Introduction: The COVID-19 lockdowns have affected overweight and obesity levels worldwide, however less is known on how it affected excess weight incidence trends by sociodemographic characteristics, especially in Spain that suffered an extreme strict-lockdown. This study aimed to examine the impact of the COVID-19 lockdown on the incidence of overweight and obesity in children and adolescents in Spain, stratified by sociodemographic characteristics.
Methods: This population-based study included 2-17-year-olds, registered in the primary health care system in Catalonia, Spain, between January 2018 until June 2023. Routinely measured weight and height were used to calculate age- and sex-specific body mass index z-scores, and overweight and obesity were defined. Monthly incidence rates (IR) were estimated for participants who had at least two zBMI measurements and had not overweight/obesity at baseline. Pre-lockdown (Jan 2018-Feb 2020), lockdown (Mar 2020-Jun 2020) and post-lockdown (Jul 2020-June 2023) IR were calculated by dividing the number of new overweight/obesity cases by the population at risk per 1,000 person-month of follow-up, stratified by child sex, age-group, SES and nationality.
Results: This study included 733,833 children and adolescents, mainly of Spanish nationality (87.4%) and 29.3% were of the most deprived SES at baseline (quintiles 4/5 of SES). The IR per 1,000 persons-month of overweight and obesity went from 3.7(95%CI 3.5; 3.8) and 2.2(2.1; 2.4), respectively, in the pre-lockdown period (Jan 2018), to 0.1(0;0.1), 0(0;0.1) in the lockdown period (April 2020) and to 4.2(4.0;4.4) and 3.2(3.0; 3.4) in the post-lockdown period (June 2021). No significant differences were seen between sexes in overweight + obesity IR, however for obesity (only), boys showed overall higher IR through the study period compared to girls (e.g., in the post-lockdown period (Nov 2020), obesity IR for boys was 3.4(3.2;3.7) vs. girls 2.4(2.2;2.6)). Children aged 6-9 years showed greater IR per 1,000 persons-month for both overweight + obesity and obesity (only) throughout the study period, followed by 10–13-year-olds (e.g., in the post-lockdown period (Nov 2020), overweight + obesity IR for 6-9-year-olds was 6.5(6.1 - 6.9) and 3.4(3.1 - 3.7) for 2-5-year-olds). Americans showed higher IR for overweight + obesity throughout the whole study period, compared to other nationalities. Lastly, trends of overweight + obesity IR in the different SES showed similar trends, with a slightly higher IR for the more deprived groups (quintiles 4 and 5), compared to the less deprived.
Conclusions: In this study, the overall IR of childhood overweight and obesity decreased during the lockdown period of COVID-19 pandemic, due to the substantial reduction of patients' monitoring in primary healthcare, increased in the first post-lockdown period and decreased again in the most recent period. Differences according to child sex, age-group and nationality were present.

AS15.03

The Impact of COVID19 Pandemic in the Obesity in Children and Adolescents: A Cross-Sectional Study

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Background: To determine the effect of COVID19 pandemic in the prevalence of central obesity in preschooler and school age of child, adolescent.
Methods: This population-based cross-sectional study comprised 11,726 participants (below aged 19 years) in the Korea National Health and Nutrition Examination Survey from 2010 to 2021. Central obesity is defined as a waist circumference percentile ≥90th. We divided the participants by age to preschooler (<9 years old) and school age of child (9-13 years old), adolescent (13-18 years old). Regression analysis is used to estimate the trend for the prevalence of central obesity in preschooler and school age of child, adolescent.
Results: The prevalence of central obesity in preschooler and school age of child, adolescent was increased annually 0.58% from 11.1% (2011) to 17.0% (2019, p=0.027). And during COVID19 pandemic (2020- 2021), the prevalence of central obesity in preschooler and school age of child, adolescent was not significantly increased annually 2.37% (p=0.117). The prevalence of central obesity in preschooler was not changed from 16.1% (2011) to 15.8% (2019, p=0.497). And during COVID19 pandemic (2020-2021), the prevalence of central obesity in preschooler and school age of child, adolescent was increased annually 4.36% (p=0.083). The prevalence of central obesity in school age of child was increased annually 0.66% from 8.5% (2011) to 16.2% (2019, p=0.035). And during COVID19 pandemic (2020-2021), the prevalence of central obesity in school age of child was not significantly increased annually 4.03% (p=0.435). The prevalence of central obesity in adolescent was increased annually 0.78% from 8.5% (2011) to 16.2% (2019, p=0.005). And during COVID19 pandemic (2020-2021), the prevalence of central obesity in adolescent was not significantly increased annually 0.09% (p=0.945).
Conclusions: Last 10 years the prevalence of central obesity was increased in preschooler and school age of child, adolescent. And during COVID19 pandemic (2020-2021), the prevalence of central obesity was rapidly increase especially in preschooler.

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AS15.04

The effectiveness of a national three-level model of obesity treatment in the paediatric population

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Introduction: The percentage of school children in Slovenia with obesity (4.2%) or being overweight (bOW) (15.0%) first peaked in 2010. There was a decreasing trend but another increase in 2020 and 2021 in both obesity (5.9%, 5.4%) and bOW (15.0%, 15.5%). This presentation aims to assess the effectiveness of a national three-level model of obesity treatment in children.
Methods: The national SLOfit surveillance system assessed body mass index and physical fitness. The physical fitness tests were carried out in schools every April. Eight fitness tests' age- and sex-specific mean percentile values were used to calculate a Physical Fitness Index (PFI). This provides the percentile position of PFI in the country for each child of a certain age and sex.
Results: A family healthy lifestyle intervention was developed to integrate the prevention and treatment of overweight and obesity at the primary health care level. It addressed the most important lifestyle factors: nutrition, physical activity, mental health, motivation for change, the use of electronic media, and sleep. We invited children and adolescents with obesity or bOW to undergo regular preventive health checks. As a part of the intervention, the team collaborated with schools and local communities to create an environment that supported a lifestyle change.
A multidisciplinary in-hospital introduction to a healthy lifestyle was provided for children whose primary level intervention failed (190 to 230 per year in two centers). This consisted of 2 hospitalizations (10 days, followed by 5 days 6 to 8 weeks later), with 7 check-ups over 24 months. The average index of obesity of enrolled children and adolescents (BMI/BMI 98th percentile) dropped significantly over one year of follow-up (1.23 on admission, 1.10 at 6 months,1.09 at 12 months; $p<0.0001$).
Children and adolescents with severe forms of obesity and complications were referred to the Department of Endocrinology, Diabetes and Metabolism, University Children's Hospital, Ljubljana. Efforts were focused on nonsurgical bariatric procedures and, recently, on treating children with GLP-1 analogs. We also focused on identifying the genetic background of b, especially concerning the genes of the leptin-melanocortin pathway. Recently, we performed next-generation sequencing in 1508 children and detected variants in the leptin-melanocortin pathway that influenced their weight in 6% of the population. In addition, all children with other monogenic obesity disorders, syndromic obesity such as Prader-Willi syndrome, and hypothalamic obesity were managed and followed up regularly. In 2023, this three-level management protocol decreased the percentage of children with obesity and bOW in Slovenia to 12.7% and 4.1%, respectively. However, the PFI was still below the pre-pandemic levels (2019/2020/2021/2022/2023 PFI for children bOW 30.3/24.2/24.9/25.9/26.5 and 15.3/11.3/11.1/11.8/12.1 for children with obesity).
Conclusion: The three-level management successfully reduced the percentage of children with obesity in childhood to pre-pandemic levels. However, additional interventions to improve physical fitness will be needed in the future.

AS15.05

Post COVID-19 Prevalence of Overweight and Obesity among 7-year-old Schoolchildren in Bulgaria, 2023

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Introduction: The childhood obesity epidemic has been additionally aggravated by the COVID-19 pandemic. There are many reports for increased levels of overweight and obesity in many countries. The present study aims to assess the post COVID-19 pandemic prevalence of overweight and obesity among Bulgarian 7-year-old schoolchildren.
Methods: Cross-sectional survey on nationally representative effective sample of 3101 first graders (7-year-old) was conducted in 2023. The research was carried out in strict compliance with the protocol developed by the WHO (World Health Organization) as part of the WHO European Childhood Obesity Surveillance Initiative (COSI). Weight and height were measured by trained examiners with uniform equipmeant. Overweight and obesity were assessed with the indicator BMI-for-age using the WHO Reference, 2007.
Results: In 2023 the prevalence of overweight (including obesity) was 32%, 95%CI:30.3-33.6 (32.4% among boys, 95%CI:30.1-34.8 and 31.5% among girls, 95%CI:29.2-33.8).15.2% of the children were with obesity 95%CI:14.0-16.5 (16.9% for boys, 95%CI:15.1-18.8 and 13.5% for girls, 95%CI:11.9-15.3). Extreme obesity is emerging as a new public health problem, especially for the boys in Bulgaria with total prevalence of 4.9%, 95%CI:4.2-5.8 (6.6 % among boys, 95%CI:5.5-8.0 and 3.2% among girls, 95%CI:2.5-4.2). Although there is no statistically significant increase in the prevalence of overweight and obesity compared to the previous round of data collection in 2019 (pre COVID-19 pandemic), the number of affected children is alarmingly high.
Conclusion: There is no statistically significant increase in the prevalence of overweight and obesity after the COVID-19 pandemic among the 7-year-old Bulgarian first graders compared to the levels in 2019. Nevertheless, the prevalence of overweight, obesity and extreme obesity among boys is alarmingly high.

AS16 – Metabolic/Bariatric Surgery

AS16.01

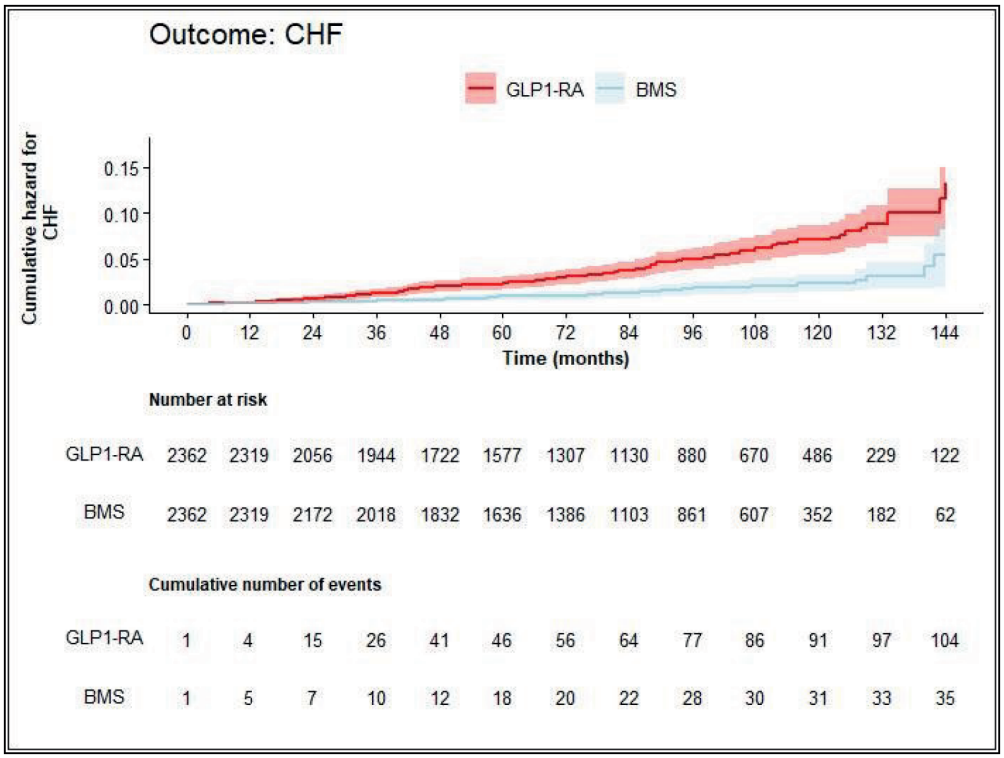
The effectiveness of bariatric metabolic surgery versus glucagon-like peptide-1 receptor agonists for the prevention of congestive heart failure

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Background: Evidence compering the relative effectiveness of bariatric metabolic surgery (BMS) and glucagon-like peptide-1 receptor agonists (GLP1-RA) in reducing the incidence of Congestive Heart Failure (CHF) is limited. Therefore, our objective was to compare the primary incidence of CHF in adults living with obesity and diabetes who were treated with BMS versus GLP-1RA.
Methods: This observational, retrospective cohort study included members of Clalit Health Services in Israel, aged ≥24 years, living with diabetes and obesity and with no prior history of ischemic heart disease, ischemic stroke, or congestive heart failure. Patients who underwent BMS during the years 2008 through 2021 were matched 1:1 to patients who initiated

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Cumulative Hazards (95% CIs) for CHF incidence. In patients with diabetes and obesity who underwent bariatric metabolic surgery (BMS) versus patients treated with Glucagon-Like Peptide-1 Receptor Agonists (GLP1-RA).

Fig. 1. Cumulative Hazards (95% CIs) for CHF incidence.

treatment with GLP-1RA at the same period of time. Matching was conducted by age, sex, BMI, duration of diabetes, year of treatment initiation, and prior treatment with CHF Indicated Medications, CIM (beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, sodium-glucose co-transporter-2 (SGLT2) inhibitors, furosemide, angiotensin receptor blockers (ARBs), and spironolacone or aldactone.

Exposure was either BMS or the initiation of GLP-1RA. Diagnoses of CHF were extracted from both inpatient and outpatient medical records. The incidence of CHF in each group was compared using multivariate Cox proportional hazards models, and further adjusted for additional sociodemographic and clinical characteristics, including maximal weight change during follow-up, hypertension, hyperlipidemia, and initial levels of hemoglobin-A1c, and triglycerides.

Results: The study included 2,362 matched pairs of patients, with a median age of 51 years, 65% female. Participants were followed for a median of 7.3 years and up to 12 years. The incidence of CHF occurred in 35 (1.5%) BMS patients and in 104 GLP1-RA patients (4.4%), HR: 0.35, 95% CI: 0.24-0.51 (figure 1).

Lower risk for CHF after BMS compared to treatment with GLP1-RA persisted after further adjustment for sociodemographic and clinical characteristics, adjusted HR: 0.46, 95% CI: 0.28-0.77.

Discussion: In this first in the literature study, BMS was associated with a stronger reduction in the incidence of CHF compared to treatment with GLP1-RA in patients living with obesity and diabetes, regardless of weight reduction and background CIM treatment.

AS16.02

Long-term weight regain after gastric bypass is associated with higher post-prandial GIP levels

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Background: Following bariatric and metabolic surgery (BMS), some patients can present primary failure by not reaching a significant weight loss or secondary failure with a mid- or long- term weight regain (WR). Changes in the secretion of enteropancreatic hormones are important for weight loss induced by BMS, but their relationship with WR is still poorly explored. Therefore, the aim of this study was to compare the enteropancreatic hormonal profile in patients with and without WR after gastric bypass.

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Methods: We included 23 patients that underwent gastric bypass surgery, with a follow-up time of at least 10 years, divided into 2 groups: WR<20% (n=11) and WR>20% (n=12). Patients from both experimental groups were paired by pre-op age and BMI, and follow-up time after surgery. Patients underwent a mixed-meal tolerance test for evaluation of fasting and postprandial glucose and enteropancreatic hormones levels.
Results: Patients with a WR>20% presented significantly higher post-prandial glucose (iAUC 242.2±20.2 vs 158.7±11.3, p=0,0021) and GIP (5925±511 vs 3984±369, p=0.0064) excursions when compared with the WR<20% group. There were no significant changes in the secretion profiles of insulin, C-peptide and GLP-1.
Conclusion: Patients with secondary failure following gastric bypass presented a higher post-prandial secretion of GIP concomitant with a higher glycemic excursion. Although the role of GIP in promoting obesity has been previously suggested, the role of GIP in WR following BMS needs to be further explored.

AS16.03

High gain of meal-induced PYY secretion after sleeve gastrectomy can predict better long-term course of weight

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Satiety Gut hormones such as GLP-1 and PYY increase, while orexigenic hormone ghrelin decrease. after vertical sleeve gastrectomy (VSG), which is the main bariatric surgery procedure in France. Analogues of GLP-1 are now used in pharmacological doses to induce weight loss in patients with obesity. However, implication of endogenous gut hormones in weight loss after surgery remains unclear. Our study aimed at objectifying the role of several gut hormones in post-operative weight loss in 32 women living with obesity who underwent VSG.
Body weight loss (%WL) and caloric intake decrease (%CID) were evaluated at 6, 12, 36 months after surgery. Pre- and post-operative (6 months) 90 min postprandial tests were realized to measure plasma gut hormones (GLP-1, PYY and ghrelin) and insulin. Area under the curve and peak/basis (T30/T0) before vs after VSG (post/pre) ratio were analyzed for each hormone in relation to %WL and % CID.
As expected, fasting GLP-1 and PYY secretions were not altered by surgery but their postprandial peaks were significantly elevated. Post-operative peaks of insulin and GLP-1 were also highly correlated. Fasting and postprandial ghrelin secretions were drastically reduced. Interestingly pre-operative ghrelin was negatively correlated with 6 months %CID. Pre-operative peak/basis ratio of PYY and GLP-1 were both negatively correlated with post-operative %WL at 3 years (P<0,01 and P<0,05). Furthermore, post/pre-operative ratios of postprandial PYY secretion were correlated to %WL from 6 months to 3 years after VSG (P<0,05). Finally ROC curve analyses show that pre-operative peak/basis PYY or GLP-1 were able to predict success of VSG defined as %WL >30% at 3 year (respectively with 70% or 83,3% specificity and 81,8% or 63,6% sensibility). In conclusion, preoperative postprandial PYY is predictive of long-term weight loss after VSG. Furthermore, the gain of meal-induced PYY early after surgery reinforces the prediction of the success of VSG. This study emphasizes the importance of postprandial gut hormone assessment before and/or early after surgery to improve the operated patient's personalized care.

AS16.04

The potential involvement of the orexigenic hormone insulin-like peptide 5 in human obesity and the modulatory effect of metabolic surgery: a novel journey in obesity physiopathology

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Introduction: insulin-like peptide 5 (INSL5) is a hormone that is secreted by the enteroendocrine cells of the distal colon. It has been found to regulate appetite and body weight in animals due to its orexigenic properties [1]. Although there is no concrete evidence, some studies suggest that it may also play a role in human obesity.
Methods: we investigated basal INSL5 plasma levels in a group of patients withsevere obesity (BMI >40 kg/m^2) referring to our Center for the Study and the Integrated treatment of obesity at baseline, after an oral glucose tolerance test (OGTT) and after laparoscopic sleeve gastrectomy (LSG). Furthermore, we analyzed the expressionof INSL5 in samples of human adipose tissue obtained from subcutaneous adipose tissue to identify a possible local hormonal production.
Results: at baseline, patients with obesity showed basal INSL5 plasma levels higher than lean subjects, with a positive correlation with adiposity markers such as BMI (p<0.01), fat mass (p<0.001), and leptin (p<0.001) plasma levels. During a OGTT in patients with obesity but without type 2 diabetes a rapid decrease of INSL5 concentration was observed after glucose ingestion, as for a non-colonic-dependent mechanism of regulation for its secretion. After weight loss by laparoscopic sleeve gastrectomy, a reduction in circulating INSL5 plasma levels was reported. Finally, we did not detect any expression of the INSL5 in human adipose tissue, both at the mRNA and protein level.
Conclusions: this study shows that subjects with obesity have increased INSL5 plasma levels positively correlating with adiposity markers, and that metabolic/bariatric surgery significantly reduced hormone concentration probably due to gastrointestinal effects more than adipose tissue reduction since this tissue does not express INSL5. Considering the orexigenic properties of INSL5, the reduction of its plasma levels promoted by metabolic/bariatric surgery may be involved in the mechanisms promoting the surgical-induced weight reduction.

Reference

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AS16.05

Evaluation of bone changes after different bariatric surgery techniques using 3D-DXA

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Introduction: 3D-DXA technology transforms the 2D-DXA image into 3D using a model similar to quantitative computed tomography and allows the evaluation of bone microarchitecture without adding more radiation. There are no published data on the usefulness of 3D-DXA after bariatric surgery (BS).

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Objective: To evaluate the changes in bone mineral density (BMD) in patients with severe obesity at 12 months after sleeve gastrectomy (SG), gastric bypass (GBP) or hypoabsorptive techniques: duodenal switch/single anastomosis duodenal switch (HT), by analysis with a 3D-DXA software of the proximal femur.
Methods: Prospective, single center and non-blinded study in patients with obesity undergoing BS from February 2019 to January 2020. All patients underwent one densitometry prior and 12 months after surgery. Areal (a) BMD was measured at lumbar spine (LS, L1-L4), femoral neck (FN) and total hip (TH) by DXA (Horizon Wi; Hologic Inc., Waltham, MA, USA). Proximal femur 3D-DXA parameters including cortical and trabecular volumetric(v)BMD, cortical thickness (CTh) and cortical surface(s)BMD at TH, FN, trochanter and shaft were analyzed using 3D-Shaper-Research software v.2.12.1(3D-Shaper Medical, Barcelona,Spain).
Results: 153 patients (81% women) aged 50±9 years, BMI 38±9 kg/m^2, undergoing SG (54.3%), HT (29.4%) and GBP (16.3%) were analyzed. After surgery, the overall weight loss was 29±11%, greater after HT (p=0.021). BMD decreased in the FN (-5.2±5.9%) and in the TH (-8.1±5.1%), with greater loss after HT/GBP compared to SG (p<0.001). On TH, cortical surface area (-4.4±4.8%), cortical volume (-1.4±2.8%), CTh (-3.1±3.9%) and trabecular volume (-8.0±6.6) decreased compared to baseline values (p<0.05). The loss of cortical and trabecular BMD was greater after HT and GBP compared to SG (p<0.01). In other regions of the femur (FN, trochanter, shaft) a similar bone loss occurred in all techniques, except for the CTh that increased in the FN after SG (2.1±7.3%) compared to baseline values (p <0.05). The final Z-score of cortical surface and trabecular volume on TH were 0.96 (95% CI: 0.73 to 1.19) and -0.17 (95% CI: -0.32 to -0.02) respectively.
Conclusions: Patients undergoing BS suffer a decrease in BMD evaluated by DXA that is confirmed when exploring bone microarchitecture using 3D-DXA (trabecular volume and cortical surface) one year after the intervention and is greater after HT. However, BMD remains within or above mean reference values from the general population at one year.

AS16.06

Association of Metformin continuation after bariatric surgery with relapse of Diabetes

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Background: Metabolic Bariatric Surgery (MBS) among patients with type 2 diabetes mellitus (T2DM) has been shown to be effective in lowering blood glucose level, and maintaining glycemic control to the point where the diabetes is in remission. Post MBS remission is defined as Glycated hemoglobin (HbA1c) ≤6.5% without taking glucose lowering medications. In many cases, patients with T2DM who were treated with Metformin prior to surgery and achieved HbA1c level of 5.7%-6.5% post-surgery (considered Pre-Diabetes range), receive a recommendation to stop taking the medication. Nevertheless, it is unclear whether continuation of Metformin among patients who achieved the Pre-Diabetes range post MBS, contributes to preventing relapse of diabetes compared to tthe same population who stopped taking Metformin.
Methods: A retrospective cohort observational study, in Clalit's patients living with obesity and diabetes who were treated with Metformin and underwent MBS between January 2005 and December 2020. Patients who underwent MBS, achieved HbA1c ≤6.5% during the 3-6 months post-surgery, and continued Metformin were compared with patients who underwent MBS who stopped Metformin after achieving the Pre-Diabetes range. Individuals age≥24 years with BMI≥30kg/m^2 and diabetes who were treated only with Metformin pre-MBS and achieved HbA1c level ≤6.5% 3-6 months post bariatric surgery were included in the analysis. Patients with history of cancer, end-stage renal disease or who had a pregnancy in the year before surgery were excluded from the study. Relapse of diabetes was defined based on HbA1c level achieved 6-12 months after surgery. Patients without a HbA1c test in this period were

Tab. 1. Continuation versus discontinuation of Metformin treatment following Metabolic bariatric surgery.

	Stopped Metformin	Continued Metformin
N	387	144
Age (years)	50.6 (9.5)	53.9 (9.5)**
Females (%)	226 (58.4%)	85 (59.0%)
Socio economic status, n (%)		
Low	79 (20.4%)	35 (24.3)
Medium	123 (59.9%)	80 (55.6%)
High	48 (12.4%)	21 (14.6%)
BMI		
Before MBS	42.8 (6.2)	42.0 (6.0)
6-12m after MBS	31.3 (5.4)	32.8 (5.3)*
Change %	-27%	-23%**
Diabetes Duration	3.9 (4.0)	5.3 (3.7)**
HbA1c level		
3-6m after MBS		
Level (mean, SD)	5.73 (0.43)	5.91 (0.43)**
6-12 months after MBS		
Level (mean, SD)	5.59 (0.45)	5.87 (0.60)**
≤6.5, n (%)	379 (97.9%)	127 (88.2%)**
*p<0.05; **p<0.01		

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also excluded from the analysis. Logistic model was used to assess the association between Metformin continuation (y/n) and relapse of diabetes (y/n ≤6.5%) within the first year after the surgery. Model was adjusted for HbA1c at baseline (3-6 months after surgery) age, change in BMI level, and duration of diabetes.
Results: Of 805 eligible patients, 25% (203) continued Metformin and 75% (602) stopped Metformin. After excluding individuals with no HbA1c test 6-12 months post MBS, 144 participants who continued Metformin and 387 participants who stopped Metformin were included in the final analysis. Both groups achieved mean HbA1c level ≤6.5% during the first year following MBS. About 88% of those who continued Metformin and 98% of those who stopped Metformin maintained this level (p<0.01). Adjusted logistic model revealed no association of Metformin continuation after bariatric surgery with relapse of Diabetes (OR: 2.2, 95% CI: 0.75-6.58).
Conclusion: The effect of MBS on relapse of Diabetes within the first year after surgery, as measured by decrease HbA1c to the Pre-Diabetes range, was preserved among both groups. This indicates that continuation of Metformin treatment in the Pre-diabetes range post MBS does not have an additional contribution to the beneficial effect of MBS in controlling blood glucose level among patients with T2DM. Future analysis is necessary to understand the long-term effect of Metformin among patients with T2DM after MBS.

GREEN COMMUNICATION

GC1 – Basic Science

GC1.001

Differentially expressed plasma N-Glycoproteomics in monozygotic twin pairs discordant for BMI

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Background: N-glycosylation of proteins is a post-translational modification sensitive to changes in physiology. Altered glycosylation has been shown to change the protein's conformation, activity, and function in cells. Unsurprisingly, aberrant plasma protein glycosylation is associated with numerous diseases, including cardiometabolic disorders. Here, we used quantitative glycoproteomics to study whether N-glycosylation is altered in plasma proteins in acquired obesity.
Methods: Using plasma samples of 48 BMI-discordant monozygotic twin pairs (within-pair difference (Δ) BMI >3 kg/m^2 amounting to 17.8 kg mean Δweight) perfectly matched for genetic and shared environmental factors, we performed N-glycopeptide and protein quantitation by mass spectrometry. We used a paired analysis model to identify differentially expressed proteins and N-glycopeptides owing to differences in environmental factors between co-twins. We subsequently determined if the N-glycosylation differences correlated with expression level differences in related protein-backbone. Importantly, we also identified proteins differentially expressed although related N-glycopeptides were not different, and N-glycopeptides differentially expressed although related proteins were not different, between co-twins. Using an in-house developed method, we elucidated peptide sequence, N-glycosylation site, glycan composition and proposed glycan structures where possible.
Results: We found 51 proteins and 2025 N-glycopeptides to be significantly different between heavier and leaner co-twins (p<0.05). Haptoglobin showed significant protein upregulation (Fold Change [FC] 1.10, p<0.001) in heavier co-twins; along with seven upregulated (FC ranging between 1.05 to 1.40, p<0.001) related N-glycopeptides at the N-glycosylation site 241, indicating increased microheterogeneity and increased sialylation at site Asn241 in heavier co-twins. The complement protein C3 was significantly upregulated (FC 1.18, p<0.01) along with one upregulated related N-glycopeptide. Interestingly, many N-glycopeptides were upregulated despite insignificant differences in related protein-backbone plasma levels, highlighting that proteins found in proteomics and proteins with altered glycosylation are not necessarily the same. Additionally, we investigated the percentage of sialylated or fucosylated N-glycopeptides per protein. Heavier co-twins had, compared to leaner co-twins, a higher percentage of sialylated N-glycopeptides attached to protein ceruloplasmin (p = 0.025) and a lower percentage of sialylated N-glycopeptides attached to protein transferrin (p = 0.031). The lower percentage of sialylated transferrin N-glycopeptides associated with multiple measures of adiposity, suggesting an important role for glycan composition.
Conclusion: Differential plasma protein glycosylation may associate with the pathophysiology of acquired obesity. Specifically, differential glycosylation of plasma proteins related to iron metabolism and inflammation could be linked to acquired obesity. These distinct plasma glycoproteomics profiles in acquired obesity may provide directions for improved prevention of cardiometabolic diseases.

GC1.002

Detrimental effects of obesity on the brain: causal implication of the white adipose tissue

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Introduction: Obesity has been associated with multiple comorbidities including detrimental changes in brain structure and cognitive impairment. Dysfunction of the visceral white adipose tissue (WAT) and its subsequent inflammation have been suggested to mediate the effects of obesity on the brain, but causal evidence is still lacking. Therefore, this study investigated the role of visceral WAT in obesity-induced brain impairment through the surgical removal of epididymal WAT (eWAT) in Ldlr-/-.Leiden mice, a translational model for obesity and its comorbidities.
Methods: High-fat diet-fed Ldlr-/-.Leiden mice underwent a surgical removal of eWAT, the visceral WAT depot mostly inflamed in mice (comparable to human visceral fat depot), or a sham operation. As a lean control, a separate group of Ldlr-/-.Leiden mice was kept on a standardized chow diet. During 4 months after surgery, brain magnetic resonance imaging (MRI) was performed to assess brain volumes, cortical thicknesses, white matter integrity and cerebral blood flow (CBF). Behavioral tests were performed to determine spatial learning and memory function. To further identify potential mechanistic links, systemic vascular function (e.g. blood pressure, atherosclerosis) and plasma inflammatory markers were examined. At the end of the experiment, visceral and subcutaneous WAT depots were cultured ex vivo to assess the effect of the eWAT removal on the secretomes.
Results: eWAT removal did not affect brain structure (e.g. brain volumes, cortical thickness and white matter tracks integrity). eWAT removal did however restore CBF under vasoconstrictive stress conditions and

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improved vasoreactivity in the hippocampus. No effect of eWAT removal was observed on short-term and long-term memory but eWAT-operated mice showed similar alternative spatial navigation to chow-fed mice. Complementary histological analyses of the brains are being analysed (and will be presented) to further explain the neuropathology underlying the observed effects of eWAT removal on brain function. While plasma inflammatory profiles were similar between the eWAT-operated and sham-operated mice, eWAT removal modified the eWAT secretome and the secretomes of the other WAT depots.
Conclusion: While eWAT removal does not directly affect brain structure or cognitive function, it does improve the circulation (vasoreactivity) inside the hippocampus. The effects of eWAT removal seems to be explained by changes in the secretomes of the eWAT and other WAT depots. This study suggests that visceral WAT inflammation is, at least partly, implicated in the detrimental effects of obesity on the brain. These findings will provide supporting evidence for targeting WAT function in obesity in addition to the traditional medications or bariatric surgeries to prevent obesity-related brain impairment.

GC1.003

Relationship between expression of clock genes in liver and visceral adipose tissue and metabolic parameters in patients with severe obesity candidates for bariatric surgery

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Introduction: Many metabolic functions are dependent on the biological clock and misalignment of the sleep-wake rhythm leads to metabolic disturbances including obesity and insulin resistance. Metabolism genes are subjected to rhythmicity conditioned both by the central clock and peripheral metabolic stimuli such as meals. Among the clock genes, the period circadian protein homolog 3 gene (PER3) would be particularly involved in the maintenance of the biological clock in peripheral tissues, notably in the liver, and in perturbations induced by misalignment. Alterations of PER3 expression are associated with adiposity and type 2 diabetes. Our aim was thus to study the link between chronotype, expression of clock genes in the liver and visceral adipose tissue (VAT) and metabolic parameters in patients with severe obesity.
Methods: We conducted a preliminary study concerning the expression of clock genes in 16 patients with severe obesity (3M/13F, age 42±10 years, BMI 48±8 kg/m², within 3 T2DM on metformin alone) candidates for bariatric surgery, from a cohort of 75 patients who completed a chronotype questionnaire, and included in the COBILOM cohort (NCT03538210). The usual clinical and biological parameters, as well as the Horne and Ostberg chronotype questionnaire (higher in morning chronotype) were collected preoperatively and samples of VAT and liver were obtained by intraoperative biopsy performed in the morning (8h25 +/- 20 min) and frozen at -80°C. The expression of the different clock and metabolism genes was quantified by RT-qPCR and reported to 2 control genes (PPIA and HPRT1) and only concordant results between the 2 reporter genes were retained. Relationships between the expression of clock genes, corpulence (assessed by BMI and % fat mass in impedance), insulin resistance (assessed by the HOMA-IR index) and metabolism genes were studied in both tissues
Results: The chronotype score was inversely correlated with the HOMA index (-0.697, p = 0.002) and plasma triglycerides (R = - 0.535, p = 0.0266), but not with corpulence. We did not find any significant correlation between clock genes and body size nor between the expression of PER1, PER2, REVERBα and BMAL genes in the VAT or liver and metabolic parameters. Conversely, the expression of PER3 in both tissues was strongly correlated with the HOMA index (R = - 0.716 and -0.852, respectively, p < 0.001) and the expression of PER3 in the liver was also correlated with the expression of GLUT2 (0.779, p < 0.001), CREBP (0.861, p < 0.001), both involved in hepatic glucose metabolism, and with IFN γ (p = 0.875, r < 0.001). The expression of PER3 in VAT was also correlated with CRP (R = -0.802, p < 0.001) and triglycerides (R -0.682, p = 0.002), but no clear correlation was found with genes of metabolism expressed in this tissue.
Conclusion: These results show that a morning chronotype is associated with less insulin resistance even in severe obesity. They suggest that the expression of PER3 in VAT and liver promotes insulin sensitivity and could modulate the expression of some genes of metabolism, notably in the liver. These results deserve to be confirmed and the mechanisms must be clarified.

GC1.004

Differential effects of peroxisome proliferator-activated receptor γ activation on transcription factor EB and autophagy in hepatocytes and hepatic stellate cells

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Background: Peroxisome proliferator-activated receptor γ (PPARγ) activation suppresses HSC activation and liver fibrosis. Moreover, autophagy is implicated in hepatic lipid metabolism. Here, we determined whether PPARγ activation ameliorates HSC activation by downregulating transcription factor EB (TFEB)-mediated autophagy.
Methods-Results: Atg7 or Tfeb knockdown in human HSC line LX-2 cells downregulated the expression of fibrogenic markers including α smooth muscle actin, glial fibrillary acidic protein, and collagen type 1. Conversely, Atg7 or Tfeb overexpression upregulated fibrogenic marker expression. Rosiglitazone (RGZ)-mediated PPARγ activation and/or overexpression in LX-2 cells and primary HSCs decreased autophagy, as indicated by LC3B conversion, total and nuclear-TFEB contents, mRFP-LC3 and BODIPY 493/503 colocalization, and GFP-LC3 and LysoTracker colocalization. RGZ treatment decreased liver fat content, liver enzyme levels, and fibrogenic marker expression in high-fat high-cholesterol diet-fed mice. Electron microscopy showed that RGZ treatment restored the high-fat high-cholesterol diet-mediated lipid droplet decrease and autophagic vesicle induction in primary HSCs and liver tissues. However, TFEB overexpression in LX-2 cells offset the aforementioned effects of RGZ on autophagic flux, lipid droplets, and fibrogenic marker expression.
Conclusions: Activation of PPARγ with RGZ ameliorated liver fibrosis and downregulation of TFEB and autophagy in HSCs may be important for the antifibrotic effects of PPARγ activation.

GC1.005

Role of lncRNAs in the differentiation of human pediatric adipocytes through Wnt pathway

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Introduction: Adipogenesis is an intricated physiological process in which pre-adipocytes, under certain stimuli, differentiate into specialized adipocytes. However, in some instances, such as in the case of obesity, this process can be dysregulated and assume pathological features. We have previously identified a panel of 16 deregulated lncRNAs in a cohort of pediatric individuals with obesity of different severity1. Fifty percent

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of identified lncRNAs, were novel and the other have been previously reported as expressed in tumors.
This study aims to undertake the characterization of this repertoire of lncRNAs during adipogenesis, to assess their potential role.
Methods: Mesenchymal stem cells (MSCs) were harvested from adipose tissue of pediatric males. MSCs were supplemented for 7, 14, 21 days with a cocktail of pro-adipogenic factors, including insulin, IBMX, dexamethasone, and indomethacin to induce adipocyte differentiation. The gene expression of the panel of 16 lncRNAs previously identified was analyzed by quantitative real-time PCR. For the antisense lncRNAs, also the protein coding sense gene expression were assessed. Bioinformatic analysis predictions were performed using tools, such as Ncpath, Annolnc, lncHUB2. Nuclear/cytoplasmic extracts were evaluated to detect the localization of investigated lncRNAs.
Results: Among the 16 lncRNAs previously identified, we found a significant change in the expression of 9 of these. Specifically, FGD5-AS1, ARMC5-AS1, SNHG5, RNF216P1, and LINC00595 exhibited a particular trend: compared to the undifferentiated MSCs, after an initial increase at 7 days of differentiation induction, we found a decrease at 14 days, and increase again after 21 days, while LINC02246 and MAP3K4-AS1 show the opposite trend. Instead MRPS30 show a gradual increase linearly during the differentiation process, and TGFBR2-1 expression increased massively after 21 days. Analyzing the gene expression of the protein coding sense to the antisense lncRNA, we observed an opposite expression for both FGD5 and ARMC5 respect to their antisense lncRNAs. Evaluating the localization of these lncRNAs, we detected that FGD5-AS1 and ARMC5-AS1 were more expressed at nuclear level, while SNHG5 was localized in cytoplasm. Moreover, since bioinformatic tools predicted a possible involvement of these lncRNAs in Wnt pathway, we validated this possible correlation investigating their expression at different time points during the differentiation. The Pearson correlation revealed a positive correlation of CTNNB, ZEB-1 and ZEB-AS1, for FGD5-AS1, SNHG5, and TGFBR2-1, and negative for LINC02246 and LINC00595, especially at 21 days.
Conclusions: Our results show for the first time the implication of novel lncRNAs in adipocyte differentiation, correlating their expression with the Wnt pathway. However, further studies are needed to better clarify their molecular mechanisms.

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GC1.006

Vasorin regulates insulin signaling pathway in human adipocytes

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Introduction: The metabolic consequences of obesity in both adults and children have increased dramatically in the last decades. In children with obesity, vasorin (VASN), a transmembrane protein that inhibits angiogenesis and TGF-beta signaling, is differentially expressed in visceral adipose tissue.
Objective: To analyze VASN protein function in human adipocytes in cell proliferation and differentiation, and its effects on the insulin signaling pathway.
Methods: Human pre-adipocytes, previously subjected to VASN gene silencing by a lentivirus containing a sh-RNA (sh-VASN) were cultured and differentiated into mature adipocytes. Control pre-adipocytes previously transfected with an RNA-scrambled (sh-control) were used. Differentiation was determined by staining Oil O Red. Mature adipocytes were stimulated with insulin (100 nM) at different times (0', 5', 10').
Results: VASN knockdown significantly reduces intracellular lipid accumulation ($P<0.001$). Besides, phosphorylation levels of AKT and ERK decrease significantly in sh-VASN adipocytes compared to sh-control, under insulin stimulation both at 5 and 10 minutes.
Conclusions: These results indicate that vasorin may regulate insulin action, modulating both human adipocyte proliferation and differentiation. These preliminary data could be of great utility for the knowledge about VASN function in adipose tissue, as well as its implications in metabolic diseases and type 2 diabetes mellitus.

Conflict of Interest: None Disclosed

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GC1.007

Adipocyte glucocorticoid receptor restricts healthy adipose tissue expansion by repressing angiogenesis

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Introduction: Synthetic glucocorticoid (GC) analogues are the most widely prescribed drugs in the world because of their inflammatory and immunosuppressive properties. However, high doses of GC often lead to adverse side effects including cortico-induced diabetes and lipodystrophy. To determine the involvement of the adipocyte GC receptor (GR) in these adverse effects, our laboratory has generated an inducible mouse model of GR invalidation in the adipocyte (AdipoGR-KO), exposed to corticosterone (CORT) treatment or its vehicule (VEH). We recently reported that GR invalidation leads to massive adipose tissue (AT) expansion of the AdipoGR-KO mice under CORT treatment, which is paradoxically associated with improvement of metabolic health compared to control mice. However, whether GR may control adipose development remains unclear.
Methods: In addition to treatment with CORT or VEH, AdipoGR-KO mice and their controls are treated or not with Aflibercept (a soluble decoy receptor). Metabolic parameters are studied such as weight gain, insulin sensitivity and glucose tolerance. Then after sacrifice, the AT of the mice are analyzed by RT-qPCR, histomorphology, cytometry and the AT is visualized by transparentization and 3D-analysis imaging.
Results: In this study, we demonstrate specific induction of the hypoxia-inducible factor HIF-1α and the pro-angiogenic Vascular Endothelial Growth Factor-A (VEGF-A) expression in GR-deficient adipocytes from AdipoGR-KO mice compared to control mice, together with an increased adipose vascular network, as assessed by 3D-analysis imaging. GR activation reduced HIF-1α recruitment to the *Vegfa* promoter, resulting in down-regulation of *Hif-1α* at transcriptional and post-translational levels. Importantly, in CORT-treated AdipoGR-KO mice, VEGFA blockade by Aflibercept prevented AT expansion and healthy metabolic phenotype. Finally, in the subcutaneous AT of Cushing's patients, higher VEGFA expression was associated with a better metabolic profile (LIPOCUSH, NCT01688349).
Conclusion: Collectively, these results highlight that adipocyte GR negatively controls AT expansion and metabolic health through the downregulation of the major angiogenic effector VEGFA and inhibiting vascular network development.

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GC1.008

Rosiglitazone and its ability to enhance adipogenesis: a metabolomic and lipidomic analysis

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Introduction: Adipose tissue is able to rapidly expand in mass by both increase in size of existing adipocytes (hypertrophy) or formation of new adipocytes through differentiation of resident precursors (hyperplasia)[1]. Adipocytes store excess calories in the form of triglycerides (TG) packaged in large lipid droplets contributing to metabolic homeostasis[2]. The standard model of adipogenesis is given by 3T3-L1 murine cell line, which undergoes adipogenic differentiation after treatment with a specific adipogenic induction medium (MAD), that could be supplemented with Rosiglitazone (MIR)[3]. This is an antidiabetic drug of the thiazolidinedione class, used as insulin sensitizer in patients with obesity and type 2 diabetes[4]. It is used to induce adipogenic *in vitro* differentiation being agonist of peroxisome proliferator activated receptor γ (PPARγ), the master regulator of adipogenesis. To analyse the metabolic effects of Rosiglitazone during adipogenesis, we performed lipidomics and metabolomics analysis on 3T3-L1 adipocytes differentiated with or without Rosiglitazone.
Methods: Adipogenesis of 3T3-L1 cells (ATCC-CL173) was induced with MAD (2 μM insulin, 1 μM dexamethasone and 0.5 mM IBMX) or MIR (MAD + 10 μM Rosiglitazone), for the first 3 days of culture. Cells were then maintained in MAD for 6 additional days and washed in the basal standard medium (DMEM high glucose 10% FBS). At the end of differentiation (day 13), cell lysis was performed in cold methanol and lysates were analysed with LC/MS (Agilent 1290 II coupled to a time-of-flight mass spectrometer). Chromatographic separation for polar metabolites was done using hydrophilic interaction liquid chromatography (HILIC-Z), while reverse phase chromatography (C18) was used for lipids separation. Statistical analysis was performed by MetaboAnalyst 5.0 using heat-maps and volcano plots, pathway enrichment analysis using BioPan tool and Small Molecule Patwhay Database.
Results: Preliminary results highlight the upregulation of TG synthesis in adipocytes obtained using MIR treatment in comparison to MAD. MIR adipocytes display increased amounts of phosphatidylinositol (PI), phosphatidylserine (PS), phosphatidylcholine (PC) and TG. This could sustain the ability of MIR in inducing adipogenesis and increasing insulin-sensitivity with higher propensity than MAD. In contrast, MAD adipocytes exhibit an abundance of phosphatidylethanolamine (PE and etherPE). Moreover, there is evidence of higher amounts of acylcarnitines molecules in MIR lysates, supporting a higher mitochondrial metabolic activity in cells differentiated using Rosiglitazone.
Conclusion: Our results suggest that adipocytes obtained by different adipogenic induction media could display specific functional and metabolic activities despite similar morphological features. In particular, the short-term Rosiglitazone treatment during adipogenesis is pivotal in driving lipid droplets production, mitochondrial activity and insulin sensitivity.

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GC1.009

The adipocyte response to ionizing radiations

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Introduction: This study is based on two key clinical observations: 1. Radiotherapy (RT), as a primary treatment for various cancers, shows reduced effectiveness in patients with obesity [4–8]. 2. Precocious exposure to RT poses a risk for the onset of lipodystrophy and dysfunction in white adipose tissue (WAT). Adipocytes, actively contribute to the tumor microenvironment by potentially secreting factors that aid tumor growth. They also undergo stress and alterations, with potential long-term consequences. A notable drawback of conventional (CONV) RT is the damage it causes to healthy tissues. An innovative protocol which implies ultrafast delivery of radiation at ultra-high dose rates (UHDR), is reportedly less damaging for the healthy tissues2 and this radiobiological sparing effect is termed FLASH.
Given WAT widespread distribution in the body, understanding how RT (both CONV and UHDR) affects this organ is crucial. This understanding should consider both the unique characteristics of WAT and its interaction with tumor lesions. In the present study we used a pre-adipocytic cell line to investigate the impact of RT (both CONV and UHDR) on adipogenesis, adipocyte survival, senescence and interplay with the human melanoma cell line A375.
Methods: We utilized SGBS cells, a cell line capable of undergoing adipose conversion when exposed to a specific cocktail, alongside the human melanoma cell line A375. The cells were irradiated with varying dosages (4, 8, 16 Gy) using a prototype electron linear accelerator that can switch between conventional and UHDR modes. Cell survival was determined 72 hours post-RT by counting Hoechst-stained nuclei without signs of pyknosis. Adipocyte differentiation was assessed 10 days post-RT through ORO staining and quantitative digital PCR.
Results: Our study uncovered that A375 cells exhibit dose-dependent survival, whereas SGBS adipocytes display substantial radio resistance, which at medium doses was higher for UHDR. Notably, conditioned medium from irradiated adipocytes, regardless of dose and mode, inhibited A375 growth by over 50%.
Irradiated preadipocytes exhibited a dose-dependent impairment in adipogenesis. Notably, at medium doses (8 Gy), the impact of CONV RT was more pronounced compared to UHDR. Except for leptin which was increased, all adipocyte markers (adiponectin, PPARgamma, FABP4 among others) were significantly less abundant in adipocytes irradiated as preadipocytes.
Conclusions: In a precisely controlled electron RT setting, SGBS adipocytes, mirroring healthy tissue, demonstrate radio-resistance and release factors influencing melanoma growth. Adipogenesis is notably affected by RT, with less pronounced effects in the UHDR mode, revealing a distinct FLASH effect and suggesting a potential better preservation of WAT function.

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GC1.010

3,5-Diiodothyronine (T2) and 3,3′,5-Triiodothyronine (T3) mitigate Brown Adipose Tissue Mitochondrial Dysfunction in mice with obesity: Implications for Therapeutic Strategies in Metabolic Diseases

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Introduction: Brown Adipose Tissue (BAT) dysfunction is closely linked to obesity and metabolic diseases. Thyroid hormones (THs) and their analogues profoundly influence BAT thermogenesis. Besides their crucial role in brown adipocyte recruitment, THs also target mitochondria. Maintaining mitochondrial homeostasis involves various mechanisms, collectively referred to as mitochondrial quality control (MQC), including the unfolded protein response (UPRmt), mitochondrial fission, fusion, mitophagy, biogenesis, and DNA repair. Pathophysiological conditions like obesity induce excessive nutrient oxidation, leading to mitochondrial stress and compromising integrity and functionality. This study analyses and compares the effect of T2 and T3 administration on mitochondrial homeostasis in mice with obesity.
Methods: Obesity was induced over 15 weeks through a high-fat diet. Cytochrome C Oxidase (COX) activity was determined polarographically. The serum levels of 8-OHdG were determined by a DNA/RNA Oxidative Damage ELISA kit. BAT Mitochondrial H2O2 content was assessed by Hydrogen Peroxide Assay Kit. Key players in mitochondrial Quality Control processes were measured using RT-qPCR and western blotting.
Results: In our experimental model both T2 and T3 mitigate mitochondrial dysfunction in BAT. The two iodothyronines reduce adiposity, increase BAT mass and Specific COX activity, indicating an enhanced termogenic effect. Furthermore, T2 and T3 counteract oxidative stress at the systemic and tissue levels, activate UPRmt, enhance antioxidant machinery, and improve diet-induced alterations in all MQC processes.
Conclusion: In conclusion, these findings support the notion that T2 and T3 mitigate BAT mitochondrial dysfunctions in mice with obesity. However, it is important to emphasize that T2, at the concentrations we used, does not exhibit thyrotoxic effects. Given the ongoing obesity epidemic, identifying a potential therapeutic agent preserving BAT mitochondria functionality and adaptive thermogenesis could represent a promising strategy to counteract weight gain and metabolic diseases.

GC1.011

Protective effect of Empagliflozin against palmitate-induced lipotoxicity through enhanced fatty acid oxidation and reduced stress signals

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Aim/Hypotheses: Sodium-glucose cotransporter 2 (SGLT2) plays a crucial role in glucose absorption. Empagliflozin, an SGLT2 inhibitor, targets renal pathophysiological defects in type 2 diabetes. While significantly lowering blood glucose, SGLT2 inhibitors have also emerged as potential cardioprotective agents, especially beneficial in early heart disease stages. However, their direct effects on cardiomyocytes remain unexplored. This study investigated the molecular mechanisms of empagliflozin (EMPA) in mitigating palmitate (PA)-induced cardiomyopathy in H9c2 cells
Methods: H9C2 cells were treated with palmitate, with and without the SGLT2 inhibitor. Subsequently, insulin resistance, 2-NBDG uptake, and immunoblotting with insulin signaling pathway antibodies were measured. Beta-oxidation and cardiac metabolism were analyzed using q-RT-PCR and oxygen consumption rate (OCR). Additionally, cardiomyocyte apoptosis was assessed through DNA fragmentation assays and immunoblotting for cleaved caspase 3.
Results: EMPA significantly reduced PA-induced impairment in insulin sensitivity, glucose uptake, cellular apoptosis, inflammation, and ER stress. EMPA also increased AMP levels, activated the AMPK pathway, and elevated carnitine palmitoyl transferase 1 (CPT1) gene expression. These effects collectively enhanced fatty acid oxidation and decreased stress signals.
Conclusions/Interpretation: This study reveals a new mechanism of EMPA's protective effects against PA-induced cardiomyocyte injury, offering fresh therapeutic insights into its role as a cardioprotective agent.

GC1.012

Dietary essential amino acids improve metabolic flexibility and promote cardioprotection in a mouse model of heart failure with reduced ejection fraction

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Introduction: Metabolic flexibility (MF) is healthy organism's ability to switch between utilizing different energy substrates. Mitochondria play a key role in MF, and both mitochondrial function and MF are impaired in metabolic diseases such as obesity, diabetes, and heart failure (HF), all characterized by alteration in proper nutrient utilization1. The heart is endowed with a high mitochondrial content and MF, which allows cardiomyocytes to catabolize a wide range of substrates to meet their energy requirements. In contrast, in HF, mitochondrial oxidation is impaired, and cardiomyocytes exclusively switch to glycolysis, with decreased pyruvate oxidation and energy production, resulting in a metabolically inflexible failing heart2. Since no drugs currently exist for improving the MF of HF, and mitochondrial nutrient supply and composition influence MF strongly, one alternative approach for HF could be a dietary intervention aimed at optimizing mitochondrial substrate handling. Essential amino acids (EAAs) are almost entirely catabolized in mitochondria and represent optimal oxidative substrates. Thus, we investigated the cardioprotective effects of a designer diet in which the protein component was replaced with a defined EAA formulation (SFA-EAA diet)3.
Methods: C57BL/6N mice underwent transverse aortic constriction (TAC) to induce heart failure with reduced ejection fraction (HFrEF); animals were fed both before (preventive protocol) and after (therapeutic protocol) TAC with control SFA or SFA-EAA diets. Ejection fraction (EF), fractional shortening (FS), and cardiac fibrosis/hypertrophy were assessed; similarly, mitochondrial substrate utilization and biogenesis markers were evaluated.
Results: In both protocols, SFA-EAA restored the TAC-induced decrease in EF and FS of SFA-fed mice and blunted the increase in cardiac stress markers. Remarkably, while SFA-fed TAC animals showed impairment in cardiac glucose oxidation, indicative of reduced MF, the SFA-EAA diet restored the oxidative capacity of TAC mice, increasing pyruvate oxidation and mitochondrial biogenesis markers. Furthermore, in vitro supplementation of endothelin-1 (ET-1) treated cardiomyocytes with an EAA mixture (EAAm), equivalent to SFA-EAA, normalized the ET-1-induced and inhibitory increase in phospho-pyruvate dehydrogenase, thus indicating that EAAs can both unlock the constrained mitochondrial fuel selection and improve the hypertrophy-induced loss of MF4.
Conclusion: By restoring the defective oxidation of substrates in cardiac hypertrophy and improving HF-induced decrease in MF, manipulating dietary amino acids exerts a cardioprotective effect. This nutritional

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approach could, therefore, represent an alternative therapeutic strategy directed toward the metabolic alterations of HF, which could implement standard pharmacotherapy.

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GC1.013

Effect of an olive oil derived N-acylethanolamine mixture (OLALIAMID®) in mice with obesity: focus on adipose tissue-liver axis

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N-acylethanolamines (NAEs) are endogenous lipid-signalling molecules belonging to noncanonical endocannabinoids, involved in inflammation and energy metabolism (Mock et al 2023). Several studies demonstrate that NAEs signalling is disrupted during obesity (Mazier el al 2015). However, there is no evidence about the potential pharmacological effect of NAEs association in managing metabolic disorders. During obesity, prolonged metabolic stress leads to adipose tissue (AT) dysfunction and inflammation, which results in increased lipid flux to the liver and insulin resistance (Lee et al 2023). Targeting liver-adipose-axis could be considered a potential therapeutic approach for the treatment of obesity-related diseases. Here, we investigated the beneficial effect of OLALIAMID®, an olive oil derived ethanolamide mixture with a higher percentage of OEA and lesser of LEA, PEA and SEA in limiting metabolic alterations in liver and adipose tissue of mice feeding a high-fat diet (HFD).
First, we showed that OLA reduced body weight gain and fat mass in HFD mice and decreased insulin resistance as shown by oral glucose tolerance test and homeostasis model assessment (HOMA)-IR index. Moreover, OLA improved serum hormonal, inflammatory and metabolic parameters of systemic chronic low-grade inflammation, including cholesterol, triglycerides and liver transaminases. Consistently, OLA limited glucose and lipid dysmetabolism caused by HFD activating insulin signalling and reducing mRNAs of key markers and enzymes of fatty acid accumulation in the liver. OLA also positively affected adipose tissue plasticity, deeply altered by HFD, activating thermogenesis (UCP1, PRDM16, PPARγ, PGC1α) in interscapular brown AT (iBAT), and inducing the 'beigeing' of subcutaneous (sc)WAT. Notably, this mixture reduced the transcription of IL-1β and the inflammation-associated hormone GDF15 in iBAT and promoted M1-to-M2 macrophage shift in scWAT of HFD mice. This anti-inflammatory effect of OLA and the increased expression of glucose transporter (GLUT)4 in scWAT sustained the improvement of liver gluco-lipid toxicity and the restored insulin sensitivity of both metabolic tissues. In conclusion, we demonstrated that the association of NAEs can represent a valid pharmacological strategy for controlling IR and obesity acting on liver-adipose axis and restoring hepatic lipid homeostasis and AT plasticity and function.

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GC1.014

Innovative approaches: phyto-probiotics as a therapeutic support for managing obesity-linked psoriasis

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Introduction: Obesity is a major health issue globally since it is linked to the development of chronic comorbidities such as type 2 diabetes, dyslipidemia, atherosclerosis, certain cancer types, and skin disorders such as psoriasis. Scientific evidence suggests that the possible link between obesity and psoriasis is multifactorial, with dietary habits, lifestyle, certain genetic factors, and the microbiome being key factors in the progression of both pathologies due to their association with a chronic pro-inflammatory state. Thus, inflammatory management during obesity is a promising target for psoriasis, not only because of the ill adipose tissue secretome profile, but also because of the link between obesity and the other immunological derangements involved with psoriasis beginning and persistence. The project aims to develop a novel therapeutic support for psoriasis that targets inflammation, obesity, and psoriasis-specific indicators. The extract utilized here is the result of a fermentation between a prebiotic and a probiotic strain, referred as Phyto-probiotics 31 (PP31).
Methods: The methods used were molecular biology on THP-1 to study 1) the impact of the extract (50 µg/ml) on the polarization of monocytes into MO or M1 macrophages by exploring the expression of pro-inflammatory cytokines (TNF-α, IL-1β, IL-6, CXCL10, IL-8), and 2) protein assays of total blood leukocytes (Luminex®) to explore the effect of the extract (50 µg/ml) on PBMCs stimulated 24 h with LPS for the cytokines IFNγ, IL-12p70, IL-1β, IL-2, IL-23, IL-22, IL17a and Resistin. 3) investigate the expression of leptin, adiponectin, and HSL in mature adipospheroid made from from women with obesity preadipocytes cells. 4) on human psoriatic keratinocytes by studying the production and expression of IL6, IL8, and filagrin.
Results: 1) Treatment with the extract substantially lowered expression of TNF-α (RQ = 0.83±0.05), IL-6 (RQ = 0.76±0.02), IL-1β (RQ = 0.70±0.03), and CXCL10 (RQ = 0.71±0.01) genes in polarized macrophages with the M1 phenotype. 2) The extract significantly reduced IFNγ, IL-12, IL-22, and IL-23 levels (-32%±5.6, -33%±7.7, -33%±8.4, and -60%±10.2, respectively) compared to the LPS control. 3) The extract significantly reduced leptin expression (RQ = 0.73±0.14) and increased HSL expression (RQ = 2.15±0.09). There was no substantial increase in adiponectin expression. 4) The extract significantly reduced IL-6 (-21%±0.02) and IL-8 (-28%±0.08) secretion, as well as IL-8 (RQ = 0.54±0.09) and filagrin (RQ = 2.04±0.32) expression.
Conclusion: This study reveal that this extract has anti-inflammatory properties, specifically on the production of pro-inflammatory cytokines and the polarization of monocytes into M1 macrophages. In addition, the extract reduced leptin expression and increased HSL expression in adult obese adipocytes. Finally, the extract demonstrated promising effects on chemokine production (IL-6 and IL-8) and filagrin expression in human psoriatic keratinocytes. As a result, the extract may have a triple effect by targeting obesity, inflammation, and psoriasis indicators, assisting in both local and systemic management of psoriasis.

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GC1.015

Comparative microbiome study for metabolic health probiotic discovery

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Introduction: Obesity and related cardiometabolic health issues have been suggested to be linked with imbalance of the gut microbial ecosystem. The present research aimed to assess whether it would be possible to find differences in the gut microbiome and fecal and urine metabolites of women with obesity and increased risk of cardiometabolic issues determined based on clinical measurements when compared to women who are of average weight and have no cardiometabolic risks. The information gained would then be used to isolate and test potential next generation probiotics for metabolic health.
Methods: An observational clinical trial (Clinicaltrials.gov NCT04229082) was performed to collect fecal and urine samples for the microbiome and metabolomic assessment. To assess the health status of the participants, anthropometric measurements, including body composition measurement with Dual-energy X-ray Absorptiometry, cardiometabolic health parameters, including fasting glucose, fasting insulin, blood pressure, blood lipids, as well as inflammatory markers were measured. Fecal microbiome comparison was performed between participants with average weight and participants with obesity, as well as subgroups of highest (obesity and clinical data showing prediabetes) and lowest (average weight and clinical data showing values within reference range) cardiometabolic health risks. Based on the results, strains of potentially health related bacterial genera and species were isolated. The most promising bacterial strains were tested in a diet-induced obesity (DIO) C57BL/6J mouse model with Bifidobacterium animalis ssp. lactis 420 as a comparator strain and liraglutide as positive control.
Results: The clinical trial included 99 participants, 57 of them having average weight and 39 were with obesity. 79 average weight and health associated bacterial Operational Taxonomic Units or species were revealed by the comparative analysis. Fecal and urine metabolite analyses suggested that the participants with average weight had higher consumption of fiber and vitamin C rich foods. Further candidate selection was done based on correlation with clinical markers, candidate species abundance and prevalence in samples from participants with average weight, as well as culturability and safety aspects. Finally, four strains representing candidate species Intestinimonas massiliensis, Segatella copri, Lachnospira eligens and Akkermansia massiliensis were chosen to be studied in a DIO mouse model. The most promising findings for cardiometabolic markers were observed with S. copri (blood glucose) and A. massiliensis alone and in combination with I. massiliensis (insulin).
Conclusion: The described comparative microbiome study proved to be an efficient way of detecting potential novel beneficial bacterial strains for metabolic health and study further the effect of weight and cardiometabolic health status to the composition and functionality of the gut microbiome.

Conflict of Interest: The authors are employees of IFF, which is a company that manufactures and commercializes probiotic strains.

Funding: All the work was entirely funded by IFF.

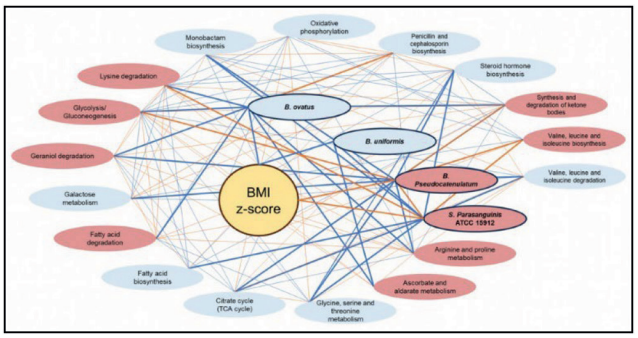
GC1.016

Comparative Efficacy of Full-Length and Partial 16S rRNA Gene Sequencing in Gut Microbiome Analysis of Children with Varied Weight Status

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Introduction: Obtaining consistent outcomes in the analysis of bacterial microbiomes through next-generation sequencing (NGS) poses challenges due to the diversity of synthetic platforms for 16S rRNA genes and the associated analytical pipelines. This study aimed to tackle this issue by comparing full-length segments (V1–V9 regions) with partial-length segments (V3–V4 regions) in sequencing synthetic 16S rRNA genes extracted from human gut microbiomes and investigate the implications of both methods on the identification of obesity-associated microbiota markers.
Methods: In this observational and comparative study, we explored the differences between these two sequencing methods in taxonomic categorization and weight status prediction among twelve children with obstructive sleep apnea.
Results: The full-length NGS method by Pacbio® identified 118 genera and 248 species in the V1–V9 regions, all with a 0% unclassified rate. In contrast, the partial-length NGS method by Illumina® detected 142 genera (with a 39% unclassified rate) and 6 species (with a 99% unclassified rate) in the V3–V4 regions. These approaches showed marked differences in gut microbiome composition and functional predictions (Table 1). The full-length method distinguished between children with obesity and children with normal weight using the *Firmicutes*/*Bacteroidetes* ratio, a known obesity marker ($p = 0.046$), whereas the partial-length method was less conclusive ($p = 0.075$). Additionally, out of 73 metabolic pathways identified through full-length sequencing, 35 (48%) were associated with level 1 metabolism, compared to 28 of 61 pathways (46%) identified through the partial-length method. The full-length NGS also highlighted complex associations between body mass index z-score, three bacterial species (*Bacteroides ovatus*, *Bifidobacterium pseudocatenulatum*, and *Streptococcus parasanguinis ATCC 15912*), and 17 metabolic pathways (Figure 1).
Conclusion: Our findings highlight disparities in NGS-based assessments, emphasizing the value of the full-length NGS method with amplicon sequence variant analysis for clinical research involving the gut microbiome and weight status. This underscores the need of meticulous consideration of methodological differences in forthcoming meta-analyses.



The network graph provides a vivid depiction of the interactions among three key gut bacteria: {Bacteroides ovatus}, {Bifidobacterium pseudocatenulatum}, and {Streptococcus parasanguinis} ATCC 15912, and their dynamic interplay with metabolic pathways, especially those with strong correlations ({r}-value ≥ 0.60). The red ellipses denote markers associated with overweight/obesity, while blue ellipses symbolize markers indicative of normal weight. Red lines highlight positive correlations, while blue lines depict negative correlations.

Fig. 1.

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Tab. 1.

Items/Parameters	Full-length	V3–V4 region
NGS methodologies		
NGS technology	Third-generation	Second-generation
Current application	Emerging	Preferred method
PCR primers	V1–V9 region	V3–V4 region
NGS platform	Pacbio®	Illumina®
Amplicon length	1500 bp	300 bp
Bioinformatics platform	QIIME 2 (version 2022.1)	QIIME 2 (version 2021.4)
Analysis pipelines	DADA2 (version 1.20)	DADA2 (version 2021.4)
Taxonomic database	NCBI (2020.7)	NCBI (version 2022.1)
Microbiota bioinformatics		
Read count	16044 (15554–18552)	147952 (141946–152740)
ASV count	13951 (12873–15875)	99357 (96097–106739)
Coverage rate	High	Low
Identified species	Numerous	Limited
Similarity of relative abundance	Similar (except at species level)	Similar (except at species level)
Alpha diversity	High	Low
Beta diversity (unweighted)	Low	High
Beta diversity (weighted)	High	Low
Correlation with weight status (small sample size)		
{Firmicutes}/{Bacteroidetes} ratio	More distinct	Less distinct
Alpha diversity	Present	Absent
Beta diversity, unweighted	More distinct	Less distinct
Representative ASVs	Higher	Lower
Functional prediction of gut microbiota		
Software	Tax4Fun2	Tax4Fun
Database	KEGG	KEGG
Differentiated level 3 pathway (overlapping/unique)	18/55	18/43
Differentiated metabolic pathway (overlapping/unique)	5/31	5/23
Translational significance	Elucidating gut bacterial species can lead to more targeted mechanistic research, enriching our understanding of the complex gut interactions	Embracing a universally accepted method for gut microbiome study ensures consistent and comparable results, fostering collaboration and field advancements

Comparison of full-length and V3–V4 region 16S rRNA gene sequencing methods in assessing gut microbiome across different weight groups in children.

GC1.017

Comparative effects of viable and heat-inactivated Lactobacillus rhamnosus GG administration in the amelioration of diet-induced liver steatosis in rats

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Introduction: Metabolic dysfunction-associated fatty liver disease (MAFLD) onset is characterized by excessive fat accumulation in hepatocytes, leading to extrahepatic conditions [1]. Among the factors affecting its development, the consumption of a Western diet and gut microbiota dysbiosis, stand out [2]. Thus, novel therapies targeting gut microbiota result of interest. The aim of this study is to compare the effects of the administration of a viable and heat-inactivated probiotic (*L. rhamnosus GG*, LGG) in liver lipid metabolism in a dietary rat model of hepatic steatosis.
Methods: 36 male Wistar rats (8-9-week-old) were divided into 4 experimental groups and fed either a standard laboratory diet (C group, n=8), or a high-fat high-fructose diet alone (HFHF group n=8), supplemented with a probiotic (LGG, 1x109 CFU/day, PRO group, n=9) or with a parabiotic (heat-inactivated LGG, same dose, PARA group, n=9) for 6 weeks.
Results: The steatotic diet induced an increase in body and liver weights of the animals. A tendency towards lower body weight was found in the treated groups ($p<0.1$ PRO and $p<0.09$ PARA vs. HFHF), while liver weights remained unchanged. Serum ALT and AST levels, were increased in the HFHF group, showing non-significant but sharp reductions in the treated groups (-23%, -40% for ALT; -44%, -40% for AST, PRO and PAR vs. HFHF, respectively). The increase in hepatic triglyceride content induced by HFHF diet was significantly reduced by viable LGG administration, while parabiotic administration resulted in a non-significant attenuation

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of this parameter. The higher hepatic fatty acid uptake found in the HFHF group (FATP2 protein expression) was significantly decreased in the PRO group. Although non-significant, a sharp increase in ACC phosphorylation (+36.3%) along with a significant decrease in FAS enzymatic activity was found in the PARA group. The latter showed a trend towards lower levels in the PRO group (p=0.1 vs. HFHF). A similar pattern was also observed for SREBP-1c (p=0.081 PRO, p<0.01 PARA vs. HFHF). Finally, the higher MTTP enzymatic activity found in both treated groups compared to the HFHF group suggested that liver lipid output to circulation was increased in these animals.

Conclusion: Based on these results, the administration of viable LGG seems to be more effective than its heat-inactivated parabiotic for the prevention of excessive hepatic lipid accumulation. This effect may be due to decreased hepatic fatty acid uptake and enhanced delivery of triglycerides from liver to circulation.

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Conflict of interest: The authors declare no conflict of interest.

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GC1.018

Impact of high-fat diet-induced obesity on triple-negative breast cancer metastatic potential through the modulation of the gut microbiota

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Introduction: Obesity is associated with an increased risk and worsened outcome for several types of cancer such as triple-negative breast cancer (TNBC). While recent studies have explored the impact of obesity on TNBC primary tumor growth, the influence on TNBC metastatic potential and the role of the gut microbiota remain less understood. Obesity is associated with a change in the gut microbiota composition, an increased intestinal permeability and a chronic low-grade inflammation. All these changes have been associated with the progression of certain types of cancer. Prebiotics like fructo-oligosaccharides (FOS) are known to change the microbiota composition and have been described to improve gut barrier function and to reduce low grade inflammation in persons living with obesity. Our objective is to investigate whether modulating the gut microbiota with FOS may mitigate the processes of TNBC metastatization in normal diet (ND)- and high-fat diet (HFD)-fed mice.

Methods: For "in vivo" TNBC metastasis study, we developed a luciferase-expressing PY8119 cell model. In Vivo Imaging System® (IVIS®) was used for longitudinal lung metastasis monitoring. C57BL/6Jrj mice were fed with normal diet (ND) or high fat diet (HFD) for six weeks before intravenous (IV) injection of 200,000 PY8119 Luc cells. Post-IV injection, half of the HFD-fed mice and ND-fed mice received 10% FOS ad libitum in their drinking water. 4 groups were included in the study mice on a ND, mice on a ND and FOS (ND FOS), mice on a HFD and mice on a HFD and FOS (HFD FOS). HFD-induced obesity and FOS effects on metastasis were monitored longitudinally through bioluminescence and quantified using histological assessment (H&E) with HALO® software, ensuring method cross-validation.

Results: After "in vitro" and "in vivo" validation of the luciferase activity, we assessed the effect of HFD-induced obesity and FOS on lung metastasis formation. After 28 days, we discovered a significant pro-metastatic effect in the lungs of HFD-fed mice, with an "in vivo" total flux IVIS® signal significantly higher than in lean mice (see figure 1). We also found that HFD-fed mice displayed an increased signal earlier in time compared to lean mice, thereby suggesting an accelerated metastatic growth. The HFD-fed mice treated with FOS exhibited a lower percentage of metastatic surface area in the lungs (ND 31,5%, HFD 64,8%, HFD FOS 27,1%, $p < 0.5$). A protective effect of FOS was observed in HFD-fed mice. These data were supported by both the IVIS® data, and the histological analysis.

Conclusion: HFD-induced obesity has a pro-metastatic effect in the lungs of mice injected with PY8119 TNBC Luc cells compared to ND-fed mice. Additionally, changing the gut microbiota composition by using FOS exhibits a protective effect in HFD-induced obesity

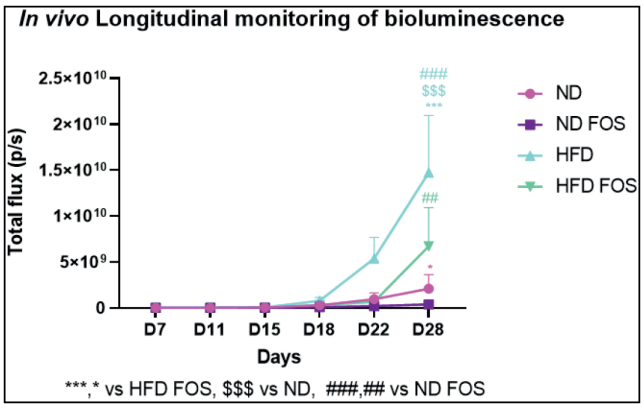


Fig1. In vivo Longitudinal monitoring of the bioluminescent signal of TNBC lung metastases, Mixed-effects analysis, (ND n=8, ND FOS n=10, HFD n=6, HFD FOS n=7). * <0.5, **<0.1, ***<0.01.

Fig. 1.

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GC1.019

Gastrointestinal complaints after Roux-en-Y Gastric Bypass Surgery. Impact of microbiota and its metabolites

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Introduction: Roux-en-Y Gastric Bypass (RYGB) surgery is one of the most commonly performed bariatric procedures. However, a percentage of RYGB patients develop unexplained gastrointestinal complaints. The microbiota is receiving more attention as a potential cause for these stomach complaints. Therefore, we aim to investigate the relation between microbiota composition, its metabolites, and the development of gastrointestinal complaints after RYGB.
Methods: This observational study included participants from the BARICO study (Bariatric surgery Rijnstate and Radboudumc neuroimaging and Cognition in Obesity). Before surgery, 6 and 24 months after surgery, fecal and plasma samples were collected. Additionally, 24 months after surgery participants completed the Irritable Bowel Severity Scoring System (IBS-SSS) questionnaire. Inclusion lasted from September 2018 till December 2020 with follow-up till March 2023. Redundancy analysis and linear mixed models were used to asses changes in microbiota and biochemistry over time and with correlation analysis the relationship between microbiota and gastrointestinal complaints was assessed.
Results: 65 participants with a mean age of 46.2±6.0 years, a mean BMI of 41.2±3.6 were included. 86.2% of the participants were women. Mean percentage of total body weight loss was 33.7±7.2 24 months after surgery. According to the IBS-SSS questionnaire, 40% of the participants had mild, and 32.3% had moderate to severe gastrointestinal complaints 24 months after surgery. Microbiota alpha diversity did not change, while beta diversity significantly changed between all timepoints. Bile acids (e.g glycolithocholic acid-3-sulphate (GLC-3S); $p < 0.001$) and short-chain fatty acids (e.g acetic acid; $p < 0.001$) were significantly higher, and inflammatory markers (e.g. c-reactive protein; $p < 0.001$) were significantly lower after surgery. Barnesiella sp., Escherichia/Shigella sp., Faecalibacterium prausnitzii and Holdemanella biformis correlated positively (log2 fold-change = 20), while Akkermansia sp correlated inversely with gastrointestinal complaints (log2 fold-change = -30). No significant correlation between alpha diversity and gastrointestinal complaints was found. Moreover, patients with mild and moderate to severe gastrointestinal complaints showed higher levels of GLC-3S ($p = 0.013$, $p = 0.001$).
Conclusion: The gut microbiome, but not its metabolites per se, might be involved in the development of gastrointestinal complaints after RYGB. Nonetheless, it is unknown how these bacteria influence gastrointestinal complaints and intensive exploration is required in order to reduce the risk of gastrointestinal symptoms after BS.

GC1.021

Cessation of Orthodox fasting, but not of time-restricted eating, disrupts the homeostatic balance between nesfatin and beta cell function in people with overweight

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Introduction: Nesfatin is a recently discovered adipokine that is involved in the regulation of apetite and food intake. Previous studies have shown that circulating nesfatin concentrations are lower in people with obesity compared to controls. Orthodox fasting (OF) is a religious fasting model that shares several characteristics with the typical Mediterranean diet. Although a positive correlation has been reported between nesfatin concentrations and markers of beta cell function, it is unclear whether diet composition can mediate this relationship.
Methods: We recruited 27 individuals (mean age 51.2 ± 7.4 years, 25% men) who practiced OF for 7 weeks. 14 people (mean age 49.7 ± 8.3 years, 28.57% men) who practiced 16:8 time-restricted eating (TRE) served as the control group. All participants had no history of chronic metabolic disease, received no supplements or medications, and were advised to maintain a stable level of physical activity during the study. Anthropometric and biochemical parameters were prospectively evaluated at 3 time points: at baseline, after the end of the diets (7 weeks from baseline), and 5 weeks after the participants returned to their standard eating habits (12 weeks from baseline). The concentrations of omentin, nesfatin, visfatin, and vaspin were measured using ELISA and body composition was evaluated with bioelectric impedance analysis. Pancreatic beta cell function was calculated using the homeostatic model assessment of beta cell function (HOMA-B).
Results: At baseline, participants in the two groups had comparable characteristics in terms of age ($p=0.32$), sex distribution ($p=0.82$), body weight ($p=0.90$) and fat ($p=0.22$), fasting glucose ($p=0.34$) and fasting insulin ($p=0.65$) levels. During the study, participants in both groups exhibited a significant reduction in body mass index at 7 and 12 weeks compared to baseline: OF: 29.3 ± 5.6, 28.5 ± 5.3, 28.3 ± 5.3 kg/m^2, $p<0.001$ and $p=0.004$, respectively; TRE: 29.1 ± 6.9, 28.3 ± 6.5, 28.0 ± 6.7 kg/m^2, $p=0.02$ and $p<0.001$, respectively. Vaspin levels decreased [795.8 (422.1–1299.4) (baseline) vs. 402.7 (203.8–818.9) (7 weeks) pg/mL, $p = 0.002$] and omentin levels increased [568.5 (437.7–1196.5) (baseline) vs. 659.0 (555.7–1810.8) (12 weeks) pg/mL, $p = 0.001$] in the OF group, while none of the analyzed adipokines changed significantly in the TRE group. After controlling for the effects of body weight, total body fat, visceral fat and lean body mass, we observed a significant and negative correlation between HOMA-B and nesfatin values at 12 weeks, only in the OF group ($r=-0.455$, $p=0.01$). No correlations were established with the other adipokines.
Conclusion: OF has a positive effect on circulating adipokine levels, while its cessation affects the homeostatic balance between insulin secretion and nesfatin. Changes in the biological effects of nesfatin appear to be evident in individuals with overweight, even in the absence of laboratory signs of overt metabolic disease, and remain unaffected by improvements in anthropometry.

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GC1.022

Transgenic overexpression of the Nrf2 in the SHR/strain is associated with amelioration of oxidative stress, reduced mitochondrial function, and features of the metabolic syndrome

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Introduction: Oxidative stress has been implicated in the pathogenesis of several components of the metabolic syndrome. The Nrf2 gene (also known as Nfe2l2, Nuclear factor-erythroid 2-related factor-2) codes for the key transcription factor that regulates expression of genes coding for antioxidative enzymes. However, its role in regulation of glucose and lipid metabolism is controversial both in humans and animal models.
Methods: We tested metabolic effects of Nrf2 in transgenic line of SHR overexpressing mouse Nrf2 transgene. Parameters of glucose and lipid metabolism and mitochondrial traits were measured by standard biochemical methods. Oxygen consumption was measured using high resolution oxygraphy.
Results: Overexpression of the mouse Nrf2 transgene under regulation of a universal promoter was associated with significantly increased activities of antioxidant enzymes and reduced levels of lipoperoxidation products TBARS in the liver and kidney compared to SHR nontransgenic rats. Reduced oxidative stress in transgenic rats was associated with increased sensitivity of adipose and muscle tissues to insulin action when incorporation of glucose into adipose tissue lipids and muscle tissue glycogen was significantly higher when compared to nontransgenic animals. Gene expression profiles in white adipose tissue revealed significantly reduced expression of genes from oxidative phosphorylation pathway which was congruent with reduced abundance of complex I in epididymal fat and lower mitochondrial respiration in skeletal muscle.
Conclusion: These results provide evidence for important antioxidative and hypoglycemic effects of Nrf2 that are associated with reduced mitochondrial function.

Conflict of Interest: None Disclosed

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GC1.023

The role of epicardial adipose tissue, hormones and adipokines in the development of coronary heart disease in men with arterial hypertension

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Introduction: Cardiovascular disease (CVD) is the leading cause of death in adults worldwide. It is known that overweight and obesity are a major risk factor for the development of coronary artery atherosclerosis and the onset of coronary artery disease (CAD). Obesity and arterial hypertension (AH) may cause progression of CVD. Epicardial adipose tissue (EAT) has begun to play a special role in recent years, which is equated with biologically active adipose tissue.
Methods: 141 men were examined with worsening arterial hypertension. The study participants were selected using randomly sequenced sampling. The analysis of general clinical, laboratory and instrumental data was carried out. The anthropometric indicators included measuring body weight, height, waist circumference (WC), hip circumference (HC) and body mass index (BMI). The structure, the functional parameters of the heart, the thickness of the epicardial fat behind the wall of the right ventricle in the parasternal position were obtained by echocardiography. The levels of immunoreactive insulin, leptin and adiponectin were measured by enzyme-linked immunosorbent assay. The index of insulin resistance (HOMA-R) was calculated. Patients were divided into 2 groups: group 1 included patients presenting with AH, average age – 55,8±2,5 years, n=89; group 2 included patients presenting with AH and CAD, documented, average age – 54,9±6,1 years, n=52.
Results: It was found that there was no reliable BMI difference between group 1 and group 2 patients: 31,3 ± 4,0 kg/m^2 and 32,3 ± 5,0 kg/m^2 (p=0,774). Patients of groups 1 and 2 did not differ significantly in terms of WC – 105,7 ± 10,2 cm and 107,8 ± 12,2 cm, (p=0,631). WC/HC was significantly higher in group 2 patients than in those in group 1: 1,04 ± 0,08 y.e. and 1,01 ± 0,07 y.e., p<0,05. Insulin levels and values of HOMA-R did not significantly differ between study groups: 19,4 ± 11,0 μU/mL and 17,9 ± 12,5 μU/mL; 4,6 ± 3,2 y.e. and 4,3 ± 3,1 y.e., respectively (p<0.05). Also, the level of adiponectin in patients in group 2 was reliably lower than in group 1: 7,7 ± 2,5 and 6,4 ± 3,0, μg/ml, p<0,05. Group 2 patients were found to have a higher EAT than group 1 patients: 4,0 ± 1,3 mm and 4,9 ± 2,2 mm, p<0,05.
Conclusion: Excess visceral fat has been found to affect the development of CAD in men with hypertension. The increase in EAT and the decrease in adiponectin levels are associated with the development of CAD in men with hypertension. This is probably due to adipokines, which have an endocrine effect. The WC indicator was less sensitive than the WC/HC indicator. WC/HC had significant differences between groups.

GC1.024

Association of epicardial adipose tissue thickness with ejection fraction in patients with essential hypertension

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Introduction: Arterial hypertension (AH) is a significant risk factor for chronic heart failure (CHF). People living with AH are at greater risk of cardiovascular mortality. Obesity is common among patients with hypertension. Adipose tissue can be accumulated in different depots. Analysis of various depots has shown that visceral adipose tissue is a key factor in the pathophysiology of cardiovascular disease. In recent years, much attention has been paid to epicardial adipose tissue (EAT), which is also visceral adipose tissue.
Methods: 36 patients (17 men and 19 women) with worsening AH were studied in a therapeutic hospital. The study participants were selected using randomly sequenced sampling. The analysis of general clinical, laboratory and instrumental data was carried out. The anthropometric indicators included measuring body weight, height, waist circumference (WC), body mass index (BMI). The structure, functional parameters of the heart and the thickness of the epicardial fat behind the wall of the right ventricle in the parasternal position were determined by echocardiography (ExoCG). Patients were divided into 2 groups: group 1 included patients presenting with reduced ejection fraction (EF) (≤40%), mildly reduced EF (41-49%) (n=22); group 2 included patients presenting with preserved EF (≥50%) (n=14).
Results: It was found that there was no reliable age difference between group 1 and group 2 patients: 66,4±5,0 and 65,4±10,2 (p=0,736). Study group 1 and 2 patients were not reliably differentiated based on BMI – 33,2±8,2 and 30,4±4,4 kg/m^2 (p=0,196), and these groups included patients with obesity or overweight. The patients in group 1 also had a higher WS than the patients in group 2, but no reliable differences were observed: 110,5±15,3 and 103,6±10,8 cm (p=0,121). Comparative analysis of ExoCG results showed that patients in group 1 had a higher left ventricular finite systolic size (FSSLV), left ventricular finite diastolic size (FDSLV) and myocardial mass index (LMM) than those in group 2: 4,2±0,6 и 3,3±0,4 cm, 5,9±0,8 and 4,8±0,4 cm, 163,4±52,6 and 115,1±24,3 g/m^2,

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respectively (p<0,05). EAT thickness was significantly higher in group 1 patients than in those in group 2: 5,5±1,2 and 4,6±0,8 mm (p<0,05). The correlation analysis also revealed a negative correlation between EAT thickness and EF: rs=-0,33 (p<0,05) and a positive correlation between EAT thickness and FSSLV, FDSLV, LMM: rs=0,35 (p<0,05) and rs=0,39 (p<0,05), respectively.
Conclusion: Thus, EAT alters the structure of the heart and worsens CHF through the influence of inflammatory mediators on coronary blood flow.

GC1.025

Blood glucose variability in men with obesity

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Introduction: Obesity generally determines the metabolic basis for the development of type 2 diabetes. Therefore, the analysis of glycemic variability in person with obesity, especially in their different phenotypes, is of particular importance.
Methods: The study included 43 men aged 25-65 years. Group 1 (n=17) represented men with subcutaneous obesity (SO), while group 2 (n=16) consisted of men with abdominal obesity (AO) and group 3 (comparator) included 10 men with normal body weight (NBW). Each participant underwent 2 days of continuous glucose monitoring (CGM) under conditions of normal diet, work and physical activity. A number of parameters, indices and ratios describing glycaemic variability (GV) for daytime (6.00-23.59) and nighttime (0.00-5.59) hours were assessed.
Results: A comparative analysis of key parameters and indices describing daytime and night-time GV in men with NBW and obesity, without taking into account the type of fat distribution, showed no statistically significant differences. It was found that men with AO had statistically significantly higher mean glucose levels, standard deviation of glucose levels and coefficient of variation; statistically significant differences were also found in CONGA index and J-index. An analysis of the LBGI and HBGI indices, which reflect the risk of hypo- and hyperglycaemia respectively, showed that the LBGI index was higher in men with SO, while the HBGI index was higher in men with AO. A comparative analysis of the blood glucose variability parameters showed that the values of the indicators were significantly higher during the day than at night. However, the changes in mean glucose levels between the study groups were ambiguous. Specifically, in men with NBW, daytime and nighttime glycemia didn't differ, whereas in men with AO there was a trend towards a decrease in nighttime glucose levels (p = 0.08), while in men with SO the decrease in nighttime glycemia became statistically significant (p = 0.005).
Conclusion: The results of glycemic variability assessment in men with obesity suggest that abdominal and subcutaneous obesity are associated with specific features of carbohydrate metabolism and determine a different level of type 2 diabetes risk.

GC1.027

Blood methylation pattern reflects epigenetic remodelling in adipose tissue after bariatric surgery

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Objective: Modifications in DNA methylation patterns have been observed after bariatric surgery, but were studied mainly in blood cells. Here, we aimed to compare methylation signatures between blood and adipose tissue (AT) to test the hypothesis that AT methylation pattern changes after bariatric surgery are reflected in blood cell methylation signatures.
Methods: We analysed genome-wide DNA methylation in blood, subcutaneous AT (SAT) and omental visceral AT (OVAT) samples from nine individuals with obesity pre- and post-bariatric surgery using Illumina 850K EPIC technology.
Results: Comparing time points before and after surgery significant differentially methylated regions (DMRs) were identified as follows: 9,267 in blood, 12,865 in SAT, and 14,632 in OVAT (all false discovery rate (FDR) < 0.05). Notably, surgery-induced DNA methylation changes were more pronounced in AT (-11.5 to 10.8% in SAT, -13.7 to 12.8% in OVAT) than in blood (-8.8 to 7.7%). Overlapping DMRs across blood and AT revealed significant enrichment of immune-related genes. Among them, 49 regions could be validated with similar methylation changes in blood from independent individuals. Furthermore, 14 validated DMRs were annotated to differentially expressed genes (DEGs) in AT after surgery-induced weight loss, from which "*"PIK3AP1"*" was downregulated in both SAT and OVAT. DNA methylation age acceleration was significantly higher in AT compared to blood but was not affected by surgery.
Conclusion: Concurrent methylation pattern changes in blood and AT after surgery related to immune processes suggest blood DNA methylation as an indicator for the inflammatory state of AT in obesity.

GC1.028

Role of Il-9-Nlrp3 Axis in Insulin Resistance and Adipose Tissue Inflammation During Diet-Induced Obesity

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Background: Despite the proven beneficial role of type-2 cytokines in diabetes and obesity, interleukin (IL)-9 has not been investigated so far in the context of inflammation and diabesity. The aim of the present study was to characterize the role of IL-9 signalling in type 2 diabetes.

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Methods: All the experiments were done in IL-9R deficient mice. Glucose and insulin tolerance tests, ELISA, real-time PCR, western blotting, bone marrow derived macrophage culture were the major techniques used. Unpaired t test, one way ANOVA tes and two-way ANOVA were the statistical tests used. Values of $p < 0.05$ were considered statistically significant.
Results: IL-9R KO mice fed hig fat diet (HFD) exhibited increased weight gain, metabolic dysfunction, heightened adipose tissue inflammation and decreased energy expenditure. Following the observation of increased gene and protein expression of NLRP3 in the adipose tissue of HFD fed IL-9R KO mice, we performed invitro experiments. Treatment of wild-type bone marrow derived macrophages, stromal vascular fraction of the adipose tissue and adipose tissue macrophages with LPS and Nigericin or LPS and palmitic acid increased the release of IL-1ß and IL-18, while rIL-9 treatment abrogated IL-1ß and IL-18 release. The finding that IL-9 signalling acts via inhibiting the NLRP3 inflammasome was further confirmed in vivo as treatment of HFD-fed IL-9R KO mice with a pharmacological inhibitor of the NLRP3 inflammasome improved weight gain, glucose and insulin tolerance and insulin signalling. In addition, we also demonstrate a role for IL-9 in the protective effects of helminth infection during obesity and insulin resistance.
Conclusions: In summary, our data shows for the first time a novel role for IL-9 signalling in the regulation of the NLRP3 inflammasome and thereby protection against impaired metabolic changes and inflammation during obesity

GC1.029

An association between omentin-1 concentration and adiposity markers in patients with obesity and hypertension

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Introduction: Omentin is an adipokine, whose gene is highly expressed in vascular adipose tissue, rather than subcutaneous. The potential role of omentin in the pathogenesis of disorders accompanied by obesity is not fully understood as well as the exact endo- and exogenic factors involved in the regulation of its expression in adipose tissue. The beneficial cardiometabolic properties of omentin have been indicated. It seems that this molecule may regulate blood pressure values and normalize other adiposity markers such as lipid profile and insulin sensitivity. The study aimed to determine an association between omentin-1 concentration and adiposity markers in patients with obesity and hypertension.
Methods: 60 patients with obesity and hypertension (research group) and 40 participants with normal weight and without hypertension (control group) underwent anthropometric measurements (weight, height, waist and hip circumference). Anthropometric indicators were calculated (Body Mass Index – BMI and Waist to Hip Ratio – WHR). Body composition was assessed using the electrical bioimpedance method with a Bioscan 920-2. Systolic (SBP) and diastolic blood pressure (DBP) were recorded. Biochemical parameters such as serum fasting glucose, insulin, lipid profile, and serum omentin concentration were determined. The degree of insulin resistance was obtained using the homeostatic model assessment of insulin resistance (HOMA-IR) formula.
Results: Serum omentin level in the participants with obesity and hypertension was significantly lower than in the control group (145.5±33.3 vs. 383.6±92.9; $p<0.001$). In the research group, omentin negatively correlated with waist ($p<0.01$) and hip circumference values ($p<0.05$), as well as adipose tissue % ($p<0.001$), SBP values ($p<0.001$), fasting insulin concentration ($p<0.001$), and HOMA-IR level ($p<0.001$). On the other hand, a positive correlation between omentin and high-density lipoprotein (HDL) concentration in both patients with obesity and hypertension ($p<0.01$) and the whole population ($p<0.001$) was shown. Omentin correlated negatively with multiple parameters, such as body weight, BMI, waist and hip circumference and its ratio, adipose tissue %, SBP, triglycerides, glucose, fasting insulin, and HOMA-IR in the overall population. A multivariate linear regression analysis, including waist circumference, adipose tissue %, fasting insulin, and SBP, showed that waist circumference (β=-0.21; $p<0.01$), adipose tissue % (β=-0.31; $p<0.001$), and fasting insulin (β=-0.49; $p<0.001$) were independent predictors of omentin concentration in patients with obesity and hypertension.
Conclusion: Omentin was inversely correlated with several cardiometabolic risk factors, including elevated blood pressure, atherogenic lipid profile, and glucose/insulin homeostasis abnormalities. Fasting insulin, adipose tissue %, and waist circumference can be considered as candidate markers of omentin concentration in people with obesity and hypertension, however further research is needed to support these conclusions.

GC1.030

Deciphering the mechanisms involved in HIV integrase inhibitors impact on weight gain and adipose tissue alterations: role of HIF-1 alpha

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Introduction: Adipose tissue is a major regulator of whole-body energy homeostasis through its storage and secretory capacities. Whereas white adipocytes are the key players of energy storage, beige adipocytes promote energy expenditure through their thermogenic function. Thermogenesis requires uncoupling protein 1 (UCP1) and is associated with high rates of fatty acid oxidation, therefore limiting adipocyte hypertrophy, insulin resistance, and fibrosis.
People living with HIV, treated with antiretrovirals such as integrase inhibitors (INIs), especially dolutegravir, often experience significant weight gain and present adipose tissue alterations, leading to cardiometabolic complications (Koethe J et al, Nat Rev Dis prim, 2020). We recently showed, both *in vivo* and *in vitro*, that INI-induced adipocyte hypertrophy resulted from impaired beige adipogenesis associated with severe adipose tissue fibrosis (Gorwood et al, CID, 2020; Ngono et al, Cells,2022). However, the molecular mechanisms underlying these harmful effects remain unclear. The aim of this study was to establish whether INI-induced adipocyte alterations were mediated by Hypoxia-Inducible Factor 1 (HIF-1)-α, known to drive adipocyte hypertrophy and fibrosis.
Methods: Fibrosis (Sirius Red staining) and gene expression were measured in subcutaneous abdominal (SCAT) and visceral (VAT) adipose tissue biopsies obtained from SIV-infected dolutegravir-treated macaques. Human Adipose Stromal Cells (ASCs) were isolated from SCAT of healthy women (age: 33±4.90 years; BMI: 26.06±1.32 kg/m²) and were differentiated into white or beige adipocytes in the presence or not of dolutegravir (concentration near Cmax; 7,4µmol/L) with or without a pharmacologic inhibitor of HIF-1α (PX-478; 5µmol/L). We assessed adipocyte beige phenotype, lipid accumulation, mitochondrial function and profibrotic profile in ASCs.
Results: Firstly, we showed that *HIF1A* gene expression was enhanced up to 1.7-fold in the SCAT and VAT of SIV-infected macaques treated by dolutegravir, when compared to control macaques. *HIF1A* expression in SCAT and VAT positively correlated with fibrosis (Red Sirius staining, expression of Type I and VI Collagens and *TGFB1*) and inversely correlated with the expression of the beige adipocyte marker PR-domain-containing-16 (*PRDM16*).
Secondly, in both white and beige adipocytes, HIF-1α expression was enhanced by dolutegravir. Interestingly, counteracting the overexpression of HIF-1α with PX-478 prevented the deleterious effects of dolutegravir

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on beige adipogenesis (Maintenance of *UCP1* expression) and restored insulin sensitivity. In both white and beige adipocytes, PX-478 treatment reduced dolutegravir-induced lipid accumulation, lipogenic gene expression, fibrosis-related gene expression and also mitochondrial dysfunctions.
Conclusion: Altogether, theses results show that dolutegravir increased the expression of HIF-1α both in *in vivo* and *in vitro*. The pharmacological inhibition of HIF-1α accumulation in beige and white adipocytes prevented the harmful effects of dolutegravir, thus stressing the central role of HIF-1α in INI-induced adipocyte hypertrophy and fibrosis.

GC1.031

Vasorin modulates adipogenesis in human adipocytes

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Introduction: Obesity incidence is raising in the last years, and total adiposity is the key driver of insulin resistance and metabolic complications. Our research group investigates the mechanisms of action of new biomarkers as a predictor of metabolic risk in children with obesity. Hence, it has been observed that vasorin (VASN), a transmembrane protein implicated in the transforming growth factor (TGF)-β pathway, is differentially expressed in visceral adipose tissue (VAT) of children with obesity. Thus, VASN could be related to adipose tissue physiopathology.
Objectives: To study VASN function in differentiated human adipocytes, used as an in vitro model of obesity. Specifically, it is intended to show the role of vasorin in adipogenesis, lipogenesis and extracellular matrix remodelling.
Methods: Human preadipocytes were transfected with a lentivirus which contained a sh-RNA, either shRNA-VASN or control sh-RNA. Then, preadipocytes were differentiated 10 days. The degree of differentiation was determined through Oil Red O staining, and the gene expression levels of VASN, peroxisome proliferator-activated receptor gamma (PPARγ), acetyl-CoA carboxylase alpha (ACACA), matrix metalloproteinase 2 (MMP2), and collagen type I alpha 1 (Col1a1) were assessed using real-time quantitative PCR.
Results: Vasorin knockdown reduced lipid accumulation in human adipocytes. In addition, it reduced ACACA and MMP2 gene expression, and Col1a1 gene was significantly up-regulated.
Conclusions: Vasorin regulates lipid accumulation in human adipocytes, which it might regulate adipogenesis, lipid metabolism and genes implicated in extracellular matrix remodelling. This could be of interest to further elucidate VASN role in adipose tissue and its possible implication in obesity and metabolic disease.

GC1.032

Effects of Cadmium on Epigenetic Changes in Human Preadipocites Exposed to Heavy Metal

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Introduction: Heavy metals, such as cadmium, have gained considerable attention due to their critical role in the development of various metabolic-endocrine disorders, favoring the development of diseases, such as cardiovascular disease and diabetes mellitus. During adipogenesis, that is, the process of cell differentiation of mesenchymal stem cells (Adipose Stromal Cells - ASCs) in adipocytes, epigenetic changes involving lysine 27 of histone 3 (H3K27) are critical for the silencing and activation of transcription factors responsible for the commitment of ASCs. We will correlate previously published transcriptome data from adipocytes exposed to cadmium and chromatin immunoprecipitation of human ASCs by bioinformatics to evaluate marks epigenetics in the regulatory region of genes with altered expression by exposure of adipocytes to cadmium.
Methods: The entire protocol and use of samples received approval from the Ethics Committee in Unifesp Research (CEP/UNIFESP Project n: 0268/2022). The patients's adipose tissue will be processed in the laboratory as described (BELLEI et al., 2017). After dissection and fragmentation of the adipose tissue (AT) the samples will be placed in digestion buffer with colagenase, so that cells can be isolated through digestion tissue by it (Rodbell, 1964). Cells will be grown in 100mm culture plates (Corning) and maintained in buffer D'MEM/F-12 (1:1) supplemented with 10% FBS and incubated at 5% CO2 and 37 ºC. The cells will be exposed to cadmium at a concentration of 1 to 5 μM/ml diluted in Milli-Q water [based on some in vitro studies that used this metal (Gasser et al., 2022; Lee et al., 2012)], for a period of 24 or 48 hours. Then protein and RNA extracted will be analysed by Western blot and RT-PCR, respectively.
Results: Currently, we have performed a cell viability assay to identify the optimal working concentration for cadmium. With the results of this experiment, we decided to work with cadmium at a concentration of 7μM/ml.
Conclusion: We believe that cadmium affects epigenetic mechanisms linked to adipogenesis, such as modifications on lysine 27 of histone 3. We hope to elucidate the exact effects that cadmium causes on such mechanisms, and compare our results with similar studies using bioinformatics tools.

GC1.033

Impact of fish oil on the modulation of deleterious effects of chronic inflammation through mechanisms involving the Nf-kB pathway and epigenetic modifications in human visceral adipose-derived stem cells

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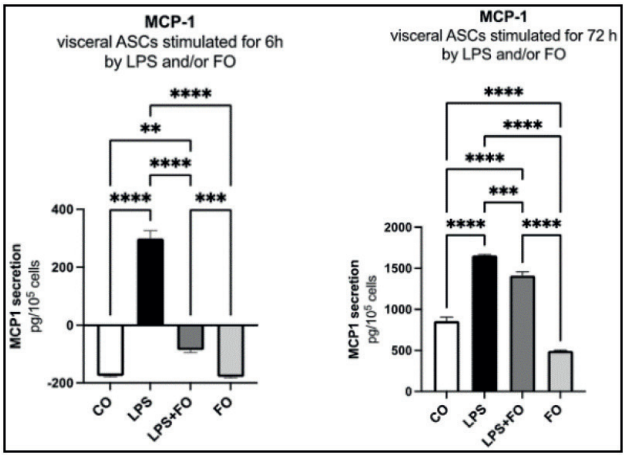
Introduction: Adipose-derived stem cells (ASCs) play a crucial role in the expansion of white adipose tissue (WAT) through adipogenesis, mitigating hypertrophic obesity. However, in people with obesity, these progenitor cells' functionalities are compromised, leading to hypertrophied adipocytes and heightened pro-inflammatory responses. Epigenetic modifications, particularly involving histone 3 lysine 27 (H3K27), further impact adipocyte regulation. Understanding these mechanisms offers potential insights into therapeutic interventions for obesity-related metabolic disorders. This study aims to explore the epigenetic modulation induced by eicosapentaenoic acid-rich fish oil (FO), effects that may underlie or play a significant role in the observed anti-hypertrophic obesity responses associated with FO, which have been described by our group (da Cunha de Sá et al., 2016, 2020, 2021; Antraco et al., 2021).

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Methods: Visceral white adipose tissue was extracted from overweight patients (BMI: 29.3) undergoing elective surgery. All procedures were approved by the Research Ethics Committee of the Federal University of São Paulo number: 0268/2022. The stromal fraction containing ASCs was isolated, and cells were cultured (in a 37-degree Celsius environment with 5% CO2). Between passages 2 and 4, ASCs were exposed to lipopolysaccharide (LPS, 1ug/ml) with or without FO (50mM) treatment. After 6 and 72 hours, culture media, total proteins and RNA were collected for ELISA, western blot, and RT-PCR analyses.
Results: FO completely prevented MCP1 secretion after 6 hours of LPS stimulation and partially mitigated this effect after 72 hours. FO also inhibited LPS-induced phosphorylation of SAPK/JNK and NF-kB pathway proteins. Notably, FO attenuated the significant increase in ACL, a key enzyme for acetyl-CoA production (a substrate for histone H3 acetylation by acetylases), triggered by LPS. Additionally, FO prevented LPS-induced increases in H3K27 acetylation, H3K27 trimethylation, and KDM6B expression, but not in LPS-induced increases in genes encoding the demethylases KDM6A and the acetylase CREBBP.
Conclusion: This study elucidates the molecular characteristics of human visceral progenitor cells and highlights FO's ability to modulate chronic inflammation effects through NF-kB pathway and epigenetic modifications. These findings emphasize the crucial role of ASCs in regulating WAT.

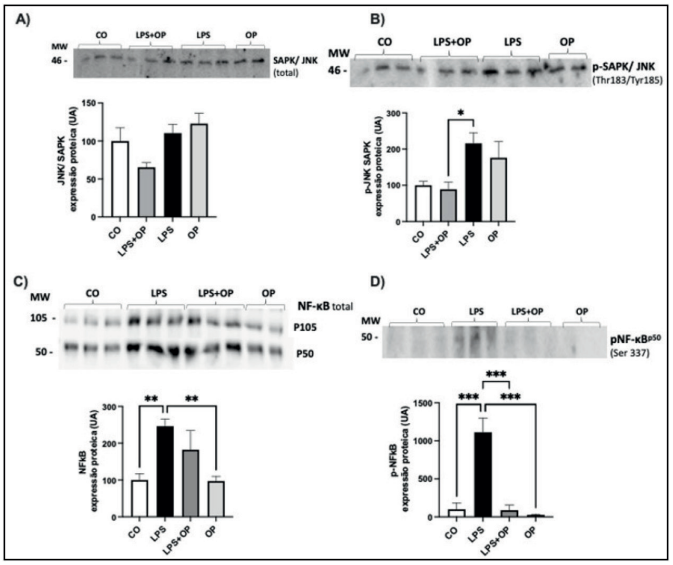
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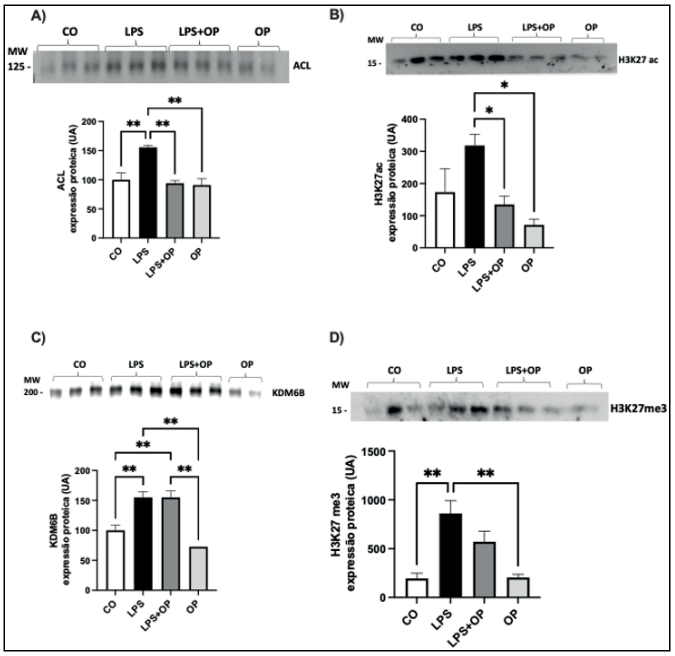
Secretion of macrophage chemoattractant protein (MCP-1) by ASCs (extracted from human visceral WAT) cultured until they reach 80-90% confluency. The cells were exposed for 6h and 72h to lipopolysaccharide (LPS) 1ug/mL and/or fish oil (FO) 50uM. MCP-1 secreted into the culture medium was quantified by ELISA kit. Mean ± SEM ** P<0.001, *** P<0.0001, **** P<0.00001.

Fig. 1. MCP-1 secreted by ASCs exposed for 6h and 72h to LPS and/or FO.



Graphical representation of protein content of total SAPK/JNK (A), phosphorylated p-SAPK/JNK (B), total NF-kBp105/NF-kBp50 (C), and phosphorylated NF-kBp50 (D), in ASCs (extracted of human visceral WAT) cultured until reaching 90-100% confluency, and exposed for 72 h to lipopolysaccharide (LPS, 1ug/mL) in the presence (or not) of fish oil (FO, 50uM). Values were expressed as mean ± SEM, in relation to the control and corrected for total protein expression by Ponceau (see Appendix 1). Above each graph is shown a representative autoradiogram from 1 experiment (n= 2-3) quantified by ImageJ. * P<0.05, ** P<0.001.

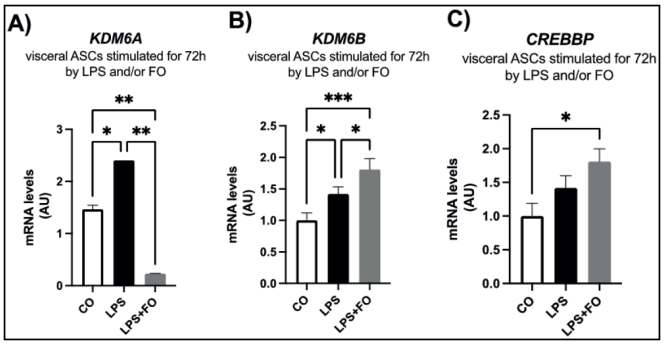
Fig. 2. Protein expression from the NF-kB signaling pathway in ASCs exposed for 72h to LPS and/or FO.



Graphical representation of protein content of ACL (A), and the histone modifiers H3K27ac (B), KDM6B (C), and H3K27me3 (D), in ASCs (extracted from human visceral TAB) cultured until reaching 90-100% confluency, and exposed for 72 h to lipopolysaccharide (LPS, 1ug/mL) in the presence (or not) of fish oil (FO, 50uM). Values were expressed as mean ± SEM, in relation to the control and corrected for total protein expression by Ponceau (see Appendix 1). Above each graph is shown a representative autoradiogram from 1 experiment (n= 2-3) quantified by ImageJ. * P<0.05, ** P<0.001.

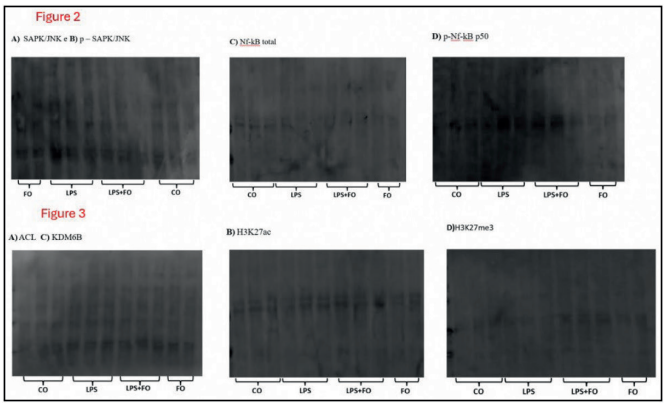
Fig. 3. Protein expression from histone modifiers in ASCs exposed for 72h to LPS and/or FO.

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Gene expression of histone modifiers in adipocytes differentiated from ASCs extracted from human visceral WAT. The cells were cultured until they reached 90-100% confluency, and exposed for 72h to lipopolysaccharide (LPS, 1ug/mL) in the presence (or not) of fish oil (FO, 50uM). After 72 hours (day 0), the treatment was removed and the cells were washed and differentiated with an adipogenic cocktail until day 4, when the RNA was extracted and RT-PCR was performed. A) KDM6A, B) KDM6B, C) CREBBP. Target genes were normalized by constitutive GAPDH. Mean ± SEM ** P<0.001.

Fig. 4. Gene expression of Histone modifiers by adipocytes differentiated from ASCs pre-exposed to LPS (in the presence or absence of FO) before differentiation.



Figures 2 and 3 – Images of nitrocellulose membranes with ponceau staining used for normalization of total proteins (quality control of applied samples and transfer to membrane) referring to the protein blot of ASCs (extracted from human visceral TAB) cultured until reaching 90-100% confluency, and exposed for 72 h to lipopolysaccharide (LPS, 1mg/μL) in the presence (or not) of fish oil (FO, 50μM) and quantified by ImageJ.

Appendix.

GC1.034

Visceral-to-Peripheral Adiposity Ratio: a Critical Determinant of Sex and Ethnic Differences in Cardiovascular Risks among young adults in Mauritius

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Introduction: Over the past few decades, the island of Mauritius has experienced a surge in cardiovascular diseases, largely driven by an epidemic of type 2 diabetes affecting almost equally its two main ethnic groups: 'Indian' of South Asian ancestry and 'Creole' of African/Malagasy ancestry. Coronary heart disease morbidity and mortality is, however, higher in Indians than in Creoles. Given the importance of body fat distribution in disease predisposition, we investigated whether as young adults without diabetes, Indians would show a less favorable cardiovascular risk profile that could be explained by differences in visceral adiposity or other fat distribution patterns.
Methods: The study was conducted in 189 young healthy adults (men and women of both ethnicities), with the following measurements conducted after an overnight fast: anthropometry (weight, height, waist circumference), whole-body and regional body composition by dual energy x-ray absorptiometry (DXA), blood pressure and blood assays for glycemic profile (glucose and HbA1c) and lipid profile (triglycerides and cholesterols). General linear model analyses were used to test the differences between men and women as well as between sex and ethnicity, and General Analysis of Variance and Covariance was applied to examine the extent to which any sex or ethnic effect for a given cardiometabolic parameter is altered after adjustments for potential anthropometric and body composition co-variants. The ratio of visceral-to-peripheral adiposity was calculated as DXA-derived visceral fat divided either by gynoid fat or by appendicular (limb) fat, i.e. sum of arm and leg fat.
Results: The results indicate significantly higher serum triglycerides and lower HDL-cholesterol in men than in women, and in Indians than in Creoles ($p<0.001$). No significant differences due to sex or ethnicity are observed in body mass index and waist circumference, but indices of visceral adiposity (visceral/android, visceral/subcutaneous) as well as visceral-to-peripheral adiposity (visceral/gynoid, visceral/limb) were significantly higher in men than in women, and in Indians than in Creoles. The significant effects of sex and ethnicity on blood lipid profile were either completely abolished or reduced to a greater extent after adjusting for the ratio of visceral-to-peripheral adiposity than for visceral adiposity per se.
Conclusion: In young adults without diabetes in Mauritius, Indians show a more adverse pattern of body fat distribution and blood lipid risk profile than Creoles. Differences in their fat distribution patterns, however, only partially explain their differential atherogenic lipid risk profile, amid a greater impact of visceral-to-peripheral adiposity ratio than that of visceral adiposity per se on sex and ethnic differences in cardiovascular risks; the former possibly reflecting the ratio of hazardous (visceral) adiposity and protective (peripheral) superficial subcutaneous adiposity.

GC1.035

Effects of *Opuntia* cactus extracts on serum plasma lipids and the expression of CD36 fatty acid transporter and aquaglyceroporins in rats fed an obesogenic diet

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Introduction: The products derived from Opuntia cactus are used in the pharmaceutical, food and cosmetic industries. Further, it has been observed that Opuntia extracts can have beneficial properties for the prevention and treatment of certain disorders, such as obesity and type 2 diabetes1.
Objective: The aim of this study was to analyse the potential effects of two different extracts from Opuntia species on the expression of CD36 and aquaglyceroporins in epididymal adipose tissue from rats fed an obesogenic diet, as well as on serum lipids.
Methods: Rats were distributed into 6 groups and fed either a standard or a high-fat high-fructose diet (HFHF), supplemented or not, with Opuntia stricta var. dillenii (OD) peel extract or Opuntia ficus-indica var. colorada (OF) fruit extract, at doses of 25 (L-) or 100 (H-) mg/kg/day, for 8 weeks. Protein expression of adipose triglyceride lipase (ATGL), aquaglyceroporins 7 and 9 (AQP7 and AQP9) and CD36 fatty acid transporter were measured by immunoblotting in epididymal tissue. Serum

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total cholesterol, high-density lipoprotein (HDL) cholesterol, non-HDL cholesterol, non-esterified fatty acids (NEFA) and triglycerides were measured spectophotometrically.

Results: Opuntia extracts were not able to significantly prevent the body weight increase induced by the obesogenic diet. Nevertheless, a significant reduction was observed in visceral (epididymal and mesenteric) and subcutaneous fat pad weights in the group supplemented with H-OD extract and L-OF extract, respectively. Regarding serum parameters, obesogenic diet caused a significant increase in total and non-HDL cholesterol. L-OD and H-OF were able to prevent partially or totally these effects. In epididymal adipose tissue, CD36 was up-regulated in HFHF group in comparison with the control (+54%). In addition, in HFHF rats AQP9, involved in glycerol uptake was increased (+28%) and AQP7, involved in the release of glycerol, was decreased (-41%) when compared with the control group. H-OD was able to prevent the AQP7 (+209%) and AQP9 (-29%) protein expression changes induced by the HFHF diet. Regarding CD36, a fatty acid transporter that under lipolytic conditions facilitates fatty acid release from adipose tissue2, it was significantly increased by both H-OD (+70%) and H-OF (+100%) extracts in comparison with HFHF rats.

Conclusions: These results suggest that the obesogenic diet induces fatty acid and glycerol uptake in epididymal tissue, which are in line with the increase observed in epididymal weight. Conversely, the changes induced by H-OD on the expression of CD36 and AQPs, seem to be involved in the reduction of epididymal depot. On the other hand, H-OF extract seems to be the one that better prevents the altered serum lipid profile associated with obesity.

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GC1.036

Investigating the metabolic role of adipose tissue GDF15 in obesity resistance using Rosa26-Cas9 knock-in B6J mice

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[2]Fachbereich Molecular Biotechnology, FH Campus Wien, Vienna, Austria

Introduction: Obesity is one of the biggest health challenges of the modern world. Therefore, a deeper understanding of underlying mechanisms is necessary to identify drug targets. A potential obesity drug target is the hormone growth differentiation factor 15 (GDF15), which can modulate body mass development by suppressing food intake.

Our previous experiments strongly suggest that inguinal white adipose tissue (iWAT) plays a pivotal role in modulating energy metabolism to counteract body weight gain on a high-fat diet. In UCP1 knockout mice, we identified a potential role of GDF15 for the obesity-resistant phenotype1. Thus, this work aims to evaluate how iWAT-specific genetic modulation of GDF15 affects metabolism and its role in obesity resistance.

Methods: We develop a novel mouse model for tissue-specific gene modulation using CRISPR-Cas technology to potentially knockout GDF15 in iWAT of UCP1 deficient mice. We designed specific single guide RNAs (sgRNAs) to target the Gdf15 gene. Knockout efficiency was tested *in vitro*. The most efficient sgRNAs were injected into iWAT using Adeno-associated virus (AAV). After virus injections, animals were fed a high-fat diet to induce obesity for 3 weeks. Subsequently, fasting blood glucose was measured and tissues were collected for further molecular analysis.

Results: Mice injected with Gdf15 sgRNAs show decreased blood glucose levels, reduced body weight gain and a trend to decrease fat gain as compared to control mice. Determination of GDF15 protein levels were unsuccessful so far but Gdf15 mRNA levels tend to be reduced.

Conclusion: Our results suggest a role of GDF15 in iWAT with impact on whole-body metabolism. Although further validation of the tissue-specific knockdown efficiency is required, the preliminary results look promising to uncover the underlying molecular pathways, which we anticipate to exploit as potential drug targets.

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GC1.037

Unveiling Histone Modifications, Leptin Signaling, and Adipose-Derived Stromal Cell Dysfunction in High-Fat Diet-Induced Obesity

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Introduction: We recently demonstrated that a high-fat diet (HFD) leads to a reduction in the acetylation of histone 3 lysine 27 (H3K27ac) and in the expression of Acly (which encodes ATP citrate lyase - ACL) in adipose tissue-derived stromal cells (ASCs) of mice (Silva et al., 2022). ACL cleaves citrate for the synthesis of acetyl-CoA, a fundamental substrate for histone acetylation. This study shows analyzes in murine WAT, producing promising results for the continuation of this work. It is important to emphasize that in white adipose tissue (WAT) of a person with obesity, home of ASCs, the environment is completely enriched with leptin, which should act paracrinal on its receptors. It has already been demonstrated by Jiang and his group (2009) that leptin decreases ACL expression in adipocytes, but not in ASCs. Thus, we aimed to investigate whether inflammation and adipocyte dysfunction triggered by HFD-induced obesity involve epigenetic changes in histone 3 lysine 27 (H3K27) in ASCs, and whether leptin plays a role in mediating this process.

Methods: We used male C57BL/6j mice subjected to control or HFD for 16 weeks. WAT from the visceral epididymis (epi) was removed and analyzed. We designed a customized panel of 84 essential genes for WAT using a PCR array gene expression assay. Furthermore, ASCs were isolated from the stromal vascular fraction, cultured, treated in vitro with leptin and analyzed by RT-PCR, Western Blot and ELISA.

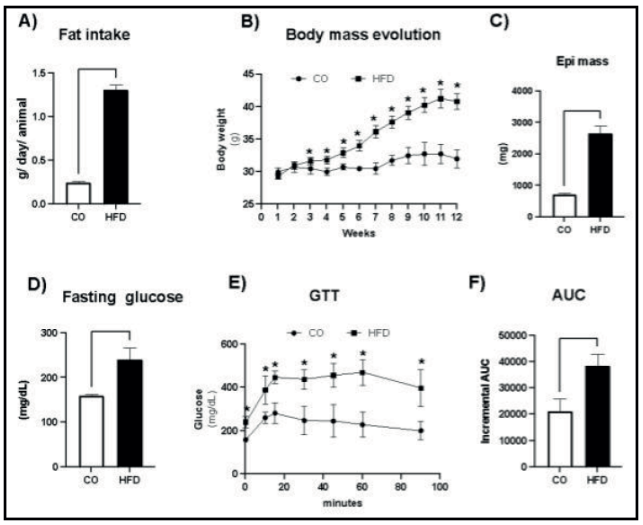
Results: The parameters of mice with obesity were evaluated and the model was characterized. HFD animals exhibited a list of altered gene expression, upregulated (10 genes), including the Lep gene (+25.48x), and downregulated (41 genes), associated with inflammation and adipose tissue dysfunction in epi WAT. Analysis of epigenetic marks revealed HFD-induced changes in histone modifications, H3K27ac in WAT (total tissue), in addition to an increase in the expression of the Crebbp, Ep300 and Kdm6b genes, and especially, a decrease in Acly expression. The study further explored leptin signaling in ASCs, identifying a potential mechanism for ASC dysfunction in the leptin-rich environment of WAT in conditions of obesity, as we identified that the Lepr1 and Lepr2 isoforms are readily expressed by these cells and, when treating mouse ASCs with leptin (in vitro), we also observed a reduction in ACL expression, corroborating the link between leptin and ASC dysfunction.

Conclusion: In summary, our study reveals a convincing association between a HFD, epigenetic modifications at H3K27, and leptin-mediated dysfunction in adipose tissue-derived stromal cells. The identified changes in gene expression and histone modifications in murine white adipose tissue lay the foundation for future explorations that will delve deeper into histone gene regulation involving leptin in human models, providing valuable insights into the complex interplay between obesity, leptin and epigenetic changes in WAT.

References

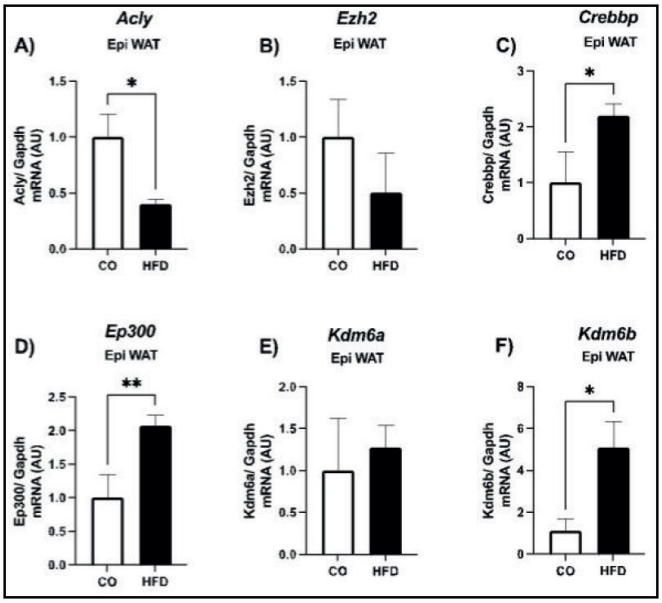
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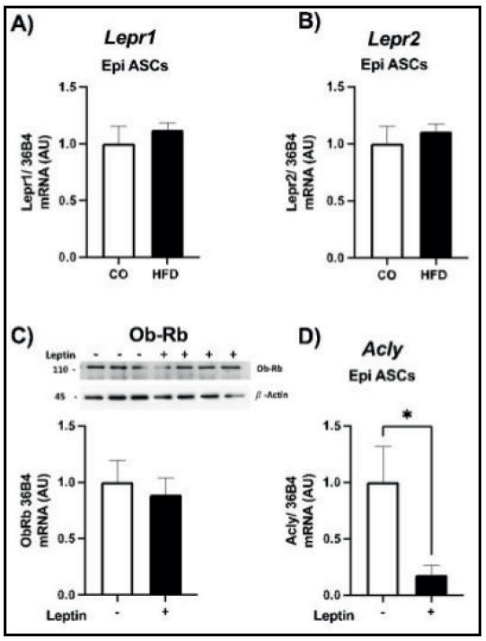
A) Food intake (g/day/animal), B) Evolution of body mass, C) epididymal (Epi) fat mass, D) Fasting blood glucose, E) Glucose tolerance test or GTT, and F) Incremental area under the glycemic curve in control (CO) and animals with obesity induced by a high-fat diet (HFD). In A-C, measurements were performed weekly throughout the experimental protocol. In E-F, the glycemic curve or glucose concentration versus time was calculated after administration of glucose (2 g/Kg). expressed as mean ± standard deviation (n=11-12).

Fig. 1. Obesity Model Characterization.



A) Acly, B) Ezh2, C) Crebbp, D) Ep300, E) Kdm6a, and F) Kdm6b, Epi WAT genes of the groups of animals that received control diet (CO) or high fat diet (HFD). Target genes were normalized by constitutive Gapdh. Mean ± standard deviation *P<0.05, **P<0.001. The graphs illustrate results from 2 independent experiments (n=2-6).

Fig. 2. Gene expression of Acly and genes encoding histone modifiers.



Gene expression of the leptin receptor Lepr1 (A) and Lepr2 (B) and Acly (D) in ASCs extracted from subcutaneous and epididymal WAT of control and HFD-induced animals with obesity. The values were expressed in relation to the control and corrected for the expression of 36B4 (constitutive). Mean ± standard deviation (n=6). *p < 0.05. In C) Total content of LEP R1 (Ob-Rb) protein in ASC extracted from subcutaneous WAT of HFD-induced animals with obesity, treated (or not) in vitro with 100ng/mL leptin for 24h. Quantification by ImageJ. The values were expressed in relation to the control and corrected by the H3 band. Mean ± standard deviation(n = 3–5). * p < 0.05.

Fig. 3. Expression of leptin and Acly receptors.

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Tab. 1. List of genes that were up-regulated and down-regulated, comparing the group with obesity to the control group: HFD vs CO.

RefSeq Number	Gene name	Description	Fold Regulation	p-Value	Pathway related
		Up- regulated			
NM_008493	Lep	leptin	25.48	0.046332	Adipokines
NM_001253904	Ncor2	nuclear receptor co-repressor 2	3.08	ns	Anti-Browning
NM_010050	Dio2	deiodinase, iodothyronine, type II	3.98	0.000554	Pro-Browning, fatty acid thermogenesis and oxidation
NM_007703	Elovl3	elongation of very long chain fatty acids (FEN1/Elo2, SUR4/Elo3, yeast)-like 3	2.63	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NM_011333	Ccl2	chemokine (C-C motif) ligand 2	5.07	0.009529	Cytokines, growth factors and signal transduction
NM_010548	Il10	interleukin 10	2.08	ns	Cytokines, growth factors and signal transduction
NM_011577	Tgfb1	transforming growth factor, beta 1	3.06	ns	Cytokines, growth factors and signal transduction
NM_013693	Tnf	tumor necrosis factor	10.65	0.009005	Cytokines, growth factors and signal transduction
NM_008689	Nfkb1	nuclear factor of kappa light polypeptide gene enhancer in B cells 1, p105	2.52	ns	Cytokines, growth factors and signal transduction
NM_009853	Cd68	CD68 antigen	9.16	0.000279	Cytokines, growth factors and signal transduction
		Down- regulated			
NM_009605	Adipoq	Adiponectin, C1Q and collagen domain containing	-2.82	0.010125	Adipokines
NM_013459	Cfd	complement factor D (adipsin)	-2.54	0.004805	Adipokines
NM_001204959	Retn	resistin	-3.30	0.016985	Adipokines
NM_133360	Acaca	acetyl-Coenzyme A carboxylase alpha	-2.55	ns	Lipases and lipogenic enzymes
NM_009127	Scd1	stearoyl-Coenzyme A desaturase 1	-2.90	0.042774	Lipases and lipogenic enzymes
NM_001130412	Lpin1	lipin 1	-8.55	0.001238	Lipases and lipogenic enzymes
NM_011044	Pck1	phosphoenolpyruvate carboxykinase 1, cytosolic	-5.98	ns	Lipases and lipogenic enzymes
NM_007988	Fasn	fatty acid synthase	-3.87	ns	Lipases and lipogenic enzymes
NM_007678	Cebpa	CCAAT/enhancer binding protein (C/EBP), alpha	-2.45	0.002073	Pro- adipogenesis
NM_007679	Cebpd	CCAAT/enhancer binding protein (C/EBP), delta	-3.64	0.041382	Pro- adipogenesis
NM_024406	Fabp4	fatty acid binding protein 4, adipocyte	-2.01	ns	Pro- adipogenesis
NM_008006	Fgf2	fibroblast growth factor 2	-2.37	ns	Pro- adipogenesis
NM_008002	Fgf10	fibroblast growth factor 10	-2.71	ns	Pro- adipogenesis
NM_010591	Jun	jun proto-oncogene	-2.05	ns	Pro- adipogenesis
NM_013834	Sfrp1	secreted frizzled-related protein 1	-2.98	ns	Pro- adipogenesis
NM_023184	Klf15	Kruppel-like factor 15	-4.62	ns	Pro- adipogenesis
NM_007420	Adrb2	adrenergic receptor, beta 2	-6.37	0.001464	Anti- adipogenesis
NM_001190703	Dlk1	delta-like 1 homolog (Drosophila)	-2.36	ns	Anti- adipogenesis
NM_019739	Foxo1	forkhead box O1	-2.26	ns	Anti- adipogenesis
NM_009170	Shh	sonic hedgehog	-18.41	0.000001	Anti- adipogenesis
NM_021279	Wnt1	wingless-type MMTV integration site family, member 1	-4.60	0.001147	Anti- adipogenesis
NM_009522	Wnt3a	wingless-type MMTV integration site family, member 3A	-11.21	0.000001	Anti- adipogenesis
NM_008090	Gata2	GATA binding protein 2	-2.32	ns	Anti- adipogenesis
NM_007557	Bmp7	bone morphogenetic protein 7	-2.06	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NR_027710	Ppargc1a	peroxisome proliferative activated receptor, gamma, coactivator 1 alpha	-2.40	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NM_133249	Ppargc1b	peroxisome proliferative activated receptor, gamma, coactivator 1 beta	-2.29	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NM_001127351	Sirt3	sirtuin 3	-2.34	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NM_011532	Tbx1	T-box 1	-11.21	0.000001	Pro-Browning, fatty acid thermogenesis and oxidation
NM_009463	Ucp1	uncoupling protein 1 (mitochondrial, proton carrier)	-5.67	ns	Pro-Browning, fatty acid thermogenesis and oxidation
NM_001177730	Nr1h3	nuclear receptor subfamily 1, group H, member 3	-2.28	0.007073	Anti-Browning
NM_011718	Wnt10b	wingless-type MMTV integration site family, member 10B	-2.50	ns	Anti-Browning
NM_001122899	Lepr	leptin receptor	-2.30	ns	Adipokines receptors
NM_197985	Adipor2	adiponectin receptor 2	-3.03	ns	Adipokines receptors
NM_007419	Adrb1	adrenergic receptor, beta 1	-2.73	ns	Adipokines receptors
NM_008337	Ifng	interferon gamma	-11.06	0.000001	Cytokines, growth factors and signal transduction
NM_021283	Il4	interleukin 4	-2.20	ns	Cytokines, growth factors and signal transduction
NM_031168	Il6	interleukin 6	-10.93	0.000001	Cytokines, growth factors and signal transduction
NM_008355	Il13	interleukin 13	-11.21	0.000001	Cytokines, growth factors and signal transduction
NM_010568	Insr	insulin receptor	-3.52	ns	Cytokines, growth factors and signal transduction
NM_010570	Irs1	insulin receptor substrate 1	-4.26	0.043055	Cytokines, growth factors and signal transduction
NM_001081212	Irs2	insulin receptor substrate 2	-4.61	0.017955	Cytokines, growth factors and signal transduction
NM_001024955	Pik3r1	phosphatidylinositol 3-kinase, regulatory subunit, polypeptide 1 (p85 alpha)	-2.33	ns	Cytokines, growth factors and signal transduction
NM_013674	Irf4	interferon regulatory factor 4	-11.92	0.000978	Cytokines, growth factors and signal transduction

*ns = Not significant. This indicates that, although there was a fold-regulation greater than 2 in the array, the 'p' value was higher than 0.5, likely due to a large variation resulting from a low number of biological replicates. Nevertheless, these genes may play an important role in the pathways activated by FO in WAT.

GC1.038

The impact of obesity and strength exercise on epigenetic modulation in the specific region of NFκB in mesenteric adipose tissue DNA of obese mice

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Introduction: Obesity is a disease characterized by the systemic increase in adipose tissue. Leading to increased inflammatory process, insulin resistance and cell death. Excess of adipose tissue generate an epigenetic modulation in DNA, increasing the NFκB. This perpetuates inflammation and insulin resistance. A possible way to reduce the harmful effects of excess adipose tissue is to increase the capacity of lipid degradation and reduce its inflammatory process. In this sense, strength exercise is an important non-pharmacological intervention promoting the reduction of adipose tissue and pro-inflammatory cytokines. Still unknown whether strength exercise regulating the NFκB epigenetic pathway in the adipose tissue. The aim was to investigate the influence of short-term strength training in the epigenetic modulation of NFκB in mesenteric adipose tissue of obese mice.

Methods: For this, Swiss mice were divided into three groups: lean control (CT), obese sedentary (OB) and obese strength training (OBexT). Obese animals were fed a high-fat diet for fourteen weeks. The obese trained animals were submitted to seven days of stair strength exercise.

Results: With this, obesity is responsible for increase the inflammation in adipose tissue, increasing the genes of inflammatory process, and by reducing adipocyte DNA methylation in the specific region of NFκB transcription. For the other side, the exercise was responsible for reduce physiological parameters and decrease the transcription of inflammatory genes. Furthermore, seven training sessions were responsible for the reduction in protein content, gene NFκB expression, and increase DNA methylation in the specific region of NFκB.

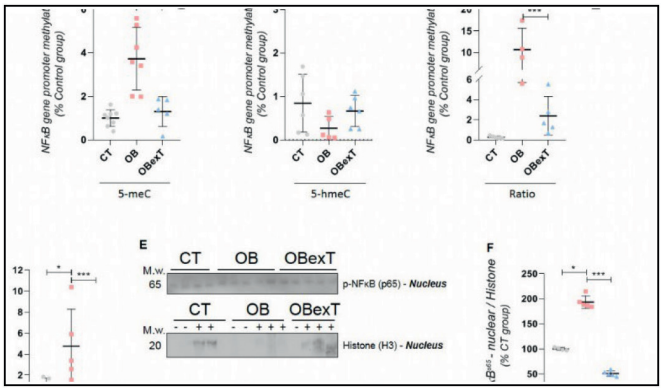
Conclusion: Therefore, we conclude that seven sessions of strength exercise may be an effective strategy to initiate morphological changes in mAT, and we demonstrate, for the first time, that exercise increase DNA methylation in mesenteric adipose tissue in the specific NFκB region of obese mice.

Conflict of interest: The authors

Funding: No funding to report.

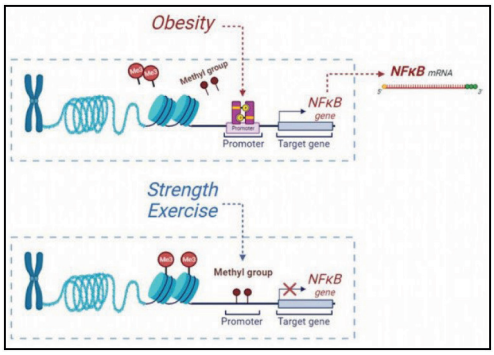
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Fig. 1. Exercise mitigating the NFκB increase in adipose tissue.



(A) Graphic referring to Nfkb gene promoter DNA methylation (5-meC). (B) Graphic referring to Nfkb gene promoter DNA methylation (5-hmeC). (C) Graphic referring to ratio of Nfkb gene methylation. (D) Graphic referring to Nfkb gene expression. (E) Figure representative of western blotting nuclear NFκB protein. (F) Graphic referring to nuclear NFκB protein. The signal of statistical difference is indicated as *p < 0.05 CT vs. OB, and ***p < 0.05 OB vs. OBexT. For the sample group that showed normality, the ANOVA test followed by the Tukey was used, and when normality was not observed, the Kruskal-Wallis test was used.

Fig. 2. Obesity and Exercise modulate epigenetic NFkB.



Illustrative model of the development of obesity at molecular levels in the adipocyte, due to the exacerbated accumulation of fat, it is possible to identify an increase in epigenetic modulation in DNA, triggering an increase in the transcription of NFκB, responsible for the inflammatory process in adipose tissue. On the other hand, the figure shows the influence of strength exercise promoting the addition of the methyl group to DNA, generating a decrease in NFκB transcription and inhibiting chronic inflammation in adipose tissue.The figure was created with BioRender.com.

GC1.039

Deciphering the Impact of SARS-CoV-2 on Adipose Tissue

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The COVID-19 pandemic has led to a critical examination of the factors that cause hospitalization rates to be higher among individuals with obesity. While preliminary evidence suggests the involvement of adipocytes in the infection process, a comprehensive understanding of their impact is still lacking. The study analysed 27 paired biopsies from the Leipzig Obesity BioBank (LOBB) and stratified patients into three groups based on their antibodies to spike and nucleocapsid proteins (NN: not infected and not vaccinated, NV: not infected but vaccinated, IV: infected and vaccinated). The investigation explores the relationship between SARS-CoV-2, adipose tissue, and systemic responses at the histological and molecular levels. Both infection and vaccination are influential factors that lead to a significant decrease in adipocyte size. It is noteworthy that SARS-CoV-2 infection, particularly in the absence of vaccination, has a more pronounced effect on gene expression in both visceral and subcutaneous adipose tissue. Serum proteome analysis provides additional insights, indicating a non-significant decrease in adiponectin levels during infection. When infection is combined with vaccination, lower levels of IL6 serum protein are observed. This suggests a complex interplay between viral infection, vaccination, and adipose tissue dynamics.
In conclusion, our findings shed light on the multifaceted impact of SARS-CoV-2 on adipose tissue and its potential repercussions for individuals with obesity. Further exploration is necessary to elucidate underlying mechanisms and guide targeted interventions during the ongoing COVID-19 pandemic.

GC1.040

Metabolic obesity in normal-weight individuals: new perspectives on adipose tissue dysfunction

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Introduction: Metabolic diseases such as insulin resistance, usually associated with obesity, are also developed in individuals with IMC < 25 kg/m². These individuals, referred to as metabolically unhealthy individuals with normoweight (MUNW), also present alterations in body fat distribution (i.e., visceral obesity) and/or lipid metabolism, thus supporting the involvement of the adipose tissue in the development of the MUNW state. However, neither the underlying pathogenic mechanisms nor the contribution of the two fat depots, subcutaneous (SAT) and visceral adipose tissue (VAT), to insulin resistance in individuals with NW, are fully understood. To address this issue and to identify potential biomarkers of insulin resistance, herein we carried out a comparative proteomic study of SAT and VAT samples from individuals with NW, and with or without prediabetes (PD).
Methods: Comparative quantitative proteomics of SAT and VAT samples from individuals with NW and normoglycaemia (NG) or PD were carried out by LC-MS coupled to diaPASEF. Data were analyzed using bioinformatic tools (SpectronautTM, Reactome). Picrosiruis Red was used for collagen staining to evaluate adipose tissue histopathology.
Results: Our study revealed the occurrence of both common and depot-specific changes in molecular pathways in individuals with NW and PD vs. NG. Thus, two main common significantly dysregulated clusters were identified in MUNW SAT and VAT: metabolism-related proteins and proteins related to signal transduction from the microenvironment (extracellular matrix -ECM-proteins or matrisome), which were down- and up-regulated, respectively, in the group with PD. However, an in-depth analysis of this last cluster in PD vs. NG showed that while core matrisome proteins (collagens, proteoglycans and glycoproteins) related to collagen synthesis were increased in SAT, VAT showed increased matrisome-associated proteins, including ECM regulators related to matrix degradation. However, no significant evidence of enhanced fibrillar collagen content was observed in adipose tissue sections in MUNW. In addition, pathways related to neutrophil degranulation were up-regulated in

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VAT whilst down-regulated in SAT of individuals with PD vs. NG. Other differentially regulated pathways included autophagy (in SAT) or programmed cell death (in VAT).
Conclusion: Molecular profiling of the adipose tissue evidenced significant molecular changes indicative of tissue dysfunction in both fat depots in relation to prediabetes development. Our results highlight the role of ECM remodelling as a key process for the development of possible therapies against prediabetes in individuals with NW. They may be also useful to identify potential predictive biomarkers of fibrosis, previously to collagen deposition in the adipose tissue, under prediabetic conditions. This study also establishes a molecular basis for understanding the implication of body mass distribution in the development of metabolic diseases and further support the notion that metabolic health definition cannot rely only on weight/BMI.

GC1.041

Total and H-Specific GDF-15 levels are not affected by liraglutide or naltrexone/bupropion administration

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Introduction: Growth/differentiation factor 15 (GDF-15) has been studied for its potential to regulate body weight.1 Although physiologically elevated GDF-15 levels are found in various diseases, such as obesity, cancer and sepsis, pharmacological GDF-15 levels in animal models have been found to reduce body weight by suppressing appetite.2,3 Therefore, GDF-15 has recently been identified as a potential anti-obesity pharmaceutical option.2 However, the role of endogenous GDF-15 remains unknown, as GDF-15 circulates in two forms that are currently detectable, namely total GDF-15 and H-specific GDF-15. The aim of the current study was to evaluate GDF-15 levels in response to anti-obesity drugs, i.e. liraglutide 3 mg and naltrexone/bupropion (N/B) in people with overweight or obesity.
Methods: Forty-two people with overweight or obesity, but without diabetes mellitus, were included in the current trial that lasted six for months. They received 3 mg of liraglutide daily or 32/360 mg of N/B daily, along with diet and exercise, depending on physician and patient preference. Participants underwent clinical and laboratory measurements at baseline and after three and six months. Anthropometric measurements and body composition analysis using bioelectrical impedance analysis were performed. Blood samples for GDF-15 and H-specific GDF-15 were collected in the fasted state and every 30 minutes for 3 hours after consumption of a standardized mixed meal.
Results: When all participants were examined at baseline and at 3- and 6-month follow-up, total GDF-15 levels and H-specific GDF-15 levels during the mixed meal did not change significantly compared with premeal levels. When examining participants by subgroup (liraglutide vs. N/B), no statistical significance was found. No significant differences in area under the curve (AUC) or incremental AUC (iAUC) values for total GDF-15 levels and H-specific GDF-15 levels were found between treatment groups at baseline (month 0) and follow-up months (months 3 and 6).
Conclusion: Both total and H-Specific GDF-15 levels are not affected by liraglutide or N/B treatment in patients with overweight or obesity.

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GC1.042

Effects of weight loss with cold exposure on appetite, smell and taste in individuals with obesity: preliminary results

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Introduction: Research has previously shown that cold exposure (CE) can increase energy expenditure (EE), which has led some researchers to believe that CE could be used as way to lose weight. CE has also been shown to increase energy intake in animals and hunger in individuals who are lean. However, the impacts of CE, specifically the orexigenic effects, have not been documented in individuals living with obesity. The goal of this study is to examine the effect of CE on appetite regulation, specifically focusing on gustation and olfaction outcomes.
Methods: A total of 23 individuals living with obesity (avg BMI=34.7 ± 3.5 kg/m^2) were subjected to one of three 8-week weight loss interventions assigned randomly: 1) CE n=9; 2) Diet (n=9); or 3) Combined (n=5). The CE engaged in 90 minutes of CE every other day, while the diet group followed a 30% caloric deficit diet. The combined group underwent both the diet and CE interventions. Measurements of appetite, olfaction and gustation were taken before and after the weight loss period. Data collection continues.
Results: There was no significant effect of intervention on hunger (p=0.427), desire to eat (p=0.411), fullness (0.110) and prospective food consumption (p=0.597), nor was there a group by intervention interactions on the same variables. Similarly, there were no significant changes in the ability to discriminate between smells (p=0.680) or threshold of determining a smell (p=0.770). However, there was a significant time by group difference in the ability to identify a smell (p=0.019). There were no significant differences in the ability to identify different tastes (salty, sweet, bitter, and sour) (p=0.475).
Conclusion: Preliminary findings indicate no interactions between CE and changes in appetite.
Results suggest that taste abilities do not appear to change following CE, nor does the ability of discriminating between smells or the threshold of determining a smell. Yet, the ability of identifying a smell could be influenced by CE or weight loss. However, further data can help understand the nature of the interaction.

Conflict of Interest: None disclosed.

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GC1.043

Circadian Rhythm Stability and Adiposity: A Comparison of Human-Smartphone Interaction and Actigraphy Measurements

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Introduction: The escalating global obesity crisis presents a major public health challenge. Emerging evidence suggests disrupted circadian rhythms and sleep disturbances contribute to this epidemic. Traditional research methods, such as self-reported questionnaires or less common continuous sleep-wake recordings and serial melatonin assays, may not fully capture the complexity of these disruptions. Our study seeks to

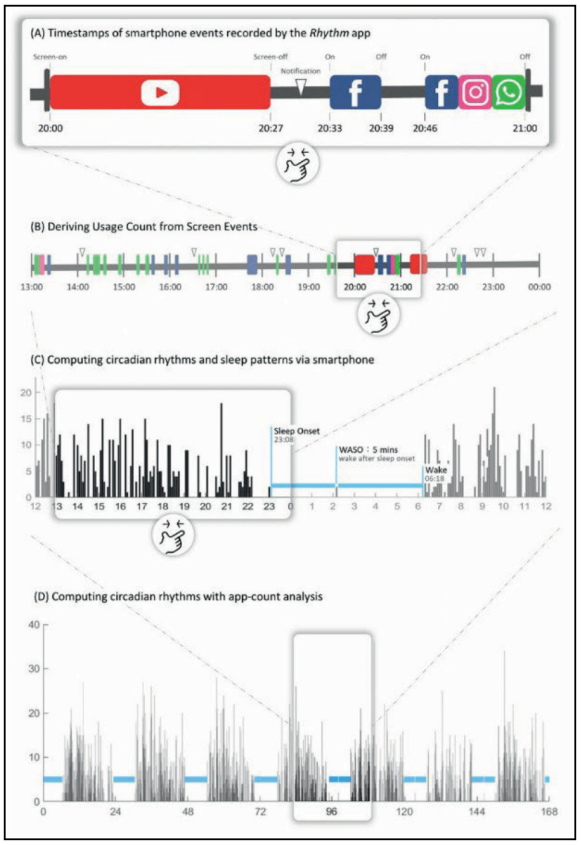
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examine the relationship between adiposity and circadian rhythm, utilizing both actigraphy and a novel smartphone application, Rhythm. This app, designed to track human-smartphone interactions, is hypothesized to provide more detailed insights into circadian rhythm, potentially revealing stronger correlations with adiposity.

Methods: Seventy-eight participants from an obesity clinic and a workplace health program were enrolled. The cohort consisted of 29 individuals with obesity, 16 overweight, and 33 controls. Each participant was equipped with a wrist actigraphy device and instructed to use the Rhythm app for at least four weeks. The app assesses sleep and circadian patterns based on human-smartphone interactions, offering a novel perspective alongside traditional actigraphy data (Figure 1). We examined correlations between adiposity indices (body mass index, visceral fat, body fat percentage) and various sleep/circadian metrics, including total sleep time, chronotype, and rhythm regularity, while controlling for physical activity, age, and gender.

Results: The mean age of all participants was 41.5 ± 9.9 years, and 59.0% (46/78) were women, with no significant differences in age or gender across the groups (obesity, overweight, control) (Table 1). The obesity group had a significantly longer total sleep time, and lower interdaily stability and intradaily variability than the overweight and control groups (Table 2). The most significant correlations with adiposity indicators were observed with interdaily stability, as measured by both actigraphy and the Rhythm app (Tables 3 & 4). While sleep onset and wake times showed no significant differences between the two methods, the app-based measurements of circadian rhythm and sleep indicators aligned more closely with existing research than actigraphy.

Conclusion: This study underscores the importance of circadian rhythm regularity in obesity prevention and highlights the potential of integrating technology like smartphone apps in capturing complex sleep and circadian patterns. Such technological advancements offer promising avenues for enhancing our understanding and intervention strategies in the context of obesity-related circadian disturbances.



Algorithm for App-Measured Circadian Rhythm and Sleep Indicators.

Fig. 1.

Tab. 1.

	Obesity ({n} = 29)	Overweight ({n} = 16)	Control ({n}=33)	{χ}2 or F	{P}-value	Comparison
Gender						-
Male	10	7	15			
Female	19	9	18			
Age	44.4 (9.9)	40.8 (10.4)	39.4 (9.3)			
Body mass index (kg/m^2)	30.8 (2.7)	25.3 (0.8)	21.5 (1.6)	169.951	< 0.001	Ob > Ow > C
Body fat percentage (%)	40.4 (6.4)	34.4 (2.8)	27.6 (4.9)	46.850	< 0.001	Ob > Ow > C
Total Body Fat (g)	32237.2 (7012.5)	22527.3 (2023.3)	15532.2 (3496.2)	88.468	< 0.001	Ob > Ow > C
Total Lean Mass (g)	45804.0 (6636.6)	42914.4 (4047.8)	40324.1 (5555.2)	7.047	0.002	Ob > C
Visceral adipose tissue area (cm^2)	151.3 (40.2)	84.6 (18.5)	53.9 (23.0)	83.477	< 0.001	Ob > Ow > C
Physical activity (M10)	57.96 (26.58)	81.32 (17.71)	77.37 (22.55)	7.332	0.001	Ob < Ow,C
Pittsburgh Sleep Quality Index	7.5 (4.2)	8.4 (4.6)	5.3 (2.7)	4.186	0.019	Ow > C

Demographic Characteristics of Participants in Obesity, Overweight, and Control Groups.

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Tab. 2.

	Obesity		Overweight		Control		{P} value differences		
Sleep Indicators	App	Actigraphy	App	Actigraphy	App	Actigraphy	Group	Measurement	Interaction
Sleep onset	23.74 ± 1.01	23.11 ± 0.73	23.66 ± 0.83	23.75 ± 0.85	23.66 ± 0.83	23.75 ± 0.85	0.002	0.059	0.093
Wake time	7.37 ± 1.27	7.08 ± 0.99	6.91 ± 0.80	6.74 ± 0.89	6.91 ± 0.80	6.74 ± 0.89	0.040	0.503	0.678
Midpoint of sleep	3.56 ± 1.09	3.10 ± 0.70	3.28 ± 0.69	3.24 ± 0.82	3.28 ± 0.69	3.24 ± 0.82	0.043	0.166	0.393
Wake after sleep onset (minutes)	17.5 ± 27.0	2.4 ± 2.2	14.7 ± 14.7	3.1 ± 3.1	14.7 ± 14.7	3.1 ± 3.1	0.756	< 0.001	0.784
Total sleep time (minutes)	440.0 ± 52.3	475.8 ± 63.0	420.5 ± 48.3	416.4 ± 36.4	420.5 ± 48.3	416.4 ± 36.4	< 0.001	0.003	0.031
Circadian Rhythm Indicators									
Interdaily stability	0.17 ± 0.11	0.37 ± 0.12	0.22 ± 0.11	0.42 ± 0.12	0.25 ± 0.09	0.44 ± 0.11	0.001	< 0.001	0.951
Intradaily variability	1.30 ± 0.30	0.91 ± 0.18	1.28 ± 0.26	0.81 ± 0.22	1.22 ± 0.23	0.92 ± 0.25	0.538	< 0.001	0.229

Comparison of App-Measured and Actigraphy-Measured Circadian Rhythm and Sleep Indicators in Participants across Obesity, Overweight, and Control Groups.

Tab. 3.

	Body mass index				Body fat percentage				Estimate visceral adipose tissue area			
	App		Actigraphy		App		Actigraphy		App		Actigraphy	
	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value
Interdaily stability	-0.342 (0.123)	0.007	-0.225 (0.118)	0.060	-0.293 (0.106)	0.008	-0.292 (0.105)	0.017	-0.305 (0.105)	0.005	-0.268 (0.103)	0.011
Midpoint	0.188 (0.109)	0.088	0.012 (0.107)	0.911	0.278 (0.094)	0.004	0.011 (0.099)	0.912	0.188 (0.093)	0.047	0.015 (0.098)	0.879
Total sleep time	-0.119 (0.119)	0.327	0.458 (0.124)	< 0.001	0.024 (0.096)	0.816	0.417 (0.112)	< 0.001	-0.128 (0.104)	0.220	0.335 (0.106)	0.002
M10	-0.282 (0.108)	0.012	0.081 (0.135)	0.555	-0.252 (0.095)	0.009	0.101 (0.121)	0.407	-0.364 (0.093)	< 0.001	-0.039 (0.117)	0.740
Age	0.196 (0.108)	0.071	0.285 (0.107)	0.009	0.296 (0.093)	0.002	0.367 (0.121)	< 0.001	0.458 (0.091)	< 0.001	0.536 (0.093)	< 0.001
Gender	0.029 (0.111)	0.794	0.004 (0.096)	0.967	-0.158 (0.095)	0.100	-0.206 (0.093)	0.029	0.087 (0.093)	0.355	0.062 (0.091)	0.496
Adjusted R2	0.213		0.262		0.408		0.410		0.421		0.437	

Results of Multivariate Linear Regression Analyses on Weight Status and Body Composition Indicators (Model 1).

Tab. 4.

	Body mass index				Body fat percentage				Estimate visceral adipose tissue area			
	App		Actigraphy		App		Actigraphy		App		Actigraphy	
	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value	{β} (SE)	{P}-Value
Social jetlag	-0.111 (0.102)	0.318	-0.152 (0.099)	0.138	-0.127 (0.095)	0.184	-0.181 (0.093)	0.053	-0.135 (0.094)	0.156	-0.147 (0.090)	0.108
Midpoint	0.238 (0.113)	0.038	0.048 (0.109)	0.662	0.314 (0.097)	0.002	0.057 (0.099)	0.565	0.225 (0.097)	0.023	0.057 (0.096)	0.556
Total sleep time	0.031 (0.103)	0.783	0.452 (0.122)	< 0.001	0.153 (0.100)	0.120	0.411 (0.112)	< 0.001	0.006 (0.102)	0.951	0.331 (0.109)	0.003
M10	-0.272 (0.114)	0.021	-0.040 (0.131)	0.746	-0.238 (0.098)	0.019	-0.055 (0.110)	0.627	-0.349 (0.099)	0.001	-0.182 (0.110)	0.103
Age	0.238 (0.109)	0.035	0.264 (0.107)	0.016	0.332 (0.096)	0.001	0.338 (0.097)	0.001	0.497 (0.095)	< 0.001	0.508 (0.095)	< 0.001
Gender	-0.026 (0.111)	0.815	0.023 (0.106)	0.829	-0.206 (0.097)	0.037	-0.185 (0.097)	0.059	0.037 (0.097)	0.704	0.078 (0.094)	0.412
Adjusted R2	0.139		0.247		0.361		0.379		0.370		0.405	

Results of Multivariate Linear Regression Analyses on Weight Status and Body Composition Indicators (Model 2).

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GC1.044

Maternal Obesity Adversely Programs Female Offspring's Metabolic Adaptation to Pregnancy

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Aims/Hypothesis: Maternal metabolic adaptation is essential for fetal nutrient supply and intrauterine metabolism. This study aimed to determine whether and how maternal obesity alters female offspring's metabolic adaptation to pregnancy.
Methods: Maternal obesity was established by feeding C57BL/6J mice (F0) with a high-fat (HF) diet 3 months before and during pregnancy. Body weight and tissue development of F1 offspring were monitored after birth. F1 female offspring were fed with a regular chow or HF diet, and their metabolic adaptation to their own pregnancies was studied.
Results: As previously reported, maternal HF feeding reduced fetal growth. After birth, there was a quick catch-up of the body weight of F1 offspring from HF-fed dams (OF-HFD). In adulthood, body fat and adiposity of OF-HFD were significantly higher than those of offspring from chow-fed dams (OF-CD), but blood glucose and insulin concentrations were comparable between OF-HFD and OF-CD. During the offspring's own pregnancies, the usual increases of maternal body fat, blood insulin, and triglyceride concentrations in OF-HFD were significantly attenuated compared with female OF-CD. Glucose intolerance also was observed in pregnant OF-HFD. Interestingly, HF diet-induced body fat gaining rates were remarkably less in OF-HFD before their pregnancy. HF feeding even further reduced F2 fetal growth in pregnant OF-HFD. Despite no change in β-cell proliferation and tissue mass, blood insulin concentrations and glucose-induced insulin secretion rates of cultured islets were remarkably decreased in pregnant F1 offspring from HF-fed dams. Surprisingly, reduced hepatic triglyceride secretion and enhanced insulin signaling were detected in livers of pregnant OF-HFD.
Conclusions: These results indicate that maternal obesity induced by high-fat feeding adversely programs metabolic adaptation to pregnancy in female offspring.

GC1.045

Interesterified palm oil consumption rechallenge in adulthood could lead mice offspring to insulin resistance

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Introduction: A poor nutritional environment during critical periods of development, also known as windows of opportunity, can significantly contribute to the development of obesity and associated disorders, such as insulin resistance and type 2 diabetes. Interesterified fats have become popular in the food industry as a replacement for trans fats but few studies have already shown a correlation between its consumption and the development of metabolic disorders that affect insulin signaling in metabolically active tissues such as skeletal muscle and liver. However, the effects of maternal consumption of interesterified fats and a rechallenge with the same fat in adulthood on their offspring's metabolism remain largely unknown.
Methods: Female C57BL/6J mice were assigned to a normocaloric diet containing natural palm oil (P) or a diet modified with interesterified palm oil (I) for four weeks before mating and in the following periods: mating, gestation and lactation. Murinometric and biochemical parameters were evaluated during the pre-gestational and lactational periods. Pups were weaned onto the P diet from the 21st day of life until the 42nd, then subdivided into four experimental groups based on their mother's diet and the diet they received during the following 8 weeks, natural palm oil (P) or interesterified palm oil (I): PP, PI, IP and II. On day 98, the pups were euthanized and the soleus and liver were collected for qRT-PCR, Western Blotting, Oxidative Stress and Inflammatory Profile analyses.
Results: The body weight (BW) of I dams was higher in weeks 2 and 3 when compared to P dams, according to weekly consumption. But, in the first week of lactation, P dams showed higher BW, while at the end of lactation both groups achieved similar BW, leading to greater weight gain of I dams compared to P dams. Offspring's weight gain did not differ between groups. Following weaning, there were no differences in glycemic homeostasis between the groups. However, preliminary analysis indicates a reduction in pAkt in the soleus of male and female offspring in the PI and II groups compared to the PP and IP groups. Only male offspring showed a similar pattern in hepatic pAkt. Furthermore, oxidative stress analyzes show increased SOD (superoxide dismutase) activity and MDA (malondialdehyde) concentration in the liver of the IP group when compared to the PP group, and of II group compared to the PI group, whereas in the inflammatory infiltrate analyzes, there was an increase in the concentration of NAG and MPO in the liver of PI female offspring compared to PP.
Conclusion: These preliminary results show that a diet containing interesterified palm oil can impact dams' murinometric parameters, but not offspring's. However, a rechallenge in adult life with the same fat might induce molecular changes in the liver and muscle of the offspring. Further analysis are needed to investigate other biomarkers of insulin signaling as well as the mechanisms leading to its impairment.

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GC1.047

Association of DNA methylation with metabolic predictors of weight gain in Hispanic children

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Background: Within the United States (US), the prevalence of overweight and obesity is increased in Hispanics, which represent an underserved minority group. In particular, the prevalence of childhood obesity is increasing, in part due to an environment that encourages sedentary lifestyle and excess food intake. Interactions between genes and environment that manifest in an obesity phenotype can be evaluated through epigenetic signatures that contribute to metabolic predictors of obesity. The Viva la familia (VIVA) study was designed to assess genetic and environmental factors affecting obesity in Hispanic children. Using this cohort, we performed an epigenome-wide study to assess the potential role of DNA methylation in metabolic predictors of weight gain, including basal metabolic rate (BMR), energy expenditure (EE), dietary intake and physical activity.
Methods: We profiled blood-based DNA methylation levels in 916 Hispanic children (age 4-19 years; average 11.0 +/- 0.2) who participated in the VIVA study, a family-based study designed to identify genetic risk factors for childhood obesity. The study included 24-hour room calorimetry, providing extensive phenotypic data on energy utilization and metabolism for our analyses. We used a hybrid candidate gene/genome-wide probe library to profile ~2.6 million CpG sites in all individuals using MethylSeq. To generate preliminary data, SOLAR was used to perform association analysis on 144 of these individuals, with analysis of the full cohort currently underway.
Results: Basal metabolic rate was heritable (h2=0.32, p=9.6x10-5), although heritability analysis indicated both genetic and non-genetic components contributing to the variability of the trait. We tested for association between DNA methylation levels and BMR using inverse-normalization and adjusting for covariates (sex, age, age2, and their interactions). In our subset of 144 samples, we did not find significantly associated CpG

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loci after adjusting p-values for multiple comparisons using Benjamini and Hochberg's false discovery rate (FDR) method. However, we identified several CpG loci with nominally significant associations with BMR. The most significantly associated genes mapped to adiposity related genes RGMA (p=1.2x10-7) and LINC02240 (p=4.1x10-7), as well as metabolism related genes S100A8 (p=2.4x10-4) and RBM38 (p=1.1x10-7).
Conclusion: Although we did not identify significant associations after FDR-correction, several nominally significantly associated genes were identified, including those previously implicated in obesity and metabolism. We are currently analyzing the full data set (n=916) to assess DNA methylation signatures in BMR and other metabolic risk factors for obesity, as well as obesity itself. We anticipate that increased sample numbers and adjustment for the correlation structure of CpG sites will allow us to identify differentially methylated loci significantly associated with metabolic predictors of childhood obesity in an at-risk population.

GC1.048

Chronic Cold Exposure and Weight Loss in Individuals with Obesity

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Introduction: The rediscovery of brown adipose tissue in adult humans has led to a resurgence in interest regarding cold exposure (CE) research. CE has been found to increase energy expenditure (EE) (1), improve peripheral insulin sensitivity, and increase GLUT4 expression in the sarcolemma (2). These findings have led to the suggestion that CE could be used for body weight control and weight loss in individuals living with obesity.
Methods: 23 individuals living with obesity (34.7±3.5 kg/m^2) underwent one of three randomly assigned 8-week weight loss interventions: 1) CE (n=9); 2) diet (n=9); or 3) combined (n=5). The CE group underwent 90 minutes of CE every other day. The diet group underwent a 30% caloric deficit diet. The combined group underwent both the diet and CE interventions. Body composition, resting EE, and cold-induced EE were measured before and after weight loss. Data collection is ongoing.
Results: There were no significant changes in body weight seen across the three groups (p=0.152), however, the CE group body weight increased by an average of 0.3±2.5 kg, diet decreased by an average of 3.4±4.6 kg, and the combined group decreasing by an average of 2.7±5.3 kg. Similarly, there was no significant change resting EE following weight loss (p=.107), but the mean values differed, with CE decreasing from 1952±308 to 1944±280 kcal/day, diet decreasing from 2091±438 to 1967±362 kcal/day, and combined increasing from 1855±339 to 1875±294 kcal/day. Expectedly, all participants had a significant increase in EE when exposed to the cold (p<0.001), averaging 34.3±17.2 kcals above baseline over 90 minutes, however, there were no significant changes in cold-induced EE due to the various weight loss interventions (p=0.189).
Conclusion: This is the first study focusing on the weight loss potential of CE in individuals living with obesity as the primary outcome. Although preliminary, these results cast doubt on the ability of CE to feasibly create the sustained state of negative energy balance necessary to induce weight loss with the small increase in EE and possibly detrimental effects on the dietary weight loss intervention outcomes.

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GC1.049

The relationship between resting metabolic rate and hepatic fat in patients with overweight and obesity: A cross-sectional study

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Introduction: The correlation between resting metabolic rate (RMR) and visceral fat is a subject of conflicting findings in the literature. Some studies suggest a modest positive association between visceral fat and RMR due to the metabolically active role of the former and the obesity-induced chronic subclinical inflammation. On the contrary, others propose a neutral relationship, suggesting that hepatic fat constitutes a small component of total body fat, insufficient to significantly influence RMR. The aim of this study is to explore the association between RMR and hepatic fat in a sample of patients with overweight and obesity.
Methods: Anthropometric measurements were obtained from a cohort of 53 patients who were specifically referred for hepatic fat quantification through magnetic resonance imaging (MRI) from the Diabetes and Obesity Unit of our clinic. During their initial visit, prior to the liver MRI, they underwent RMR measurement using indirect calorimetry and body composition analysis with bioelectrical impedance. Depending on the distribution of the data, parametric or nonparametric tests were applied for analysis, which was performed using STATA.
Results: Fifty three patients were included, of which 35 were males (66%) and 18 females (34%), with a mean age of 48 years ±11.2 (mean ± SD) and a mean body mass index of 38.5 kg/m², 32.7, 44.7 (median, 25th and 75th percentiles). Linear and robust regression analysis revealed that RMR was independently correlated with gender, age, muscle mass, and fat mass (all p<0.05), but not with hepatic fat. After adjusting for confounders (gender, age, muscle mass), only muscle mass retained its statistically significant impact on RMR (coef.= 24.1, p<0.01), whereas both total and hepatic fat did not significantly influence RMR.
Conclusion: The present findings confirm the established correlation between muscle mass and RMR and highlight the absence of a relationship between hepatic fat and RMR in individuals with overweight and obesity.

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GC1.050

No differences in meal induced thermogenesis were observed in patients with type 1 diabetes (T1DM) with or without obesity compared to healthy controls

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Introduction: Traditionally, the phenotype of people living with type 1 diabetes mellitus (T1DM) was normal- or under-weight, however, there is evidence that this may be changing. Multiple studies have shown that the prevalence of overweight and obesity in people living with T1DM is

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rising. The aim of the present study is to assess the acute effect of the consumption of a test meal on metabolic parameters and meal-induced thermogenesis (MIT) in patients living with T1DM and obesity.
Methods: Four groups of participants were recruited, consisting of 15 lean healthy individuals (group 1/L), 15 patients living with obesity (group 2/O), 13 lean patients living with T1DM (group 3/DL), and 12 patients living with obesity and T1DM (group 4/DO). Patients were subjected to a 3-hour mixed meal test rich in protein and fat, wherein resting energy expenditure was measured at 60-minute intervals. We additionally assessed anthropometrics and body composition analysis.
Results: The mean BMI for group L was 22.1 kg/m^2 (SD: 1,8), for group O was 37,8 kg/m^2 (SD: 5,4), for group DL was 22,6 kg/m^2 (SD: 2,2) and for group DO was 34,3 kg/m^2 (SD:4,9). Body composition analysis showed that the fat percentage was 23,4% (SD: 2,6) for group L, 40,7% (SD:8,1) for group O, 23,08 (SD:6,8) for group DL and 35,4% (SD: 9,1) for group DO. MIT assessed in all patients reached statistical significance between resting metabolic rate and all time points thereafter (p<0,001). When area under the curve (AUC) of metabolic rate was compared between the four groups, the difference was statistically significant only between people living with obesity and individuals with normal weight (p<0,5). A trend was observed between group O and group DO, wherein people living with obesity and T1DM had lower AUC without reaching statistical significance (p=0,16).
Conclusion: Preliminary outcomes from this study displayed that resting metabolic rate and MIT had no significant difference between people living with T1DM and heathy controls. Limited is known about energy expenditure in people living with obesity and T1DM and the purpose of the present study is to explore further metabolic parameters, such as gut hormones in obesity and T1DM.

GC1.051

A replicate crossover trial on the interindividual variability in sleep responses to acute exercise

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Background: Chronically inadequate sleep quantity and quality are associated with adverse health consequences including obesity and cardiovascular disease. Single exercise bouts elicit modest but positive effects on sleep including improvements in sleep duration and architecture, and exercise performed close to bedtime does not appear to disrupt sleep during the subsequent night. Using a replicate crossover study design, we investigated the consistency of home-assessed markers of sleep quality and quantity in response to acute exercise and quantified the magnitude of individual differences in responses.
Methods: Eighteen healthy men (mean (SD) age: 26 (6) years; body mass index: 23.9 (2.5) kg/m^2) completed two identical control (8 h laboratory rest, 08:45–16:45) and two identical exercise (7 h laboratory rest; 1 h laboratory treadmill run [62(7)% peak oxygen uptake], 15:15–16:15) trials in randomised sequences at least five days apart. Wrist-worn actigraphy (MotionWatch 8, CamNTech) measured sleep metrics (total sleep time, actual wake time, sleep latency, sleep efficiency) in the home environment two nights before and three nights after the day of the exercise/rest interventions. Using Pearson's correlation coefficients, we quantified the consistency of individual differences between the replicates of control-adjusted exercise responses to explore the (1) immediate (night 3 minus night 2); (2) delayed (night 5 minus night 2); and (3) overall (average post-intervention minus average pre-intervention) exercise effect. Within-participant linear mixed models were used to derive participant-by-trial interactions and individual response SDs for each comparison.
Results: For all comparisons and outcomes, the 95% confidence intervals (CI) for the mean difference between exercise and control overlapped zero with trivial-to-moderate effect sizes (Cohen's d range: 0.06 to 0.55, P ≥ 0.111). Pearson's correlation coefficients between the replicates of control-adjusted exercise responses were not statistically significant and ranged in magnitude from trivial to moderate (r range = -0.44 to 0.41, P ≥ 0.065) (Figure 1A). Participant-by-trial interactions were trivial (P ≥ 0.157), apart from the interaction for sleep latency (P = 0.007) and sleep efficiency (P = 0.002) for the delayed effect of exercise. The individual differences SDs were small with wide 95% CI and were not supportive of true individual response heterogeneity (Figure 1B).
Conclusion: Control-adjusted sleep responses to single exercise bouts were inconsistent on repeated occasions and large trial-to-trial within-participant variability precluded the identification of true exercise response heterogeneity in sleep outcomes.

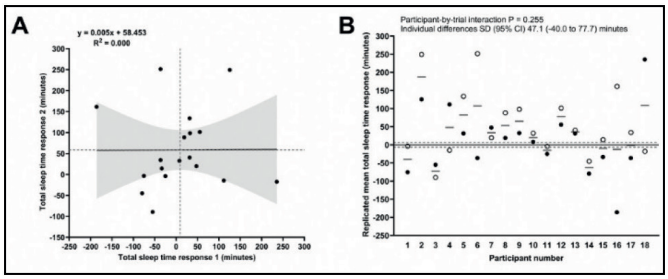


Figure 1. Panel A: Relationship between exercise and control pre-to-post change scores (night 3 minus night 2) on the two occasions for total sleep time in 18 healthy men. 'Response 1' calculated from the first pair of trials (exercise 1 minus control 1) and 'response 2' calculated from the second pair of trials (exercise 2 minus control 2). Dashed lines depict the mean responses and grey shaded region represents the 95% confidence interval of the regression line (black solid line). Panel B: Individual changes in total sleep time between the exercise and control trials (exercise minus control). Black and white circles indicate pre-to-post change scores (night 3 minus night 2) for response 1 and response 2, respectively, and grey lines indicate the replicated mean response for each participant. Dashed horizontal lines depict the standardised minimal clinically important difference calculated as 0.1 multiplied by the baseline between-participant SD.

Fig. 1.

GC1.052

Effect of Protocatechuic Acid on Prolongation of Fructose-Induced Villi in Mice with obesity

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Introduction: Fructose is often added or naturally present in foods and drinks. It is reported that fructose increases the length of intestinal villi and promotes caloric absorption, accelerating the development of obesity. Protocatechuic acid (PCA) is a natural phenolic acid present in various plants. This study aims to investigate the effect of PCA on intestinal villus length in mice with fructose-induced obesity and the possible underlying mechanism.
Methods: Male C57BL/6J mice were randomly divided into five groups (n = 8 each): (1) a low-fat diet (LFD) group; (2) a high-fat diet (HFD) group; (3) a HFD supplemented with 1% PCA (HFD+PCA) group; (4) a high-fat-high-fructose diet (HFHF) group; (5) a HFHF supplemented with 1% PCA (HFHF+PCA) group. The feeding experiment lasted 10 weeks. Body weight and diet intake were recorded. Small intestinal villus length,

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plasma lipids and gut microbiota were measured. Histology of organs were analyzed. Protein levels of genes involved in villi prolongation were quantified.
Results: PCA was found to alleviate the prolongation of fructose-induced villi in the small intestine. PCA could also reduce the body and adipose tissue weights. Hyperlipidemia and lipid intolerance were mitigated after PCA treatment. PCA significantly down-regulated the protein levels of LDHA and ENO1 in the hypoxia-inducible factor-1 (HIF-1) signaling pathway. The composition of gut microbiota was favorably modulated by PCA.
Conclusion: Fructose-mediated obesity was alleviated by PCA via shortening the small intestinal villus length, most likely by down-regulation of HIF-1 signaling pathway and the reshaping of gut microbiota.

GC1.053

Changes in intestinal permeability and gut microbiota following diet-induced weight loss in people with obesity, metabolic dysfunction-associated steatohepatitis and liver fibrosis

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Introduction: The mechanism through which weight loss improves metabolic dysfunction-associated liver disease (MASH) remains unclear. We explored whether changes in gut microbiota and intestinal permeability are part of the mechanism.
Methods: In this 24-week, prospectively-registered, single-arm trial (ISRCTN12900952), 16 adults with MASH, liver fibrosis, and obesity received a low-energy (880 kcal/d) total diet replacement programme with one-to-one remote support by a dietitian for 12 weeks and stepped food reintroduction for the following 12 weeks. Liver fat was blindly evaluated with magnetic resonance imaging proton density fat fraction. Intestinal permeability was estimated using zonulin, lipopolysaccharide binding protein (LBP), and intestinal fatty-acid binding protein (I-FABP) in serum at 0, 12, and 24 weeks. Selected faecal short chain fatty acids (SCFAs) were analysed with ion-chromatography mass-spectrometry (IC-MS) using a targeted approach. Faecal microbiota was determined with 16S rRNA gene amplicon sequencing at 0, 12, and 24 weeks. Data were analysed using mixed effects linear regression and sparse partial least squares regression.
Results: Fourteen participants (87.5%) completed the intervention, lost 15% (95% CI: 11.2%–18.6%) of their weight, and had clinically meaningful reductions in their liver fat (absolute change: −13.1% (95% CI: 8.9%–16.7%)). Zonulin significantly reduced at both 12 and 24 weeks (-152.0ng/ml, 95% CI: -217.4, -88.0, p<0.001). Each percentage weight loss point was associated with a 13.2ng/mL (95% CI: 3.8, 22.5, p<0.001) reduction in zonulin. For every 10 ng/mL reduction in zonulin, there was a 6.8% (95% CI: 3.5%, 10.2, p<0.001) reduction in liver fat. There was no evidence of significant change in LBP or I-FABP. There was a temporary decrease in the levels of SCFA. Of the 6 measured SCFAs, propionate was significantly reduced at 12 weeks (-0.4 ± 0.1, p=0.003) and remained lower than baseline at 24 weeks (-0.2 ± 0.1, p=0.047). There were significant transient reductions in the alpha-diversity indices of the gut microbiota (Shannon's diversity index and evenness) but no significant change between baseline and 24 weeks (p>0.05). These were not associated with changes in weight or liver fat. After transient increases at 12 weeks, inter-individual beta-diversity (Bray-Curtis dissimilarity index) was significantly reduced at 24 weeks compared with baseline at class, order, and family level but not at phylum or genus level.
Conclusion: Reductions in intestinal permeability can partly explain how weight loss improves liver disease severity in people with obesity and MASH. Changes in SCFAs and the gut microbiota profile with substantial weight loss were small and their contributions to the mechanism remain unclear.

GC1.054

Beta-cell function and insulinotropic actions of incretin hormones before and after Roux-en-Y gastric bypass in patients with type 2 diabetes

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Background: Roux-en-Y gastric bypass (RYGB) improves glucose tolerance in patients with type 2 diabetes (T2D), but whether RYGB affects beta-cells independently of signals from the gut is unclear. Also, the sensitivity of the beta-cell to glucagon-like peptide 1 (GLP-1) and glucose-dependent insulinotropic peptide (GIP) remains to be clarified. We aimed to investigate beta-cell function before and after RYGB, and particularly, the sensitivity of the beta-cell to the incretin hormones. We hypothesized that sensitivity to GIP would be increased after RYGB because of relieve of glucotoxicity.
Methods: Nine patients with obesity and T2D (5 women, age: 45±3 years, weight: 127.4±8.1 kg, BMI: 42.7±2.3 kg/m^2) were examined with a 75 g OGTT and three 90-min hyperglycemic clamps at ~15 mM plasma glucose (CV 2%) with primed continuous co-infusions of either GIP (1.5 pmol/kg/min), GLP-1 (1 pmol/kg/min) or saline before (pre) and 3 months (3mo) after RYGB. Beta-cell function was calculated separately for the OGTT (as beta-cell glucose sensitivity (β-GS): slope between insulin secretion rates and plasma glucose concentrations) and the intraveneous stimulation (first phase as the acute insulin response to glucose (AIR) (positive incremental (pi)AUC0-10 min) and second phase (piAUC 20-90 min) during clamps).
Results: After RYGB, fasting plasma glucose decreased (pre: 7.9±0.3 mmol/L, 3mo: 5.4±0.3, p<0.01) and insulin sensitivity improved (HOMA2 IR: pre 4.1±0.3, 3mo: 2.4±0.2, p<0.01). Weight loss was 19±0.7 kg (14.9%). During the OGTT, 2-hour plasma glucose decreased (pre: 13.6±0.7 mmol/L, 3mo: 7.3±0.8, p<0.01) and insulin secretion increased resulting in a two-fold increase in β-GS (pre: 0.9±0.1 (mmol/kg/min)/mmol/L, 3 mo: 1.8 ±0.1, p<0.01). GIP secretion decreased slightly after RYGB (piAUC pre: 5270±913 pmol/L·min, 3mo: 4310±339, p=0.01), whereas GLP-1 secretion increased markedly (pre: 1156±583 pmol/L·min, 3mo: 6007±691, p<0.01). During the saline clamp both first and second phase of insulin secretion increased after RYGB (AIR pre: 15±5 pmol/kg, 3mo: 58±15, p<0.01; piAUC 20-90 min pre: 296±54, 3mo: 445±54, p<0.05). GIP-infusion augmented second phase of insulin secretion equally before and after RYGB (pre: +96±16% vs saline-clamp, 3mo: +90±14%, p=0.57). GLP-1 infusions increased insulin secretion even more, with a small decline in the potentiating effect after RYGB (Pre: +399±84%, 3mo: +233±32%, p=0.03).
Conclusion: In patients with obesity and T2D, beta-cell function increases after RYGB both in response to oral and iv glucose. An insulinotropic effect of GIP was demonstrated before surgery and this effect was maintained postoperatively. The potentiating effect of GLP-1 on insulin secretion was pronounced both before and after surgery with a slight decline observed after RYGB. Thus, the improved beta cell function in response to an oral glucose stimulus after RYGB is the result of GLP-1 hypersecretion, rather than an increased insulinotropic action of the incretins.

GC1.055

Different variants of apolipoprotein e genes polymorphism in obese people

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Background: Currently questions on the role of genes polymorphism that regulate metabolism and implicated in metabolic disorders are disputed. Objective. The.

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Methods: The study involved 217 obese people. All the patients underwent genotyping of polymorphic sites c.388 (T>C) c.526 (C>T) of the ApoE gene. Proteomic studies included the determination of the content of adipokines (adiponectin, resistin, apelin and visfatin), cytokines (IL-6, TNFa, IL-1a), CRP and fatty acids L-FABP, annexin V. Assessment of metabolomic markers was based on a study of the lipid profile.
Results: It was established that, with the ApoE genotypes ε3 / ε3 and ε2 / ε3 of the ApoE gene, the content of lipids and glucose in patients with obesity was statistically significantly reduced, which indicated a high efficiency of diet therapy. In patients with the genotypes ε2 / ε2 and ε4 / ε3, no such patterns were found. The most pronounced changes in lipid metabolism are revealed in carriers of C allele at position c.388 and T at position c.526 of ApoE gene (c.388 T/C+c.526C/T and c.388 T/C+c.526 T/T). In the course of the execution of the correlation analysis of metabolomic and proteomic markers 1SNP or absence of SNP (c.388 T/T+c.526 C/T or s.388 T/C+c.526 C/C) in ApoE gene was found to be accompanied with dyslipidemia and the initiation of inflammation. At 2 SNP in the ApoE gene (c.388 T/T+c.526 T/T and c.388 T/C+c.526 C/T), we have identified correlations of lipid metabolism markers and adipokines (adiponectin, visfatin). At 3 SNP we found the relationship between adipokines (apelin, visfatin, resistin) and pro-inflammatory cytokines (IL1a), annexin V and lipid metabolism markers.
Conclusion: The studied polymorphic genotypes may be used in the complex with the individual characteristics of energy metabolism, hormonal and immune status of the patient for preventive medical measures and the implementation of a personalized diet of obese people.

GC1.056

Effects of fasting and intermittent fasting on THP1 macrophage metabolism and phenotypic profile

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Introduction: Intermittent fasting has raised interest as a dietary approach for obesity, with recent research suggesting its potential to modulate the body's inflammatory profile. Macrophages activation status and metabolism are closely related. Not only its profile changes in response to nutrient availability, but the acquisition of an M1 or M2 phenotype results in switches in their metabolic pathways. The effects of fasting and intermittent fasting (IF) on the inflammatory profile have been studied in vivo but its effects on macrophages in vitro have not been deeply studied. It is important, not only in terms of the implications of dieting or nutrient shortages but also from a practical point of view in studies in vitro. Here we assessed the effects of short-term in vitro fasting and IF on macrophage immune status, activating capacity and senescence.
Methods: THP1 macrophages were cultured in different nutrient-availability conditions. Cells were fasted by removing the serum from the media, and subsequently, replenishing it with serum for varying incubation periods. The cellular metabolic response was assessed by measuring changes in the MTS reduction capacities, as well as mitochondrial activity markers, including the NAD+/NADH ratio, AMPK activation, ROS production and the mitochondrial membrane potential. Moreover, the macrophages profile was studied with different inflammatory markers (IL1β, MRC1 and p65). Their senescence state was also assessed by using senescence markers (p21, p53, p16 and β-galactoside).
Results: We found fasting to shift macrophages into an M2 profile with reduced capacities to respond to stimuli, while IF promoted an M1 profile with a re-established stimuli response. These effects correspond to quick changes on metabolism and have long-lasting effects, even after the replenishment of nutrients. Moreover, IF promotes macrophages to enter senescence in earlier stages of the cell span.
Conclusion: Our results give an insight into the molecular changes that occur at a cellular level during fasting and IF. In addition, it emphasizes the importance of considering culture media composition when designing and interpreting in vitro experiments.

GC1.057

Impact of Bariatric Surgery on Intestinal Immunity: Insights from Rat Model Evaluating CD8αα and CD8αβ Ratios

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Introduction: The interactions between intestinal epithelial cells and luminal content (nutrients and microbiota) may favor the early inflammation in the gastro-intestinal (GI) tract that appears before the onset of obesity and contributes to its development Several studies have also revealed bidirectional interactions between intestinal epithelial cells and intraepithelial lymphocytes (IEL) that affects several intestinal functions such as hormone secretion, barrier integrity, and nutrient absorption. The remodeling of the GI tract by bariatric surgery such as vertical sleeve gastrectomy (VSG) and Roux-en-Y gastric Bypass (RYGB), results in important intestinal adaptations including increased number of GLP-1 positive cells and GLP1 secretion benefiting obesity comorbidities like Type 2.
We hypothesize that the remodeling of the GI tract by bariatric surgery could also impact intestinal immunity and contributes to the positive effects of bariatric surgery.
Method: 36 Wistar female rats were fed a high fat diet during 16 weeks before being operated on sham surgery, vertical sleeve gastrectomy (VSG) or Roux-en-Y gastric bypass (RYGB) (n=12 per group). Weight and food intake were measured daily for two weeks post-surgery. Post euthanasia, the jejunum was collected and divided into 3 segments: proximal, median and distal jejunum for SHAM and VSG animals and biliopancreatic, alimentary and common limb for RYGB animals. The lymphocytes from the intraepithelial compartment (IEL) and the lamina propria (LPL) were isolated and the different immune sub-populations were characterized by flow cytometry analyses with specific markers (CD45, CD3, TCRγδ, CD4, CD8α and CD8β). The different ratios of cell populations TCRαβ/TCRδ, CD8+CD4-/CD8-CD4- amongst the TCRδγ, and CD8αα/CD8αβ amongst the TCRαβ were compared between animals and according to their location. Results were analyzed with 2-way Anova and Tukey's multiple comparison tests. Values were considered as statistically different for $p<0.05$.
Results: Within the IEL, an increase of the CD8αα/CD8αβ ratio was reported in the proximal and median jejunum of VSG animals compared to equivalent segments of SHAM animals ($p<0.05$). A similar, non-significant trend was noted in LPL. The CD8αα/CD8αβ ratio was also increased in the alimentary and common limbs of the RYGB rats compared to the corresponding jejunal segments of the SHAM rats ($p<0.05$ and $p<0.001$ respectively) in the IEL with a parallel non-significant trend in PL. No other strong difference was reported except a reduced ratio of CD8+CD4-/

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CD8-CD4- amongst the TCRδγ in the LPL of the biliopancreatic limb of RYGB animals compared to proximal jejunum of SHAM ($p<0.01$).
Conclusion: Bariatric surgery impacts the intestinal lymphocyte CD8αα and CD8αβ ratio among the TCRαβ sub-population suggesting a decrease in the CD8αβ population. As CD8αα cells in epithelium and lamina propria denote a lower capacity to secrete proinflammatory cytokines than CD8αβ cells, these observations suggest that intestinal remodeling by bariatric surgery could directly decrease gut inflammation levels.

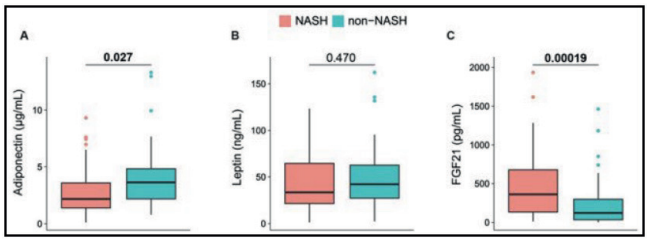
GC1.058

Adipose tissue fibrosis and adipocyte area: implication in non-alcoholic steatohepatitis development of patients with severe obesity

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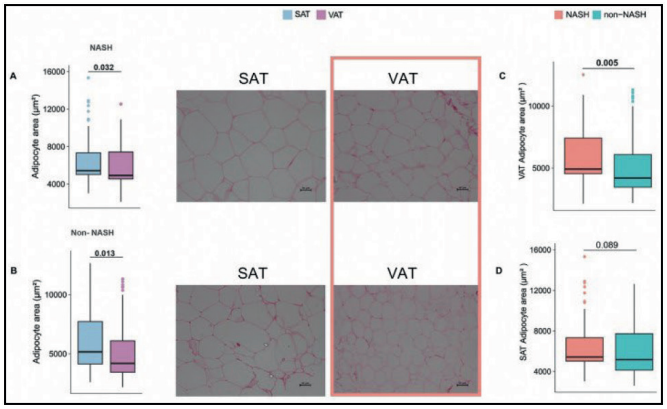
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Introduction: Obesity is the main risk for non-alcoholic fatty liver disease (NAFLD) development, and the prevalence of both diseases is increasing. Adipose tissue dysfunction has been suggested as a key factor in the development of obesity-related comorbidities. When the capacity of adipose tissue to store lipids is exceeded, expansion via hypertrophy can occur, leading to hypoxia, apoptosis and fibrosis. Ultimately, ectopic deposition of lipids and altered secretion of adipokines can be promoted, which can trigger NAFLD development and its progression to non-alcoholic steatohepatitis (NASH). However, not all the patients with severe obesity present NASH. The aim of this study is to determine if patients with severe obesity with NASH exhibit different subcutaneous and visceral adipose tissue (SAT and VAT) histological traits compared to individuals without NASH, and analyse if the circulating levels of three important adipokines changes between the groups.
Methods: Biopsies for liver, SAT, and VAT and blood samples were obtained from n=183 patients with severe obesity undergoing bariatric surgery. 71 patients were diagnosed with NASH and 92 without NASH. Plasma concentrations of adiponectin, leptin, and FGF21 were assessed via indirect sandwich Enzyme-linked immunosorbent assay. Histological analyses were conducted using stained slides of SAT and VAT. We measured the adipocyte area with Image J and assessed the FAT Score.
Results: The presence of adipose tissue fibrosis and SAT adipocyte area did not differ between patients with NASH and without NASH. Both displayed larger SAT adipocyte areas compared to VAT adipocyte areas. Patients with NASH showed a greater VAT adipocyte area, which was unrelated to VAT fibrosis, while the opposite was observed in patients without NASH. Besides, the plasmatic concentrations of adiponectin were lower in patients with NASH, whereas the concentrations of FGF21 were higher in those.
Conclusion: The histology of VAT, but not that of SAT, differed between patients with severe obesity with NASH and those without NASH. In addition, different plasmatic concentrations of adipokines were observed comparing these groups, and we could establish associations between these adipokines' concentrations and histological features of adipose tissue. Our findings suggest that the morphology and endocrine function of adipose tissue can differ between patients with NASH and non-NASH, indicating overall a potential influence of adipose tissue on the liver's health status.



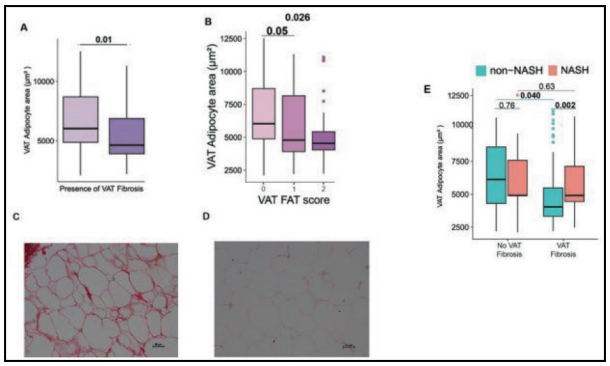
Plasma concentrations of adiponectin, leptin, and FGF21 determined in NASH and non-NASH individuals. A. Comparison regarding the plasma-concentration of adiponectin between NASH and non-NASH groups. B. Comparison regarding the plasma concentration of leptin between NASH and non-NASH groups. C. Comparison regarding the plasma concentration of FGF21 between NASH and non-NASH groups.

Fig. 1. Adipose tissue - liver crostalk: adipokines.



Areas of VAT and SAT adipocytes of the sudy patients. A. Comparison between the mean SAT adipocyte area and the mean VAT adipocyte area within NASH group (Sirius Red staining) (scale: 50 µm). B. Comparison between the mean SAT adipocyte area and the mean VAT adipocyte area within non NASH group (Sirius Red staining) (scale: 50 µm). C. Comparison regarding the mean VAT adipocyte area between NASH and non-NASH patients. D. Comparison regarding the mean SAT adipocyte area between NASH and non-NASH patients.

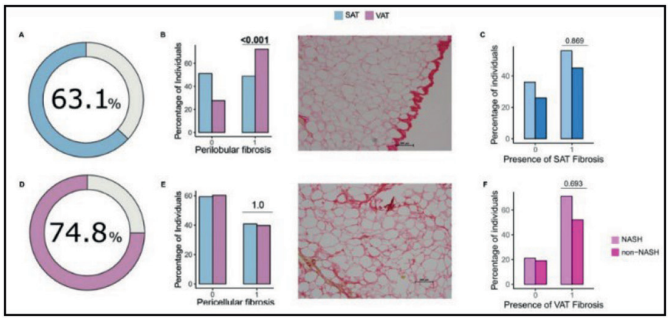
Fig. 2. Adipose tissue histology: adipocyte areas.



Adipose tissue fibrosis and adipocyte area. A. VAT adipocyte area and VAT fibrosis. B. SAT adipocyte area and SAT fibrosis. C. VAT adipocyte area and VAT fibrosis (scale: 50 µm) (Sirius Red staining). D. VAT adipocyte area observed in a patient who did not show VAT fibrosis (scale: 50 µm) (Sirius Red staining). E. VAT adipocyte area among the different VAT FAT Scores. F. SAT adipocyte area among the different SAT FAT Scores G. Comparison regarding VAT adipocyte area between NASH and non-NASH patients. H. Comparison regarding SAT adipocyte area between NASH and non-NASH patients.

Fig. 3. Adipose tissue histology: adipocyte areas and fibrosis.

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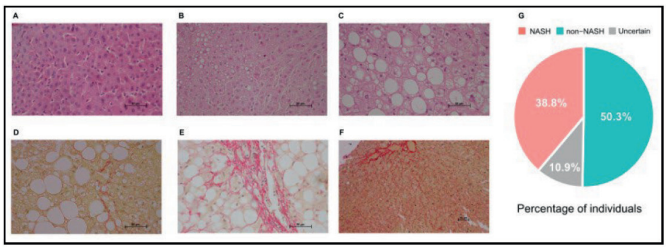


VAT and SAT fibrosis. A. Percentage of the patients that showed SAT fibrosis. B. Presence of SAT and VAT perilobular fibrosis (x = 1 present; x = 0 absent) (VAT sample, Sirius Red staining) (scale: 200 µm). C. Comparison regarding the presence of SAT fibrosis between NASH and non-NASH patients (x = 1 present; x = 0 absent). D. Percentage of the patients that showed VAT fibrosis. E. Presence of SAT and VAT pericellular fibrosis (x = 1 present; x = 0 absent) (VAT sample, Sirius Red staining) (scale: 200 µm). F. Comparison regarding the presence of VAT fibrosis between NASH and non-NASH patients (x = 1 present; x = 0 absent).

Fig. 4. Adipose tissue histology: presence of fibrosis.

- The mean **VAT adipocyte area**, but not that of SAT, is asociated with NASH.
- The presence of VAT and SAT fibrosis do not differ between NASH and non-NASH patients.
- The presence of **VAT fibrosis is asociated with smaller VAT adipocytes** only in non-NASH patients.
- NASH patients show lower plasmatic concentrations of adiponectin and higer concentrations of FGF21.

Fig. 5. Conclusions.



The hepatic liver histology of the studied patients (n = 183). A. Liver with no apparent ballooning or steatosis (scale: 50 µm) (Hematoxylin and Eosin staining). B. Liver with steatosis (scale: 50 µm) (Hematoxylin and Eosin staining). C. Liver with steatosis and ballooning (scale: 50 µm) (Hematoxylin and Eosin staining). D. Liver with moderate perisinusoidal fibrosis (scale: 50 µm) (Sirius Red staining). E. Liver with significant perisinusoidal fibrosis (scale: 50 µm) (Sirius Red staining). F. Liver perisinucoidal fibrosis (scale: 50 µm) (Sirius Red staining). G. Percentage of patients diagnosed as NASH, non-NASH, and uncertain.

Fig. 6. Liver histology: abnormal and heterogenic.

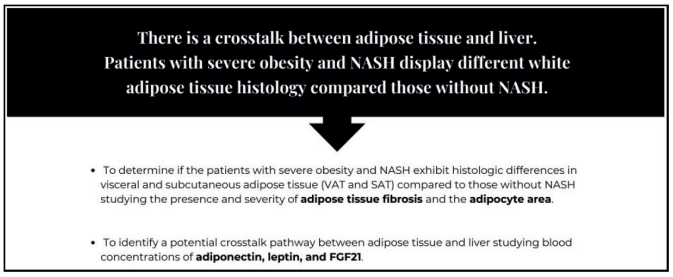
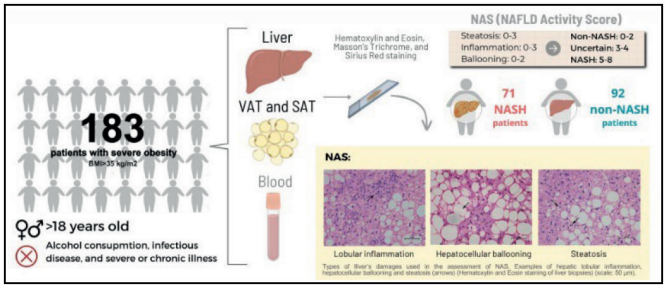
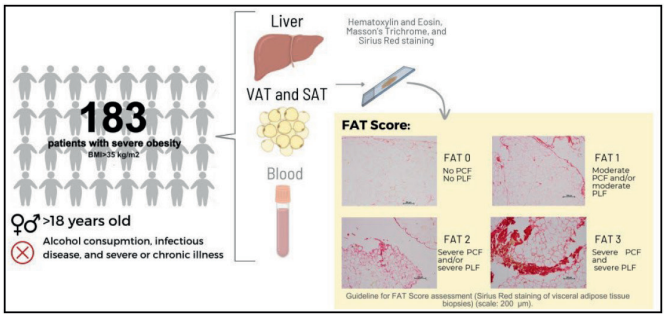


Fig. 7. Objectives.



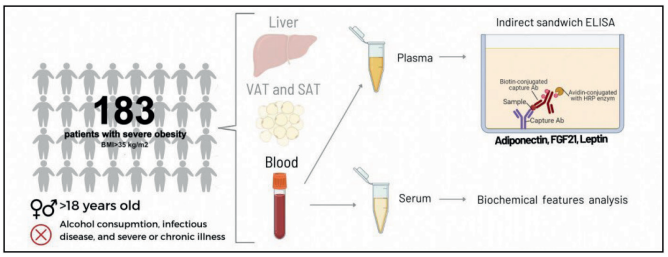
Schematic representation of the study design. Figure created using BioRender.com (BioRender Inc., Toronto, Canada). Abreviations: SAT: subcutaneous adipose tissue; VAT: visceral adipose tissue; NAS: NAFLD Activity Score.

Fig. 8. Study design 1.



Schematic representation of the study design. Figure created using BioRender.com (BioRender Inc., Toronto, Canada). Abreviations: SAT: subcutaneous adipose tissue; VAT: visceral adipose tissue; FAT Score; Fibrosis score of adipose tissue; PLF: perilobular fibrosis; PCF: pericellular fibrosis.

Fig. 8. Study design 2.



Schematic representation of the study design. Figure created using BioRender.com (BioRender Inc., Toronto, Canada). Abreviations: SAT: subcutaneous adipose tissue; VAT: visceral adipose tissue; Ab: antibody; ELISA: Enzyme-linked immunosorbent assay.

Fig. 8. Study design 3.

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GC1.059

The effect of intracerebroventricular administration of GALP on key hepatokines and hepatic glucose metabolism in mouse

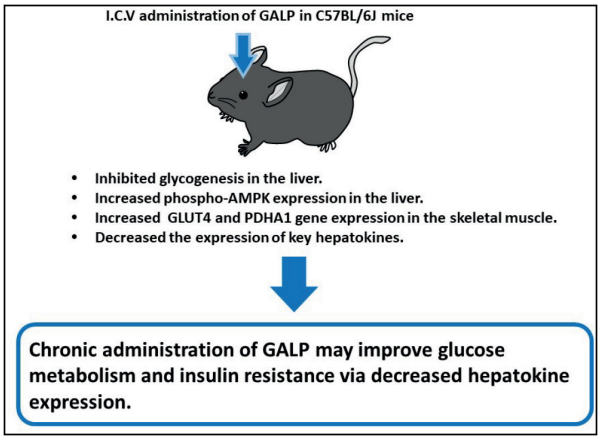
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Introduction: Galanin-like peptide (GALP) is a neuropeptide isolated and identified from the porcine hypothalamus. Previous studies have reported the anti-obesity effect of GALP. We found that intraventricular administration of GALP resulted in a gradual increase in respiratory exchange rate after 12 to 16 hours of administration. We thought that GALP also affects glucose metabolism, but the detailed mechanism has not been elucidated. In this study, we investigated the effects of GALP on glucose and lipid metabolism in the liver and skeletal muscle.
Methods: Nine-week-old male C57BL / 6J mice were intraventricularly administered a single dose of saline or GALP and dissected 16 hours later.
Results: There was no significant difference in body weight and blood glucose levels between the two groups. In the gene and protein expression levels, G6Pase associated with hepatic gluconeogenesis was significantly reduced in the GALP group. In addition, selenoprotein P (SeP) and Fetuin-A (Fet-A), which are hepatkines and known to induce insulin resistance in the liver and skeletal muscle, were significanty decreased in the GALP group. On the other hand, the gene expression of glucose transporter 4 (GLUT4), which is involved in glucose uptake into cells, was significantly increased by GALP treatment in skeletal muscle.
Conclusion: These results suggest that GALP intraventricular administration enhances glucose metabolism and improves insulin resistance via increased several hepatokines.

Conflict of Interest: No potential conflicts of interest were disclosed.

Funding: This work was supported by JSPS KAKENHI Grant Number 21K11632(S.H.).



In summary, GALP promote glucose metabolism and potentially improve insulin resistance via a reduction in some hepatokines.

Fig. 1. Summary of this study.

GC1.060

Hepatic steatosis in patients with obesity: The role of long-term glucocorticoid exposure and liver fibroblast growth factor 21

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Introduction: Obesity is associated with long-term biological stress, characterised by increased systemic glucocorticoid levels, as has repeatedly been measured in scalp hair. Glucocorticoid excess promotes fat accumulation in the liver and is associated with a higher prevalence of non-alcoholic fatty liver disease (NAFLD). In response to fat accumulation, the liver produces the hormone FGF21 which was shown to protect against NAFLD in mice. Therefore, we investigated whether the degree of hepatic steatosis was associated with FGF21 levels in the context of glucocorticoid excess among patients with obesity.
Methods: We included 62 women with obesity (BMI≈41.3 kg/m^2) who underwent bariatric surgery. Before surgery, long-term glucocorticoid levels were measured in scalp hair: cortisol (HairF) and cortisone (HairE). Liver biopsies were taken from patients who were classified as being relatively low-/normocortisolistic (HairF ≤ 3.2 pg/mg) or relatively hypercortisolistic (HairF ≥ 9.3 pg/mg). Liver biopsies were scored by two trained pathologists for the degree of steatosis based on the NAFLD activity score (NAS), which comprises 3 features: steatosis, hepatocellular ballooning and lobular inflammation. In addition the biopsies were also scored for the degree of fibrosis and portal inflammation. Liver FGF21 mRNA expression levels were measured using RT-qPCR.
We investigated the cross-sectional association between the severity of hepatic steatosis (consisting of NAS total score and separate features, fibrosis and portal inflammation) and liver FGF21 mRNA expression levels in the context of high/low hair glucocorticoid levels, using linear regression analyses, adjusted for age.
Results: In patients with high HairF or HairE, positive associations were observed between NAS total score, steatosis, hepatocellular ballooning and lobular inflammation with FGF21 levels (all $p<0.05$). No associations were observed between the severity of hepatic steatosis and FGF21 levels in patient with low HairF or HairE. In addition, no associations were found between portal inflammation, fibrosis and FGF21 levels. Also, no associations were observed between HairF or HairE with FGF21.
Conclusion: In women with obesity, specifically with high long-term biological stress, the severity of hepatic steatosis was positively associated with liver FGF21 mRNA expression levels. This supports the notion that FGF21 levels are increased in hepatic steatosis. However, it is unclear whether FGF21 has protective effects on NAFLD and whether it may be interpreted as a compensatory mechanism to high systemic glucocorticoid exposure.

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Antioxidant effect of *Opuntia stricta* var. *dillenii* peel and *Opuntia ficus-indica* pulp extracts in diet-induced steatosis in rats

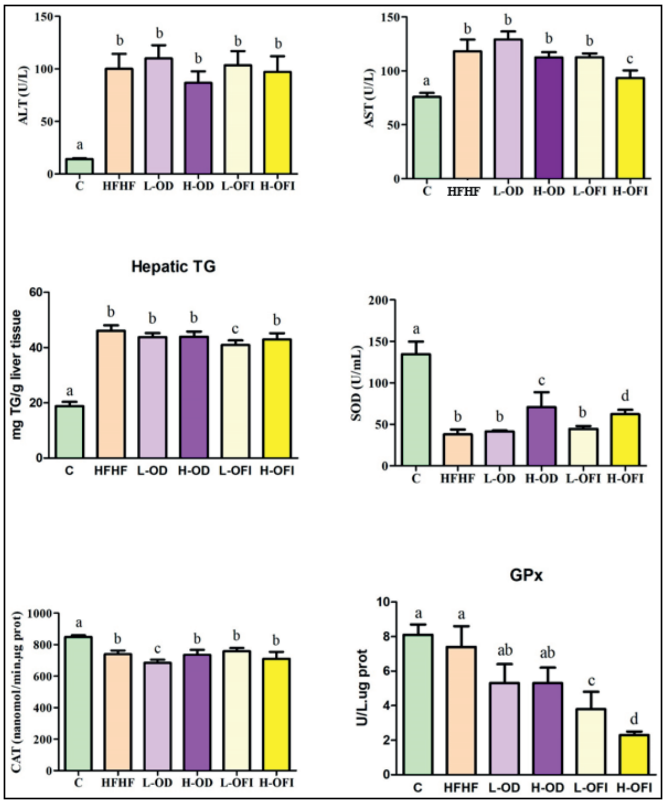
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Introduction: Nonalcoholic fatty liver disease (NAFLD) shows a wide spectrum of alterations, beginning with steatosis, which is characterized by excessive hepatic accumulation of triglycerides (>5%). It is well known that oxidative stress is one of the main factors involved in its pathogenesis. Nowadays there are not specific treatments, and thus new tools are being investigated to manage steatosis. *Opuntia stricta* var. *dillenii* (OD) and *Opuntia ficus-indica* (OFI), belonging to the *Cactaceae* family, are rich in bioactive compounds, such as flavonoids, phenolic acids and betalains, that could help in the prevention of steatosis [1]. The aim of this study was to analyse the effects of an OD peel extract and an OFI pulp extract on hepatic oxidative stress in a model of murine liver steatosis.
Methods: For this purpose, 60 male Wistar rats were distributed into 6 groups (n = 10) and fed either a standard diet (C group) or a high-fat high-fructose diet (HFHF group), supplemented or not with 25 mg OD peel extract/kg body weight (b.w.)/day (L-OD group), 100 mg OD peel extract/kg b.w./day (H-OD group), 25 mg OFI pulp extract/kg b.w./day (L-OFI group) or 100 mg OFI pulp extract/kg b.w./day (H-OFI group), for 8 weeks. Serum transaminase levels and liver triglyceride content were determined spectrophotometrically. Superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx) activities were determined by enzymatic assays.
Results: The HFHF diet led to an increase in final body and liver weights, along with higher hepatic triglycerides and serum transaminase levels. Although a significant reduction in liver weight was not observed after the administration of the extracts, H-OFI and L-OFI supplementations were able to significantly reduce serum aspartate transaminase (AST) level (21 %) and hepatic triglyceride content (11.3 %), respectively. Regarding antioxidant enzymes, the HFHF diet significantly inhibited both SOD and CAT activities, whereas no changes in GPx activity were observed. The H-OD and H-OFI treatments were able to partially prevent the SOD decrease induced by the diet (86.6 % and 63.9 %, respectively). In addition, negative results were observed with both L-OFI and H-OFI extracts, as they induced reductions in GPx activity when compared with HFHF group (-48 % and -69 %, respectively). In the case of CAT activity a deteroration was observed in L-OD group, due to the induction of an additional decrease (-7.4 %) compared to HFHF group.
Conclusions: The steatogenic diet induced hepatic oxidative stress. The administration of the OFI pulp extract partially ameliorated the steatosis induced by the HFHF diet. Nevertheless, H-OD seems to be the most potent extract in the prevention of oxidative stress caused by the HFHF diet, due to an increase in SOD activity and no negative modifications in CAT and GPx activities, compared with the HFHF group.

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Graphs representing the differences among tratment groups about serum transaminases, hepatic triglyceride content, superoxide dismutase activity, catalase activity and glutathione peroxidase activity.

Fig. 1. Serum transaminases, hepatig triglycerides, superoxide dismutase, catalase, glutathione peroxidase.

Table1. Intake and weight data.

	C	HFHF	L-OD	H-OD	L-OFI	H-OFI
Daily calorie intake (kcal/day)	76.6a	91.7b	90.0b	88.0b	88.0b	90.0b
Body weight gain (g)	232a	281b	267ab	261ab	274b	277b
Liver weight (g)	10.7a	22.0b	20.7b	20.8b	20.6b	21.0b

Daily caloric consumption, body wieght gain and liver weight data.

GC1.062

VLDL particles carrying miR-122 from the liver were associated with higher BMI in humans

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Introduction: Metabolic dysfunction-associated steatotic liver disease (MASLD) is strongly related with the prevalence of obesity. In the pathogenesis of MASLD there is an increase in VLDL content in the bloodstream, responsible for transporting mostly triglycerides to extrahepatic tissues, mainly adipose tissue. Recently, a study showed the presence of miRNAs into VLDL particles. A liver-specific miRNA, miR-122 involved in lipogenesis silencing, is modulated in hepatocytes, and has increased circulating rates in the MASLD models. This study aimed to investigate

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miR-122 levels into VLDL, liver and adipose tissue and its association with BMI in human patients.
Methods: Participants were invited to join our research signing the Research Ethics Committee under the protocol CAAE: 44054421.7.0000.5404. After agreement, liver, visceral and subcutaneous adipose tissues and plasma were collected from patients who underwent a cholecystectomy (to compound Control group) or bariatric surgery (for Obesity group) in Hospital das Clínicas – UNICAMP, Brazil. miR-122 expression was evaluated by RT-PCR in RNA later frozen tissues and in VLDL samples, isolated from plasma by ultracentrifugation.
Results: Patients with obesity (Ob) had normal levels of liver injury markers (AST and ALT) and fibrosis indicators (FIB-4 and APRI), and the lipid profile (cholesterol and triglycerides) wasn't different from control group (C) (N=19 C, 15 Ob). Despite that, hepatic miR-122 levels were increased in participants living with obesity compared with the control group (N= 5 C, 7 Ob; $p<0.0001$). Although some authors describe miR-122 as liver-specific, its expression were found in subcutaneous (N= 4 each group) and visceral adipose tissues (N= 11 C, 13 Ob), whereas in smaller quantities than the liver ($p<0.0001$). miR-122 expression was also found in VLDL particles, with no differences between groups (N=13 C, 10 Ob). miR-122 levels in VLDL and in liver were positively associated with each other and with the BMI.
Conclusion: VLDL particles can transport miR-122 from the liver to extrahepatic tissues in humans, and the presence of obesity has been sufficient to significantly increase the expression of miR-122 in the liver. Furthermore, adipose tissue, the main destination of VLDLs, exhibits lower levels of miR-122.

GC1.063

Hepato-protective profile of SGLT2 inhibitor short-term treatment is less significant in animal models of genetic obesity

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Introduction: the underlying mechanisms explaining the pleiotropic effects of SGLT2 inhibitors (SGLT2i) remain unclear, while their indications for clinical use are still increasing. Recent studies also proposed their beneficial effect in the setting of NAFLD: SGLT2i are in fact capable of reducing liver fat accumulation [1], enhancing the FGF-21 pathway [2], and reducing the burden of inflammation and fibrosis. However, it remains to be established if these modifications are displayed in both conditions of energy excess such as obesity and T2DM, and physiological settings.
In this study, we aimed to evaluate if the SGLT2i effects are different in lean animal and genetic models of obesity.
Methods: both C57BL/6J WT and B6.V-LEP (ob/ob) mice were randomly assigned to the control (placebo) or treatment group (dapagliflozin 0.15 mg/kg/day for 4 weeks) and liver gene expression of FGF-21 and markers of fibrosis such as TGF-β, α-SMA, PDGF-α and PDGF-β were evaluated at baseline and after treatment. We also evaluated the effect of dapagliflozin on liver steatosis through the assessment of hepatic triglyceride content.
Results: at basal conditions, expression of FGF-21, TGF-β, and PDGF-α were significantly higher in the ob/ob animal than in lean animals ($p<0.05$, $p=0.001$ and $p<0.001$, respectively), but interestingly, after treatment, the FGF-21 gene expression significantly increased in the liver of lean mice ($p<0.001$), while remaining unaffected in ob/ob mice. In addition, the expression of fibrosis markers remained unremarkable in lean animals, while tended even to increase in ob/ob animals after treatment. Finally, a more evident reduction of hepatic fat content was reported in lean than ob/ob mice.
Conclusions: dapagliflozin treatment increases FGF-21 liver expression along with a reduction of hepatic steatosis in lean more than ob/ob mice. These data suggest a possible less sensitive response to SGLT2i in obesity, probably due to chronic stimulation of the FGF-21 axis. Future studies are needed to understand the clinical implications of these results in the treatment of NAFLD.

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Conflict of Interest: None to Disclose.

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GC1.064

"Body and fat shaming" – are shame and avoidance a good way to build motivation to exercise in men with normal and excessive body weight? Analysis of results regarding obligatory exercise, muscle dysmorphia and positive body image

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Introduction: Currently commonly existing pressure to change the body shape and weight are very often related to body and fat shaming. This phenomenon is favourable social stigmatization of overweight and obesity, exposure to multiple forms of weight-related discrimination and mistreatment, and consequently, increases the risk of many psychopathological symptoms. The literature presents various data regarding women, but there are still no reports from men. Therefore, the aim of the study was to compare men with normal and excessive body weight with low vs. high level of motivation to exercise based on shame and avoidance in terms of obligatory exercise, muscle dysmorphia and positive body image.
Methods: Participants (N = 374 men; Mage= 28.96 ± 8.52) completed: (a) the Exercise Appearance Motivations Scale, (b) the Obligatory Exercise Questionnaire, (c) the Muscle Dysmorphic Disorder, (d) the Body Appreciation Scale-2. A median split was use to categorise participants as low or high in motivation for physical activity based on shame and avoidance. The second division factor was body weight (in accordance with WHO guidelines regarding BMI): (a) normal body weight, (b) excessive body weight (overweight and obesity). On this basis, four groups were analysed: (I) normal body weight and high level of shame and avoidance, (II) normal body weight and low level of shame and avoidance, (III) excessive body weight and low level of shame and avoidance, (IV) excessive body weight and high level of shame and avoidance.
Results: Referring to the selected results (analysed using Bonferroni post hoc ANOVA tests), our outcomes showed that: (a) the group with excessive body weight and a high level of motivation for physical activity based on shame and avoidance had a significantly higher level of obligatory exercise ($Mnormal = 42.80 \pm 10.36$ vs. $Mexcessive = 46.88 \pm 10.05$, $p < 0.05$), and muscle dysmorphia ($Mnor = 27.60 \pm 9.58$ vs. $Mexc = 34.37 \pm 9.36$, $p < 0.001$), as well as a significantly lower level of positive body image ($Mnor = 3.71 \pm 0.96$ vs. $Mexc = 3.35 \pm 0.88$, $p < 0.05$) than the group with normal body weight and a low level of shame and avoidance; (b) groups with high levels of motivation for physical activity based on shame and avoidance with normal and excessive body weight achieved similarly high levels of nonadaptive behaviours and psychopathological symptoms in regard to obligatory exercise ($Mnor = 45.71 \pm 10.01$ vs. $Mexc = 46.88 \pm 10.05$, $p > 0.05$) and muscle dysmorphia symptoms $Mnor = 34.53 \pm 9.91$ vs. $Mexc = 34.37 \pm 9.36$, $p > 0.05$); (c) the groups mentioned in the previous subpoint had similarly low score in terms of positive body image ($Mnor = 3.55 \pm 0.98$ vs. $Mexc = 3.35 \pm 0.88$, $p > 0.05$).

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Conclusion: These preliminary results may mean that, in general, motivation to exercise based on shame and avoidance may increase the risk of health-harming behaviours and psychopathological symptoms. Importantly, however, the group most exposed to the effects of this may be men with overweight and obesity. Therefore, when undertaking preventive and treatment activities, we should pay attention to the basis for building motivation for change.

GC1.065

A cross-sectional analysis of emotional and binge eating in UK adults enrolled on the NHS Low-Calorie Diet Pilot for Type 2 Diabetes

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Aims: This study presents data gathered as part the Re:Mission evaluation of the NHS low-calorie diet programme pilot for Type 2 Diabetes, to address two research questions: 1) What is the presence and severity of emotional and binge eating within this population? 2) Are demographic and health factors associated with the presence of binge eating or the severity of emotional eating?
Methods: An online survey gathered data from n = 580 individuals who were enrolled on the programme but had not yet begun total diet replacement. The survey assessed emotional eating (TFEQ-R21), potential Binge Eating Disorder diagnosis (BEDS-7), wellbeing (Short Warwick-Edinburgh Mental Wellbeing Scale), quality of life (EQ-5D-5L), frequency of weight cycling and demographic factors (collected via NHS England programme monitoring). Descriptive statistics and regression analyses were used to address the research questions.
Results: The mean emotional eating score from the TFEQ-R21 was 2.58 (0.96), and the presence of potential Binge Eating Disorder diagnosis was demonstrated in 24.3% of the sample. Regression analyses suggested that being female and engaging in more frequent weight cycling was associated with higher emotional eating and greater likelihood of binge eating. Lower wellbeing and lower quality of life were associated with emotional and binge eating, respectively.
Conclusions: Rates of emotional and binge eating in the NHS low-calorie diet pilot sample are higher than in the general public, and in other similar samples. Consideration should be given to screening for emotional and disordered eating, and for additional tailored support and monitoring for such individuals.

Conflicts of Interest: All authors confirm that they have no conflicts of interest to declare. Louisa Ells has received funding from NIHR, MRC, Leeds City Council and OHID/PHE in the last 3 years and has had an honorary contract with OHID. KC is a member of the Patient Advisory Board at Boehringer Ingelheim.

Funding: This project (NIHR132075) is funded by the NIHR Health Service and Delivery Research Programme. The views expressed in this abstract are those of the author(s) and not necessarily those of the MRC, NIHR or the Department of Health and Social Care.

GC1.066

Childhood trauma in patients with bariatric surgery – a comparison between women and men

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Barbara Mangweth-Matzek

Introduction: It is well described that trauma experiences are highly prevalent among obese patients. This study focused on gender-specific differences in patients undergoing bariatric surgery.
Method: In the course of psychosomatic evaluation for bariatric surgery, patients were also administered a questionnaire including the CTQ (Childhood Trauma Questionnaire). Demographic characteristics, weight history and various forms of abuse and neglect (emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect) based on the CTQ-scores were assessed.
Results: A total of 396 patients (256 women and 140 men) were included in the analyses. With regard to demographic and weight characteristics women and men were similar in age (Mean: 41 years), in partnership (more than 50%), maximum lifetime weight, frequency of overweight in mother and in father and predominance of early onset of obesity. As to childhood trauma experiences, the two groups showed high experiences of any abuse or neglect (80%) and did not difference gender-wise in most variables. They were similar regarding mean scores on physical abuse, sexual abuse, emotional neglect and physical neglect and differed only in emotional abuse.
Conclusion: Patients who undergo bariatric surgery, presenting with a morbid BMI above 40 describe extremely high prevalence rates of moderate to extreme childhood trauma experience. There seem to be no gender-specific differences in most forms of traumatization. Although causal dynamics were not assessed in this study, further research is need in order to examine the role of food as compensation for childhood maltreatment and neglect.

GC1.067

Taiwanese green propolis ameliorates metabolic syndrome via remodeling of white adipose tissue and modulation of gut microbiota in diet-induced obese mice

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Chronic overnutrition leads to hypertrophy of adipocytes, dysbiosis of gut microbiota, and low-grade inflammation throughout the body, thereby resulting in the progression of obesity-induced metabolic disorders. Taiwanese green propolis (TGP) has been used as a folk medicine since several decades ago and it possesses an extensive variety of biological properties, including anti- inflammatory and antioxidant activities. The anti-obesogenic property of TGP, however, is not yet completely explored. Therefore, we took a deep dive into the improved effects of TGP on adipose tissues (white and brown) and gut microbiota in high-fat diet (HFD)-fed mice. According to the results of serum biochemistry and histological analysis, TGP treatment at the dose of 1000 ppm ameliorated lipid profile, fat deposition, hepatic steatosis, the whitening of BAT mediated by the HFD in mice, and also increased the non-shivering thermogenesis (NST) caused by cold in BAT. Mice on HFD with the administration of TGP at 500 ppm showed reduced insulin insensitivity, glucose intolerance, and TGP also shuffled the composition of the gut microbiota and regulated metabolism-related bacteria group, including increasing the abundance of genus Lachnospiraceae NK4A136 group and decreasing the abundance of genus Desulfovibrio. According to the results of Pearson's correlation analysis, the prevailing microbiota changed by TGP was associated with the blood lipid and glucose homeostasis. The results of transcriptome analysis and micro-western array of visceral WATs exhibited that TGP increased WAT browning and beige adipogenesis, inhibited inflammatory pathway, and attenuated ROS, bringing about positive remodeling of WAT and offsetting the severe metabolic consequences of obesity. Therefore, we concluded that TGP exhibited anti-obesogenic activity via altering gut microbiota and modifying WAT, hence promoting energy homeostasis throughout the body.

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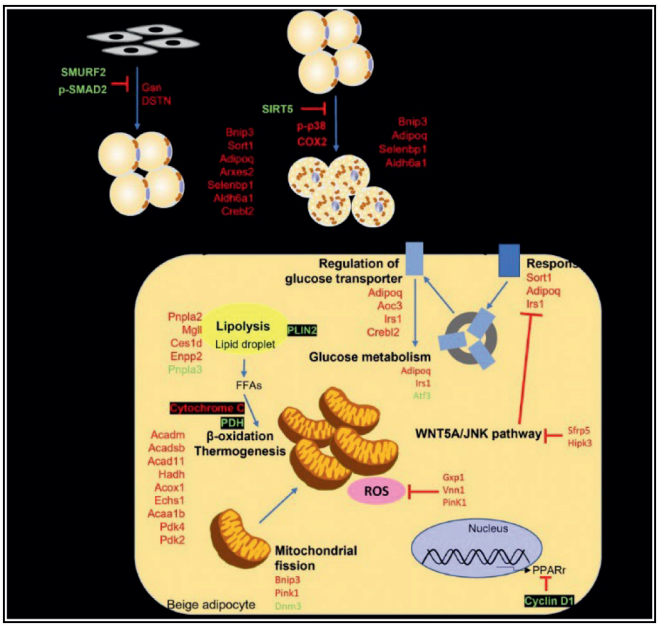


Illustration of pathways involved in the lipid and glucose metabolism in eWAT regulated by TGP.

Fig. 1. In conclusion, the TGP supplementation reduced the lipid profile as well as the ratio of fats and decreased the LD accumulation in cytoplasm of hepatocytes and white adipocytes. These were achieved by preventing the whitening of iBATs and strengthening their thermogenesis. Also, the supplement of TGP reshaped the structure of gut microbiota in HFD mice, where the dominant bacterial taxa were altered to change the metabolic parameters of obesity, IR, and lipid profile. By improving the WAT dysfunction and promoting the transition to beige adipocytes, TGP improved glucose tolerance and insulin sensitivity in HFD mice. Collectively, TGP shows strong potential to solve the problem of metabolic syndrome. Note: Up- and down-regulated genes are displayed in red and green color, respectively. Up- or down-regulated proteins analyzed by MWA are indicated in red and green with black backgrounds, respectively.

GC1.068

Body fatness predicts weight and fat mass gain during controlled overfeeding in men

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Introduction: The influence of the obesogenic environment on weight gain shows large inter-individual variability. Epidemiological data shows that lean individuals resist exposure to the obesogenic environment better than those with excess body weight (Wardle & Boniface. IJO 2008). Biological traits related to body size, body composition, or both may determine the resistance to weight gain when exposed to obesogenic conditions. This retrospective analysis studied the influence of baseline body mass index (BMI) and body composition (fatness) on weight and fat mass gains induced by an 8-week controlled 40% overfeeding in men.
Methods: 35 men aged [mean±SD (range)] 26±5 (19–40) years, with a BMI of 25.5±2.5 (22.1–31.4) kg/m² and body fat of 19.2±5.1 (10.5–28.0)% consumed for 8 weeks 40% more energy than needed at weight maintenance. The overfeeding diet supplied 15% of energy as protein, 44% as fat and 41% as carbohydrate. Participants ate their meals under supervision. Body composition was measured by DXA at baseline and after overfeeding. Pearson correlations and regression analyses were carried out to identify whether BMI, fatness, or both were related to weight gain and fat mass gain. The costs of weight gain and fat mass gain (kcal/kg) were calculated as the 8-week excess energy consumed (EEC) divided by the total body or fat mass gains.
Results: After 8 weeks of overfeeding, body weight increased by 7.2±2.1 kg and fat mass by 4.0±1.4 kg. Body weight and fat mass gains showed inter-individual variability of 5-fold (2.3–10.7 kg) and 9-fold (0.8–7.1 kg), respectively. EEC over 8 weeks was 67,001±12,777 kcal (39±7%), varying from 38,214 to 91,270 kcal (20–56%). The energy cost of weight gain was 10,434±4,673 (4,199–30,029) kcal/kg, while that of fat mass gain was 20,387±14,786 (6,274–91,190) kcal/kg. Unexpectedly, EEC did not associate with the gains in weight (r=0.08; P=0.65), fat mass (r=-0.03; P=0.86), or fat-free mass (r=0.15; P=0.39). Neither was baseline BMI related with the gains in weight (r=0.21; P=0.23), fat mass (r=0.22; P=0.20), or fat-free mass (r=0.09; P=0.61). However, baseline body fat percentage was directly related with body weight gain (r=0.58; P<0.001) and fat mass gain (r=0.60; P<0.001) but inversely related with the energy costs of weight gain (r=-0.49; P<0.01) and fat mass gain (r=-0.39; P=0.02). Stepwise linear regression analyses including EEC, baseline body fat percentage, age, and height identified body fat percentage as positive (34%) and age as negative determinants of fat mass gain (adjusted R^2=0.39; P<0.001), which persisted after further adjustment for baseline fat mass (kg) (adjusted R^2=0.37; P<0.001).
Conclusion: The 8-week excess energy intake during controlled overfeeding did not predict weight and fat mass gains in men. However, baseline fatness predicted body weight and fat mass gains. Our results emphasize the relevance of biological factors on weight gain, showing that leaner vs. fatter individuals resisted fat mass expansion better. The mechanisms conferring resistance to weight gain (energy expenditure and metabolizable energy from food) and its link to fatness deserve investigation.

GC1.069

Spontaneous nonsense mutation in Tuft1 (tuftelin 1) gene is associated with amelioration of glucose and lipid metabolism in the rat

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Introduction: Recently, we identified a recessive mutation, an abnormal coat appearance in BXH6 strain, a member of the HXB/BXH set of recombinant inbred (RI) strains. In this study, we report identification of the responsible mutation and describe its effects on metabolic traits.
Methods: Whole-genome sequencing (30X average coverage) was performed on genomic DNA isolated from blood. Parameters of glucose and lipid metabolism were measured by standard biochemical methods. The mass spectrometry proteomic analysis was performed on liver samples.
Results: Whole genome sequencing of the mutant rats identified the 195875980 G/A mutation in the Tuft1 (tuftelin 1) gene on chromosome 2, which resulted in a premature stop codon. Compared to wild-type BXH6 rats, BXH6-Tuft1 mutant rats exhibited lower body weight due to reduced visceral fat and lower ectopic fat accumulation in the liver and heart. Reduced adiposity was associated with decreased serum glucose and insulin, and increased insulin-stimulated glycogenesis in skeletal muscle. In addition, mutant rats had lower serum MCP-1 and leptin levels, indicative of reduced inflammation. Analysis of the liver proteome identified differentially expressed proteins from fatty acid metabolism and beta oxidation, peroxisomes, carbohydrate metabolism, inflammation, and proteasome pathways.

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Conclusion: These results provide evidence for an important role of Tuft1 gene in the regulation of lipid and glucose metabolism and suggest the underlying molecular mechanisms.

GC1.070

Transgenic rescue of mutant Endog (endonuclease G) gene in the SHR strain is associated with increased mitochondrial respiratory efficiency and amelioration of metabolic disturbances

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Introduction: Recently, loss-of-function mutation in Endog (endonuclease G) gene has been identified as a genetic determinant of impaired mitochondrial function and increased left ventricular mass in the SHR. In the current study, we used a transgenic rescue approach to analyze the effects of mutant Endog on parameters of lipid and glucose metabolism and mitochondrial function.
Methods: Transgenic SHR-Endog rats were derived by microinjecting fertilized eggs with a mix of the Sleeping Beauty construct containing Endog cDNA of BN origin under control of the universal EF-1alpha promoter and mRNA of the SB100X transposase. Parameters of glucose and lipid metabolism were measured by standard biochemical methods. Oxygen consumption was measured using high resolution oxygraphy.
Results: SHR-Endog transgenic rats with wild type variant of Endog when compared to SHR with mutant Endog gene showed decreased relative weight of epididymal fat, reduced ectopic fat accumulation in liver and heart, and lower serum triglyceride and nonesterified fatty acid levels, increased sensitivity of white adipose tissue to insulin action (lipogenesis), as well as increased palmitate oxidation and incorporation into brown adipose tissue lipids. Left ventricular mitochondria isolated from SHR-Endog transgenic rats operated at higher efficiency when compared to SHR, although the capacity and protein content of OXPHOS enzymes was comparable in both strains.
Conclusion: These results provide compelling evidence that mutant Endog is a novel determinant of metabolic disturbances in the SHR.

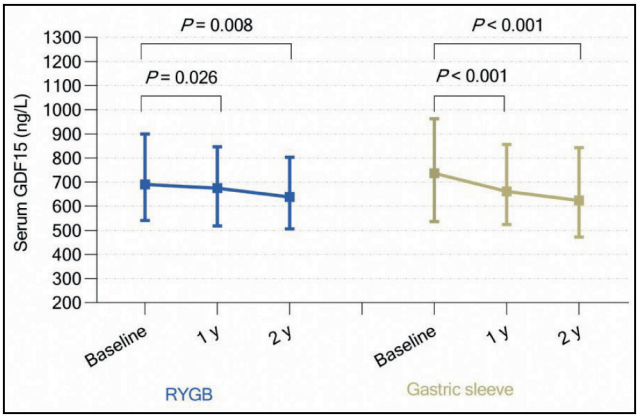
GC1.071

Long-term effect of bariatric surgery on circulating GDF15 concentrations

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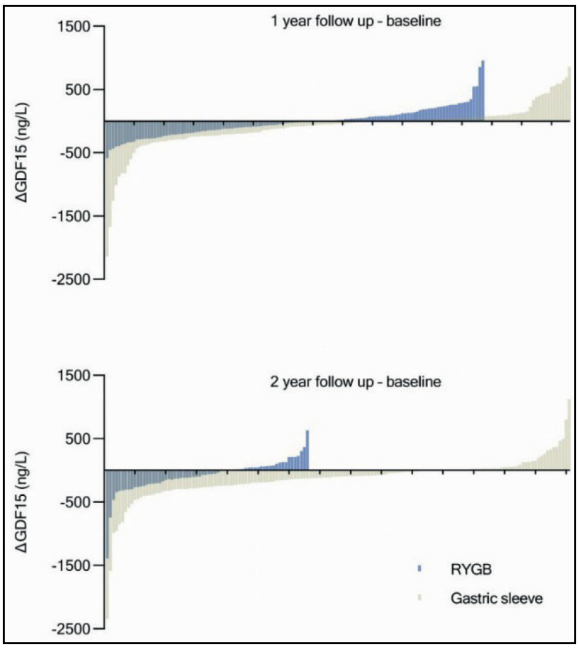
Introduction: GDF15 is a stress response cytokine involved in the regulation of appetite, and has emerged as a potential therapeutic target in obesity and T2DM. Several recent studies have investigated the long-term effect of bariatric surgery on circulating GDF15 concentrations, but findings are conflicting with both increasing and decreasing postoperative concentrations being reported. As all previous studies have measured GDF-15 using manual ELISA on modest sample sizes (N = 21 to 118), the aim of our study was to investigate the long-term changes in circulating GDF15 after bariatric surgery using an automated immunoassay on a larger sample size.
Methods: Our study was performed in western Norway as an observational two-center study in randomly selected patients with severe obesity (BMI > 40 or BMI > 35 and presence of comorbidity) undergoing routine bariatric surgery. N = 132 patients undergoing Roux-en-Y gastric bypass (RYGB) and N = 158 patients undergoing gastric sleeve (GS) were included. Serum was collected at baseline, 1 and 2 years following surgery and frozen at -80°C. Analysis was performed in one run on first thawed samples using the Roche ElecsysTM GDF15 high-throughput automated immunoassay.
Results: Patients undergoing RYGB and GS displayed a net long-term decrease of circulating GDF15 concentrations. The distribution of GDF15 measurements were non-normally distributed and pooled data (N = 290) showed a median concentration of 710 ng/L (IQR 538 – 939 ng/L) at baseline, decreasing to 672 ng/L (523 – 811 ng/L), $P < 0.001$ after one year and 634 ng/L (482 – 828 ng/L), $P < 0.001$ two years following surgery. Patients undergoing RYGB displayed a postsurgical reduction from a median baseline of 690 ng/L (538 – 900 ng/L) to 675 ng/L (518 - 846 ng/L), $P = 0.026$ 1 year postoperatively, and 638 ng/L (506 – 807 ng/L) at the 2-year follow-up, $P = 0.008$. Corresponding values for the group undergoing GS were 737 ng/L (536 – 963 ng/L), 662 ng/L (524 – 856 ng/L), $P < 0.001$ and 624 ng/L (472 – 843 ng/L), $P < 0.001$, respectively. Large *inter*-individual differences in delta-GDF15 concentrations after surgery were observed. 67% of the patients displayed a postsurgical decrease 2 years after surgery whilst approximately half as many (30%) displayed a long-term increase of circulating GDF15. The remaining 3% exhibited no change.
Conclusion: Our study is to date the largest investigation (N = 290) of the long-term effect of GDF15 following bariatric surgery. Patients undergoing RYGB and GS displayed a net long-term decrease of circulating GDF15, but large individual differences in delta-GDF15 following surgery were observed. We are currently performing statistical analyses that may help us identify factors impacting circulating GDF15 concentrations after bariatric surgery, e.g. weight loss parameters, biomarkers of inflammation or biomarkers of glycemic control.



GDF15 are presented as medians (IQR) due to being non-normally distributed. P-values calculated by Wilcoxons Signed Ranked tests, with an α = 0.025 (Bonferroni correction of α = 0.05/2 = 0.025).

Fig. 1. Serum GDF15 concentrations at baseline, 1 and 2 years following bariatric surgery.

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Each bar represents an individual patient, whilst each tick on the x-axis represents 10 patients.

Fig. 2. Waterfall plots showing individual GDF15 changes at 1 and 2 years compared to baseline.

GC1.073

The deletion of α7nAChR in hypothalamic POMC neurons impairs the energy balance, glucose homeostasis, and leptin signaling in male mice chronically exposed to a high-fat diet

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The hypothalamus regulates energy balance control through the neuropeptide expression as pro-opiomelanocortin (POMC) further hepatic glucose homeostasis. POMC neurons can be mediated by the JAK2-STAT3 pathway through receptors such as alpha 7 nicotinic acetylcholine receptor (α7nAChR) and leptin receptor. Recent studies have shown mice α7nAChR-/- exposed to a high-fat diet (HFD) presented an phenotype similar to a people with obesity (increased body weight, hepatic insulin resistance, and reduced energy expenditure). Thus, this study aimed to evaluate metabolic parameters, glucose homeostasis, and leptin signaling in mice knockout to α7nAChR in POMC neurons exposed to a HFD. Genetically modified animals were used in this study: α7fl/fl (control) and α7fl/flPOMCCre (knockout). Firstly, mice had their body weight, metabolic parameters, glucose homeostasis, and leptin signaling evaluated on the chow diet. All procedures are described below. Then, mice were exposed to a HFD (45%kcal; lipids; 4.6 kcal/g) from the 4th to the 8th week. Body weight was measured weekly. Glucose and Insulin tolerance tests (GTT and ITT) were performed on the 8th week as body weight gain and loss and adiposity measurement. Metabolic parameters were obtained by indirect calorimetry in the 8th week. A group of mice received a leptin stimulus intraperitoneally (2.5μg/kg of body weight) and euthanized after 30 minutes. The entire hypothalamus was used to analyze some proteins involved in the leptin signaling. The unpaired Student t-test was used to compare groups. Interestingly, knockout mice on a chow diet were lighter than control after weaning. However, knockout mice showed an increased body weight gain which was related to an increased food intake. α7fl/flPOMCCre also showed a delay in the anorexigenic response induced by an intraperitoneal leptin stimulus as well as an impairment in its hypothalamic signaling. Otherwise, α7fl/flPOMCCre exposed to a high-fat diet showed no difference in body weight and body weight gain but an increase in body weight loss. Besides, showed increased adiposity. Knockout mice presented a reduction in glucose decay rate (ITT) and no difference in the GTT. Furthermore, food intake and reduced heat in the dark cycle in α7fl/flPOMCCre mice were increased. Thus, the deletion of α7nAChR has repercussions on body composition by inducing a positive energy balance and concurrently exacerbating impairment in glucose homeostasis. Leptin signaling seemed to be impaired in knockout mice on a high-fat diet as showed in the male mice on chow.

GC1.074

Dysregulation of plasma metabolite variability in South Asian Indian males with type 2 diabetes

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Plasma metabolome is a whole-body readout of its metabolic regulation. As such, it can act as a highly sensitive tool for identifying metabolites for designing nutritional and pharmacological interventions for maintaining metabolic homeostasis leading to healthy aging. We have evaluated plasma metabolomic correlates of type 2 diabetes (T2D) in South Asian Indian male participants: 30, who were apparently healthy, non-diabetic (38.2 ± 5.7 years, BMI 25.1 ± 2.2 kg/m^2) and 29, with T2D (48.8 ± 8.1 years, BMI 24.7 ± 2.8 kg/m^2), using a high-resolution accurate mass orbitrap-based untargeted metabolomic approach.

We obtained Coefficients of Variation (CV = SD/mean) for 1308 identified plasma metabolites. Relative abundance of 100 of these metabolites were significantly different between plasma from participants without and with T2D, at FDR<0.10. We categorized these 100 metabolites according to CV ratio (CVR = T2D CV/NGT CV) into CVR>1 [T2D high CV (T2DHC)], CVR=1 and CVR<1 [NGT high CV (NGTHC)]. T2D plasma metabolome exhibited much higher variability [T2DHC: 63 versus NGTHC: 33 metabolites]. Only 4 metabolites exhibited similar variability in T2D and NGT plasma. Acetylcholine exhibited 60% increase in variability but 67% decrease in relative abundance while cortisol exhibited 70% decrease in variability but 38% increase in relative abundance in T2D plasma.

Amongst the 1308 metabolites with similar relative abundance between T2D and NGT, 883 (68%) exhibited higher variability in T2D (CVR>1), 95 (7%) exhibited similar variability and 230 (18%) exhibited lower variability in T2D (CVR<1). Majority of the metabolites with extremely different variability in T2D versus NGT plasma are exogenous drugs or their metabolites. Carnitine synthesis, retinol, pyrimidine and phenylacetate metabolism were pathways with increased variability while alpha linolenic acid, linoleic acid, sphingolipid metabolism and fatty acid biosynthesis were pathways with decreased variability in T2D plasma.

Pathways highlighted by this combined analysis of relative abundance and variability are likely to provide new insights into the dysregulation of metabolic homeostasis that accompanies T2D. Future, larger untargeted plasma metabolomic studies will be key towards identification of plasma metabolites and pathways associated with regulation of variability in T2D that are likely to help in identification of novel biomarkers and therapeutic candidates.

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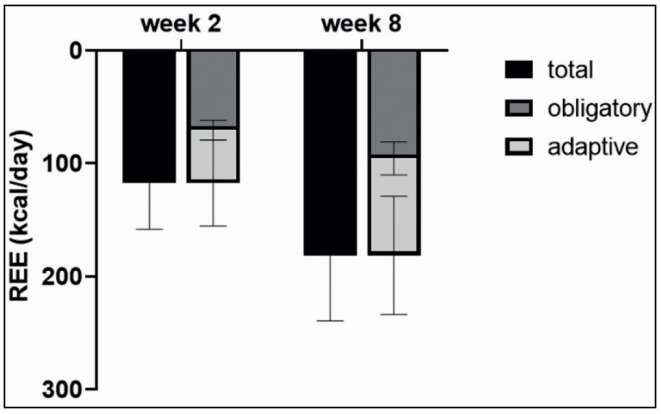
GC1.075

Assessment of dynamic reductions in resting energy expenditure during rapid weight-loss

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Introduction: Voluntary weight-loss results in obligatory reductions in resting energy expenditure (REE) following the loss of metabolically active fat-free mass (FFM). This is often accompanied by adaptive reductions in REE designed to restore energy balance whilst in energy deficit, a process referred to as adaptive thermogenesis (AT). Such declines are suggested to be amplified during rapid weight-loss resulting in early weight plateau and less-than-predicted weight-loss.
Methods: 22 females with overweight or obesity enrolled on a commercial total diet replacement programme (TDR) for 8 weeks, providing 600 kcal and 50g protein per day (LighterLife UK Ltd, Essex). Measures of body weight, body composition (fat mass, FFM, total body water) and REE were collected at baseline, week 2 and week 8. Body composition was measured using both multi-frequency bioelectrical impedance analysis (MF-BIA) and dual-energy X-ray absorptiometry (DXA). REE was measured by indirect calorimetry using a ventilated hood. AT was estimated as the difference between measured REE and that predicted by FFM.
Results: Participants lost 3.80±1.68 kg body weight at week 2 and 8.96±3.81 kg at week 8. FFM reductions of 2.24±1.30 kg and 3.17±2.05 kg occurred at week 2 and 8 respectively, consisting largely of total body water; 1.25±1.22 L at week 2 and 1.86±1.35 L at week 8. After 8 weeks, REE decreased by 181±238 kcal/day (48% of REE reductions attributed to AT). Two-thirds of total REE reductions occurred by week 2 (117±183 kcal/day, 40% attributed to AT). Across all timepoints, MF-BIA estimates of fat mass were 6–7 kg lower than that measured by DXA. Subsequently, MF-BIA underestimated FFM loss by 0.5–0.6 kg at week 2 and 8.
Conclusion: TDR resulted in clinically significant weight-loss within 8 weeks. FFM reductions were considerable, however this may be attributed to significant fluid losses. A >10% reduction in REE was observed at week 8, yet approximately 65% of this reduction occurred in the first 2 weeks of weight-loss. 40% of REE reductions at week 2 were explained by AT, supporting the existence of an immediate AT response. MF-BIA provided systematically lower estimates of fat mass compared to DXA, giving the illusion of more desirable body composition changes. Thus, MF-BIA estimates in clinical weight management should be interpreted with caution.



Data is presented as mean (SEM). Total REE represents REE measured by indirect calorimetry, obligatory REE represents that predicted by loss of FFM and adaptive REE represents that assumed adaptive thermogenesis (REE-measured–REE-predicted). FFM, fat-free mass; REE, resting energy expenditure.

Fig. 1. Changes in resting energy expenditure at week 2 and 8.

GC1.077

In vivo anti-obesity properties of a Lactiplantibacillus plantarum probiotic strain

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Introduction: The search for new approaches to address the complex development of obesity and related comorbidities has turned in the recent years onto the not so new field of probiotics. Probiotics, live organisms which confer health benefits to the host, have been showed to influence gut microbiota composition and function, modulate metabolism, and improve overall physiological parameters. In this context, it is imperative to characterize the strain-specific effects and their mechanisms of action for a deeper knowledge and further clinical applications. Previous studies by our group with different bacterial strains in *C: elegans* have led to the selection of a novel strain of *Lactiplantibacillus plantarum*. In this work, we unveil the effects of this probiotic in diet-induced obese Wistar rats by using a multi-level approach involving body composition measurements, transcriptomics and metagenomics analyses.
Methods: Wistar rats with high-fat-high sugar (HFS) diet-induced obesity were treated with 109 CFU/day of *L. plantarum* (*L. plantarum* group, n= 14) for 10 weeks. The outcomes were compared with those of rats receiving a control balanced diet (CNT group, n= 8) and rats receiving only the HFS diet (HFS group, n= 14). Body composition measurements, including total weight, fat depots and tissue weights, and serum biochemical analyses, were performed at the end of the study. Gene expression analyses were carried out by qPCR in mesenteric fat samples. 16S metagenomics analyses were conducted in fecal samples.
Results: Animals supplemented with *L. plantarum* showed lower percentages of mesenteric, retroperitoneal, subcutaneous, visceral, and total fat, together with an increase in gastrocnemius muscle weight when compared to the HFS group. The treatment also reduced the serum levels of the inflammatory marker MCP-1 and slightly improved glucose tolerance after a glucose tolerance test. Metagenomic analyses revealed a significant increase of *L. plantarum* in the fecal samples of the treated group, which also modulated the diversity and composition of the microbiota.
Conclusion: Our results suggest this novel *Lactiplantibacillus plantarum* strain as a potential probiotic for the prevention and treatment of obesity and its related comorbidities, including the excess of adiposity, inflammation, and gut microbiota dysbiosis.

Conflict of Interest: None Disclosed.

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GC1.078

Putative players in metabolic health: gut-bacteria derived membrane vesicles have distinct functionalities dictated by composition

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Introduction: The intestinal microbiota play a pivotal role in human health. In diseases such as type 2 diabetes (T2D) and obesity, the composition and functionality of the gut microbiota is often altered, with profound implications for human host energy and substrate metabolism. Gut bacteria produce bacterial membrane vesicles (bMVs) containing metabolites, nucleic acids and toxins. In animal models, gut bMVs can exit the intestinal lumen to reach systemic circulation and home to insulin sensitive tissues. Thereby they can affect host energy metabolism leading to diabetic phenotypes. In humans, potential effects of bMVs on the human host in the context of metabolic disease are poorly characterized. In this work, we relate the gut-bMV repertoire to the composition of bacterial strains in 12 study participants living with prediabetes (with BMI > 25 kg/m^2) and 12 healthy control participants. In addition we characterize immunogenicity of feces-derived bacterial membrane vesicles in vitro.
Methods: Fecal samples were collected and bMVs were purified through consecutive (ultra)centrifucation and size exclusion chromatography steps. DNA was obtained from feces-derived bacteria and bMVs. Column-purified DNA was subjected to 16S rRNA variable region amplification and Illumina sequencing. Normalized amounts of feces-derived bMVs were incubated with human THP-1 macrophages and differentiated adipose-tissue derived mesenchymal stem cells (hMADS) in vitro. Inflammatory cytokine expression and secretion (IL6, TNFα, IL1β) was related to vesicle composition.
Results: Per gram of fecal matter, ~10^{11} bMVs were isolated. The composition of bMVs is dissimilar from the fecal bacterial composition. Gram negative anaerobes such as *Bacteroides*, *Alistepes*, *Barnesiella*, *Coprobacter* and *Odoribacter* are overrepresented in vesicle compositions whilst not in bacterial compositions. No clear differences in bacterial composition or vesicle composition can be observed between participant groups. However, the immunogenic potential of fecal bMVs on macrophages and adipocytes is largely explained by the proportional abundance of vesicles attributed to the Lachnospiraceae family. Intriguingly, the abundance of *Akkermansia* vesicles appears to be negatively correlated to IL1B production by THP1 macrophages, but not for IL6 and TNFa.
Conclusions: Gut-derived bMVs add complexity to microbiome-host interactions as their composition is different from the composition of the bacteria that produced them. Although bMV compositions themselves are not different between the investigated participant groups, their immunogenic potential is dictated by their bacterial origin and might be a determinant of host immunometabolism. Research looking into translocation of gut bMVs to metabolic tissues in humans is warranted, to investigate effects on host energy and substrate metabolism.

Conflict of Interest: None disclosed

Funding: No external funding to report

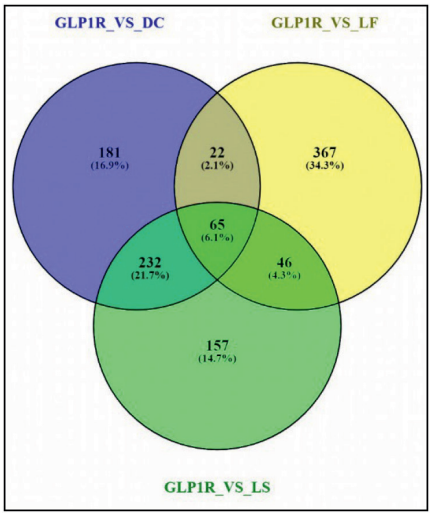
GC1.079

Identification of bioactive natural compounds with GLP1R agonist activity: An *in silico* approach

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Introduction: Despite the effectiveness of current GLP1R agonists like semaglutide and tirzepatide, their long-term benefits are under review, mainly derived from recent data showing an increasing number of side effects and their subcutaneous administration (1). Recent advancements have highlighted non-peptidic analogs, such as TTOAD2 and Orforglipron, as potential solutions to these challenges (2,3). The present work focuses on identifying, through high-performance computational techniques, new non-peptidic natural-derived bioactive compounds that may activate the Glucagon-like-peptide receptor 1 (GLP1R), offering a promising alternative to existing drugs with fewer adverse effects.
Methods: Ligand-based and structure-based virtual screening have been employed to select natural molecules as bioactive compounds with GLP1R agonist activity. Next, the top 100 compounds with the highest similarity or docking score were chosen for additional visual analysis, in order to determine whether they interacted with key residues of the GLP1R. Finally, we carried out a consensus through the Venn diagram (4). This procedure allowed the identification of 65 compounds present in all computational methods indicating high potential as a GLP1R agonists.
Results: From all 65 potential molecules, our results showed Natural Compounds A and B*, derived from a plant source were able to strongly bind to the crucial residues in a similar way that non-peptide GLP1R agonists TTOAD2 and Orforglipron do, suggesting their potential activity as GLP1R agonists.
Conclusion: In silico studies provide a systematic way to explore new bioactive compounds for GLP-1 receptor agonism. Our computational research identified Compounds A and B, derived from natural sources, as having notable in silico agonist activity on the GLP-1 receptor. These compounds are currently being further investigated for their efficacy in obesity treatment through in vitro analysis.
*Compounds and natural sources were masked for patent issues.



Venn diagram showing the similar compounds among different ligand-based and structure-based virtual screening techniques.

Fig. 1.

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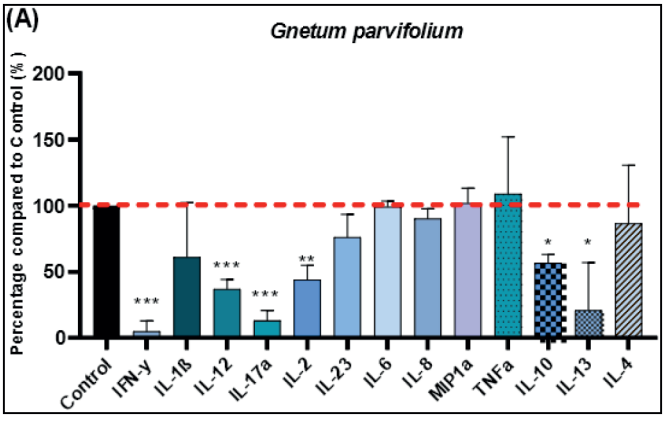
GC1.080

Anti-inflammatory effects of Gnetum parvifolium and it Major Bioactive Compound, Isorhapontigenin: Impact on Oxidative Stress, Cell Viability and Obesity

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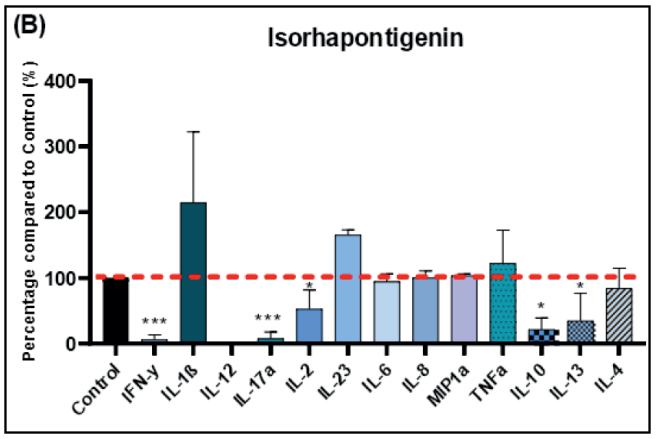
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Chronic inflammatory diseases are recognized by the World Health Organization (WHO) as the first cause of death in the world. Gnetum parvifolium is a Chinese traditional medicinal plant, rich in bioactive compounds, known for their pharmaceutical properties. In this study, we aimed to investigate the anti-inflammatory effects of Gnetum parvifolium and its bioactive compound isorhapontigenin (ISO) as well as their impact on oxidative stress, cell viability and, adipose cell differentiation. The antioxidant activity was associated with a high inhibition of ROS production by Gnetum parvifolium extract (IC50=13.9 µg/mL) and by ISO (IC50=15.8 µM), without significant effects on cell viability. The evaluation of the anti-inflammatory properties of Gnetum parvifolium extract and ISO on cytokine levels and COX-2 gene expression showed an inhibition of the secretions of pro-inflammatory cytokines (INF-γ, IL-12, IL-17a, IL-2) and a significant decrease of COX-2 with Gnetum parvifolium extract (0.76±0.03, p<0.05) and ISO (0.70±0.09, p<0.05) respectively. Among all studied markers related to adipose cell differentiation (aP2, pref1, PPARγ, HSL, adiponectin and adipoR1), only the expression of aP2 was down-regulated by Gnetum parvifolium extract (0.77±0.1, p<0.05) and ISO (0.6 ±0.1, p<0.05). Therefore, these results demonstrated an anti-inflammatory and antioxidant potential of Gnetum parvifolium and ISO, suggesting their potential use as supplement in chronic inflammatory diseases.



Impact of Gnetum parvifolium extract (50 µg/mL) (A) on the production of pro-inflammatory cytokines (IFNγ, IL-1ß, IL-12, IL-17a, IL-2, IL-23, IL-6, IL-8, MIP-1α and TNF-α) or anti-inflammatory cytokines (IL-10, IL-13 and IL-4) by PBMCs stimulated with PHA (5 µg/mL) for 24 h.

Fig. 1. Anti-inflammatory effects of Gnetum parvifolium.



Impact of ISO (5 µM) (B) on the production of pro-inflammatory cytokines (IFNγ, IL-1ß, IL-12, IL-17a, IL-2, IL-23, IL-6, IL-8, MIP-1α and TNF-α) or anti-inflammatory cytokines (IL-10, IL-13 and IL-4) by PBMCs stimulated with PHA (5 µg/mL) for 24 h.

Fig. 2. Anti-inflammatory effects of Isorhapontigenin.

GC1.081

Rare case of GLP-1 agonist therapy in patient living with obesity and autoimmune disorders including MG and Hashimoto's thyroiditis

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Introduction: GLP-1 RA usage for the treatment of obesity in a patient with myasthenia gravis, Hashimoto's thyroiditis and thrombocytopenia. Combination of Myasthenia Gravis (MG) and autoimmune thyroiditis poses unique challenges in the management of patients with extreme obesity. This abstract dives into the potential benefits and considerations of utilizing GLP-1 agonist therapy in this group of patients.
Autoimmune diseases (AIDs) are the result of specific immune responses directed against structures of the self. Frequently autoimmune thyroid diseases, such as Hashimoto's thyroiditis and Graves' disease, are associated with other autoimmune diseases as myasthenia gravis. The etiology of this disease is multifactorial and is related to genetics accompanied by environmental factors as well. Eepidemiological studies showed that thyroid disorders occur in approximately 5–10% of MG patients.
Objective: This study aims to investigate the safety, efficacy, and potential therapeutic outcomes of GLP-1 agonist therapy in patients with Myasthenia Gravis, Hashimoto's thyroiditis, thrombocytopenia and extreme obesity. By addressing this intersection, we hope to contribute valuable insights into the management strategies for individuals facing the complex interplay of these health conditions.
Methods: Patient demographics, clinical outcomes, medication adherence, and potential side effects will be assessed to provide a comprehensive understanding of the impact of GLP-1 agonists in this specific population.
Results: Results of the efficiency and safety of the usage of GLP-1 RA will be presented, including changes in body mass index (BMI), waist circumference, fat and lean mass percentage. Any adverse events or unexpected outcomes will be examined and discussed.
Over the course of 5 months, a weight reduction of 15 kilograms was achieved with the administration of 2.4mg of semaglutide. The patient

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exhibited improved insulin sensitivity, as indicated by a reduced /insulin level of 10 mU/l. Furthermore, euthyroid function was sustained while undergoing treatment with 100 µg of T4.
Conclusion: This abstract outlines the investigation into the usage of GLP-1 agonist therapy in patients affected by Myasthenia Gravis, Hashimoto's thyroiditis, thrombocytopenia and extreme obesity. The findings from this study have the potential to inform clinicians and researchers about the safety and efficacy of GLP-1 agonists in managing extreme obesity in such patients.

GC1.082

Metabolic effects of extra-virgin olive oil's polyphenols in a mice model of diet-induced obesity

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Introduction: Overweight and obesity, defined as dysfunctional fat accumulation due to an imbalance in caloric intake and energy expenditure, promote the cardiovascular-kidney-metabolic (CKM) syndrome, increasing cardiovascular disease risk. Even though the progressive pathophysiology leading from dysfunctional adiposity along the spectrum of CKM syndrome needs to be fully elucidated, the quantity/quality of dietary macronutrients are thought to play relevant roles. The high adherence to the Mediterranean diet is associated with multiple metabolic benefits and a better cardiometabolic prognosis (Ebbeling et al. BMJ 2018). These health benefits have been widely ascribed to the consumption of extra-virgin olive oil (EVO), as a foremost source of unsaturated fatty acids, polyphenols, and lipid derivate molecules (e.g., squalene and tocopherols) (Stewart N Engl J Med. 2018). We recently demonstrated that EVO consumption has beneficial effects on the heart and liver in mice fed with a low-grade saturated fatty acid diet (Ruocco et al. Nutr Metab Cardiovasc Dis 2022). To characterize the relevance of the EVO's bioactive compounds, we investigate their effects in a mouse model of obesity.
Methods: Male C57BL6/N mice (8 weeks old) were fed for 35 weeks with the following diets (Fig.1):
1) Chow, standard diet;
2) Lard, 40% of fat from lard (high saturated fatty acid content);
3) EVO Pol+, 40% of fat from EVO, with polyphenols, squalene and tocopherol;
4) EVO Pol-, 40% of fat from EVO deprived of polyphenols, with squalene and tocopherol;
5) NUT, 40% of fat from hazelnut oil, without polyphenols and squalene, with tocopherol.

Body weight, food intake, glucose tolerance, and transcriptional profiles in multiple organs were studied.
Results: We demonstrate that EVO Pol+ consumption results in a healthier metabolic profile. Only EVO-Pol+ fed mice show a moderately positive effect on body weight, associated with a marked improvement in the glycemic and insulinemic profiles (Fig.2). By RNA-seq analysis, we identified

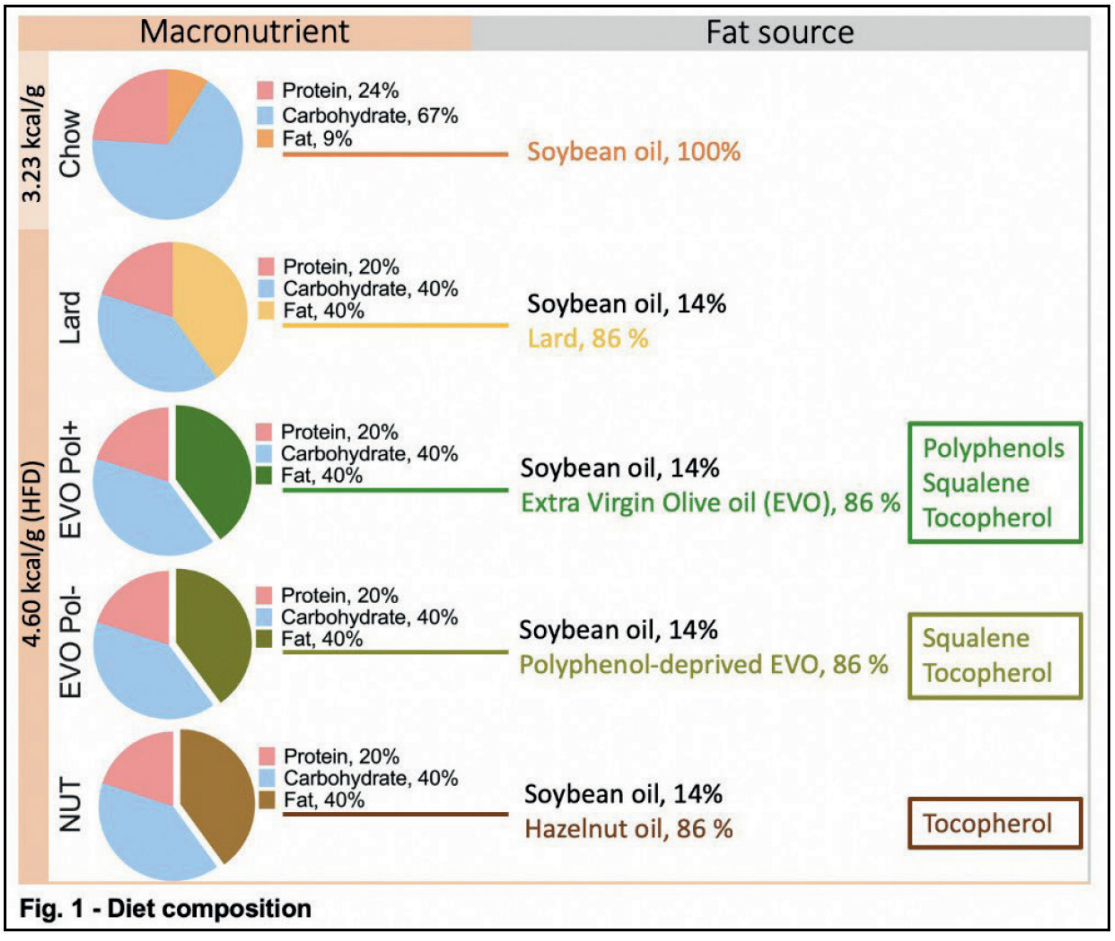


Fig. 1.

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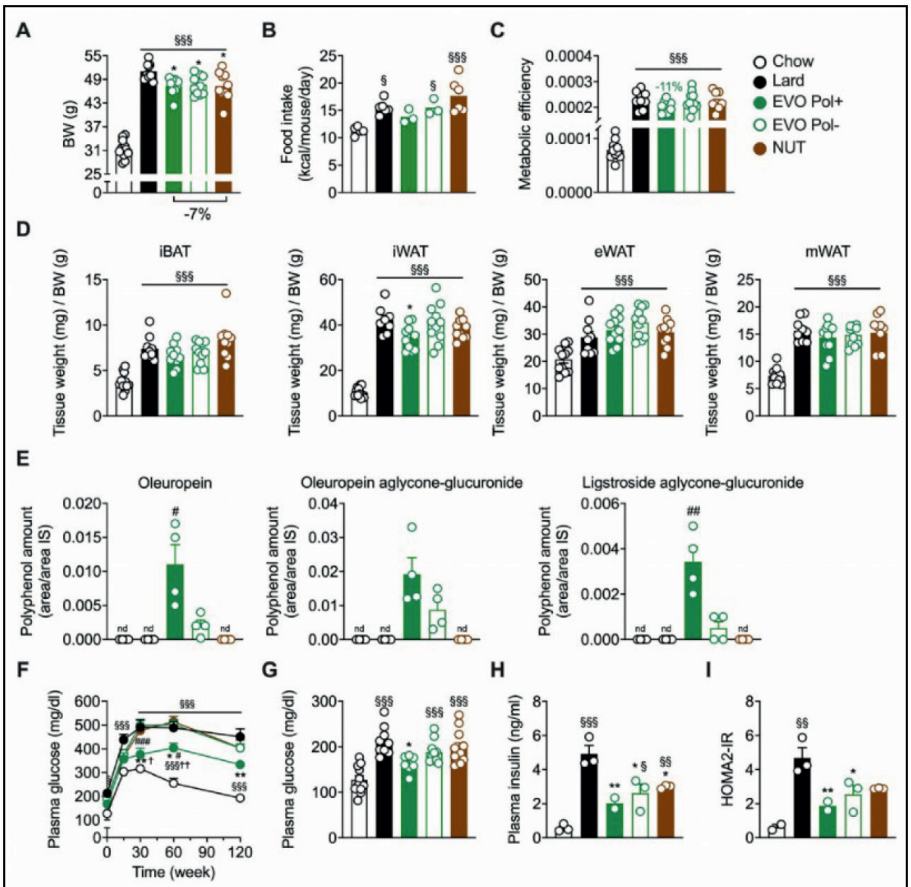


Figure 2. Characterizaton of EVO-Pol+ diet effect on body weight and insulin sensitivity. C57BL6/N male mice were fed *ad libitum* with Chow, Lard, EVO Pol+, EVO Pol- and NUT diets for 35 weeks. (**A, B**) Body weight (BW) and food intake at the end of treatment; (**C**) Metabolic efficiency (ME) as body weight gain divided by energy intake over 35-week dietary treatments; (**D**) Weight of different fat pads normalized to body weight (mg of tissue/BW). iBAT, interscapular brown adipose tissue; iWAT, inguinal white adipose tissue; eWAT, epididymal white adipose tissue; mWAT, mesenteric white adipose tissue. (**E**) Urinary polyphenol content: targeted metabolomic analysis performed in UHPLC/MS-MS. Urine samples were collected by direct bladder puncture in fed mice at the end of treatment. Data are reported as [mean area/internal standard area (IS)]. ND, not detected. (**F**) Glucose tolerance test (GTT, 1.5 g/kg of BW glucose, i.p.) in mice fed for 28 weeks.The results are reported as time course of blood glucose levels measured at different time point. (**G**) Glucose plasma levels in overnight-fasted mice after 28 weeks of treatment; (**H**) Plasma insulin levels in 5h-fasted mice after 30 weeks of treatment; (**I**) Homeostasis model assessment-insulin resistance (HOMA-IR 2) was calculated using fasting plasma glucose and insulin with the Oxford HOMA calculator (www.dtu.ox.ac.uk/homacalculator). Data are means ± SEM (n= 3-10 mice/group). One-way ANOVA (A-D, G-I); Student's t-test (E), two-way ANOVA (F). § p<0.05, §§ p<0.01, §§§ p<0.001 vs Chow-fed mice, * p<0.05, ** p<0.01 vs HFD-fed mice, # p<0.05, ### p<0.001 vs EVO Po- fed mice, † p<0.05, †† p<0.01 vs NUT-fed mice.

Fig. 2.

potential targets modulated specifically by polyphenols in the metabolically active organs, which are critical regulators of glucose homeostasis (adipose, skeletal muscle, heart, and liver).

In particular, the preliminary results show that EVO Pol+ tends to rescue mitochondrial respiration in the liver and precisely modulate hepatic gene expression profile compared to the other organs (Fig.3). Among the primary genes differentially expressed, Cyp2b9 and Cyp4a12b are increased in Lard, EVO-Pol+, and NUT fed mice compare to Chow, and are associated with metabolic disease development (Lu et al. Food Funct. 2020). The expression of both genes is renormalized only in the EVO Pol+ mice, strongly suggesting that the beneficial effects observed with this diet might be due to the polyphenol fraction. We are now extending these observations to obtain conclusive results on the beneficial effects of the EVO-Pol+ diet.

Conclusion: Our results suggest a relevant role of polyphenols in the modulation of bioenergetic metabolism and mitochondria in metabolically active organs and offer the opportunity to transfer this new knowledge to clinical trials.

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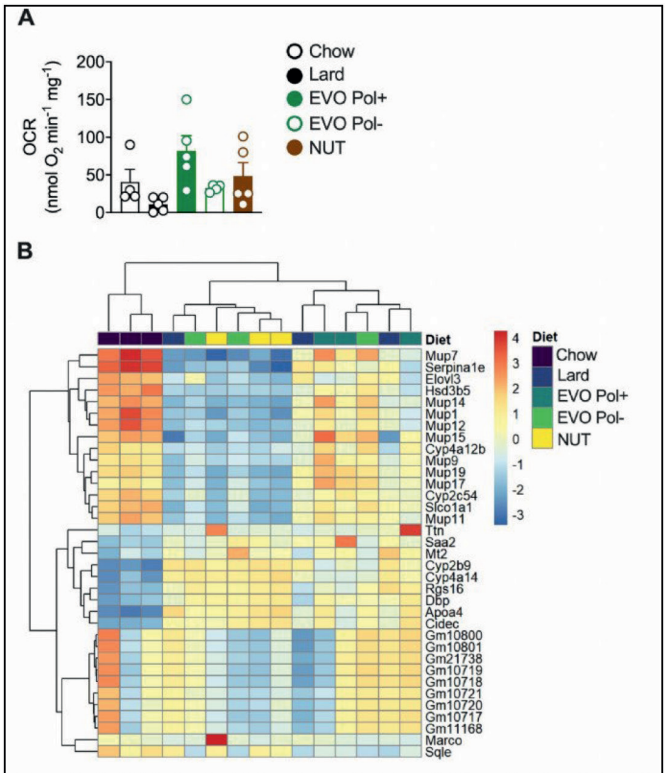


Figure 3. EVO-Pol+ diet partially modulate mitochondrial activity and markedly affects gene expression profiles in liver. (**A**) Oxygen consumption rates (OCR) were normalized to mitochondrial protein content. Mitochondria were isolated from liver of mice fed with different dietary regimens for 35 weeks. Data are presented as means ± SEM (*n* = 4 mice per group); (**B**) Hierarchical clustering. A variance-stabilized transformation was performed on the raw count matrix, and 35 genes with the highest variance across samples were selected for hierarchical clustering. Each row represents one gene and each column represents one sample. The color represents the difference of the count value to the row mean.

Fig. 3.

GC1.083

Replacing part of maltodextrin with galactose in the postweaning diet results in an improved body composition and energy metabolism in early life in a mouse model

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Introduction: Lactose, a disaccharide of glucose and galactose, is the primary carbohydrate source in early life. However, recently there has been an increased demand for lactose-low/free infant formulas. Maltodextrin (MDX) is a popular, alternative carbohydrate source in these formulas yet the (long-term) health effects of consuming maltodextrin in early life are unclear. Previously, consuming galactose in a postweaning diet was shown to improve metabolic health outcomes in mice. Our objective is: What are the effects of partly replacing MDX with galactose in a postweaning diet on body composition and energy metabolism?
Methods: Weaned female mice received isocaloric diets as dough balls with different carbohydrate profiles for three weeks (PN21-PN42). MAL (control, n=13) contained 8 en% glucose and 38 en% MDX, GAL (n=12) contained no glucose, 16 en% galactose and 31 en% MDX, and GLUGAL (lactose mimic, n=13) contained 16 en% galactose, 16 en% glucose and 15 en% MDX. Afterward, all mice received a 40 en% high-fat diet (HFD) until PN105. Body composition was weekly measured by Echo-MRI. From PN40 to PN42, following intervention diets, energy metabolism was assessed by indirect calorimetry. At PN105, 4hr food-deprived mice were sacrificed for serum and tissue analysis.
Results: Mice in both galactose-fed groups had significantly lower body weight, fat mass, and relative fat mass compared with the MAL group at PN42 ($p < 0.0001$). The respiratory exchange ratio was significantly lower in both galactose-fed groups compared with the MAL group ($p < 0.05$) suggesting lower carbohydrate oxidation and thus higher relative fat oxidation levels. At the same time, both galactose-fed groups showed lower energy expenditure ($p < 0.05$). The observed differences in body composition at PN42 were not detected at PN105.
Discussion: The GAL group was similar to the GLUGAL lactose mimic group in terms of body weight, composition, and energy metabolism while being significantly different from the control MAL group in early, not late, life. These data are the first to compare the effects of consuming galactose partly replacing MDX in early-life nutrition and reinforce that carbohydrate quality in early life does matter and should be determined by its impact on health.

GC1.085

No effect of high fructose and high glucose diet on body weight of male Wistar rats

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Introduction: Obesity is a chronic metabolic disease with increasing worldwide prevalence in the population during the last decades [1]. It is also a risk factor for the manifestation of many systemic diseases – of the cardiovascular system, of the endocrine system – impaired glucose tolerance, insulin resistance, type 2 diabetes and more [1]. The modern "Western" diet consists of high caloric density foods, usually with a high content of carbohydrates, especially refined sugar like the monosaccharides glucose and fructose (as primary components in food products and soft drinks). In combination with the sedentary lifestyle, this leads to an increase of body weight and accumulation of fat tissue, due to increased caloric intake and decreased caloric expenditure. The aim of our study was to examine the effects of different carbohydrate types on the metabolic parameters in male Wistar rats [2].
Methods: 45 male Wistar rats at age of three months at beginning of the trial were randomly assigned into three experimental groups consisting of 15 animals each: Control group (C), High Fructose Diet group (HFD) and High Glucose Diet group (HGD). All three groups were given free access to clear tap water and standard laboratory chow diet. The HFD group animals were additionally supplied with a 25% D-Fructose solution (Valerus LTD, Bulgaria), and the HGD group animals were additionally supplied with a 25% D-Glucose solution (Valerus LTD, Bulgaria). This diet protocol was applied for a period of 20 weeks. During this period, the following measurements were taken once weekly: body weight (g), abdominal circumference (cm), body length (nose-to-anus length, cm), Lee index, and Body-Mass index (BMI). At the end of the experimental period, blood was taken for plasma glucose measurements. Then, the rats were anesthetized by intraperitoneal injection of Sodium Thiopental solution and subsequently euthanized by decapitation.
Results: No statistically significant changes were observed in the following parameters between the three groups: abdominal circumference, body length, Lee index, BMI, and plasma glucose at the end of the study. The body weight showed a slight increase with the two diets, enriched with carbohydrates. The mean increase of body weight compared to the beginning was as follows – for group C - 41 g (+16%), for group HFD - 61 g (+24.9%), and for group HGD - 55 g (+20.1%).
Conclusion: Consumption of 25% solution of fructose or glucose for a period of 20 weeks did not lead to metabolic changes in male Wistar rats.

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Conflict of Interest: The authors declare that there is no conflict of interest.

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GC1.086

The feasibility of a clinical tool to establish adherence to the Eatwell Guide

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Introduction: Dietary adherence to the Eatwell Guide, the UK national dietary recommendations1, correlates with reduced risk of complications such as cardiovascular disease and cancers2. Food diaries are effective in assessing adherence to national guidelines yet are onerous to complete and analyse. The development of a screening tool to evaluate adherence to the Eatwell Guide could be valuable in research and clinical settings to rapidly evaluate diet quality of individuals and identify areas for improvement. The aim of the present study was to co-develop a clinical tool to assess dietary adherence to the Eatwell Guide and test its feasibility.
Methods: An initial draft of the screening tool was generated by the research team. Following ethical approval, ten participants (mean (SD): age 34(14) years; 60% women) completed the screening tool and gave feedback on its usability. Feedback was used to refine the screening tool to improve clarity and a final co-developed version of the tool was produced. Twenty participants (age 37(12) years, 65% women) reported their diet using the co-developed screening tool and a 4-day food diary, completed in a randomised order, from which Eatwell Guide adherence scores were derived. Agreement was visually evaluated using a Bland-Altman plot.
Results: The screening tool-derived Eatwell Guide adherence scores were an average of 3.55 points higher than those derived from the 4-day food diary (7.58 vs. 4.03). All values were within the upper and lower (95%) limits of agreement. We did not identify any evidence for proportional bias.
Conclusion: This study co-designed a feasible screening tool to assess adherence to the Eatwell Guide in UK adults. Additional work is needed to further refine the tool and evaluate applications in a larger, more diverse cohort.

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Conflict of interest: None disclosed.

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GC1.087

Oral Administration of Xylitol Compared to Sucrose Reduces Total Energy Intake during a Subsequent *ad libitum* Test Meal

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Introduction: The increase in sugar intake stands as significant factor contributing to the rise of obesity and type 2 diabetes mellitus, which have become major health problems in our century. Hence, the World Health Organization has recommended reducing sugar intake as a strategy for both prevention and treatment. Artificial low-caloric sweetener (LCS), such as acesulfame potassium (ace-K), are often used to replace sugar as they provide sweetness without calories. However, artificial LCS do not stimulate the release of gastrointestinal (GI) satiation hormones, thus failing to produce a satiating effect. The low-caloric bulk sweetener xylitol has gained popularity by offering beneficial properties such as being low-caloric, low-glycemic, and low-insulinemic while preserving sweet taste. In contrast to artificial LCS, xylitol stimulates the release of GI satiation hormones, however, its effects on subsequent energy intake remains uncertain. Therefore, the aim of this study was to investigate the effect of oral administration of xylitol compared to sucrose, ace-K and tap water on total energy intake during a subsequent *ad libitum* test meal.
Methods: In this randomized, double-blind crossover study, 20 healthy participants with normal weight [10 women, 10 men, age: 27.45 ± 7.86 years, BMI: 23.04 ± 1.41 kg/m^2 (mean ± SD)] were included. In four study visits, the participants received oral preloads containing either 33.5 g xylitol, 33.5 g sucrose, 167.5 mg ace-K dissolved in 300 mL tap water or 300 mL tap water as control. Participants were offered a test meal 15 minutes after receiving the preload. Within 20 minutes, they were allowed to consume as much as they want. Total energy intake was assessed by calculating the calories of the preloads and weighing food and drinks before and after the test meal. Additionally, blood samples were collected at fixed time points to measure plasma glucose and insulin concentrations.
Results: All participants completed the study visits. The results show that total energy intake was significantly lower for xylitol and ace-K compared to sucrose (p*Tukey* = 0.03 and p*Tukey* < 0.01, respectively), with no differences between xylitol and ace-K or water (p*Tukey* = 0.93 and p*Tukey* = 1.00, respectively). There was no increase in plasma glucose concentrations after the administration of xylitol compared to sucrose (p*Holm* < 0.001) until the start of the test meal, with no differences between xylitol and ace-K or water (for both comparisons, p*Holm* > 0.05); the increase in plasma insulin concentrations was significantly lower for xylitol compared to sucrose (p*Holm* < 0.001), but significantly higher for xylitol compared to ace-K or water (for both comparisons, p*Holm* < 0.001).
Conclusion: The findings of this study indicate that orally administered xylitol prior to an *ad libitum* test meal leads to a reduction in total energy intake compared to sucrose, but not compared to ace-K or water. Based on the observed effects, xylitol seems to be a promising sugar alternative for people suffering from obesity and type 2 diabetes mellitus.

GC1.088

Broccoli Extract as a Nutraceutical to relieve Endoplasmic Reticulum Stress and Associated Mitochondrial Dysfunction in Human Adipocytes

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[4]School of Medicine, Western Sydney University, NSW, Australia

Background: Overnutrition can lead to obesity, increasing inflammation and inducing endoplasmic reticulum (ER) stress and mitochondrial dysfunction within cells. This contributes to the pathogenesis of type 2 diabetes mellitus (T2DM) and other metabolic diseases. Many people with obesity struggle to achieve long-term maintenance of weight loss, and as such there is a need to develop an intervention that can disconnect obesity from its comorbidities. Nutraceuticals, such as broccoli, have been shown to reduce inflammation in humans, and may therefore mitigate inflammation-induced cellular disruption that precedes insulin resistance in human adipocytes. Therefore, these studies investigated the impact of freeze-dried broccoli extract (BE) on ER stress, mitochondrial dysfunction and the signalling between them in human adipocytes.
Methods: Differentiated human adipocytes (Chub-S7 cell line, n=6) were treated with tunicamycin (Tun; 750ng/ml) alone, to induce ER stress, or combined with a freeze-dried broccoli extract (BE; hybrid *Brassica oleracea* var. italic; 10ng/ml) acutely (24hr) and chronically (48/72hr). ER

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stress changes were measured through marker genes (ATF4, ATF6 and CHOP) and proteins (BiP, p-eIF2α and eIF2α). Mitochondrial function was assessed via a Mito Stress Test, measuring oxygen consumption, and through marker genes (SIRT3), whilst mitochondrial morphology was assessed using live cells on a fluorescent microscope. ER-mitochondria Ca2+ signalling was investigated via protein expression (GRP75, MCU).
Results: Tun increased ER stress marker genes up to 4.5-fold (CHOP, 72hr, $p<0.001$), whilst BE+Tun reduced this expression up to 64% ($p<0.001$). Tun increased mitochondrial oxygen consumption rate by 77% (24hr, $p<0.05$) whilst BE mitigated this by 37%. BE increased the expression of SIRT3 up to 3-fold, regardless of Tun presence. Live cell imaging highlighted Tun-induced mitochondrial fragmentation, indicative of dysfunction, which progressed with time (48hr, 72hr). BE+Tun treated cells displayed a more efficient, elongated mitochondrial phenotype, similar to control. Ca2+ signalling proteins were significantly increased with Tun ($p<0.05$), whilst BE prevented this.
Conclusion: These studies demonstrated that BE can alleviate ER stress and associated mitochondrial dysfunction in human adipocytes. BE reduced markers of ER stress, prevented excessive mitochondrial oxygen consumption and maintained morphologically healthier mitochondria than cells exposed to Tun alone. In addition, cellular stress-associated Ca2+ signalling was reduced with the inclusion of BE in the treatment. These impacts occurred both acutely and chronically, with most notable protection from BE observed at 72hr. As such, BE may be a viable nutritional agent to relieve obesity-induced inflammation and associated insulin resistance.

GC1.089

Effects of estradiol replacement during early and late menopause on glucose and lipid metabolism in high-fat-fed female mice

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Introduction: Postmenopausal women show a decrease in estrogen levels, increasing their susceptibility to insulin resistance, particularly in the context of obesity. It is known that estradiol (E2) replacement can reverse this condition. However, there is no consensus on whether the effects mediated by E2 associated with a high-fat diet (HFD) on glucose and lipid metabolism depend on the timing of E2 treatment after menopause.
Objective: Our aim was to investigate the effects of E2 treatment on glucose and lipid metabolism in female ovariectomized mice fed HFD during early and late menopause.
Methods: Eight-week-old female C57BL/6J mice underwent bilateral ovariectomy (OVX) or sham surgery (SHAM) and were fed HFD (45% of calories from fat). After 4 weeks (4wk) (early menopause) or 20 weeks (20wk) (late menopause) post-surgery, OVX mice were divided into two groups. Some of the OVX mice had subcutaneous E2 pellets implanted (OVX+E2), and the other group received vehicle (OVX). This resulted in six experimental groups: SHAM-4wk (n=10); OVX-4wk (n=10); OVX+E2-4wk (n=10); SHAM-20wk (n=10); OVX-20wk (n=10); OVX+E2-20wk (n=10). After 4 weeks of E2 treatment for both 4 and 20wk, the experiments were conducted. Body weight, body composition analysis by MRI, and glucose tolerance test (GTT) were performed. Triglyceride (TG) levels in the liver, muscle, and plasma, as well as total cholesterol serum levels were assessed. Protein expression of SREBP1, FASN, SCD1, and estrogen receptor-α (ERα) was analyzed in adipose tissue, liver, and gastrocnemius muscle (CEUA 1031/2021R1). Statistical analysis was performed by one-way ANOVA followed by Tukey's test. Significance level: $p<0,05$. Data presented as mean ± SEM.
Results: E2 treatment led to weight loss in both 4wk and 20wk groups. MRI showed that E2 treatment reduced body fat percentage and increased lean body mass in both early and late menopause. OVX+E2 had a smaller AUC during GTT than OVX for 4- and 20 wk groups. Cholesterol levels in OVX+E2 were increased compared to other 4 wk groups. There were no differences in cholesterol levels between 20 wk groups. E2 treatment reduced liver and muscle TG content in both 4wk and 20wk. Plasma TG levels in 4wk groups were decreased in OVX+E2 compared to OVX and SHAM. There were no differences in TG levels between 20 wk groups. Protein expression of SREBP1, FASN, and SCD in the adipose tissue of 20wk females was increased in the OVX+E2 compared to OVX and SHAM, but not in the liver and muscle. ERα expression showed no difference between groups in any analyzed tissue.
Conclusions: Our findings reinforce the important role of E2 in regulating lipid and glucose metabolism. In contrast cardiovascular and bone metabolism literature, which suggests that E2 has more beneficial effects during early menopause, our data indicate that E2 action on glucose and lipid metabolism was not dependent on time since menopause for most of the parameters analyzed. Even in late menopause, E2 treatment continues to exert beneficial effects by regulating glucose tolerance, body fat distribution, and insulin-mediated lipogenesis.

GC1.090

Acute kaempferol stimulation is associated with AKT activation independent of insulin receptor tyrosine phosphorylation

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Introduction: Type 2 Diabetes Mellitus (T2DM) is a global public health problem caused by a deficiency in insulin's action and/or production. Obesity is complex and multifactorial. The accumulation of body fat characterizes this disease, that predisposese to T2DM. Flavonoids such as kaempferitrin (KP) and kaempferol (KM) are promising compounds for the management of T2DM due to their insulin-mimetic effects. Both compounds are found in the leaves of plant species, like *Bauhinia forficata*. The objective was to evaluate whether these compounds can modulate the insulin signaling pathway.
Methods: Human hepatocarcinoma (HepG2) cells were cultivated with DMEM. For cell viability assay, cells were incubated in 96-well plates at a density of 1x105 cells/well and subsequently treated with KP or KM, at concentrations 0.1, 1, 10, 20, and 50 μM and 0.1, 1, 10, 20, 50, 80, and 100 μM respectively, for 24 or 72 hours. After this period, the cells were incubated in DMEM 5.5 mM glucose medium supplemented with 100 U/ml of penicillin and 0.1 mg/ml of streptomycin, and with MTT. The absorbance was measured at a wavelength of 570 nm. For protein extraction and Western blotting analysis, cells were incubated in 6-well plates with a density of 6x105 cells/well. The cells were lysed using RIPA lysis buffer and the protein content was determined with Bradford reagent. Membranes were incubated with the following antibodies: IRβ, pTYR, AKT, pAKT, ERK1/2, pERK1/2, β-actin, as a constitutive protein. Image acquisition were with "UVI Band" program in the Uvitec Cambridge equipment. Band intensities were quantified using Image J (NIH).
Results: Cell viability results showed that the two components are not cytotoxic to HepG2 cells. The concentration of the compounds chosen for the experiments was 10 μM. In the analysis of the expression of insulin signaling pathway proteins, was verified that the levels of IR and ERK1/2 phosphorylation did not changed, neither after the administration of KP or KM alone, nor after the concomitant administration of each compound with insulin (100 nM), used to evaluate the additional effect. However, KM stimulated the increase in the levels of AKT phosphorylation when administered alone. When stimulated for 5 minutes, together with insulin, KM showed an additional effect on the levels of phosphorylation of this hormone.

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Conclusion: KP and KM do not stimulate the phosphorylation of IR and ERK1/2. However, KM can increase the levels of AKT phosphorylation, a key protein in the insulin signaling pathway, independent of IR activation. Also, KM presented an additional effect, together with insulin, on the activation of AKT. Our study provides compelling evidence indicating KM capability to acutely induce AKT phosphorylation, highlighting its independent influence on insulin signaling and positioning it as a prospective candidate for T2DM treatment and management.

GC1.091

Inequalities in comorbid obesity-related complications in people living with obesity according to deprivation and ethnicity; a UK real world retrospective study

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Introduction: The increasing health and economic burden of living with obesity is unequal with greater prevalence in more deprived compared to more affluent communities. Inequalities in obesity-related complications (ORCs) are less clear. We aimed to estimate the complication prevalence gap in people living with obesity across deprivation and ethnicity.

Methods: This was a retrospective, open cohort study using Discover, a real-world database of linked primary and secondary electronic health records covering 2.5 million people residing in North-West London. The study cohort consisted of individuals aged ≥ 18 years living with obesity (BMI ≥ 30 kg/m^2). A normal BMI (BMI 18-24.9 kg/m^2) comparison group was also identified. The study period was 1 Jan 2016–31 Dec 2019 and the prevalence of 27 ORCs and ORC multimorbidity, were identified in each individual's patient record during this period. Individuals were grouped into ethnicity (Asian, Black, Mixed, White, and Other) and quintiles of deprivation according to the Index of Multiple Deprivation (IMD) which is the official measure of deprivation in England. Prevalence gaps were estimated by calculating the difference in age-standardised prevalence of individual ORCs between IMD quintile 1 (most deprived) and 5 (most affluent). All outcomes were age-standardised to the European Standard Population.

Results: There were 362,023 individuals with obesity included in the population, with 64,866 in IMD quintile 1 and 24,590 in quintile 5 and the largest proportion in the white ethnicity group. There were 512,984 in the normal BMI population. Demographic characteristics are outlined in Table 1. The largest ORC prevalence gaps in the obesity population were generally seen in the conditions with highest aggregate prevalence (Figure 1). Gaps were greatest in type 2 diabetes (5.1 percentage point difference

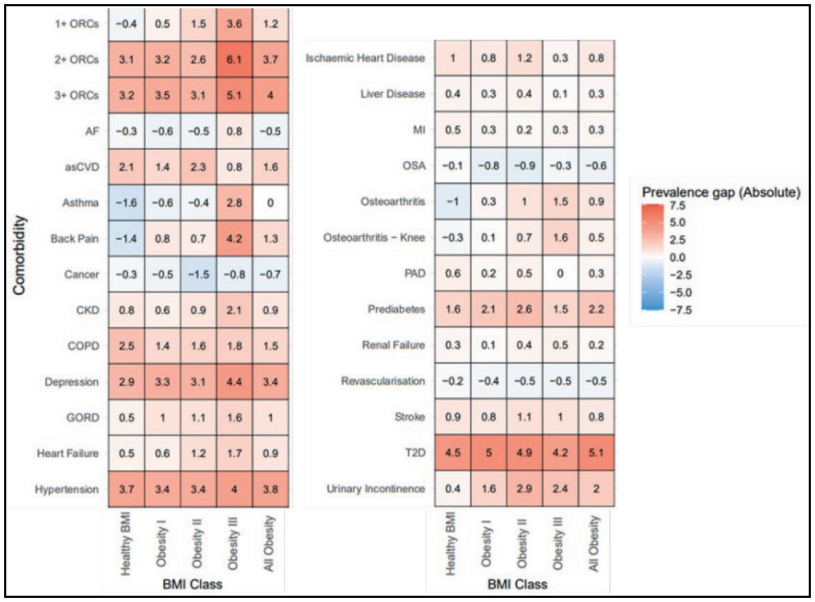


Fig. 1. Prevalence gaps by IMD across comorbidities across BMI classes.

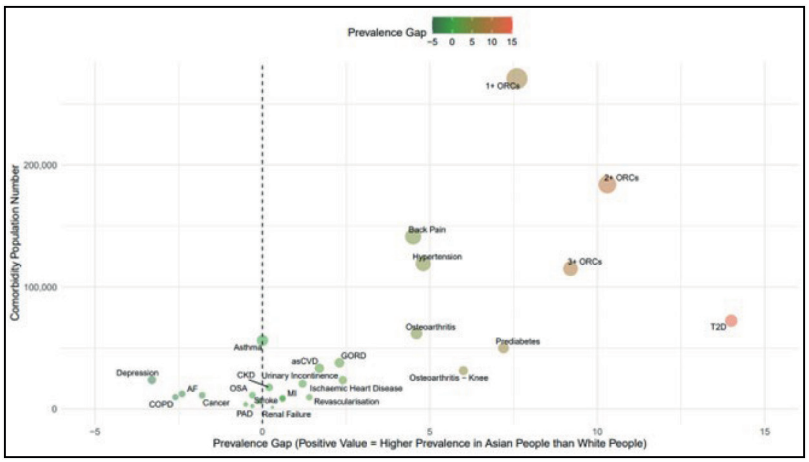


Fig. 2. Prevalence gaps between Asian and white ethnicities in the Obesity population against the number of individuals with the comorbidity.

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Tab. 1. Baseline characteristics by BMI group.

Baseline characteristic		Healthy BMI	Obesity	Obesity BMI classes		
				Obesity I	Obesity II	Obesity III
Number of patients	Count, N	512,984	362,023	253,974	70,644	37,405
BMI	Mean (SD)	22.4 (1.8)	34.3 (5.0)	31.9 (1.4)	37.0 (1.4)	45.7 (6.4)
	Median (IQR)	22.6 (2.9)	32.7 (4.8)	31.6 (2.2)	36.8 (2.3)	43.5 (6.0)
Sex	Female, N (%)	273,729 (53.4)	203,273 (56.1)	134,409 (52.9)	43,845 (62.1)	25,019 (66.9)
	Male, N (%)	239,255 (46.6)	158,750 (43.9)	119,565 (47.1)	26,799 (37.9)	12,386 (33.1)
Age	Mean (SD)	37.9 (16.2)	43.5 (15.0)	44.7 (15.0)	41.6 (14.4)	39.3 (14.3)
	Median (IQR)	33.0 (23.0)	43.0 (22.0)	44.0 (22.0)	41.0 (21.0)	38.0 (21.0)
Ethnicity	Asian, N (%)	131,165 (25.6)	97,679 (27.0)	73,780 (29.1)	16,856 (23.9)	7,043 (18.8)
	Black, N (%)	33,207(6.5)	46,399 (12.8)	30,521 (12.0)	10,152 (14.4)	5,726 (15.3)
	Mixed, N (%)	15,279 (3.0)	11,638 (3.2)	7,827 (3.1)	2,371 (3.4)	1,440.0 (3.8)
	White, N (%)	281,082 (54.8)	174,821 (48.3)	119,265 (47.0)	35,332 (50.0)	20,224 (54.1)
	Other, N (%)	52,251 (10.2)	31,486 (8.7)	22,581 (8.9)	5,933 (8.4)	2,972 (7.9)
IMD	Q1, N (%)	74,352 (14.5)	64,866 (17.9)	43,843 (17.3)	13,541 (19.2)	7,482 (20.0)
	Q2, N (%)	165,038 (32.2)	124,348 (34.3)	86,415 (34.0)	24,644 (34.9)	13,289 (35.5)
	Q3, N (%)	143,470 (28.0)	97,001 (26.8)	69,000 (27.2)	18,456 (26.1)	9,545 (25.5)
	Q4, N (%)	89,615 (17.5)	51,218 (14.1)	36,836 (14.5)	9,494 (13.4)	4,888 (13.1)
	Q5, N (%)	40,509 (7.9)	24,590 (6.8)	17,880 (7.0)	4,509 (6.4)	2,201 (5.9)

Tab. 2. Highest and lowest prevalence gaps in the Healthy BMI and Obesity populations.

Rank		Healthy BMI			Obesity		
		Comorbidity	Prevalence (%)	Prevalence Gap	Comorbidity	Prevalence (%)	Prevalence Gap
Highest	1	T2D	9.4	4.5	T2D	19.5	5.1
	2	Hypertension	18.4	3.7	Hypertension	32.7	3.8
	3	Depression	5.0	2.9	Depression	6.3	3.4
	4	COPD	3.0	2.5	Prediabetes	13.2	2.2
	5	asCVD	7.9	2.1	Urinary Incontinence	5.8	2.0
Lowest	1	Asthma	11.1	-1.6	Cancer	3.2	-0.7
	2	Back Pain	29.0	-1.4	OSA	2.9	-0.6
	3	Osteoarthritis	11.4	-1.0	Revascularisation	2.8	-0.5
	4	Osteoarthritis – Knee	3.8	-0.3	AF	3.9	-0.5
	5	Cancer	3.5	-0.3	Asthma	15.8	0.0

prevalence gap; 19.5% prevalence), hypertension (3.8, 32.7%), depression (3.4, 6.3%) and prediabetes (2.2, 13.2%) (Table 2). The prevalence gap was larger with increasing ORC multimorbidity (MM) with a gap of 1.2 for 1+ ORC, 3.7 for 2+ ORC and 4.0 for 3+ ORC. The prevalence gap patterns were similar across obesity classes, however, the highest prevalence gaps in ORC multimorbidity, depression (4.4) and musculoskeletal conditions (4.2 for back pain) were in Obesity class III. The greatest prevalence gaps across ethnicities were generally seen in ORC multimorbidity with a 10.3 prevalence gap between Asian and white ethnicity for 2+ ORC (Figure 2). Prevalence gaps for diabetes and prediabetes were largest for Asian compared white ethnicities whilst gaps were greatest across hypertension and back pain for black ethnicity compared to white ethnicity.

Conclusion: Inequalities in prevalence of ORCs exist according to both deprivation status and ethnicity in people living with obesity. The largest prevalence gaps were generally in the most prevalent ORCs including hypertension, type 2 diabetes, and depression. Interventions that are targeted according to variations in unmet need are likely to have greatest impact on improving the health of those living with obesity and reduce inequalities.

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GC1.092

Weight loss and ketosis induced by a very-low calorie ketogenic diet (VLCKD) normalizes enhanced ABCG1 methylation in blood leukocytes from individuals with obesity

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Introduction: Recent findings have revealed the importance of the ABCG1 methylation (ATP-binding cassette subfamily G member 1) in pathophysiology of metabolic diseases, showing that ABCG1 methylation may represent a potential biomarker and new therapeutic target in obesity management. Its deregulation in adipose tissue contributes to increased fat mass growth and weight gain. Lower expression of ABCG1 in human visceral adipose tissue has been shown to be linked to obesity and metabolic syndrome. Increased methylation level in blood was inversely associated with ABCG1 expression. Previously, we have demonstrated that the beneficial effects of a very-low calorie ketogenic diet (VLCKD) therapy on obesity could involve a methylome more suggestive of normal weight. The current work was aimed to evaluate if a VLCKD, which induce a reduction of 20% in body weight of patients with obesity, is able to modulate the ABCG1 methylation in human blood leukocytes (PBMCs).
Methods: The global genomic DNA methylation of ABCG1 was evaluated from Illumina Infinium MethylationEPIC BeadChip. Data were evaluated in patients with obesity (n=24) and normal weight voluenteers (n=20) at baseline andafter following a VLCKD in patients with obesity (n=10) at baseline, makimum ketosis (1-2 months) and endpoint (6 months). Data were correlated with anthropometric parameters (BMI, circumference waist).
Results: ABCG1 methylation levels were higher in patients with obesity than in normal-weight volunteers. Among the studied CpG sites, the cg06500161 was the most representative ($p<0.001$). Moreover, DNA methylation levels at the ABCG1 cg06500161 site positively correlated with BMI ($r=0.91$, $p<0,001$). Importantly, in patients with obesity, ABCG1 methylation levels were decreased after weight loss following VLCKD. This effect was observed since the point of maximum ketosis.
Conclusion: Obesity-related blood leukocytes shows a hypermethylation of ABCG1 gen and it is reversed after a weight loss therapy with a VLCKD. This effect could be induced by the nutritional ketosis synergistically with the weight loss. Further studies based on larger sample size and prospective cohort are needed to validate our findings, and functional experiments are warranted to unravel the underlying molecular mechanisms and the role of ABCG1 methylation on the VLCKDs efficacy in obesity management.

GC1.093

Obesity and breast cancer: impact of vitamin D on the inflammatory adipose tumor microenvironment in obesity in a 3D co-culture model

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Intorduction: Obesity is a recognized risk factor for breast cancer, the leading cause of cancer death worldwide. Vitamin D (vit D), a molecule with anti-inflammatory effects, is able to act on different cell types via the presence of its VDR receptor. Our aim was therefore to study the impact of vit D in a 3D culture model mimicking the breast tumor microenvironment of a person with obesity.
Methods: To this end, the effect of a physiological concentration of the active form of vit D was assessed in a 3D co-culture model between 3 cell types present in the microenvironment: M1 macrophages, cancer cells as tumoroids and pre-adipocytes (obtained from women with obesity) cultured as preadipospheroids or mature adipocytes as adipospheroids,
Results: The results show a decreased expression of adipocyte differentiation genes (leptin, adiponectin, HSL, aP2) in preadipospheroids, of inflammatory cytokines (IL-8, IL-6, TNFα, IL-1β, CXCL10) in pro-inflammatory M1 macrophages and of proliferation gene (PCNA) in tumoroids in the presence of preadipospheroids in the treated conditions compared to the non treated one. These results were not observed in the co-culture with adipospheroids. A decrease in IL-6 and an increase in IL-2 secretion in the supernatants were also observed with preadipospheroids.
Conclusion: Vit D has therefore a more pronounced action on preadipospheroids, and could be used as a primary prevention for women with obesity at risk of breast cancer

GC1.094

Obesity Sparks the Immune System: Lessons from the COVID-19 Pandemic

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Purpose of Presentation: Obesity and overweight are among the biggest health challenges of the 21st century. Since decades, it seems that immunological signals gear inflammatory processes among obese individuals with different arrays of ill health conditions and diseases. This review aims to shed light on how obesity sparks or rewires the immune system and establish it as a risk factor for severe COVID-19 pandemic outcomes.
Recent Findings: In recent studies, obesity has been linked to altering and sparking the immune system in different ways. Adipose tissue is considered a secondary immune organ, and adipocytes per se secrete several pro-inflammatory cytokines (IL-6, IL-4, MCP-1, and TNF-α) involved in the activation of macrophages, resulting in chronic low-grade inflammation. Autophagy occurrence in adipose tissues further rewires the immune system due to the flushing and outburst of leptin and adiponectin, which are cytokines and influence pro-inflammatory immune functions. These immune alterations are collectively implicated in triggering several metabolic disorders. Obesity with pre-existing pro-inflammatory cytokines such as LI-6 is a risk factor for cytokine storm and coagulopathy among COVID-19 patients with a higher outcome risk.
Summary: Obesity is associated with chronic low-grade systemic inflammation, which sparks and alters different pillars of the immune system, triggers different metabolic disorders, increases cancer susceptibility, and puts people at high risk of developing severe COVID-19. Although the new weight loss drugs and bariatric surgery are considered breakthroughs for obesity treatment, preventing it is easier than treating it once it has taken hold.

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GC1.095

Associations between *TCF7L2*, *PPARγ*, and *KCNJ11* genotypes and insulin response to an oral glucose tolerance test: a systematic review

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Introduction: Insulin responses to a standardized meal differ greatly between individuals. This variability may in part be explained by genotype. An understanding of the association between genotype and postprandial insulin response could help to identify individuals at risk for obesity and type 2 diabetes mellitus. Aim of the current systematic review was to investigate associations between genotype and insulin response to an oral glucose tolerance test (OGTT).

Methods: Three electronic databases were searched (Web of Science, Embase, PubMed), starting in July 2022. Inclusion criteria were: 1) intervention: OGTT, 2) measurement: insulin response in terms of insulin area under the curve (AUC), 3) genotyping: single nucleotide polymorphisms (SNPs) belonging to the *TCF7L2* gene (transcription factor 7 like 2), the *PPARγ* gene (peroxisome proliferator-activated receptor gamma) or the *KCNJ11* gene (potassium inwardly rectifying channel subfamily J member 11), and 4) outcome: association between SNP and insulin AUC. Exclusion criteria were: 1) language other than English, 2) animal or plant studies, 3) special cohort characteristics (e.g. serious illness, pregnant/breastfeeding women, children, participants with diabetes), and 4) publications before the year 2000. The quality of the included reports was assessed using criteria defined by Campbell and Rudan. The review was registered in PROSPERO (CRD42022349783).

Results: A total of 5,175 articles were identified, of which 34 were included in the narrative systematic review. Among them were family-based studies (8), twin studies (2) and studies with unrelated participants (24). Fifteen articles investigated the *TCF7L2* gene (6 different SNPs), 14 investigated the *PPARγ* gene (1 SNP) and 6 investigated the *KCNJ11* gene (5 different SNPs). The most frequently investigated SNP was rs7903146, belonging to the *TCF7L2* gene. Most of the reports (20) were rated intermediate-quality; 14 were rated high-quality. For all of the SNPs, the majority of reports indicated no significant association with postprandial insulin response.

Conclusion: No evidence could be found for an association between SNPs belonging to the *TCF7L2*, *PPARγ* or *KCNJ11* gene and insulin AUC after an OGTT. Future studies should, using polygenic risk scoring, investigate the effect of combinations of SNPs on postprandial insulin response. Furthermore, other factors than the here investigated ones might have a greater impact on the variability of postprandial insulin response.

GC1.096

Genetic dissection of serum pro-neurotensin implicates its causal effect on brain structure

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Introduction: Neurotensin (NT)(1,2) is a 13-amino acid peptide primarily expressed in the central nervous system (CNS) and the small intestine (2–4). Tissue-specific processing may lead to different forms of NT. In the CNS, NT acts as neurotransmitter regulating various processes like body temperature, nociception, pituitary hormone secretion, and dopaminergic transmission (5). In response to fat intake, NT facilitates fatty acid absorption based on food lipid content through the gut (6). Peripherally, NT promotes fat absorption and weight gain, whereas central NT signalling supresses feeding and favours weight loss (7).

Studies in NT-deficient mice showed protection from obesity, hepatic steatosis and insulin resistance associated with high fat consumption (8). Human studies showed that insulin-resistant person with obesity have elevated pro-NT levels, which could serve as an indicator of obesity risk later in life (8).

Material and Methods: Meta-analysis of genome-wide association studies (GWAS) for serum pro-NT from four independent cohorts (LIFE-Adult and Sorbs, Germany; Malmö Diet Cancer (MDC) and Malmö Offspring Study (MOS), Sweden; N=10,096) was conducted. Potential functional variants of the *NT* locus were included in Mendelian Randomization (MR) analyses to assess possible causative chains between NT and correlated metabolically relevant traits. Further, MRI-based outcomes of the reward network using connectivity strengths (CS) and cluster coefficients (CC) of fractional anisotropy (FA) and number of streamlines (NOS) of white matter connections between major hubs of the reward network (N=1090; LIFE-Adult) were analyzed.

Results: Meta-GWAS followed by secondary analyses revealed three loci with significant associations: i) one on chromosome (chr) 4 – rs6822751; ii) on chr 11 – rs41392245 and iii) on chr 12 – rs2723889. MR analyses using the three variants suggested a causal effect of pro-NT on pallidum brain structure (P=7.4x10-5 in the penalized and penalized-robust MR-Egger). Moreover, there was a significant causal effect on brainstem, in the robust and penalized-robust IVW methods (P=0.009).

In addition, in a subsample with MRI measurements (N=1090), BMI was not significantly different between genotype groups after correcting for age and sex, for all three variants (full - null model comparison, all F<2.5, all P>0.08). Except for NOS CC (P=0.016), simple linear regressions adjusted for age and sex confirmed that a higher BMI was related to less reward network coherence, i.e. to lower FA CS, NOS CS, and FA CC (all t<-4.2, all P<3.4x10-5).

Conclusion: The present genetic study not only revealed genetic variation associated with serum pro-NT, but also highlights causal effect of the pro-NT on human brain structure.

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GC1.097

Tracing obesity from parents to adult offspring: The Tromsø Study 1994-2016

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Introduction: Obesity is a chronic lifelong disease which contributes significantly to ill health and premature death. The obesity epidemic affects all ages and socioeconomic groups. Our genes are important in determining our susceptibility to weight gain, but the energy balance is determined by our energy intake from food and energy expenditure from physical activity. The combination of shared genetic and environmental factors can be studied through intergenerational transmission, previously shown in studies of children and adolescents. The objective of this study is to assess

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the association between parents' body mass index (BMI) and obesity status and their adult offspring's BMI and obesity status.
Methods: We used data from the population-based Tromsø Study with family linkage via the Norwegian National Population Register. All participants aged 40-59 years attending the seventh survey of the Tromsø Study (Tromsø7 2015-2016) with both parents aged 40-59 years attending the fourth survey of the Tromsø Study (Tromsø4 1994-1995) were included (n=2068 complete parent-offspring trios). Obesity status was defined by anthropometry (BMI ≥30 kg/m² calculated by measured height and weight). We explored the associations between parents' and adult offspring's BMI and obesity status using linear- and logistic regression models with regression coefficients, odds ratios (ORs) and confidence intervals (CIs), adjusted for offspring's sex, and parents' and offspring's age, education- and physical activity level.
Results: We found strong associations between parents' and offspring's BMI and obesity status, and inclusion of covariates did not affect the associations. When adjusting for covariates, we found that one standard deviation increase in maternal and paternal BMI were associated with 0.80 (95 % CI 0.60-1.00) and 0.74 (95 % CI 0.55-0.93) units increase in adult offspring's BMI, respectively. In a separate model combining the exposure of mother's and father's obesity status, the offspring had increased odds of obesity when only the mother had obesity (OR 3.44 [95 % CI 2.31-5.11]), only the father had obesity (OR 3.74 [95 % CI 2.54-5.50]), and when both parents had obesity (OR 6.01 [95 % CI 2.85-12.66]), compared to both parents having normal weight.
Conclusion: Parents' BMI was strongly associated with their adult offspring's BMI. Obesity in both parents sixfold increases the odds of obesity in the adult offspring. Our findings indicate that the intergenerational transmission of obesity continues in adulthood.

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GC1.099

DNA methylation association with obesity in a Hispanic childhood obesity cohort

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Background: Obesity is an ongoing issue characterized by an imbalance of energy intake and expenditure and is diagnosed by the body mass index (BMI), disproportionately affecting population groups within the United States (US) such as Hispanics. Despite this, they remain an understudied population in genetics. While studies have been conducted to elucidate genetic and environmental contributions to obesity, neither have been able to completely explain the obesity phenotype. By looking at epigenetics, we can work within the intersection of genetics and environment to identify risk factors for childhood obesity that may differ from those identified in adult cohorts.
Methods: We are examining blood-based DNA methylation signatures in Hispanic children (age 4-19 years; average 11.0 +/- 0.2) who participated in the Viva la Familia study (VIVA), a family-based study designed to identify genetic risk factors for childhood obesity. Body weight was measured to the nearest 0.1 kg with a digital balance, and height was measured to the nearest 1 mm with a stadiometer. Using MethylSeq and a hybrid candidate gene/genome-wide probe library, we profiled 2.6 million CpG sites in 916 Hispanic children. The SOLAR package is used for heritability estimates and association analyses, and the bedmap program is used to assign genes to CpG loci.
Results: Body mass index (BMI; h2=0.39, p=5.3x10-9) was heritable, suggesting a non-genetic component in this trait. We tested for associations between DNA methylation levels and this phenotype using inverse-normalization and adjusting for covariates (sex, age, age², and their interactions). Based on 144 samples, we did not find significantly associated CpG loci after adjusting p-values for multiple comparisons using Benjamini and Hochberg's FDR method, however we do see several CpG loci that show nominally significant associations with BMI when uncorrected. The most significantly associated genes mapped to obesity related genes *SIGLEC15* (p=4.0x10-5) and *KDM4B* (p=9.1x10-5) as well as genes associated with gut health *DAB1* (p=1.0x10-4) and *ZNF277* (p=9.1x10-5).
Conclusion: While not significant after FDR correction, the CpGs with the lowest p-values show association with obesity, gut, and metabolism. We are currently analyzing the full data set (n=916) and anticipate that analysis of all samples plus consideration of the correlation structure of the CpG sites will allow us to identify differentially methylated loci significantly associated with childhood obesity in an at-risk population.

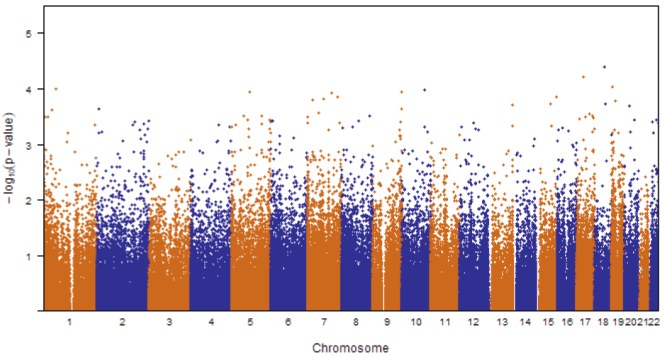


Fig. 1. Manhattan plot showing DNA methylation and its association with BMI.

GC1.100

The effect of obesity and aging on the metabolome in monozygotic twin pairs discordant for BMI

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Introduction: Identifying the molecular mechanisms connecting obesity to cardiometabolic complications during the aging process is of great importance for developing new treatments. We aimed to investigate which circulating metabolites were associated with excess body weight and age independent of genetic factors by using the design of monozygotic (MZ) twin pairs discordant for BMI in two age groups.
Methods: Sixty-three MZ twin pairs discordant for BMI (intrapair difference ΔBMI ≥ 2.5 kg/m², 42 pairs 27–42 years, 21 pairs 57-69 years) were characterized in detail for metabolic health. We performed non-targeted metabolite profiling of fasting plasma with an ultra-high performance liquid chromatography (LC) system coupled online to a high-resolution mass spectrometry (MS) instrument using two separate chromatographic
Methods: reversed phase (RP) and hydrophilic interaction chromatography (HILIC). This was carried out in both heated electrospray ionization (ESI) polarities, i.e., ESI+ and ESI-. We performed differential analyses between heavier and leaner co-twins (n=63 pairs) using the Limma R package, adjusted for twinship, sex, age, and diabetes. Next, we analyzed the differential metabolites between the two age groups, adjusted for twinship, sex and diabetes status. We identified and annotated significantly different metabolites according to the guidelines from the Metabolomics Standard Initiative (MSI).
Results: We obtained 2978 molecular features (580 and 2398 from HILIC and RP modes, respectively) of which 436 features were significantly different (p < 0.05) between the co-twins. Among these, 58 metabolites were identified with MSI level 1 or 2. In heavier co-twins, lysophosphatidylcholines (LPC) were lower, while amino acids (e.g. L-isoleucine, L-tyrosine)

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and most phosphatidylcholines (PC) were higher. The association of BMI discordance to metabolites was different in the older and younger twin pairs. Compared to their leaner twin pair members, 229 differential metabolites ($p < 0.05$) were found in the older, heavier twins and 371 differential metabolites ($p < 0.05$) in the younger, heavier twins. Out of these, 131 were significantly different between the two groups (23 L1 and L2). In the heavier co-twins, several bile acids (colic acid, chenodeoxycholic acid, glycodeoxycholic acid) were lower in older pairs and higher in younger pairs. The aromatic amino acids L-phenylalanine and L-tryptophan were higher in older heavier twins compared to their leaner co-twin but were not different between co-twins in younger pairs.
Conclusion: Obesity was associated with lower plasma LPC levels and higher amino acids levels. Plasma bile acids were associated with obesity in opposing directions in aging with lower levels in older, heavier twins and higher levels in younger, heavier twins. This may suggest a more pronounced worsening of plasma bile acid profile in the aging process in people with obesity.

GC1.101

Continuous glucose monitoring in patients with symptoms of hypoglycemia after bariatric surgery: a retrospective study

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Introduction: Hypoglycemia or late dumping syndrome is a known long-term complication after bariatric surgery. Yet, no consensus exists regarding the best diagnostic approach and treatment for these patients. Since 2019, in our bariatric center, patients complaining of hypoglycemic symptoms after bariatric surgery underwent continuous glucose monitoring (CGM) for 7 days whilst concomitantly logging complaints. This study retrospectively analyses this data with the aim to better understand patient complaints in relation to glucose variations.
Methods: All patients who received GCM due to hypoglycemic complaints after bariatric surgery were included. The data of the first 100 patients are presented. Demographic data was extracted from the electronic patient files, as well as details regarding surgical history, comorbidities, weight loss and treatment of post-bariatric surgery hypoglycemia.
Results: Of the 100 cases analyzed, 86% were female with a mean age of 47 (± 11) years and a mean BMI of 30.2 (± 6.2) at the time of CGM. Glucose values below 3.0 mmol/L were present in 57% of these patients, with a median of 2 events [1.0 – 3.5] and 20 minutes [7.5 – 60.0] spent below this value over 7 days. Within this group 80.7% received only lifestyle advice, which resulted in 50% reported symptom improvement. 21% of patients received additional pharmacological treatment, resulting in 75% improvement. In the remaining 43% of patients without hypoglycemia during the CGM, 53% still experienced postprandial pseudo-hypoglycemic symptoms.
Conclusion: CGM analysis of post-bariatric patients with hypoglycemic symptoms gives relevant insights regarding the occurrence of hypoglycemia. The presence of postprandial pseudo-hypoglycemic symptoms, without measured hypoglycemia, suggests that the development of symptoms has a different etiology in this patient group. Further analysis of our data on eating behavior, glucose variability and slope declines shall give valuable information herein.

GC1.102

Nutritional Profile and Body Fat in Beneficiaries of a Senior Care Center in Tijuana, Mexico

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Introduction: The nutritional status in the elderly, along with an elevated amount of body fat, are variables that may be significantly related to other relevant health aspects, highlighting an increased probability of developing sarcopenia (Nasimi et al., 2019). Therefore, the aim of this study is to characterize the nutritional profile and percentage of body fat in non-institutionalized older adults attending a senior care center.
Methods: Observational, descriptive, and cross-sectional study involving 31 older adults (22 women and 9 men) residing in communities in the city of Tijuana, Mexico. Participants voluntarily attended the Laboratory of Biociences of Human Motility (LABIMH) at the Faculty of Sports, Autonomous University of Baja California. Informed consent was obtained in the presence of a witness. Nutritional status was assessed using the Mini Nutritional Assessment (MNA), and weight, height, BMI were measured. Body fat percentage was analyzed using electrical impedance (InBody 770).
Results: The mean age of participants was 76.5 ± 10.0 years, height 154.9 ± 7.5 cm, weight 67.4 ± 16.2 kg, and skeletal muscle mass 21.7 ± 4.5 kg. MNA scores identified five participants (16.1%) in a malnutrition state (14.5 ± 1.3), 20 (64.5%) at risk of malnutrition (19.8 ± 2.1), and six (19.4%) well-nourished (26.2 ± 1.2). According to BMI classification, twelve subjects (38.7%) had obesity status (32.9 ± 3.6), eleven (35.5%) were overweight (27.3 ± 1.0), seven (22.6%) had a normal BMI (22.1 ± 1.6), and one (3.2%) was underweight (16.2). Regarding body fat percentage, based on Muth et al. (2009), 28 subjects (90.3%) were in an obesity status (39.1 ± 7.0%), while only three subjects (9.7%) had a normal status (18.8 ± 1.6%).
Conclusion: This study reveals a high prevalence of malnutrition and risk of malnutrition based on MNA, overweight and obesity based on BMI, and obesity based on body fat percentage among participants. This emphasizes the need to provide attention to this population group and implement intervention programs to improve these health indicators.

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GC1.103

Passive dehydration changes bioelectrical impedance's assessed body fat percentage and phase angle in overweight and obese individuals

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Introduction: Bioelectrical impedance analysis (BIA) is one of the most widely used methods to estimate body composition and phase angle (PhA). PhA is considered a marker of cellular health, analyzing the quality of the plasma membrane through resistance and reactance. The aim of this study is to determine whether weight loss due to passive dehydration

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Tab. 1. Descriptive statistics of participants in body composition variables and phase angle before and after sitting for five hours in a warm environment.

Variable	Before	After	Difference	p =
Body weight (kg)	88.4 ± 10.4	87.5 ± 10.4	–0.90	0.001
Body fat mass (%)	27.3 ± 4.6	26.6 ± 4.6	–0.70	0.010
Skeletal muscle mass (kg)	37.1 ± 5.1	36.8 ± 4.9	–0.30	0.159
Phase angle (°)	7.05 ± 0.46	7.13 ± 0.47	0.08	0.044

influences body composition variables and phase angle obtained by BIA in people with overweight or obesity.
Methodology: Nineteen participants (Age= 22.9 ± 2.4 yr., Height= 173.5 ± 5.9 cm) with overweight or obesity were recruited. They were assessed for body weight, body fat percentage (BF%), skeletal-muscle mass (SMM), and PhA before and after remaining seated for five hours in a room with controlled climate conditions (Temp. = 28.2 ± 1.2 °C, Relative humidity = 74.8 ± 6.1%). The participants were instructed to attend well-hydrated (1.012 ± 0.006 specific gravity) and 10 hours of fasting. On the day before the session, participants drank at least 3 L of water (to attend well-hydrated), refrained from engaging in moderate-to-high-intensity physical activity, medications, and ingesting beverages or foods considered diuretics. People with implants, prosthetics, or pacemakers were excluded. For the first BIA measurement (InBody 770), participants were instructed to urinate and defecate beforehand and afterward. Bathroom visits were restricted until the completion of the second measurement. Participants were asked to remove any metal objects they were wearing. A t-test for repeated measures was applied, and effect sizes (Cohen's d) were calculated.
Results: No significant differences were observed in SMM (p= 0.159; d= 0.34); however, changes were found in body weight (p= 0.001; d= 2.03), BF% (p= 0.010; d= 0.34), and PhA (p= 0.044; d= -0.50) before and after remaining seated for five hours in a warm environment (Table 1).
Conclusion: The loss of approximately ~0.9 kg of body weight through sweating in a hot climate room results in a change in the BF% and PhA values obtained by BIA. Body water loss reduces BF% (small ES) and increases PhA (moderate ES) in individuals with overweight or obesity.

GC1.104

Postingestive reward acts through behavioural reinforcement and is conserved in obesity

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Introduction: Postingestive nutrient stimulation conditions food preferences through striatal dopamine and may be associated to blunted brain responses in obesity. Here, we hypothesized that postingestive reward, as measured in a Flavour-Nutrient Conditioning (FNC) paradigm, is impaired in obesity, when compared with a healthy and lean sample, and is recovered by bariatric surgery.
Methods: We developed a novel FNC protocol in healthy volunteers (n=159), masking sensory cues for maltodextrin-enriched yoghurts, for FNC with maltodextrin-paired (+102 kcal, CS+) and control (+1.8 kcal, CS-) flavours. Postingestive conditioning strength obtained in this optimized protocol was then compared between patients with obesity either before or after bariatric surgery, and healthy volunteers, all of whom were also assessed with [123I]IBZM SPECT to explore potential associations between postingestive conditioning and striatal dopamine D2-like receptors (DD2lR) availability.
Results: After conditioning, healthy volunteers (n=52) increased preference for CS+ assessed according to intake, but not pleasantness. In a clinical study (n=61), behavioural conditioning in the absence of effects on pleasantness was confirmed across pre-bariatric candidates with obesity, weight-stable post-surgery patients, and healthy controls, without significant differences between groups. DD2lR availability was reduced in the obesity group, and strongly correlated with conditioning strength, as well as a measure of restrained eating, in patients with gastric bypass.
Conclusions: These results show that postingestive nutrient stimulation influences human food choices through behavioral reinforcement and is conserved in obesity as well as after bariatric surgery.

GC1.105

Beneficial metabolic effects of amino acids, Krebs cycle intermediates and electrical pulse stimulation on C2C12 myotubes

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Introduction: Mus musculus C2C12 myotubes are a widely used in vitro model to analyse the functionality of skeletal muscle cells, multinucleated cells rich in protein content. Eventual damages or dysfunctions, especially at the mitochondrial level, can be prevented through dietary supplementation of a branched-chain amino acid-enriched mixture (BCAAem) and physical exercise, able to ameliorate mitochondrial dysfunction stimulating mitochondrial biogenesis (Jager et al., Proc Natl Acad Sci, 2007; D'Antona et al., Cell Metab. 2010) and prevent oxidative stress (D'Antona G. et al., Antioxid. Redox Signal. 2016). Thus, we seek to determine whether using an amino acid mixture enriched in Krebs cycle intermediates (PD-E07) and electrical pulse stimulation (EPS) synergistically reproduces these effects on C2C12 differentiated myotubes.
Methods: C2C12 myotubes (day 5 of differentiation) are treated with PD-E07 (0.1-1% w/v) for 24 and 48 hours with or without electrical stimulation (EPS, 15V, 2Hz, 1ms) for 1 hour with Ionoptix C-Pace EM Culture Stimulator to reproduce physical exercise in vitro (Fig.1). Cell viability was evaluated with MTT assay. Afterwards, we investigate the gene and protein expression of myokines, mitochondrial markers, antioxidant systems, mitochondrial mass (mtDNA), mitochondrial function (measured by oxygen consumption rate with Clark's electrode), and glucose uptake.
Results: Our preliminary results show that PD-E07 increase the viability of C2C12 myotubes compared to non-treated (NT) C2C12 cells in a dose-dependent manner, probably due to the stimulation of mitochondrial function, since MTT assay indirectly evaluates the activity of mitochondrial dehydrogenase. Accordingly, PD-E07 treatment significantly increases the expression of mitochondrial biogenesis (PGC1α, NRF1, Tfam) and antioxidant (SOD1, SOD2, catalase) markers, mitochondrial mass and respiration, myokine production (IL-6, FGF-21), and insulin sensitivity already after 24 hours of treatment. Of note, PD-E07+EPS synergistically increases mitochondrial biogenesis and antioxidant mechanisms. Furthermore, PD-E07 decreases EPS-induced inflammation and increases glucose uptake.
Conclusions: In summary, we demonstrate the beneficial effect of PD-E07 and the synergistic effect of PD-E07 and EPS on differentiated C2C12 myotubes, thus increasing mitochondrial biogenesis and glucose uptake,

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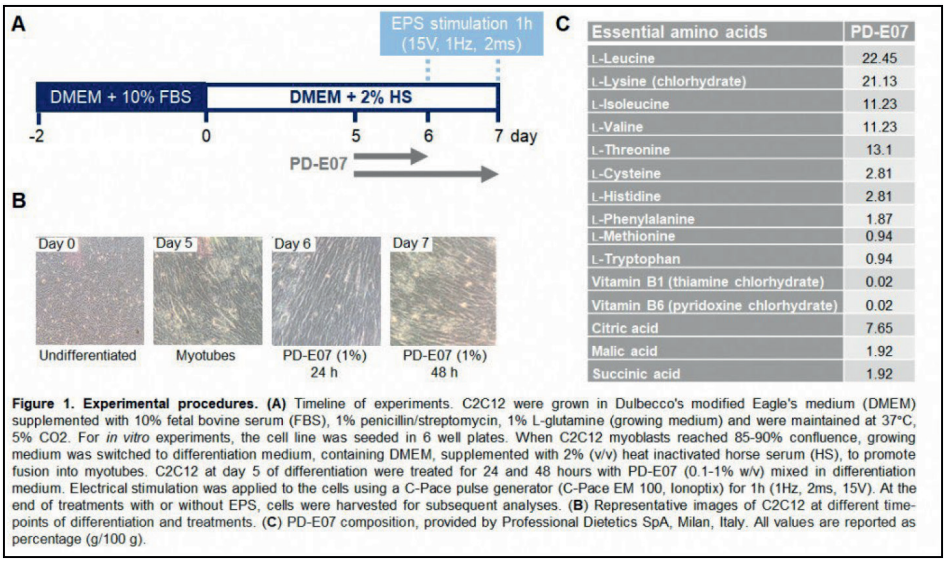


Figure 1. Experimental procedures. (A) Timeline of experiments. C2C12 were grown in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% fetal bovine serum (FBS), 1% penicillin/streptomycin, 1% L-glutamine (growing medium) and were maintained at 37°C, 5% CO2. For *in vitro* experiments, the cell line was seeded in 6 well plates. When C2C12 myoblasts reached 85-90% confluence, growing medium was switched to differentiation medium, containing DMEM, supplemented with 2% (v/v) heat inactivated horse serum (HS), to promote fusion into myotubes. C2C12 at day 5 of differentiation were treated for 24 and 48 hours with PD-E07 (0.1-1% w/v) mixed in differentiation medium. Electrical stimulation was applied to the cells using a C-Pace pulse generator (C-Pace EM 100, Ionoptix) for 1h (1Hz, 2ms, 15V). At the end of treatments with or without EPS, cells were harvested for subsequent analyses. (**B**) Representative images of C2C12 at different time-points of differentiation and treatments. (**C**) PD-E07 composition, provided by Professional Dietetics SpA, Milan, Italy. All values are reported as percentage (g/100 g).

Fig. 1.

activating the antioxidant defence systems and decreasing inflammation levels. On these results, we will investigate whether our original PD-E07 formula ameliorates mitochondrial dysfunction and energy metabolism in mice and human patients suffering from metabolic myopathies.

GC1.106

Adverse muscle composition predicts all-cause mortality in obesity – A personalized assessment of sarcopenic obesity using magnetic resonance imaging

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Introduction: Weight loss has become an attractive target in the management of several chronic conditions. As pharmaceuticals are becoming more and more effective in achieving larger weight loss, the need to better understand the aspects of muscle health is growing. Adverse muscle composition assessed by magnetic resonance imaging (MRI) has previously been linked to poor functional performance, comorbidity, and all-cause mortality in non-alcoholic fatty liver disease (NAFLD) and general population. The aim of this study was to investigate the associations of all-cause mortality with adverse muscle composition within obesity (BMI >30 kg/m^2).
Methods: 56,109 UK Biobank participants were imaged using a 6-minute neck-to-knee protocol. Images were analyzed by AMRA® Researcher for quantification of thigh fat-free muscle volume and muscle fat infiltration (MFI), and calculation of a personalized sex-, weight-, and BMI-invariant muscle volume z-score (z-MV). Participants were partitioned according to muscle composition phenotype (adverse muscle composition, only high MFI, only low z-MV, normal muscle composition) using previously published cut-offs for high MFI (8.82/7.69% for females/males) and low z-MV (-0.68 standard deviations for both females and males). The associations of muscle composition with all-cause mortality were investigated using Kaplan-Meier survival curves and Cox proportional-hazard modelling with normal muscle composition as referent. Models were adjusted for low hand grip strength, sex, age, BMI, other diseases (cancer, type 2 diabetes, coronary heart disease), and lifestyle factors (smoking, alcohol consumption, physical activity).
Results: 9,840 participants had obesity and complete data (50% men, age 64.4 (±7.6) years and BMI 33.5 (±3.4) kg/m^2). During a mean (±SD) follow-up of 3.9 (±2.2) years 174 deaths were recorded. The most common causes of death were ischaemic and hypertensive diseases. Modelling showed that adverse muscle composition (20.3% prevalence) was significant associated with all-cause mortality (hazard ratio [95% CI] 3.05 [2.11;4.42], p<0.01), but not only high MFI and only low z-MV (1.43 [0.98:2.07], p=0.063 and 1.50 [0.76;2.96], p=0.243). Adverse muscle composition remained significant when including low hand grip strength (3.07 [2.10;4.48], p<0.01), sex, age, and BMI (1.88 [1.25;2.82], p<0.01), other diseases (1.83 [1.21;2.78], p<0.01), and lifestyle factors (1.70 [1.12;2.59], p=0.013). Other significant factors in the fully adjusted model were sex, age, type 2 diabetes, and smoking.
Conclusion: Adverse muscle composition was common in obesity and significantly associated with all-cause mortality. A significant association was found only when participants had both low muscle volume z-score and high muscle fat infiltration indicating the importance of assessing the amount of muscle fat when evaluating muscle health.

GC1.108

GDF15 is dispensable for the insulin-sensitizing effects of exercise

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Growth and differentiation factor 15 (GDF15) has recently emerged as a weight loss and insulin-sensitizing factor. Growing evidence also support a role for GDF15 as a physiological, exercise-induced, stress signal. We here tested whether GDF15 is required for the insulin-sensitizing effects of exercise in mice and humans. At baseline, under standard nutritional state and independently of sex, GDF15 KO mice display normal glucose tolerance, systemic insulin sensitivity, maximal speed and endurance running capacity when compared to littermates. When submitted to a 4-week exercise training program, wild-type and GDF15 KO mice similarly improve their endurance running capacity, glucose tolerance, systemic insulin sensitivity and peripheral glucose uptake. Insulin-sensitizing effects of exercise training were also unrelated to changes in plasma GDF15 in humans. In summary, we here show that GDF15 is dispensable for the insulin-sensitizing effects of exercise.

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GC2 – Behavioural and Public Health

GC2.001

Social inequity in health among individuals with severe obesity and multimorbidity

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Introduction: Obesity adversely affects the health of the individual and impacts society through increased healthcare costs and lost workdays. Those in lower socioeconomic groups are more severely affected with a 1.6 and 2.8 higher prevalence of BMI≥25 kg/m^2 and BMI≥30 kg/m^2, respectively, among the lowest compared to highest educational level. Here we examined the distribution of people living with severe obesity and comorbidities across municipalities and different educational levels.
Methods: Data derives from the Danish National Health Survey 2021, a cross-sectional sample, that aim to describe the prevalence and distribution of health and morbidity in the adult (age ≥16 years) population in Denmark. The questionnaire was sent out to a national and municipality representative sample of 324,000 individuals with a response rate of 56.7% (n=183,646). The focus was on individuals with BMI≥35 kg/m^2. Education was categorised into 5 different levels (Elementary school [≤10 years]; Vocational school [11-12 years]; Higher education, short [13-14 years], medium [15-16 years], long [≥17 years]). Obesity related co-morbidity was categorized into having 0, 1, 2 and ≥3 out of 12 morbidities [Asthma; T2DM; Hypertension; Coronary artery syndrome; Chronic bronchitis, COL; Osteoarthritis; Rheumatoid arthritis; Mental disorder; Disc herniation or sciatica; Myocardial Infarction; Stroke; Cancer]. Analysis including educational level was only conducted for individuals ≥30 years.
Results: A total of n=167,573 had sufficient data to be included of which 5.8% had a BMI≥35 kg/m^2 ranging from 2.2% to 10.7% in the 98 Danish municipalities and from 2.6% (highest education) to 8.8% (lowest education) according to education level. An estimated 280,500 Danes ≥16 years of age (216,500 ≥30 years of age) live with a BMI≥35 kg/m^2 of which 69% had ≥1 co-morbidity. Among those with BMI≥35 kg/m^2, 86.6% and 52.6% of individuals with shortest education had ≥1 and ≥3 co-morbidities, respectively, while these numbers were 52.6% and 14.6% among those with longest education. Among those with BMI≥35 kg/m^2 and ≥3 comorbidities, 73.6% (n=45,800) have elementary school or vocational school as highest education level and 3.4% (n=2,200) have a long higher education although representing 58% and 7% of the general Danish population, respectively. The difference between individuals with lowest and highest education level is a factor 3.4 and 10.6 among individuals with BMI≥35 kg/m^2 and BMI≥35 kg/m^2 with ≥3 co-morbidities, respectively.
Conclusion: Social inequity in health becomes more pronounced as BMI increases and comorbidities start to emerge. Hence, more research is needed to understand the underlying causes to better prevent and manage obesity in the future as well as reducing social inequity in health.

Conflict of interest: None disclosed.

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GC2.003

Experiences of healthcare professional delivery of opportunistic discussions about weight management in a mental health setting: a mixed methods design

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Introduction: Making Every Contact Count (MECC) is a person centred and opportunistic approach to health behaviour change that applies appropriate theory informed behaviour change techniques from behavioural science, delivered during every appropriate contact. MECC promotes behaviour change by using opportunistic delivery of healthy lifestyle information in five key health related areas including smoking, healthy eating, physical activity, drugs and alcohol and mental health. This study aimed to explore the perceptions and experiences of staff delivering MECC discussion about weight in a mental health setting.
Methods: This study was conducted within a mental health setting in the North East of England, including inpatient and outpatient staff, and patients with severe mental illness and also those in secure services. Using a mixed methods design, firstly a quantitative online survey was conducted to capture staff perspectives on the delivery of MECC after being trained, three surveys were distributed to staff (pre training, post training, and follow-up 8-10 weeks post training). An interview study was then conducted with staff who had received training to gain an understanding of healthcare professionals' views on delivering MECC. Quantitative data was entered into SPSS and descriptive statistics were used to calculate means of MECC use and delivery across three surveys. Repeated measures ANOVAs were used to compare means across surveys to identify how receiving MECC training impacted staff confidence and delivery of MECC. Healthcare professional interview data (transcripts) was coded in NVivo using a framework analysis.
Results: For the quantitative survey, 36 members of staff completed the pre survey, and 20 completed the post survey. Fifteen trained healthcare professionals took part in the interviews. The training provided to staff appeared to increase staff views' of capabilities, opportunities and motivation to deliver MECC. Although only one statistically difference was shown for the Psychological Ability to deliver MECC to service users, it is apparent that at post training, staff are showing the most prominent changes to how they view MECC, it's importance, usefulness and how confident they feel to deliver MECC to service users following training. Qualitative findings identified 10 categories of barriers or facilitators, including: (i) impact on patients, therapeutic relationship, and organisation (ii) skills and confidence to deliver MECC, (iii) availability of resources, organisational support, and time constraints, (iv) awareness of MECC, and (v) alignment of MECC with role.
Conclusion: The study revealed that MECC training positively influenced healthcare professionals' perceptions and confidence in delivering healthy lifestyle discussions, particularly regarding weight, in a mental health setting. While statistically significant changes were observed in psychological ability, qualitative insights highlighted multifaceted factors influencing MECC implementation, including organisational support, resource availability, and role alignment.

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GC2.005

Overview of obesity in people with severe mental illnesses in Bulgaria, region of Ruse

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Introduction: Obesity is a huge problem for the whole society, but less attention is paid to this problem in some vulnerable groups of the population. People with severe mental illness SMI /defined as those with schizophrenia and psychotic disorders, bipolar disorder and major depressive disorder with psychotic features/ are often with obesity. Obesity is a serious problem in people with mental illness and is the result of the combined action of a number of factors: the orexigenic effect of psychotropic medication, behavioral characteristics, unhealthy diet, low physical activity, and the stigma of mental illness and poverty.

Obesity is particularly undesirable in people with mental illness as it further impairs their quality of life and increases the risk to their somatic health. Despite the high prevalence of obesity, the mentally ill have more difficulty accessing health risk modification advice and lifestyle interventions to prevent and treat obesity than the general population.

Methods: The study included 114 men and women aged 21-65 years (mean age 44.42±11.91 years), diagnosed with mental illnesses (SMI and intellectual disability), living in the city of Ruse, Bulgaria. Of these, 64 (56.1%) live in a family environment, and 50 (43.9%) live in municipal family-type accommodation centers. Their anthropometric status was assessed using different tools: waist circumference (WC), BMI, % body fat and visceral fat measured with BIA (Bielectric Impedance Analysis) – professional type "Tanita". The data were entered and processed with statistical package IBMSPSS Ver.26.0.

Results: The results show that the mean value of BMI is 28.69%. In the studied group, 70.1% were with overweight and obesity, 28.9% were with overweight and 40.2% with obesity. The highest frequency of obesity (based on Fat mass %) is in the group of women aged 40-60. (57.6%), followed by younger women 18-40 (33.9%). WC is normal in 16.9% of women and 30.9% of men. The VFR indicator, which gives the most accurate information about the cardio-metabolic risk, is within the optimal, safe values for 40.4% of women and 21.9% of men. In women, the strongest correlation was found between WC and VFR ($r=0.843$, $p<0.001$), and in men, a correlation was found between BMI and VFR ($r=0.866$, $p<0.001$), between BMI and Fat mass% ($r=0.875$, $p<0.001$) and WC and BMI ($r=0.900$, $p<0.001$).

Conclusion: Obesity is a current problem in people with mental illness, especially in women aged 40-60. Both BMI and BIA can be used to monitor deviations from normal body weight due to their higher accuracy. WC also has a number of advantages for health risk stratification: it does not require expensive instrumentation and is a readily available and reliable tool for predicting metabolic risk in people with mental illness. The high prevalence of overweight and obesity among patients with SMI justifies the development of specific programs on obesity risk awareness for this population, which would reduce the health risks of this group of patients and improve their quality of life.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC2.009

Influences on excess weight gain in 0-5 year olds: A co-produced stakeholder systems map

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Introduction: Excess weight gain in 0-5 year olds is increasing globally. In the UK, around 20% of children start school already living with being overweight or obesity. There are significant inequalities, with obesity rates being twice as high in areas of socioeconomic deprivation. For adults, whole systems approaches are increasingly taken to understand the influences of obesity. Examples include the Foresight Map, which considered the influence of national policies, food manufacturing processes, local infrastructure and individual behaviours. However, no existing systems map focuses on younger children, where unique factors may operate including the influence of parents and early years childcare providers. We aimed to use a systems thinking approach and stakeholder co-production to develop a systems map to identify key factors contributing to excess weight gain in 0–5 year olds.

Methods: We held a single 6 hour workshop with 23 stakeholders in the UK including childcare practitioners, public health specialists and commissioners. The research team introduced stakeholders to systems thinking and divided the attendees into 5 mapping groups, each with a variety of stakeholders. Using a 'blank canvas' group model building approach, each group was asked to consider factors they felt influenced excess weight gain and to start building the map using flipcharts and post-it notes. The groups were also encouraged to draw arrows between connected factors. Vignettes of families with young children were used to aid thinking. Stakeholders then considered which factors were the most influential by applying stickers on any map in the room. After the event, we collated the maps into a single systems map and a summary ecological framework. We developed these maps through discussion with 6 parents, getting feedback from the workshop attendees, and reviewing existing obesity and child development frameworks, policies and relevant literature.

Results: Stakeholders suggested that multiple, interacting domains impact on excess weight gain amongst 0-5 year olds. The final systems map included 157 factors grouped into 10 domains. Our summary ecological framework included 4 levels. Level 1: 'individuals' within the domains of children and parents (e.g. physiological, food preferences and medical needs' alongside parents' own eating habits, income, food literacy and life pressures). Parents were viewed as critical. Level 2 includes family and social networks. Level 3 are local influences including childcare providers and access to green spaces. Level 4 relates to national/global aspects. Stakeholders felt that national policies and global events over the last decade including Austerity and Food inflation had been detrimental to supporting families and services with helping young children to eat healthily.

Conclusion: Multiple interacting factors impact on excess weight gain amongst 0-5 year olds. Some were unique for this age group or were considered more significant, especially the stresses parents face. Our stakeholder-informed systems map supports the development and evaluation of interventions aiming to prevent or reduce excess weight amongst 0-5 year olds.

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GC2.010

Air pollution and risk of overweight and obesity in a large real-world data of adult population

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Introduction: Exposure to air pollution could potentially influence the onset of adult overweight and obesity. Nevertheless, existing literature lacks consistency, primarily consisting of cross-sectional studies, and more research is needed to reduce uncertainty. The objective of this study is to evaluate the longitudinal association between air pollution and risk of adult overweight and obesity in a large population-based cohort in Catalonia, Spain.
Methods: We included individuals aged 18-90 years old registered in the Information System for Research in Primary Care (SIDIAP) between January 1, 2006 and December 31, 2017. Air pollution (nitrogen dioxide [NO2] and particulate matter <10 µm [PM10], <2.5 µm [PM2.5], and 2.5-10 µm [PMcoarse]) was estimated using a land use regression (LUR) model annually at residential census tract levels. Height and weight were recorded by healthcare professionals during primary care visits. Body mass index (BMI) was calculated as a person's weight in kilograms divided by the square of their height in meters (kg/m^2) and was used to classify individual weight status. Information on demographics and lifestyle factors (e.g., smoking status, alcohol use) was available. We selected individuals with at least one environmental measure, an initial normal BMI < 25 kg/m^2 taken within a year of that measure, and at least one more BMI measurement with a minimum 6-month gap. Individuals were followed until they developed overweight or obesity, died, were transferred out of SIDIAP, or the end of study period (31/12/2018). We estimated the risk of developing overweight and obesity (hazard ratio, HR) per interquartile range (IQR) increase in air pollution exposure with Cox proportional hazard models. Models were adjusted for sex, age, smoking, alcohol consumption, nationality, rurality and socioeconomic status. We stratified the results by sex.
Results: Exclusions resulted in a total analytic sample of 324,397 individuals (67% women) with a mean age of 53 years old at baseline. After a median follow-up time of 5 years, a total of 102,758 individuals (32%) developed overweight or obesity and these individuals were more likely to be men, of younger age and to have a lower socioeconomic status. Exposure to higher levels of NO2, PM10 and PM coarse was associated with a higher risk of developing overweight or obesity (HR = 1.01, 95% CI 1.00 – 1.02, per IQR [27.9 µg/m3] increase; HR=1.01, 1.00 – 1.02, per IQR [7.9 µg/m3] increase; HR = 1.02, 1.01 – 1.03, per IQR [5.29 µg/m3] increase, respectively). Associations were stronger and mainly significant among women (NO2, HR =1.02, 1.01 – 1.04 in women compared to HR = 0.99, 0.96 – 1.01 in men; PMcoarse, HR = 1.03, 1.01 – 1.04 in women vs. 1.01, 0.99 – 1.02 in men).
Conclusion: Our results suggest that exposure to higher levels of air pollution may be linked to a higher risk of developing adult overweight and obesity, especially among women. Associations are weak, nonetheless they hold significant global health implications considering the prevalence of air pollution and the health risks associated with obesity.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC2.012

Behavioural Susceptibility to Eating Disorders: Examining Shared Genetic Aetiology Underlying Appetite and Eating Disorder Symptoms During Adolescence in the Gemini Twin Cohort

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Introduction: Obesity and eating disorders (EDs) commonly co-occur, are both moderately heritable, and share some genetic aetiology. Appetite avidity is an established neurobehavioural mediator of genetic susceptibility to obesity - so-called Behavioural Susceptibility Theory. Emerging epidemiological evidence also implicates appetite avidity in susceptibility to ED symptoms, suggesting it mediates genetic susceptibility to EDs as well as obesity; however, this has never been explored. This is the first study to examine the extent of shared genetic aetiology underlying a key appetitive trait (food cue responsiveness) and ED symptoms during early adolescence.
Methods: Participants were from Gemini, a population-based prospective birth cohort of n=2404 British families with twins born in 2007. This study uses data from n=970 twins, collected when they were 12-13 years old. Parents reported on their children's appetite using the Food Responsiveness (FR) scale of the Child Eating Behaviour Questionnaire. Twins self-reported ED symptoms (binge eating; compensatory behaviours) using the Development And Well-Being Assessment, and on disordered eating using the Restraint scale of the Dutch Eating Behaviour Questionnaire and the Uncontrolled Eating and Emotional Eating scales of the Three Factor Eating Questionnaire. A multivariate twin model examined: (i) phenotypic correlations between FR and ED symptoms; (ii) heritability of each phenotype; and (iii) the extent of shared genetic aetiology, estimated using genetic correlations (*rG*: range -1 to 1; higher correlations indicate greater degree of shared genetic factors).
Results: There were significant, moderately sized phenotypic correlations between FR and ED symptoms (r =.16 -.32; all p<.001), with the largest associations observed between FR and Uncontrolled Eating (r =.32; 95%CI=.25-.38) and Emotional Eating (r =.19; 95%CI=.12-.25). Heritability estimates for FR (52%; 41-65%) and ED symptoms (range: 15-35%) were significant and moderate-large. There were significant and large genetic correlations between FR and Uncontrolled Eating (rG =.80;.48-1.0), and between FR and Emotional Eating (rG =.71;.22-1.0). This indicates that many of the same genes that predispose individuals to have a more avid appetite also increase the likelihood of disinhibited eating and eating in response to negative emotions. We did not observe any other significant genetic correlations.
Conclusions: Adolescents with a more avid appetite also report experiencing more ED symptoms. Variation in appetite, and susceptibility to ED symptoms, are all under moderate-to-high genetic influence. The associations between FR and Uncontrolled and Emotional Eating appear to be largely explained by shared genetic factors. This study has important implications for individuals living with obesity: (1) the large genetic contribution to variation in appetite adds to the burgeoning evidence for a strong biological basis to obesity; and (2) findings underline the importance of investigating the co-occurrence of obesity and disordered eating in the population, in particular, loss of control and emotional aspects of eating.

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GC2.013

Public support for obesity policies; findings from a national survey on the island of Ireland

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Introduction: Public attitudes towards measures targeting obesity may influence their implementation[1]. Therefore, before introducing obesity policies, it is important to gain a better understanding of the biopsychosocial characteristics that may influence people's acceptability of these policies. In this study, we explored how social determinants, anthropometrics, health behaviours and beliefs may influence public support for different obesity policies.
Methods: We conducted a cross-sectional telephone survey with 1000 adults from Northern Ireland (NI) and the Republic of Ireland (RoI). Participants were presented with 39 obesity interventions and reported their level of agreement on a 5-point Likert scale. Other data collected included: demographics; self-rated height and weight; lifestyle behaviours; and obesity-related beliefs and experiences. Principal Component Analysis was conducted to examine whether the policy items could be combined to form scales. The reliability of the scales was measured using Cronbach's alpha. Multiple linear regression tested the association between biopsychosocial characteristics and policy support.
Results: From the 39 obesity interventions, 5 policy components were identified accounting for 63% of the variance in policy support. These components were used to create 5 policy scales with Cronbach's alpha ranging from 0.69 to 0.91. The five polices scales were: 1) Enabling healthier choices, 2) Intrusive polices, 3) Resources, 4) Promotion and information and 5) Advertising restrictions. Higher levels of support for all policy scales were associated with: older age; living comfortably on current income; being physically active; and stronger beliefs that obesity has negative outcomes on health. Compared to the RoI, residents of NI reported greater levels of acceptability of more intrusive policies (e.g. fiscal policies), increased resources and advertising restrictions. Compared to men, women reported higher levels of support for policies that enabled healthier choices, intrusive polices and more resources. Participants who believed that maintaining a healthy weight is costly and difficult were less likely to agree with policies providing more resources, those that aim to inform and educate, and advertising restrictions. Those with a previous personal experience of weight stigma were less likely to support intrusive policies.
Conclusion: This work gives an insight into how people's demographic characteristics, health behaviours and beliefs can influence acceptability of various obesity interventions on the island of Ireland. These findings have significant implications for policy makers and can inform their recommendations for communicating and implementing population-wide strategies to address obesity.

Reference

1. WHO. Handbook for Guideline Development. 2nd edition. Geneva: World Health Organization, 2014. https://www.who.int/publications/i/item/9789241548960

Conflict of Interest: Authors have no interest to disclose.

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GC2.014

Navigating Patient Barriers in Obesity Pharmacotherapy: A Multifaceted Approach

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Obesity, a multifaceted and complex condition, presents distinct challenges in pharmacotherapy, often intensified by prolonged patient hesitation, ingrained biases, and unrealistic expectations. This presentation delineates strategies to surmount these obstacles, thereby enhancing long-term adherence to anti-obesity pharmacotherapy.
Uniquely, this work benefits from the combined perspectives of an Obesity Physician and a Patient Advocate with lived experience. This rare and powerful partnership brings forward a comprehensive understanding of both clinical and patient-centered viewpoints, enriching our approach with real-world insights and empathy.
Initially, we confront the notable delay in patient-led healthcare engagement, marked by an average waiting period of seven years before seeking professional help. This reticence stems from a spectrum of factors, including personal and healthcare provider (HCP) biases toward obesity. Our methodology emphasizes dismantling these biases through comprehensive educational interventions and empathy-based training, fostering a supportive and insightful healthcare milieu.
The focus then shifts to medication adherence and proper usage. We investigate the prevalent disparity between prescribed and actual use of obesity medications, aiming to unearth the roots of non-adherence. This component involves an intensive exploration into counseling on managing medication effects, establishing realistic expectations, and navigating potential side effects. Enhanced by regular monitoring, these measures aim to better equip patients for their therapeutic journey.
Moreover, we incorporate pioneering strategies to boost treatment effectiveness. Cognitive Behavioral Therapy (CBT) is underscored as an essential adjunct therapy, providing psychological backing that synergizes with pharmacological treatment. The influence of CBT in confronting internalized weight bias, modifying eating behaviors, improving well-being, and catalyzing lifestyle alterations is evaluated, underlining its potential to markedly elevate treatment outcomes.
In summation, this presentation offers a comprehensive examination of the multifarious barriers in obesity pharmacotherapy and formulates an all-encompassing strategy for their mitigation. By amalgamating patient education, bias reduction, adherence enhancement, and adjunctive therapies like CBT to tackle anticipated impediments, we advocate for a more efficacious approach to treatment, underpinned by enduring adherence.

GC2.015

Text messages with financial incentives for men with obesity, a randomized clinical trial

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Introduction: Effective, scalable weight loss interventions with wide reach are needed for underserved populations, particularly men, who are less likely to engage in weight management services.
Methods: This three parallel group, assessor blind randomized clinical trial was conducted in three UK areas and recruited 585 men with a Body Mass Index ≥30kg/m^2 through general practices and community

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information. Men were randomized to: texts with loss-framed financial incentives, texts only, or a waiting list for texts. Intervention groups received daily automated behavioural texts for 12 months, localised web-based information, signposting to services and self-monitoring web pages with or without an endowment incentive of €463 (£400) at enrolment, with money 'lost' by not meeting verified weight loss targets (5% at 3 months, 10% at 6 months and 10% at 12 months). The primary outcome was percentage weight change from baseline and 12 months.

Results: Participants' mean (Standard Deviation, SD) age was 50.7 (13.3) years; 227 (39%) lived in disadvantaged areas; 426 (73%) provided weight at 12 months. Mean percentage weight change from baseline (SD) was -4.8% (6.1) for texts with incentives, -2.7% (6.3) for texts only, and -1.3% (5.5) for waiting list. Texts with incentives were superior to waiting list, mean difference -3.2% (97.5 % CI, -4.6, -1.9, p <0.001); texts only were not -1.4% (-2.9, 0.0, p =0.053). Mean weight changes were -5.7kg (SD 7.4), -3.0kg (SD 7.5), and -1.5kg (SD 6.6). For texts with incentives the number needed to treat for ≥5% and ≥10% weight loss at 12 months is four and five; payments were €148 (£128) per randomized participant.

Conclusion: Texts with incentives were effective for men living with obesity and can potentially be delivered at scale. With wide reach and four in-person contacts over 12 months, they offer an alternative to intensive programs. TRIAL REGISTRATION: ISRCTN91974895

GC2.016

Changes in consummatory behavior (liking) after liraglutide treatment in adult people with obesity

Alorayyidh, N.[1]; *Abdeen, G.*[1]; *Aldhwayan, M.*[1]; *Masood, A.*[2]; *Alfadda, A.*[3]

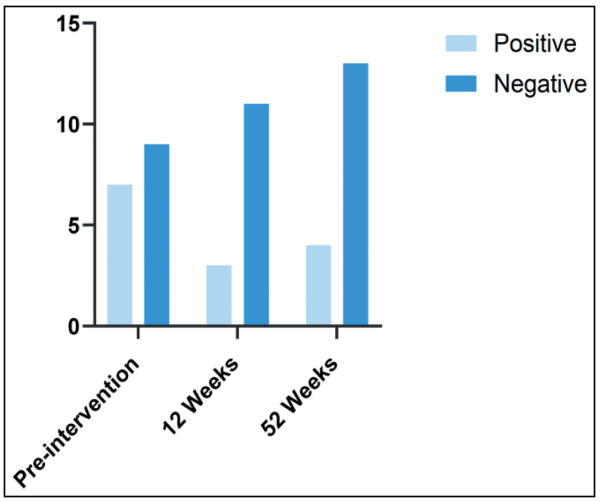
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Introduction: Bariatric surgery alters sweetness perception, but the impact of liraglutide treatment on taste and therefore consummatory behavior liking remains unknown. This study aims to explore how liraglutide influences liking behavior in adult people with obesity.

Methods: This is a prospective cohort study nested from a clinical trial that studies the impact of lirglutide. A total of 19 people with obesity underwent daily subcutaneous liraglutide administration, with gradual escalation to a maximum of 3 mg following prescribed guidelines. Taste reactivity test, involving the ingestion of complex chocolate stimuli, were conducted at three key points: baseline, 12 weeks, and after 52 weeks. Visual analog scales were employed to subjectively measure taste changes before and after the ingestion of the stimuli. Facial expressions were captured via camera during the experiment and analyzed to identify hedonic aversive reactions.

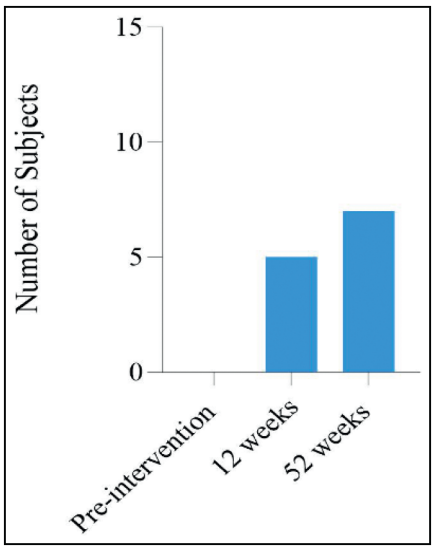
Results: All 19 participants completed the study, showing significant weight loss (12.8 ± 9.4 kgs, 11%) and body mass changes (3.77 ± 2.03 kg/m^2, P < 0.001). Nausea increased significantly before the taste reactivity test at all three visits (P < 0.001). Hunger difference before and after ingestion was observed in the third visit (P < 0.01). Negative reactions, turning off stimuli, were reported by 45% and 63% participants in the second and third visits respectively (P < 0.05).

Conclusion: This study demonstrates that liraglutid significantly influences liking behavior in adult people with obesity. The observed alterations in sweet/high dense stimuli perception suggest clinical implications for managing obesity through liraglutide treatment.



The general behavior of turning the stimuli off was greatly reported in the second and third visit. The negative effective value (NEV) or expressions of disliking the stimuli was greatly reported compared to the positive effective value (PEV) or expressions of liking the stimuli.

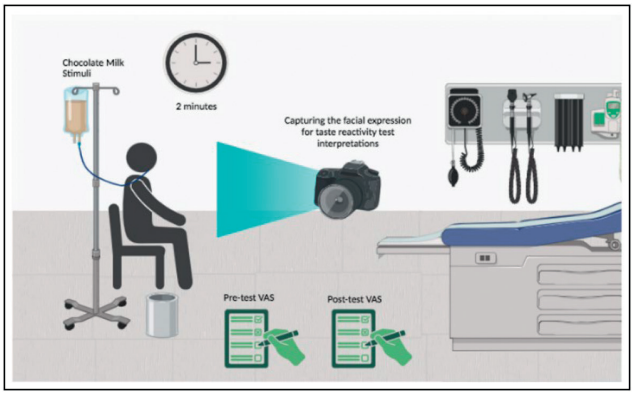
Fig. 1. Comparison between the negative reaction (NEV) and Positive reaction (PEV) of the taste reactivity test.



General behavior represented by turning off the stimuli was reported by 45% and 63% subjects in the second and third visits respectively (P < 0.05).

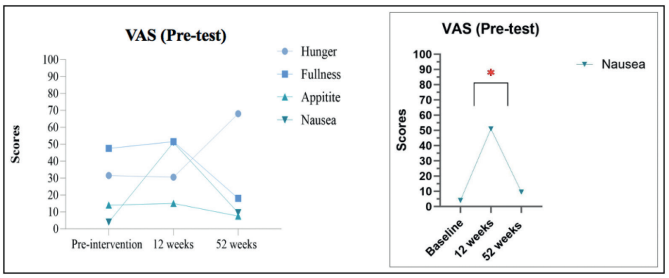
Fig. 2. General behavior of turning off the stimuli in all the three visits.

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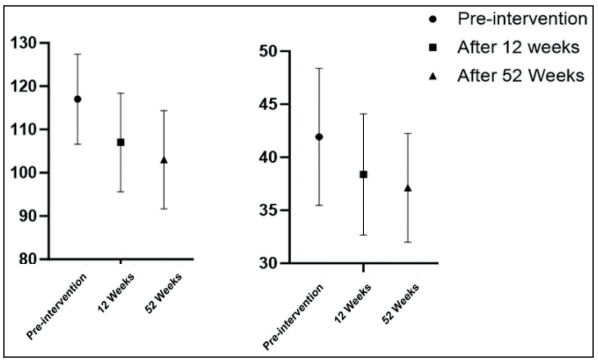
Taste reactivity test, involving the ingestion of complex chocolate stimuli, were conducted at three key points: baseline, 12 weeks, and 52 weeks. A commercial chocolate milk (Almarai) was poured into the subject's mouth by hanging the chocolate milk in a giving set bag from a 1.5-2 meters stand and thus using gravity to deliver a rate of 25mL/minute (50 ml /2 minutes). Subjects were allowed to stop the experiment any time they wish by turning the infusion off or removing the straw from their mouth. Camera was placed in front of the subject; to capture the facial expressions for two minutes (unless the subject made it shorter) as it was informed. Facial expressions were captured via camera during the experiment and analyzed to identify hedonic and aversive actions.

Fig. 3. Illustration of the Taste reactivity test at the Obesity Research Clinic (ROC).



There was a significant difference in nausea before the consummatory behavior test in the three visits P-value 0. 001. In addition, a significant difference in hunger before and after the ingestion in the third visit with a P=0.013.

Fig. 4. Rating Visual Analog Scale (VAS) Pre-test.



All 19 participants completed the study, showing significant weight loss (12.8 ± 9.4 kgs, 11%) and body mass changes (3.77 ± 2.03 kg/m^2, P < 0.001).

Fig. 5. Weight & BMI changes after the liraglutide treatment.

GC2.017

Developing a digital intervention to support healthy growth in formula fed infants using the Person-Based Approach: Baby Responsive Intervention for Growth & Health Tracking (BRIGHT)

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Introduction: Rapid weight gain (RWG) from 0-2 years is an established risk factor for later obesity. It is common among formula-fed infants, affecting up to 40%. Managing RWG is challenging for caregivers: many infants have an avid appetite and preference for sweet foods, predisposing them to excessive milk/food intake; parents often feed to calm unsettled infants and to promote sleep; and caregivers and healthcare professionals often view RWG as healthy. Two face-to-face interventions succeeded in changing target parenting behaviours during exclusive milk-feeding (BABY MILK) and complementary feeding (NOURISH). However, there is a need for a digital intervention that is scalable to the population level, cost-effective and sustainable over the longer-term. Baby Buddy is an established, free, award-winning parenting app, hosted by the UK charity Best Beginnings, and is actively used within the UK National Health Service. It provides an ideal platform for delivering and evaluating a digital intervention targeting caregivers of infants.
Aim: To develop a novel digital intervention to prevent RWG and promote responsive feeding among formula-fed infants, based on BABY MILK and NOURISH, delivered via the Baby Buddy app.
Methods: Intervention development was guided by the COM-B Model for Behaviour Change, and the Person-Based Approach for enhancing acceptability and feasibility of interventions. Work was conducted in 3 phases. Phase 1 included evidence synthesis on responsive feeding, and identification of intervention components. Phase 2 involved co-development of the intervention guiding principles and co-creation of the intervention prototype with a PPIE panel of the target population (n=15), Best Beginnings' Content, Digital and Engagement teams, and key stakeholders. Phase 3 involved optimisation of the prototype using 'think aloud' interviews (n=25), and evaluation of the intervention against the APEASE criteria (affordability, practicability, effectiveness, acceptability, safety, equity) using in-depth 'in the wild' qualitative interviews (n=7) - conducted online with target users.
Results: This systematic process resulted in a new digital intervention called BRIGHT: Baby Responsive Intervention for Growth & Health Tracking. BRIGHT comprises 6 modules that support caregivers to manage specific weight-related behaviours during the first 2 years of life: formula-feeding; complementary feeding; child appetite; sleep; crying; growth monitoring. Content includes written articles, videos and interactive features that tailor content to infant behaviour and weight, and draws on a range of behaviour change techniques (e.g. tailored feedback on behaviour, demonstration of behaviours, framing/reframing). User-testing confirmed that BRIGHT fulfils the APEASE criteria, and that target users valued the app format and tailored approach.
Conclusions: BRIGHT will provide caregivers with support on managing key behaviours related to RWG, and healthcare professionals with information to signpost families to, and will be freely available to all families living in the UK via Baby Buddy. The efficacy of BRIGHT will be tested in future work.

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GC2.018

Changes in body weight, nutrition, and physical activity among the Lithuanian students during and after the COVID-19 quarantine

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Introduction: The long-term impact of the COVID-19 pandemic on lifestyle changes remains underexplored. This study aimed to assess changes in body weight, nutrition, and physical activity among students during and after the COVID-19 quarantine.
Methods: A cross-sectional online survey was conducted among first-year students from the four largest Lithuanian Universities of Applied Sciences during spring 2022. A self-administered questionnaire was completed by 1430 respondents (325 males and 1105 females). Students were asked about consumption frequencies of selected foods, physical activity levels, self-reported weight and height, and changes in these parameters during and after quarantine. Body mass index was calculated using self-reported weight and height.
Results: The COVID-19 quarantine led to significant shifts in students' eating habits, characterized by increased snacking, consumption of fast food, homemade confectionery, and sweets, along with an increased reliance on home delivery or takeaway food services. Approximately one-third of students decreased their physical activity. Changes in dietary and physical activity habits during the quarantine were associated with body weight variations. More than a third of students reported weight gain during this period. In multivariate logistic regression analyses, reduced physical activity during the quarantine increased the odds of weight gain by 3.8 times, followed by an increase in the consumption of red meat, snacks, fast food, and homemade confectionery.
After the quarantine, 32.3% of males and 22.4% of females were overweight ($p<0.05$). They were more likely to report weight gain during the quarantine compared to students with normal weight, 52.7% and 34.3%, respectively. Even 40.9% of students who gained weight during the quarantine reported that body weight remained elevated after the quarantine. Approximately half of such students (52.5%) continued to consume snacks frequently. Almost a third of them answered that other unhealthy eating habits, such as the increased amount of food eaten, increased sweets consumption, and home-ordered/takeaway food purchases, remained after quarantine. Reduced physical activity was mentioned by 47.5% of students, whose weight remained elevated, compared to 19.2% of students, whose weight returned to pre-quarantine levels ($p<0.05$).
Conclusion: COVID-19 caused shifts in student lifestyles, leading to weight changes. Post-quarantine, these habits persisted, signaling the importance of continual support for healthier choices among students. Promoting a healthy diet and regular physical activity among students is essential for developing lifelong habits that contribute to healthy body weight and overall well-being.

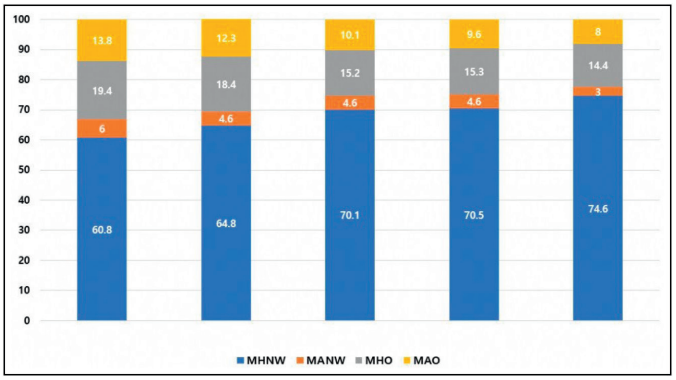
GC2.019

Association between obesity phenotype and sleep duration in apparently healthy adults

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Introduction: Recent studies have reported on the relationship between sleep, obesity, and metabolic syndrome, but research for people without underlying known chronic disease is limited. So, we conducted an analysis on the association between sleep duration and obesity phenotype in apparently healthy adults.
Methods: This research utilized dataset from the Korean National Health and Nutrition Examination Survey (KNHANES) conducted between 2013 to 2015 by the Korean Ministry of Health and Welfare. Of 22,948 participants, data for 6,276 apparently healthy peoples were included. The various body size characteristics were categorized as metabolically healthy normal weight (MHNW), metabolically abnormal normal weight (MANW), metabolically healthy individuals with obesity (MHO), and metabolically abnormal individuals with obesity (MAO), based on both body mass index and the presence of metabolic syndrome. The sleep duration was categorized into 5 groups: <5 hours, 6, 7, 8, and more than 9 hours.
Results: The prevalence of sleep durations was 12.8% for less than 5 hours, 28.6% for 6 hours, 30.0% for 7 hours, 21.5% for 8 hours, and 7.1% for more than 9 hours, respectively. A short duration of sleep was associated with older age, higher body mass index, elevated blood pressure, and lower family income. After adjusting for confounding factors, including age, smoking, alcohol consumption, family income, education, place of residence, and exercise, the multivariate logistic regression analysis revealed that sleep duration of less than 5 hours, is associated with worse metabolic phenotype like the MANW, MHO, and MAO phenotype compared with that of more than 9 hours (MANW, Odds ratio (OR) 1.952, Confidence Interval (CI) 1.069-3.563; MHO, OR 1.765, CI 1.226-2.540; MAO, OR 1.737, CI 1.117-2.702).
Conclusions: In apparently healthy adults, the short duration of sleep was identified as independent risk factors for deleterious obesity phenotype. To improve public health, increased attention and successful strategies for obesity phenotype associated with sleep duration could offer valuable clinical implications.



MHNW, metabolically healthy normal weight; MANW, metabolically abnormal normal weight; MHO, metabolically healthy individuals with obesity; MAO, metabolically abnormal individuals with obesity.

Fig. 1. Proportion of body size phenotype according to sleep duration.

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Tab. 1. Characteristics of the study population according to sleep duration.

	≤ 5	6	7	8	≥ 9	*P*-value
Number (%)	1064(12.8)	2323(28.6)	2389(30.0)	1712(21.5)	564(7.1)	
Sex (male, %)	42.0	52.2	51.3	50.5	48.2	0.000
Age (years)	48.8±15.8	44.3±13.7	43.0±13.6	43.1±14.8	43.6±18.9	0.000
BMI (kg/m^2)	23.7±3.5	23.7±3.4	23.2±3.4	23.0±3.4	22.8±3.7	0.000
WC (cm)	80.8±9.9	80.3±10.0	79.0±9.5	79.0±9.6	78.5±10.1	0.000
SBP (mmHg)	116.8±16.9	114.2±14.7	113.6±15.2	113.3±15.0	112.6±15.9	0.000
DBP (mmHg)	75.3±10.3	75.1±10.2	74.4±10.2	74.1±10.1	71.8±10.1	0.000
FPG (mg/dL)	95.1±15.1	95.3±15.3	94.4±13.5	94.9±15.7	94.8±15.1	0.000
HbA1c (%)	5.6±0.5	5.6±0.5	5.6±0.5	5.6±0.5	5.6±0.6	0.020
LDL-C (mg/dL)	119.6±32.2	117.3±31.0	115.8±31.0	117.1±30.6	113.6±30.3	0.000
HDL-C (mg/dL)	51.9±12.3	52.3±12.2	52.2±12.2	52.2±12.0	52.2±12.2	0.000
TG (mg/dL)	127.6±93.1	128.9±107.9	125.9±108.7	125.9±96.7	119.9±94.1	0.000
Family income percentile (%)						0.000
< 25	24.2	13.0	11.3	13.8	16.0	
25-50	24.7	24.1	23.9	26.4	27.8	
50-75	25.9	29.7	32.0	30.5	31.9	
≥ 75	25.2	33.2	32.8	29.3	24.3	
More than high school education (%)	61.1	75.8	73.7	71.2	21.4	0.000
Residence in urban area (%)	82.7	83.3	84.4	81.7	80.7	0.003
Smoking						0.095
Never	58.2	55.7	56.8	56.8	59.3	
Past	18.6	20.0	21.4	19.4	18.8	
Current	23.2	24.3	21.8	23.9	21.8	
Alcohol drinking (Yes, %))	82.2	86.3	86.5	84.9	76.0	0.000
Regular exercise[a] (yes, %)	57.4	59.6	57.5	56.1	50.7	0.000
Metabolic phenotype						0.000
MHNW	60.8	64.8	70.1	70.5	74.6	
MANW	6.0	4.6	4.6	4.6	3.0	
MHO	19.4	18.4	15.2	15.3	14.4	
MAO	138	12.3	10.1	9.6	8.0	

Tab. 2. Association between sleep duration and body size phenotypes.

	Fully Adjusted OR (95% CI)				
	MAO		MANW		MHO
MAO/MHNW		MANW/MHNW		MHO/MHNW	
≤ 5	1.737 (1.117-2.702)[a]	≤ 5	1.952 (1.069-3.563)[c]	≤ 5	1.765 (1.226-2.540)[d]
6	1.590 (1.044-2.423)[b]	6	1.737 (0.993-3.038)	6	1.625 (1.156-2.284)[e]
7	1.261 (0.834-1.905)	7	1.755 (0.992-3.104)	7	1.254 (0.885-1.777)
8	1.177 (0.765-1.810)	8	1.640 (0.915-2.939)	8	1.235 (0.859-1.776)
≥ 9	Reference	≥ 9	Reference	≥ 9	Reference
MAO/MANW		MANW/MHO			
≤ 5	0.837 (0.421-1.667)	≤ 5	0.850 (0.558-1.297)		
6	0.918 (0.481-1.754)	6	1.083 (0.703-1.669)		
7	0.746 (0.386-1.439)	7	1.223 (0.771-1.940)		
8	0.679 (0.338-1.361)	8	0.736 (0.347-1.564)		
≥ 9	Reference	≥ 9	Reference		
MAO/MHO					
≤ 5	0.976 (0.719-1.324)				
6	0.994 (0.727-1.359)				
7	1.004 (0.705-1.432)				
8	1.011 (0.575-1.777)				
≥ 9	Reference				

CI, confidence interval; MANW, metabolic abnormal normal weight; MAO, metabolic abnormal individuals with obesity; MHNW, metabolic healthy normal weight; MHO, metabolic healthy individuals with obesity; OR, odds ratio. Logistic models are adjusted for age, sociodemographic factors (place of residence, family income, and education), lifestyle behaviors (smoking status, alcohol consumption, regular exercise). Statistically significant between-group difference: a p=0.013, bp=0.034, cp=0.030, dp=0.002, ep=0.009.

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GC2.020

Alterations in the daily rhythms of body Temperature, Activity and Position (TAP) associate with impaired glucose tolerance

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Introduction: Glucose tolerance is the capability to metabolize a glucose load effectively. The impairment of this process may be a result of a reduction of sensitivity and/or secretion of insulin and is a risk factor for the development of Type 2 Diabetes Mellitus (T2DM). A decrease in 24-h day/night rhythm robustness (lower amplitude, increased fragmentation, decreased day-to-day stability), might be a contributor to the development of glucose intolerance. An integrated analysis of daily rhythms of temperature (T), Activity (A), and Position (P), called "TAP", has been previously shown to be a non-invasive technique to assess circadian-related alterations under free-living conditions, and to be associated with metabolic alterations. Our study aim was to unravel the potential association between variables derived from TAP and glucose control measures.
Methods: In a Spanish cohort of 840 individuals (ONTIME-MT; ClinicalTrials.gov NCT03036592), adults wore a temperature sensor and accelerometer sensor for seven days to objectively record wrist temperature, activity, and position, to assess the daily patterns of TAP. From these recordings, we calculated the following variables: Interdaily Stability (IS), which determines the constancy of the 24-hour rhythmic pattern over days; Intradaily Variability (IV), a measure of rhythm fragmentation; Relative Amplitude (RA), defined as amplitude of the cosine fit normalized to the average 24-h level, and the derived Circadian Function Index (CFI). After 8 hours of fasting, we performed a 2-h Oral Glucose Tolerance Test (OGTT) and assessed the Glucose Area Under the Curve (AUC), insulin concentration (at fasting) and AUC, Homeostatic Model Assessment of Insulin Resistance (HOMA-IR), and Insulin Sensitivity Index (ISI) to test their associations with TAP derived variables. We further performed ANCOVA analyses dividing into tertials according to glucose control measures to test for differences in TAP variables.
Results: Higher values of glucose AUC were associated with a flattening of the TAP daily rhythms towards a lower relative amplitude ($r = -0.081$, $P<0.05$), a decreased CFI ($r = -0.086$, $P<0.05$), a higher fragmentation of the rhythms measured as IV ($r = 0.099$, $P<0.01$), and a trend to lower IS of TAP ($r = -0.067$, $P=0.07$). Similar results were obtained for higher insulin concentration and higher HOMA-IR levels (both $P<0.05$), and for lower ISI values ($P<0.05$). When stratifying the population into tertiles according of Glucose AUC, participants in the highest tertile displayed less stable, more fragmented, and flattened TAP rhythms pattern ($P<0.05$) compared to participants in the lowest tertile.
Conclusion: These findings underscore the intricate interplay between circadian-related rhythm dynamics and glucose control. Our study provides cross-sectional evidence that a flattened, fragmented, and less stable daily rhythm of TAP is associated with glucose tolerance impairments. Further studies should explore whether implementing adequate timings of behaviors (sleep timing and duration, light exposure, meals, and exercise timing) could positively affect glucose management and prevention of T2DM.

GC2.021

Evaluating the Efficacy of Community-Based and Online Behavioral Interventions: Experimental Design and Preliminary Insights on Health Outcomes and Obesity

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Introduction: In older populations, there is a high prevalence of increased cardiovascular risk associated with arterial hypertension, obesity, type 2 diabetes and physical inactivity. Addressing the cardiovascular risk factors in this demographic is crucial for promoting overall well-being and mitigating the burden of chronic diseases. However, elderly people are considered to be more reluctant to change life style behavior which might lead to limitations in decreasing the cardiovascular risk. The prospect of personalized behavioral lifestyle interventions emerges as a promising avenue in this age cohort, yet further extensive research is substantiation to prove its efficacy.
Methods: We aimed to assess the effectiveness of community-based and online behavioral interventions designed to enhance the health of elderly participants (the outcome variables included blood pressure readings, waist circumference (in cm), Body Mass Index (BMI), community section body composition, 30-second Chair Stand Test and 2-minute Step Test). The participants were randomly assigned to two intervention groups (online and community) through simple and block randomization methods. Participants in the community module engaged in six community meetings and received eight phone calls to encourage adherence to their personalized goals. Meanwhile, interactions with participants in the online module were facilitated through a dedicated online platform. Each intervention spans 14 weeks. Baseline health status and fitness measurements were conducted at the beginning and conclusion of the interventions (week 14). Paired T-test was used to assess the effect of the intervention.
Results: The primary hypothesis of this experiment posits that, when compared to the control group, the intensive modules (community-based and online-based) will exhibit significantly greater efficacy in producing positive behavioral and health outcomes, The group of 71 participants in the community part (mean age 69 years, 56-80) and 70 participants (mean age 64.9 years, 55-76) in the online type were included. Both types of interventions were efficient in reducing BMI (community $p<0.001$, online $p=0.001$), weight (community $p<0.001$, online $p<0.001$), and waist circumference (community $p=0.011$, online $p<0.001$) and improving fitness capacity (30-second Chair Stand Test - community $p<0.001$, online $p<0.001$ and 2-minute Step Test community $p<0.001$, online $p<0.001$). Moreover, the community type led to the normalization of blood pressure (systolic <0.001 and diastolic <0.001) and decrease of percentage of visceral fat ($p=0.049$).
Conclusion: Fourteen-week community and online behavioral intervention with the use of coaching principles is efficient in the elderly. It can lead to weight loss, waist circumference decrease with the decrease of visceral fat and, normalise blood pressure, and improve fitness health of seniors.

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GC2.022

The Role of Pre-Intervention Motivation in Health Behavioral Change: Insights from a Randomized Control Trial on Health Management and Obesity Decreasing Among Seniors

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In the context of combating obesity among older generations, the establishment and maintenance of healthy habits pose significant challenges due to ingrained lifestyle patterns and potential resistance to change. However, tailored interventions, such as community-based programs and online platforms, emerge as promising avenues for supporting habit formation in older individuals, promoting positive behaviors related to nutrition, physical activity, and overall health. Recognizing the distinct factors influencing habit formation in the elderly becomes paramount for developing targeted strategies to foster lasting health improvements and address obesity.

This randomized control trial investigates innovative strategies, specifically online and community-based health training, designed to facilitate behavioral change, particularly the establishment of new habits, in the elderly population. Drawing on literature, various determinants influencing behavioral change, including motivation, goal-setting, and coaching, are considered in the study. Participants set personalized goals, with their initial motivation and post-intervention commitment toward these goals assessed. The study also explores the interplay between initial motivation and dropout rates during health training sessions.

Building on a behavioral change model and prior research, the study anticipates that higher pre-intervention motivation correlates with greater goal attainment, particularly in online health intervention. The research explores whether behavioral interventions yield differential effectiveness based on participants' pre-intervention motivations. The hypothesis suggests that individuals with low pre-intervention motivation would achieve better outcomes through community-based health training compared to online health training and the control group. The study posits that community-based health training positively impacts post-intervention motivation.

The study employs regression analysis on 266 participants, revealing that a higher level of pre-intervention motivation is associated with greater goal attainment only in the online health intervention. The final findings are slated for presentation at an upcoming conference, shedding light on effective strategies for fostering behavioral change and combating obesity among older populations.

GC2.023

GLP-1 receptor agonists: a new frontier in the war against sarcopenia

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Introduction: Sarcopenia, defined as the progressive and generalized loss of muscle mass and function, represents a significant health issue associated with aging population. This condition is characterized by the decline in both the quality and quantity of muscle mass, leading to a reduction in the functionality of the musculoskeletal system. Within the context of this phenomenon, GLP-1 RAs have recently been identified as potential modulators of muscle homeostasis and sarcopenia.

Methods: Employing a descriptive approach and secondary analysis of data from the National Library of Medicine, the effects of GLP-1 RAs on muscle mass are under scrutiny to determine the most advantageous medication for preserving the quality and quantity of musculature. A systematic search was performed using the keywords sarcopenia, GLP-1 receptor agonist, muscle mass.

In the pursuit of understanding and addressing this health challenge, our current research endeavors have focused on investigating the effects of GLP-1 receptor agonists on muscle mass.

Results: Studies on mouse models demonstrate that GLP-1 receptor agonists stimulate the mTOR pathway, crucial for muscle protein synthesis, contributing to the maintenance of muscle mass. Moreover, they influence translation initiation factors and reduce muscle protein degradation by inhibiting ubiquitin–proteasome pathways and modulating autophagy. The proposed mechanisms suggest a therapeutic potential of GLP-1 agonists in combating sarcopenia. Studies on rodent models indicate that liraglutide induces myogenesis in myoblasts and protects against muscle atrophy. In human studies, GLP-1 infusion has been associated with improved microvasculature in skeletal and cardiac muscles, suggesting that GLP-1 RAs may have positive effects on muscle mass, providing supplementary insights into the mechanisms underlying the impact of semaglutide on heart failure.

Conclusion: Muscle mass loss is associated with an increased risk of low bone density, fatigue, injuries, and decreased strength. The implementation of GLP-1 RAs as a pharmacological approach to combat obesity does not lead to a diminution of lean muscle mass, but rather preserves it concurrently with adiposity reduction.

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GC2.024

Assessing the Validity of Weight Stigma Scales Among Nursing Students

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Introduction: Misconceptions about a person's weight are deeply rooted in the belief that it is easy to control weight through dietary and physical activity modifications. There is evidence that healthcare professionals have a weight bias toward individuals with overweight or obesity, even when the presenting concerns are unrelated to obesity. The purpose of this study was to establish the reliability and validity of the Antifat Attitudes Questionnaire (AFA), Beliefs About Obese Persons Scale (BAOP) and the Weight Self-Stigma Questionnaire (WSSQ) in a convenience sample of 70 nursing students from the University of Medicine and Pharmacy "Gr T Popa" Iași, Romania. Material and methods. In this validation study, we tested for internal consistency (alpha Cronbach) and validity (principal component analysis). The differences among the groups were assessed using the Mann-Whitney U test, given that the data did not exhibit a normal distribution.

Results: The value of the alpha Cronbach coefficient for the AFA questionnaire indicated adequate internal consistency (0.769). The exploratory factorial analysis identified three factors corresponding to the original questionnaire version: Dislike, Fear of Fat, and Willpower. We validated a two-factor structure of the BOFA scale: Emotional Eating and Excessive Eating, which had adequate internal consistency (0.792). The WSSQ questionnaire had adequate internal consistency (0.822) and a two-factor structure corresponding to two subscales: the self-devaluation subscale and the fear of enacting stigma subscale. A positive relation between body mass index (23± 3.53 kg/m^2) and AFA and WSSQ scores was noticed ($p<0.001$

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and respectively p = 0.002). Furthermore, participants with overweight and obesity (21.4%, n = 15) had a higher score on the WSSQ (31.1±9.15 vs. 24.4±7.77, p = 0.01) and a lower BAOP score (34.5±4.78 vs. 37.8±4.78, p = 0.03). A comparable, albeit not statistically significant, relation was seen with respect to the AFA scale (22.1±15.3 vs. 25.3±13.3, p = 0.25).

Conclusion: This study demonstrated the reliability of weight stigma evaluation scales among healthcare students. The questionnaires could also assist faculty members in comprehending the level of stigma among students and the significance of this factor in their relationships with patients.

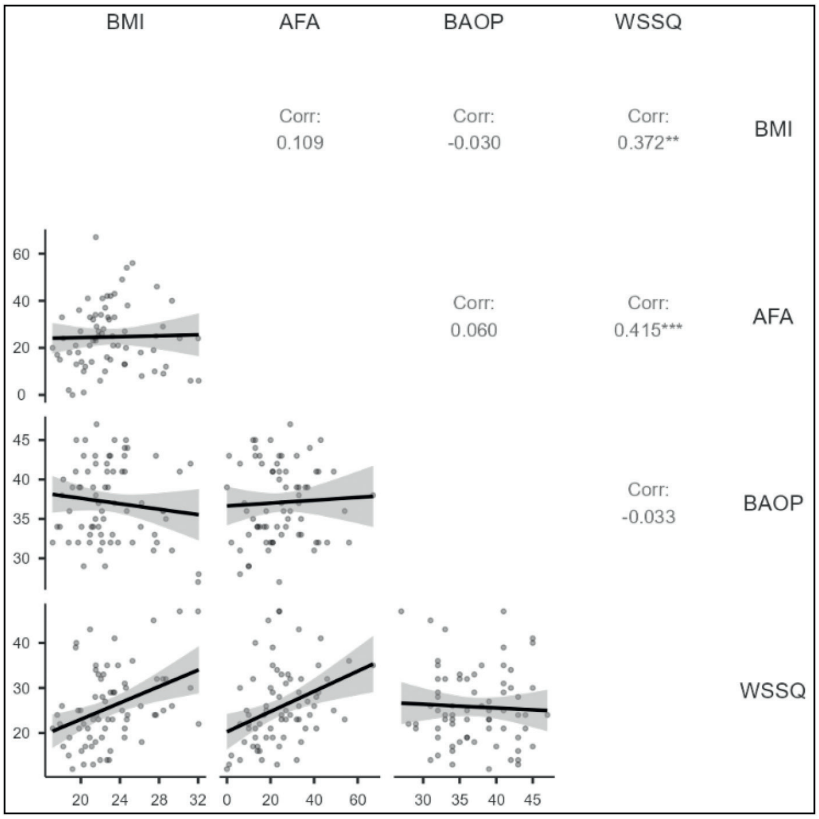


Fig. 1. The relationships between weight stigma scores and BMI.

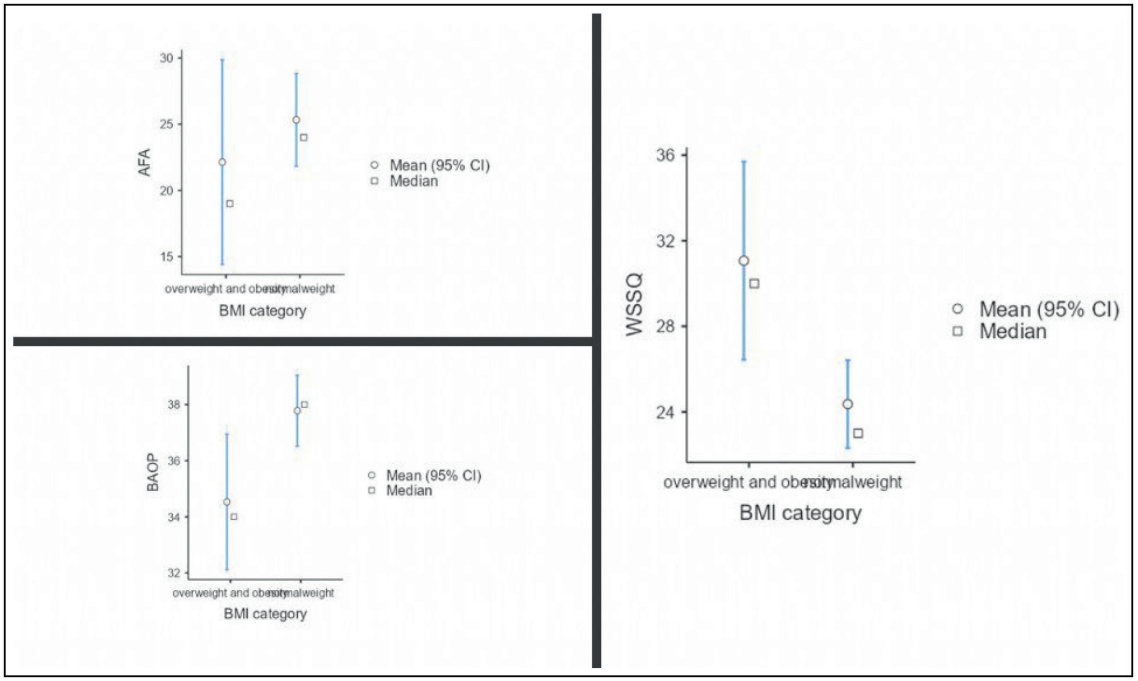


Fig. 2. Relationship between weight stigma and BMI category.

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GC2.026

Impact of sustained weight loss on obesity burden and expenditures using simulation model and exploring behavioral gaps among people with obesity in Thailand: Insights from APAC obesity disease burden study

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Introduction: Obesity is a complex, multifactorial disease which is on the rise globally and in the Asia-Pacific (APAC) region. Despite the prevalence of the disease, policy interventions tend to have a narrow definition of obesity, when in reality, obesity has multifaceted social and psychological dimensions. This research assessed the impact of sustained weight loss (SWL) on disease burden and healthcare costs in obesity-related diseases, and also explored attitudes and behaviour towards weight management across four countries (Australia/India/Thailand/South Korea). Here we report findings from Thailand.
Methods: A rapid scoping review of published data was performed from 2012-2022 to assess the socioeconomic burden of obesity. This data was used in an epidemiological-economic simulation weight loss tool adapted from a previously published model1 to estimate the impact of SWL by 10% (intervention) vs no intervention on the prevalence of ten obesity-related diseases including type 2 diabetes (T2D) among adults (aged 20-69; BMI, 25-50 kg/m^2). The model also estimated the related direct medical costs. Part B: An online survey was conducted to understand attitudes among eligible adults (overweight, 23.0-24.9 kg/m^2/with obesity, 25-50 kg/m^2).
Results: Part A: In 2019, the estimated direct costs on obesity-related diseases were USD 1.7 billion, with a corresponding productivity loss of USD 5.2 billion. Among 14.9 million people with obesity (PwO), the estimated T2D prevalence was 2,930,000 without intervention. With a 10% SWL, the prevalence decreased to 2,090,000, leading to a reduction of 29%. Similarly, without intervention, estimated direct treatment costs of obesity-related diseases are expected to increase from 10.2 billion USD in 2022 to 24.8 billion USD in 2032 approximately doubling the current per-person cost (684 USD to 1,666 USD). Over a 10-year period, a 10% SWL intervention resulted in significant savings of 2.4 billion USD for the total population. Part B: Of 400 respondents (overweight, 200; with obesity, 200) only 8% maintained a 5-15% WL for at least a year. Additionally, 43% of all respondents were undiagnosed and a similar proportion reported not discussing weight with their HCPs in the past 5 years. In comparison to low-income, those with higher incomes were twice as likely to agree that their healthcare system supports people with overweight/obesity. Almost 80% of respondents tried lifestyle changes (diet and exercise) to lose weight, while only 32% relied on medical interventions.
Conclusion: This evidence suggests that a SWL could have a positive impact on reducing prevalence of obesity and obesity-related comorbidities, leading to reduced overall healthcare expenditures. The fact that fewer PwO discussed weight with their HCPs, and most relied on lifestyle changes alone to lose weight highlights a gap in disease understanding and management. These insights emphasize the need for a holistic, integrated approach to managing obesity and its comorbidities.

GC2.027

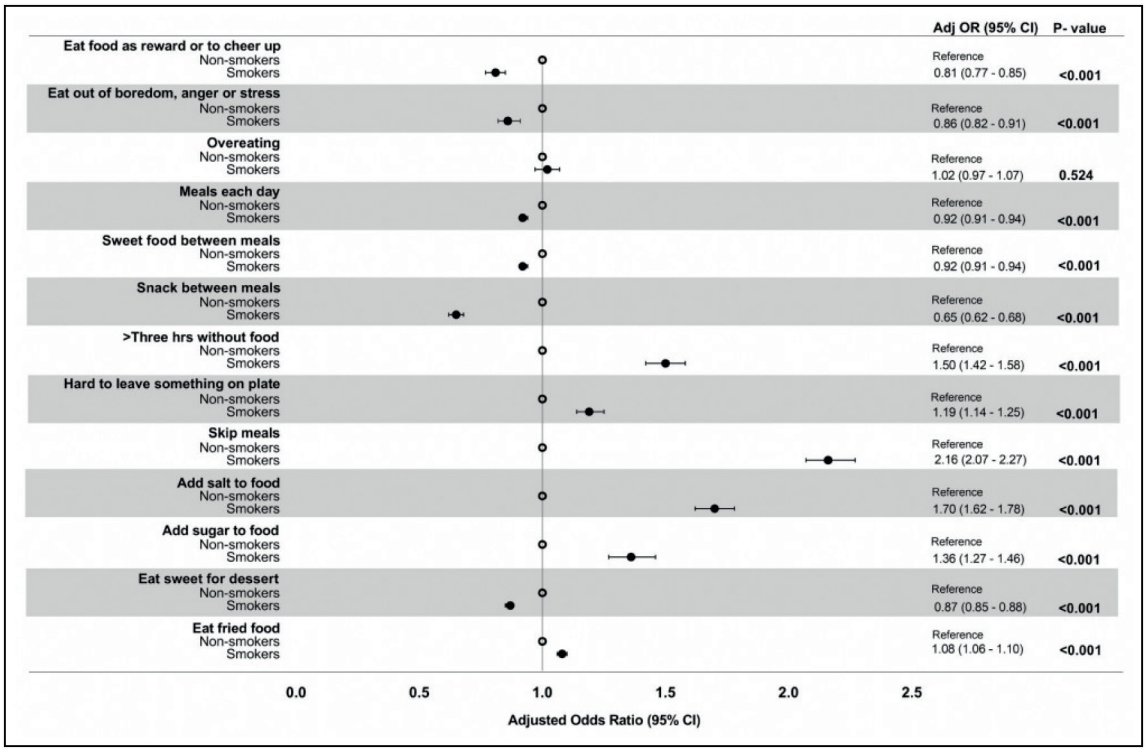
The association of smoking with different eating and dietary behaviours: a cross-sectional analysis of 83,781 UK adults

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Background: Individuals who smoke typically have a lower body mass index (BMI) than their non-smoking counterparts while smoking cessation is associated with weight gain. Pre-clinical research suggests that nicotine in tobacco smoking may suppress appetite and influence subsequent eating behaviour; however, the relationship between smoking and eating behaviour in humans is unclear. This study examined associations of smoking with eating and dietary behaviours in a large, population-based cohort of UK adults.
Methods: This cross-sectional study included data for 83,781 men and women (mean ± SD: age, 43.1 ± 10.4 years; BMI, 25.7± 4.2 kg·m-2; 62% male) collected from health assessment programmes between 2004 - 2022 within a UK-based healthcare charity. Participants were stratified into two groups based on their status as a smoker (n = 6,454) or non-smoker (n = 77,327). Pre-assessment questionnaires assessed demographic variables (including smoking status and an index of multiple deprivation [IMD]) and selected eating and dietary behaviours (Likert scales), while BMI was measured during health assessments.
Results: Generalised linear models, adjusted for age, sex, and IMD, examined associations of smoking with different eating and dietary behaviours. In fully-adjusted models, smokers were more likely to skip meals, have fewer meals per day, go more than three hours without food, and find it hard to leave something on their plate compared to non-smokers (all adjusted odds ratio [aOR] ≥ 1.08; 95% CI ≥ 1.06-1.09; P < 0.001). Smokers were less likely to snack between meals and eat food as a reward or out of boredom compared to non-smokers (aOR ≤ 0.86; 95% CI ≤ 0.82–0.91; P ≤ 0.001). Additionally, compared to non-smokers, smokers were less likely to eat sweet foods between meals and for dessert (aOR ≤ 0.92; 95% CI ≤ 0.91–0.94; P < 0.001), but were more likely to eat fried food and add salt and sugar to meals (aOR ≥ 1.08; 95% CI ≥ 1.06-1.10; P < 0.001). Several of the aforementioned relationships were modified by age, sex, and IMD.
Conclusions: Smoking is associated with eating behaviour patterns consistent with inhibited food intake and poor dietary quality, which could help explain the weight gain commonly observed during smoking cessation. These observations underscore the importance of providing nutritional and weight management support for smokers, particularly those considering cessation.

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Forest plot of the associations of smoking with eating and dietary behaviours in adjusted models. Generalised linear models were adjusted for age, sex, and IMD. Data are presented as adjusted odds ratios and 95% confidence intervals. The non-smoking group were assigned as the reference group (i.e., an OR = 1.00). P values < 0.050 indicate statistical significance. Adj OR, adjusted odds ratio; CI, confidence interval; IMD, index of multiple deprivation.

Fig. 1.

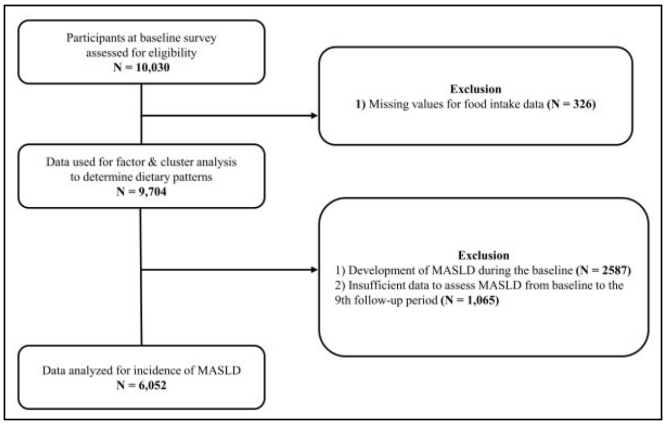
GC2.028

Association between dairy-rich dietary pattern and metabolic dysfunction-associated steatotic liver disease: Findings from the Korean Genome and Epidemiology Study

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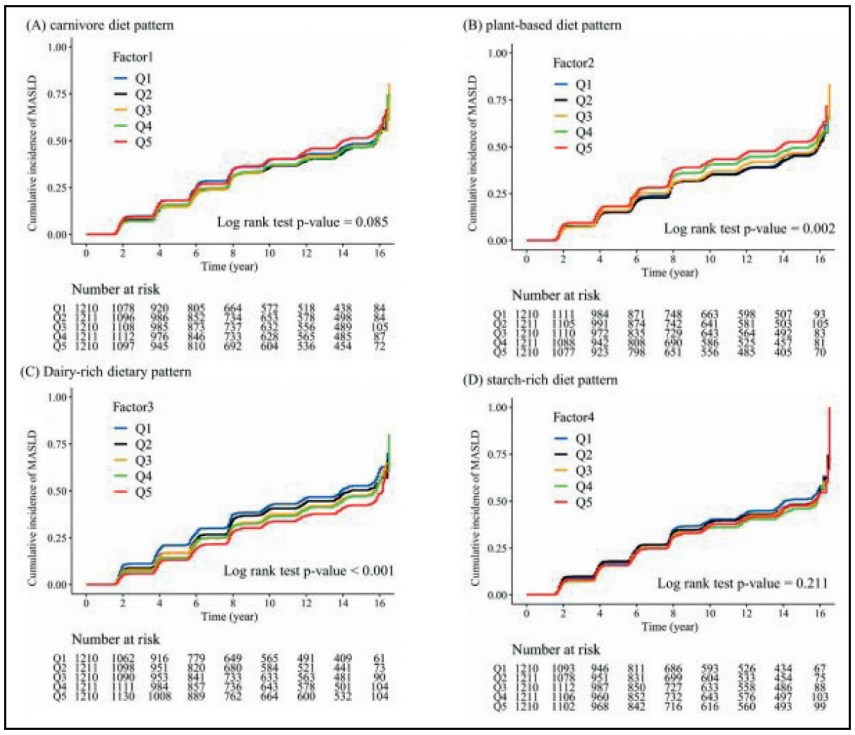
Backgrounds: Dietary components and the development of metabolic dysfunction-associated steatotic liver disease (MASLD) are closely linked, but large-scale studies on dietary patterns and MASLD are scarce, most previous studies having focused on individual nutrients or foods rather than overall dietary patterns. Therefore, we aimed to investigate the association between dietary patterns and MASLD in Koreans.
Methods: A total of 6,052 participants from the Korean Genome and Epidemiology Study. Dietary intake was assessed using a validated Korean semiquantitative food frequency questionnaire comprising 106 food items. Principal component analysis was used to determine the major dietary patterns. Cox proportional hazard regression analysis was performed to assess the association between the incidence of MASLD and dietary patterns.
Results: Four major dietary patterns, namely carnivore, plant-based, dairy-rich, and starch-rich diet patterns, were identified. The carnivore, plant-based, and starch-rich diet patterns showed no significant association with incident MASLD, while the dairy-rich diet pattern was associated with a lower risk of MASLD, also showing significantly lower cumulative incidence of MASLD in the higher adherence to dairy-rich diet pattern. In the dairy-rich diet pattern, the hazard ratio (95% CI) for highest quintile (Q5) compared to referent lowest quintile (Q1) was 0.72 (0.64–0.81) in the unadjusted model. Compared to Q1, the hazard ratio (95% CI) for Q5 was 0.82 (0.72–0.93) after adjusting for confounders.
Conclusion: The dairy-rich diet pattern was significantly associated with a lower risk of MASLD in Koreans. Appropriate dietary guidance based on dietary patterns is crucial for preventing MASLD.



A total of 10,030 participants were included in the baseline survey, from which those with missing data on food intake (n = 326), presence of NAFLD at baseline (n = 2,587), and missing data for calculating the NAFLD score from baseline to the 9th follow-up period (n = 1,065) were excluded. Thus, a total 6,052 participants were included in the final analysis.

Fig. 1. Flowchart of the study population selection.

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No significant difference was observed in the cumulative incidence rate of NAFLD across the carnivore diet pattern score quintiles (log-rank test, p = 0.085) and starch-rich diet pattern scores quintiles (log-rank test, p = 0.211). The cumulative incidence rate of NAFLD was significantly higher in Q5 compared with Q1 (log-rank test, p = 0.002) in the plant-based diet pattern, while it was significantly lower in Q5 compared with Q1 in the dairy-rich diet pattern (log-rank test, p <0.001).

Fig. 2. Kaplan–Meier curves of the cumulative rates of incident NAFLD with respect to the different quintiles of the major dietary patterns.

Tab. 1. Cox proportional hazards regression analysis for the incidence of metabolic dysfunction-associated steatotic liver disease according to quintiles of a dairy-rich diet in the Korean population.

	Unadjusted		Model 1		Model 2		Model 3	
	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value	HR (95% CI)	P-value
Dairy-rich diet pattern								
Q1	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Q2	0.89 (0.80–1.00)	0.057	0.95 (0.84–1.07)	0.354	0.96 (0.85–1.08)	0.453	0.95 (0.84–1.07)	0.360
Q3	0.85 (0.75–0.95)	0.005	0.90 (0.80–1.02)	0.089	0.90 (0.80–1.02)	0.107	0.89 (0.79–1.01)	0.074
Q4	0.83(0.74–0.93)	0.001	0.91 (0.81–1.03)	0.145	0.91 (0.81–1.03)	0.148	0.91 (0.80–1.02)	0.111
Q5	0.72(0.64–0.81)	<0.0001	0.83 (0.73–0.95)	0.005	0.82 (0.72–0.94)	0.003	0.82 (0.72–0.93)	0.003

The highest quintile of a dairy-rich diet was associated with a lower risk of incident metabolic dysfunction-associated steatotic liver disease compared to the referent lowest quintile.

GC2.029

Investigating motivations to eat: Refining and validating a framework of Eating Behaviour Traits in dieters and the general population

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Due to the escalating public health concern of obesity, there is a need to examine the explanatory power of factors that motivation people to (over or under) eat. In a previous study, a four-factor model of eating behaviour traits (EBTs) was developed which identified individual differences in psychological factors influencing motivations to eat. The current study used confirmatory factor analysis, with an item-level approach to refine and extend previous EBT models, with the aim of examining and validating the domain structure of an EBT framework. The analysis used two samples including a representative sample of the UK population (n = 2010, 51% female, 49% male, 18 – 88 years), and members of a weight management program (n = 2317, 96.6% female, 2.8% male, 21 – 84 years), who completed 5 questionnaires including 10 EBTs. The results supported a 6-factor model, encompassing reactive eating, negative emotional eating, positive emotional eating, restricted eating, homeostatic eating, and eating for pleasure. Although there were significant differences in eating behaviours between the two samples, the underlying structure of the models were stable which indicates the framework's generalisability across different contexts. The models were also able to predict BMI and weight change, with homeostatic eating predicting the most variance in external outcomes for the general population and restricted eating predicting the

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most variance in external outcomes for the weight management sample. Overall, this research contributes to a nuanced understanding of the motivations underlying eating behaviours, emphasising the utility of the EBT framework for identifying at-risk individuals and tailoring interventions to meet specific individual needs.

GC2.030

The Relationship Between Ultra-Processed Food Consumption and Obesity and Body Composition in University Students

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Introduction: NOVA classification has been developed, which divides ultra-processed foods (UPF) into four groups according to their naturalness, scope, and purpose of industrial processing. Consumption of UPS increases energy and carbohydrate consumption, leads to weight gain (in a randomized controlled study), and has a strong association with obesity (in a prospective cohort study). This study was evaluated the relationship between UPF consumption, body composition, and obesity in university students.

Methods: In this cross-sectional study, a total of 595 individuals, 195 males (32.8%) and 400 females (67.2%), were included with an average age of 21.2±1.45 years. The descriptive characteristics of the individuals were questioned with a survey form. Anthropometric measurements, including height (cm), body weight (kg), waist circumference (cm), hip circumference (cm), and neck circumference (cm), were taken by the researchers. Body fat percentage, lean body mass, and body water amount were determined with Tanita BC 601 Golden. The degree of processing of foods was determined by creating a food consumption frequency form, taking into account the foods defined in the FAO report of the NOVA classification and the foods consumed in Turkish culture. The amount consumed at a time was questioned along with the frequency form. The data obtained were evaluated through the Turkish Nutrition Information System program (Bebis 9.1), and the energy intakes of individuals were calculated. Energy rates of individuals coming from ultra-processed food consumption were determined. Statistical findings were obtained using IBM SPSS 21, and $p<0.05$ was accepted for statistical significance.

Results: The most consumed food-to-energy ratio (43.9±14.35%) comes from UPF. There was a weak positive correlation between consuming unprocessed and minimally processed foods and body mass index (BMI), waist circumference, hip circumference, neck circumference, and total body muscle mass, muscle and fat mass in the trunk. There is a weak positive correlation between the consumption of processed foods and BMI, waist circumference, hip circumference, waist/hip ratio, neck circumference, total body muscle mass, and trunk muscle mass. There is a weak negative correlation between the consumption of UPF and BMI, waist circumference, neck circumference measurements, and total and trunk muscle mass. Additionally, there is a positive relationship between total energy intake and BMI.

Conclusion: This study found a weak negative relationship between the consumption of UPF and obesity indicators. This shows that individuals who have low BMI consume high levels of UPF. These results can be interpreted as individuals with high BMI paying extra attention to their nutrition or indicating lower nutritional intake. Long-term follow-up studies are needed to investigate the reasons for the data obtained.

GC2.031

Evaluation of a simple, non-judgemental Nutrition Score to support weight loss within a mobile application

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Introduction: The World Health Organization estimated that, between 2022 and 2025, 167 million people would become less healthy due to living with overweight or obesity [1]. Mobile applications are increasingly being recognised as an effective platform to improve behaviour change and support weight loss (WL).

Self-monitoring is a key feature of many mobile health apps, but offering feedback on behaviours is an additional behaviour change technique which can help to further support WL.

A Nutrition Score (NS) was developed within a mobile application that supports WL through time-restricted eating, to offer feedback on food logs made within the app to promote WL whilst maintaining a nutritionally balanced diet. The NS takes into consideration calorie density, protein, fibre, sugar, saturated and unsaturated fats, calcium and salt and offers foods a rating within the following categories: Optimal; Good; Fair; Low.

This evaluation seeked to explore the association between NS ratings and WL.

Methods: Eligible mobile app users recorded their weight from August 2023 to January 2024 at least twice to evaluate weight changes at the 4th (W4), 8th (W8), and 12th (W12) weeks following the initial weigh-in. They used the NS feature minimum 5 times per week for at least 75% of the weeks within each observational period.

As independent variables, the proportions of Optimal and Low NS were used. The primary outcome was WL %. Regression was adjusted for gender, age, fasting protocol (FP), initial BMI category, and the average number of meal tracks per week.

Results: The study included a total of 6,097 users, with 5,413 users at W4, 2,106 at W8, and 849 at W12. The average age was 50.8 (SD: ±14.2) years, initial BMI — 32.2 (±6.4) kg/m². 57.4% of participants were women, 47.3% chose the 16:8 FP. The average proportions of Low scores were 1.6 (±3.7)%, 1.6 (±2.8)%, and 1.6 (±2.9)% for W4, W8, and W12. The average proportions of Optimal scores were 15.3 (±16.7)%, 18.3 (±16.0)%, and 19.5 (±16.2)%. Median WL at W4 was -2.0 (IQR: -3.3, -0.8)%, at W8: -3.3 (-5.4, -1.5)%, and at W12: -4.1 (-7.1, -1.8)%. The association between Optimal scores and WL was linear: at W12, users with Optimal score proportions <10% lost -3.6 (IQR: -6.3, -1.4)%, while those with ≥40% had a median WL of -6.4 (-9.8, -4.0)%. Regression analysis confirmed these FINDINGS: every additional 10% in Optimal scores was associated with an additional WL of 0.13%, 0.39%, and 0.63% at W4, W8, and W12, respectively (all P-values < 0.0001). An inverse association between the proportion of Low scores and WL was not statistically significant.

Conclusion: The proportion of Optimal NS obtained by users within the first 12 weeks of app usage, is an effective predictor of WL, with this trend intensifying over time. The potential impact of this metric on other aspects of user health unrelated to WL remains an area for future investigation.

Reference

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Conflict of Interest: The authors declare that there is no conflict of interest.

Funding: No funding to report.

GC2.032

Dietary patterns in early childhood: Influence of socioeconomic position and migration status in the Elfe cohort

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Introduction: Strong social inequalities for chronic diseases associated with diet and lifestyle exist in high-income countries. The high prevalence of overweight among the most disadvantaged children, as early as preschool age, is a notable consequence of this inequality. We know that socio-economically differentiated dietary patterns are formed from the first year of life and tend to persist into childhood. However, beyond investigating maternal educational level (often used as a proxy for socio-economic position), few studies have addressed the social determinants of the child's diet more comprehensively. We aimed to determine the association of various family-based socio-ecological factors with dietary patterns in early childhood.

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Methods: Data were from 12,696 children recruited in the nationwide French Elfe cohort in 2011. We used principal component analysis to derive dietary patterns in children aged 2 years. Within the framework of both the socio-ecological and hierarchical approaches, we conducted multivariable linear regression analyses, with the dietary patterns as the outcomes and the various socio-ecological factors added progressively from the most distal to the most proximal, i.e maternal migration status, maternal education level, older children, living as a couple, maternal age (block 1), maternal occupational category (block 2), and household income (block 3). We also ran these three embedded models using paternal factors.

Results: We identified two dietary patterns in 2-year-old children: one was characterised by "A balanced and diversified diet", and the other was defined by more frequent consumption of sweet and savoury snacks and sugar-sweetened beverages and called "Discretionary consumption". Children born to mothers with a low socio-economic position (low education level; first quintile of household income; or manual worker, unemployed), with previous children, or who did not live as a couple had low scores on the "Balanced and diversified" dietary pattern. Conversely, these children adhered more to the "Discretionary consumption" pattern, as did those born to immigrant mothers (and to a lesser extent, those born to descendants of immigrants). Consistent findings were observed using the paternal socio-ecological factors.

Conclusion: These findings provide novel and comprehensive insights into the social determinants at the family level (i.e., mother and father) involved in the setting of social inequalities in diet early in life. To be more effective, early nutritional and obesity prevention interventions should target and be tailored to the needs of the most disadvantaged families, especially those with an immigration background or a low socio-economic position (not only education, but also occupation, income) or experiencing single parenthood.

GC2.033

Obesity and Overweight in Asian Indians Associated with Lower Macronutrient and Energy Consumption as Compared to Normal Weight Individuals

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Introduction: Obesity prevalence is high in Indian(Asian) adults with 28.6% people having generalized obesity and 39.5% central obesity. Studies have shown association between obesity and higher caloric and protein intake, higher animal protein intake and higher protein intake during early childhood. However, there is very limited data showing association of higher protein intake with decreased risk of obesity. Indians are largely vegetarian population with high consumption of carbohydrates and lower intake of proteins. They have higher body fat and higher central adiposity and have lower cut-offs of BMI for defining obesity. However, despite lower protein intake, prevalence of obesity, especially central obesity is increasing. In this clinic based study, we tried to find association between macronutrients intake and obesity in Indian adults.

Methods: During a screening program we evaluated the macronutrients and energy intake in all the persons visiting our centre. All the participants had height, weight, blood pressure and blood sugar measured, and some of them also underwent detailed laboratory investigations also. Dietary recall for preceding 1 week was taken by a trained nutritionist and macronutrient intake was calculated using online protinex nutri-calculator. Overweight (OW) was defined as BMI between 23-25kg/m^2 and obesity as BMI>25kg/m^2. Comparison was made for total caloric intake and different macronutrients intake in people with BMI<23kg/m^2 vs those with BMI>23kg/m^2.

Results: The study population included 200 persons(111 men and 89 women) in the age group 18-84 years. Most of the people(181/200, 90.5%) had OW or obesity with a BMI>23kg/m^2(82/89 women, 92.13%; 97/111 men, 87.39%), and 158/200(79%) had type 2 diabetes(T2D). Average BMI(±SD) was 29.44(±5.67), 28.71(±5.1) for men and 30.35(±6.21) for women. Average daily energy intake was 1808.11(±528.85)kcal, with higher intake in men than women(1987.36±537.6 vs 1584.56±425.3 kcal). Average daily energy intake(kcal/kg body weight) in people with obesity was significantly lower (22.58±8.38) than those with normal BMI (34.6±4.89, p<0.0001), both in people with or without T2D. Average daily intake of proteins, carbs and fats(gms/kg body weight) were also lower in people with obesity as compared to normal BMI persons (0.71±0.27 vs 1.17±0.24, p<0.0001; 2.25±0.91vs4.18±0.71, p<0.0001; 0.9±0.4vs1.41±0.32, p<0.0001), all being statistically significant(Table1), and this was observed in people with diabetes also. Further comparisons were made for BMI<23 vs BMI 23-24.99, BMI 25-30 and BMI>30 for caloric as well as various macronutrients intake(Table2). In all groups, energy as well as protein intake was significantly higher in people with lower BMI vs higher BMI.

Conclusion: Our study shows a strong association between decreased caloric, protein as well as overall macronutrients intake and obesity rather than increased caloric and protein intake. Since this is a clinic based study and there is scarcity of data on this association, more work needs to be done to look at the association of caloric and macronutrients intake and obesity.

Conflict of Interest: None

Funding: None

Tab. 1. Comparison of Energy and Macronutrients intake between people with BMI<23 vs BMI>23.

	Total	BMI <23 (A)	BMI >=23(B)	Mean Difference (A-B)	p value
All Participants(n)	200	19	181		
Energy intake/weight (kcal/kg)	1808.11±428.85	2000.17±315.13	1787.95±543.11	12.025	<0.0001
Protein intake/weight(gms/kg)	0.76	1.17±0.24	0.71±0.27	0.46	<0.0001
Carb intake/weight(gms/kg)	2.94±1.13	4.18±0.71	2.8±1.09	1.38	<0.0001
Fat intake/weight(gms/kg)	0.95±0.42	1.41±0.32	0.9±0.4	0.51	<0.0001

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Tab. 2. Comparisons of Energy, Carbs, Protein and Fat intake between different BMI groups.

	Total	BMI<23	Group1. BMI<23vs BMI>=23	Group 2. BMI<23vs BMI23-24.99	Group3. BMI<23 vsBMI25-30	Group4. BMI<23vs BMI>30	p value Group1. BMI<23vs BMI>=23	p value Group 2. BMI<23vs BMI23-24.99	p value Group3. BMI<23 vsBMI25-30	p value Group4. BMI<23vs BMI>30
(n)	200	19	181	26	76	79				
Protein intake gms/kg body wt (mean±SD)	0.76±0.3	1.17±0.24	0.71±0.27	0.96±0.36	0.79±0.21	0.56±0.2	<0.0001	0.0117	<0.0001	<0.0001
Carb intake gms/ kg body wt (mean±SD)	2.94±1.13	4.18±0.71	2.8±1.09	3.72±1.23	3.07±0.89	2.25±0.91	<0.0001	0.36	<0.0001	<0.0001
Fat intake gms/ kg body wt (mean±SD)	0.95±0.42	1.41±0.32	0.9±0.4	1.25±0.56	0.99±0.36	0.7±0.25	<0.0001	0.44	<0.0001	<0.0001
Energy intake Kcal/kg body wt (mean±SD)	23.72±8.84	34.6±4.89	22.58±8.38	30.36±9.68	24.83±6.66	17.85±6.46	<0.0001	0.36	<0.0001	<0.0001

GC2.034

Associations Between Meal Frequency, Mean Corpuscular Volume, and Incidence of Coronary Artery Disease in Middle-Aged and Older Women Without Anemia

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Objective: Mean corpuscular volume (MCV) has been reported to impact all-cause mortality. Reduced meal frequency is related to unhealthy cardiometabolic profiles. However, scarce literature exists on the relationship of meal frequency with MCV, and limited longitudinal evidence exists on the relationship of MCV with coronary artery disease (CAD). This study aimed to investigate the association of meal frequency with MCV and changes in MCV over 2 years with the incidence of CAD in middle-aged and older women without anemia in Korea.
Methods: The Korean Genome and Epidemiology Study (KoGES) is an ongoing prospective cohort study of community-dwelling men and women, aged 40–69 years, recruited by Korean government entities. In this study, we included 2,569 women without anemia from KoGES. First, self-reported meal frequency in connection to the highest tertile of MCV (97.2–116.9 fL), defined as high MCV, was analyzed after stratification by BMI (<25 or ≥25kg/m^2). Second, the association between changes in MCV over 2 years and the incidence of cardiovascular disorders, including coronary artery disease and myocardial infarction, was analyzed. A range of confounders known to influence MCV, such as micronutrient levels (folate and vitamin B12), lifestyle factors (alcohol consumption and smoking status), and a spectrum of clinical parameters (liver chemistries, renal function, thyroid disease, inflammation, and cancer), were taken into account during the analyses. Additionally, the analysis incorporated variables associated with an augmented risk of cardiovascular disorder development, namely hypertension, diabetes mellitus, dyslipidemia, family history of coronary artery disease, levels of high-density lipoprotein, and level of physical activity.
Results: The multivariate-adjusted odds ratios (95% confidence intervals) for high MCV in women without obesity who consumed 1 or 2 meals a day were 1.46 (1.01–2.11), as compared to those who consumed 3 or 4 meals a day. The odds ratio of the highest tertile of MCV changes over 2 years (2.21–24.20 fL) for newly developed CAD in women without obesity was 3.29 (1.2–9.0), as compared to the lowest tertile. Meanwhile, women with obesity did not show statistical significance in the analyses.
Conclusion: In middle-aged and older women without obesity and anemia, a lower frequency of meal consumption was positively associated with high MCV, a prognostic marker associated with all-cause mortality. Furthermore, changes in MCV were found to be positively associated with the risk of developing CAD. Future prospective studies are necessary to substantiate our findings.

GC2.035

Associations of parental periconception dietary glycemic index and load with fertility: A study among couples in the general population

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Introduction: The dietary glycemic index (GI) and load (GL) indicate the quality and quantity of carbohydrates, which can influence fertility through modulation of insulin sensitivity and generation of oxidative stress. Despite fertility being influenced by both parents, reproductive research often focuses exclusively on maternal factors. We examined periconception dietary intake in women and partners, and subsequent associations of dietary GI and GL with time to pregnancy (TTP) and subfertility.
Methods: Among 840 women and 659 partners, participating in a population-based prospective cohort study from preconception onwards, we assessed periconception dietary intake and calculated GI and GL, using a food frequency questionnaire at median 12.4 weeks gestation (95% range 10.9, 18.4). We calculated maternal pre-pregnancy and paternal body mass index (BMI) using height and weight. Information on TTP was obtained through questionnaires, with subfertility defined as TTP of one year or more.
Results: In periconception, maternal mean energy intake was 1869 kcal (SD: 498; 46%, 16%, 33% from carbohydrates, protein, and fat, respectively). Paternal mean energy intake was 2348 kcal (SD: 590; 43%, 16%, 33% from carbohydrates, protein, and fat, respectively). Mean maternal dietary GI was 56.2 (SD: 3.5), and GL 141.3 (SD: 67.2), while mean paternal dietary GI was 56.8 (SD: 3.3) and GL 156.4 (SD: 75.3). Both dietary GI and GL were higher in women and partners with overweight or obesity compared to those with a normal weight. Higher maternal dietary GL, but not maternal GI, was associated with increased subfertility risk (p-value < 0.05). These associations remained after adjustment for sociodemographic and lifestyle factors. Higher paternal dietary GI, but not paternal GL, was associated with a lower probability of becoming pregnancy per month and increased subfertility risk, after adjusting for paternal sociodemographic and lifestyle factors (Fecundability Ratio (95%): 0.91 (0.84, 0.99); Odds

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ratio (95%): 1.23 (1.02, 1.49) per SDS increase in paternal dietary GI). In the combined maternal and paternal model, only higher paternal dietary GI remained associated with a lower probability of becoming pregnancy per month and increased subfertility risk. No subgroup specific effects were present among women or men with periconception overweight and obesity.
Conclusion: Suboptimal maternal and paternal periconception carbohydrate intake, reflected by a higher glycemic index and load, are related to an increased risk of subfertility. No specific effects were found in individuals with overweight or obesity. Further studies are needed to confirm our findings.

GC2.036

Social Disparities in Children's Diet Early in Life: Mediating Role of Parental Diets in the Elfe birth cohort

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Introduction: Children experiencing social disadvantage are at increased risk of obesity, distinguishable as early as preschool age, in part because of the social patterning of a number of parental dietary practices. More specifically, socioeconomic position is associated with the overall quality of family diets. Yet, causal pathways of this association have not been thoroughly explored for mothers and still less for fathers. We aimed to test whether parental diet mediates the association between socioeconomic position and the child's diet quality.
Methods: We used data from 18,329 children included in the French Elfe birth cohort. Perinatal dietary intake was collected retrospectively for parents at birth (throughout the 4 waves of inclusion for mothers and only at the fourth wave for fathers) and for children at age 2 years. Therefore, we considered two separate subsamples in the analyses: – maternal (n=13,879) and paternal (n=998). Preceding this study, we derived dietary patterns for parents ("candidate" mediators) and children (outcomes) via principal component analyses. Socioeconomic position (exposure) was defined by parental education level (low, intermediate and high); parental migration status was classified as immigrants, descendants of immigrants and non-immigrants. We used a parametric approach to mediation embedded within the counterfactual framework to test the mediation hypotheses. In the maternal subsample, we additionally tested the moderating effect of migration status and stratified results accordingly.
Results: Among non-immigrant mothers, 30% to 40% of the association between education level (intermediate vs low and high vs low, respectively) and the child's *Balanced/Diversified* dietary pattern was mediated by the maternal *Balanced* dietary pattern. Likewise, the same maternal dietary pattern mediated 5% to 10% of the inverse association between maternal education level (reference low) and the child's *Discretionary consumption* pattern. Among immigrant mothers, the mediating effect for the maternal *Balanced* dietary pattern was β = -0.11 (95%CI -0.18, -0.05) for the association between education level (intermediate vs low) and the child's *Balanced/Diversified* pattern. The paternal *Balanced* dietary pattern mediated 13% of the inverse association between paternal education level (high vs low) and the child's *Discretionary consumption* pattern.
Conclusion: Our study confirms the importance of both parents in forming their children's dietary habits. It additionally reveals the potential modifiable aspects of family lifestyle that could be targeted by public health actions aiming to decrease childhood disparities in the nutrition and weight status association with socioeconomic position and migration status.

GC2.037

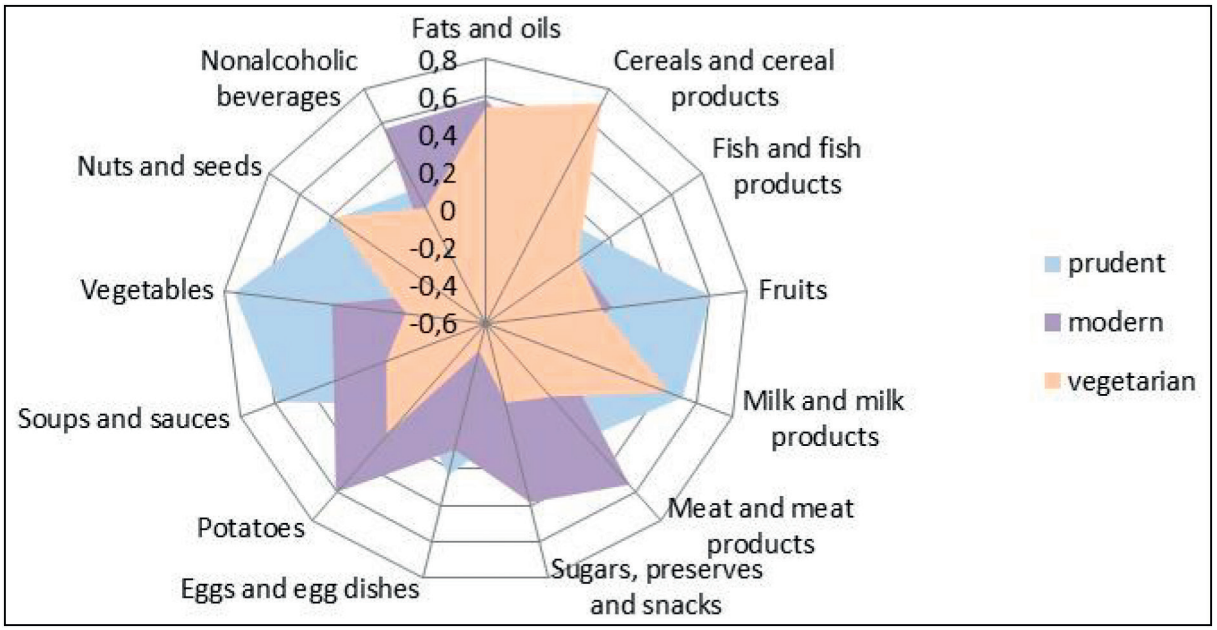
The association of dietary patterns with pre-gestational BMI and gestational weight gain in a group of pregnant women in Romania

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Introduction: The global shift toward an obesogenic environment is evident in the evolving food behaviors of Romanian pregnant women. This study aims to identify dietary patterns in a group of pregnant women and assess the relationship between pre-gestational body mass index (BMI), gestational weight gain (GWG), and these patterns.
Methods: We recruited 251 adult women during their final antenatal routine visit at the "Elena Doamna" Obstetrics and Gynaecology Hospital in Iasi. Pre-gestational weight was self-reported. GWG was calculated. Dietary intake was assessed using a previously validated EPIC - food frequency questionnaire.
Results: Principal component analysis identified three dietary patterns: vegetarian (characterized by substantial intake of cereals, cereal products, nuts, and seeds), modern (characterized by significant intake of potatoes, fats, oils, soft drinks, meat, meat products, sugar, preserves, and snacks), and prudent (characterized by considerable consumption of vegetables, fruits, soups, sauces, milk, and dairy products). Regarding pre-gestational BMI, 142 women (58.19%) were classified with a normal weight, 55 (22.54%) with overweight, and 47 (19.26%) with obesity. Concerning GWG, 150 participants (61%) had adequate GWG, 39 (15.9%) had inadequate GWG, and 57 (15.9%) had excessive GWG. Among those with normal pre-gestational BMI, 36.2% adhered to the prudent pattern, 33.3% to the modern pattern, and 30.4% to the vegetarian pattern. For those with pre-gestational overweight, the adherence rates were 30.5% for the prudent pattern, 35.6% for the modern pattern, and 33.9% for the vegetarian pattern. Among those with pre-gestational obesity, the adherence rates were 29.8% for the prudent pattern, 36.2% for the modern pattern, and 34% for the vegetarian pattern. There was a positive correlation between GWG and the consumption of fats/oils (p=0.002), non-alcoholic beverages (p=0.027), and adherence to the modern dietary pattern (p=0.034). Additionally, a positive correlation existed between pre-gestational BMI and increased consumption of eggs and egg dishes (p=0.038). The modern dietary pattern was associated with a significantly reduced probability of inadequate weight gain (OR = 0.317, p = 0.012), a relationship preserved after adjusting for socio-demographic and lifestyle factors (OR=0.316, p=0.014). When considering BMI as an additional confounder, the significance of this relationship was maintained (OR=0.352, p=0.03). Women with normal or overweight pre-gestational BMI had a reduced likelihood of experiencing excessive prenatal weight increase (OR=0.375, p=0.012, and OR=0.286, p=0.016, respectively).
Conclusion: The modern dietary pattern demonstrated a lower risk of inadequate gestational weight gain, even after adjusting for pregestational BMI, lifestyle, and socio-demographic factors. Significantly, the modern dietary pattern tends to overlook key dietary guidelines. This highlights the crucial role of nutritional counseling during pregnancy, emphasizing that mere evaluation of gestational weight gain is insufficient to fully understand a mother's nutritional well-being.

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The 13 food groups identified from the FFQ analysis were subsequently utilized in factor analysis. Principal component analysis identified three dietary patterns (based on the factor loading): vegetarian (characterized by substantial intake of cereals, cereal products, nuts, and seeds), modern (characterized by significant intake of potatoes, fats, oils, soft drinks, meat, meat products, sugar, preserves, and snacks), and prudent (characterized by considerable consumption of vegetables, fruits, soups, sauces, milk, and dairy products).

Fig. 1. Dietary patterns identified in the study group.

GC2.038

Long-term Hair Cortisone and Long-term Psychological Stress are Associated with Long-term Hedonic Eating Tendencies in Patients with Obesity

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Introduction: Long-term biological stress, reflected in hair cortisol and cortisone levels, predicts future weight gain and metabolic deterioration. This is likely at least partially mediated by glucocorticoid-induced increases in hedonic overeating. Yet, the relationship between long-term biological stress and long-term hedonic eating tendencies remains to be elucidated.
Methods: We included N=108 adults with lifestyle-induced obesity (91 women, median body-mass-index=38.4 kg/m^2) to investigate cross-sectional associations between long-term hair glucocorticoid levels (cortisol and cortisone measured in the first 3 cm of scalp hair) and self-reported long-term hedonic eating tendencies (emotional and external eating, 'Dutch Eating Behavior Questionnaire', and trait food craving, 'Food Craving Questionnaire-Trait'). Additionally, we investigated the role of long-term psychological stress ('Perceived Stress Scale') in determining the relation of hair glucocorticoid levels and hedonic eating tendencies.
Results: Higher hair cortisone levels were associated with more food cravings after adjustment for sex and age, and also after additional adjustment for psychological stress (all p<0.05). The association between hair cortisol levels and food cravings did not reach significance in crude or adjusted analyses (all p>.10). Psychological stress correlated positively with all measured hedonic eating domains (all p<0.05). Results from dummy-coding of stress groups (high vs. low psychological stress in addition to high vs. low biological stress) suggested food cravings to be highest in the group with high-psychological-stress combined with high-hair-cortisone (p<0.05). No such additive effect was revealed for any other stress measures in relation to hedonic eating.
Conclusion: Adults with obesity may be more susceptible to long-term hedonic eating tendencies if they have higher long-term biological and/or psychological stress. Long-term psychological and biological stress relate to hedonic eating tendencies in different ways with potentially adverse effects on clinical features of obesity.

GC2.039

Binge Eating Disorder screening in a sample of Italian outpatients with excess weight

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Introduction: Binge Eating Disorder (BED), is predominant among outpatients with overweight/obesity, having a bidirectional link to excessive weight. On one side, patients with BED exhibit a 3-6 times higher probability of suffering from obesity than who are not affected; on the other side, around 30% of individuals with BED are preceded by a history of obesity during childhood BED and obesity share risk factors, mechanisms of onset and complications. An effective screening helps in the diagnosis of patients with obesity who need personalized treatment, as they are unlikely to respond to generic weight loss dietary treatment.

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The study aimed at i) exploring the prevalence of BED in an Italian sample of outpatients with overweight/obesity; ii) analysing factors associated with BED.

Methods: An observational, cross-sectional study was conducted. Participants (n=176; 104F/72M) attending the Clinical Nutrition and Dietetics Operative Unit (ICS Maugeri IRCCS, Pavia) were recruited according to inclusion (aged≥18; BMI≥28 kg/m^2; signed informed consent) and exclusion criteria (restrictive eating, psychiatric and central nervous system disorders; taking antipsychotic, mood stabilizing, hypnotic medications). Participants completed the Binge Eating Scale (BES) self-administered psychometric questionnaire for BED screening. Age at onset of excess weight; weight cycling syndrome (Y/N); past dietary interventions; smoking habit (no/current/former); alcohol consumption (no consumer, in line/not in line with national guidelines); emotional eating (Y/N) and presence of other comorbidities were recorded.

Results: The median BES score of the total population was 11.17 (IQR, 4.00-16.00) and it was significantly higher (p=0.035, Mann-Whitney test) in females (11; IQR, 5.00-18.50) than in males (6.50; IQR, 3.00-11.00). The presence of possible BED (18≤BES score<28) was observed in 13.07% of the patients, without significant gender differences; probable BED (BES score ≥28) was observed in 7.95% of the patients with significant differences (p=0.035, Fisher's Exact test) between males (2.78%) and females (11.54%).

Spearman correlation showed that the BES score was significantly and positively associated with BMI (p=0.0002), while negatively associated with age (p<0.0001), and the age of excess weight onset (p<0.0001). Furthermore, the BES score was significantly associated with the presence of weight cycling syndrome (p=0,038), anxious-depressive syndrome (p=0.0004) and emotional eating (p<0.0001) and with past dietary interventions (p=0.0005).

The multiple regression analysis revealed that the BES score was negatively correlated with the age of excess weight onset (p=0.0002) and positively associated with the presence of emotional eating (p=0.0051).

Conclusion: The twin epidemics of BED and obesity cast a shadow over our society, carrying with them profound health implications and escalating social costs. Identifying risk factors and forging tailored pathways for health management is not just a medical imperative but a societal call that hinges on our ability to integrate effective treatments.

Reference

McCuen-Wurst C, et al. Ann NY Acad Sci. 2018;1411(1):96–105.

GC2.040

Applying parental factors and strategies for nutritional support for parents of adolescents with disordered eating behaviour to parents of adolescents with obesity

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Introduction: In Singapore, prevalence of children aged between 7 and 18 with overweight and obesity has risen from 11% in 2013 to 16% in 2021. Evidence-based programmes such as family-based treatments have been developed to help support and equip parents of children with obesity with the knowledge and skills to improve healthy behaviour such as appropriate dietary intake. However, little is known about factors that lead to successful implementation and factors that sustain these improvements in the home environment after intervention. Amongst adolescents with obesity about 16% reported disordered eating behaviours with challenges with emotional eating and parental involvement may be necessary in addressing these behaviours. Lessons can be drawn from caregivers of adolescents with eating disorders and disordered eating as caregivers similarly must be involved in nutritional choices and address emotional regulation challenges associated with eating. Thus, insights can be drawn from successful caregiving strategies of parents of adolescents with eating disorders and disordered eating to inform programme development for families of adolescents with obesity.

Objectives: 1) To understand how parents interpret health care professionals' nutritional guidance on caring for adolescents with disordered eating behaviour 2) To understand components of successful health care professional communication 3) To understand parental factors and strategies that lead to appropriate nutritional choices at home

Methods: In-depth qualitative interviews and focus groups (n=19) were conducted with parents of adolescents with disordered eating behaviour (n=8) and healthcare providers (n=11) to understand their caregiving experience. Interviews were transcribed and analysed using standard qualitative methods. These interviews will inform the factors that lead to improvements in parental involvement and efficacy in ensuring appropriate nutritional choices for their adolescents.

Results: Multiple key themes emerged from the interviews. First, parents felt that a strong trust with the health care providers was essential for parents to be confident to enact changes and follow providers' recommendations at home. Second, parents identified that understanding the severity of the condition as an important step to make changes. Parents also described a need to have autonomy and creativity in how guidance was implemented and to have the confidence to know how to best adapt recommendations for their child. Finally, parents also identified parental emotional status at the time of parent-provider communication as well as meal time at home as factors which impacts their effectiveness.

Conclusions: Health care providers' communications and future parental skills training programmes for parents of adolescents with obesity and disordered eating behaviours should consider the above factors in communication and programme design to improve healthy and appropriate food intake.

GC2.041

Association between Neck Circumferences and Insulin Resitance in general population under 50 years

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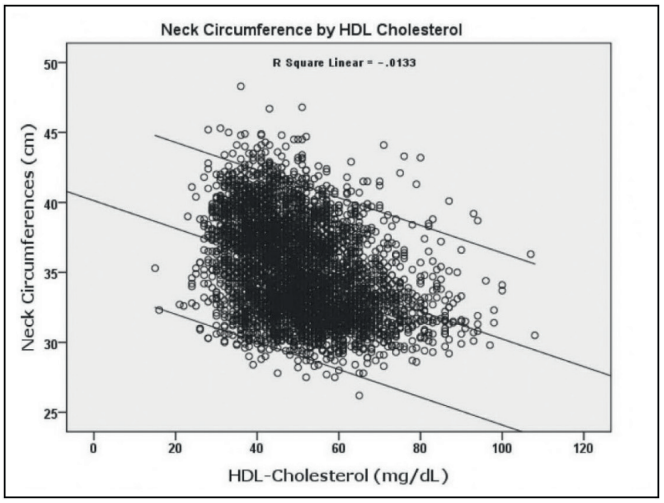
Our study aimed to explore the link between neck circumference and metabolic risk factors, particularly insulin resistance, in the general population under 50 years. We conducted a comprehensive analysis of metabolic variables, including weight, height, waist circumference, blood pressures, fasting plasma glucose, insulin, triglyceride, HDL-cholesterol, and white blood cell count, alongside co-morbidities such as hypertension, diabetes, and dyslipidemia.

Examining 961 participants (mean age 44.7 ± 0.1 years, BMI 24.3 ± 0.1 kg/m^2, female: 56.7%) from the 2020 Korea National Health Analysis Nutrition and Examination Survey, we stratified individuals into four quartiles based on neck circumferences. We excluded postmenopausal individuals to focus on the premenopausal state.

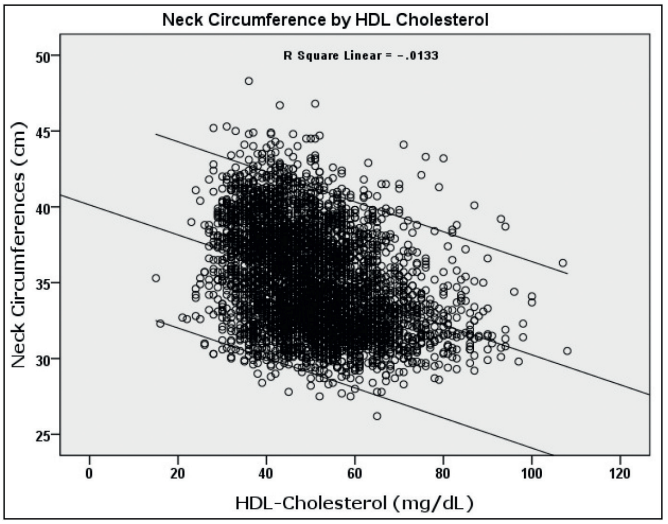
Utilizing SPSS software, we employed correlation analysis (Pearson) and one-way ANOVA tests. The results revealed a positive correlation between neck circumference and BMI ($p < 0.0001$), HOMA IR index ($p = 0.018$), and insulin ($p = 0.018$). Conversely, a negative association was observed with HDL-cholesterol ($p = 0.015$) after adjusting for age, sex, waist circumference, triglycerides, total cholesterol, blood pressures, and energy/macronutrient intakes.

In conclusion, neck circumference is significantly associated with insulin, HOMA index, and BMI, but inversely related to HDL-cholesterol in the Korean general population under 50. Further controlled clinical trials are warranted to validate these findings.

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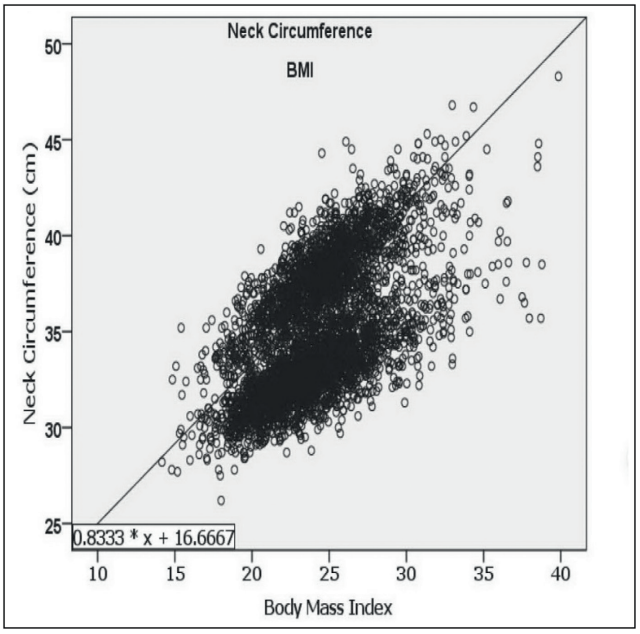


NC by HDL Cholesterol.

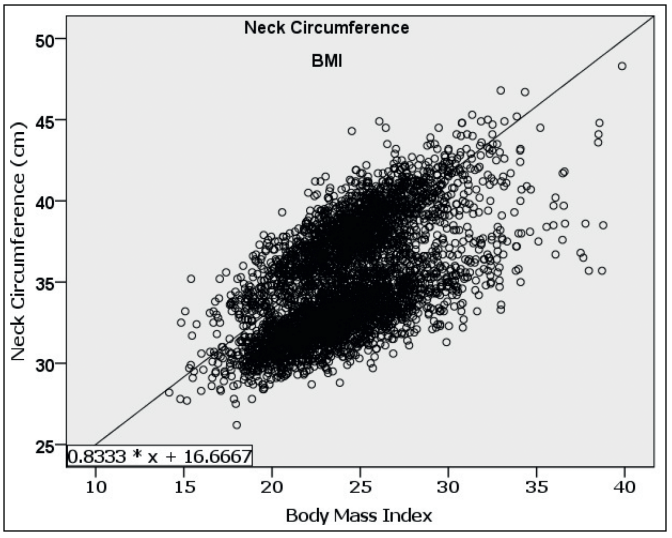


Neck Circumference by HDL-Cholesterol.

Fig. 1.



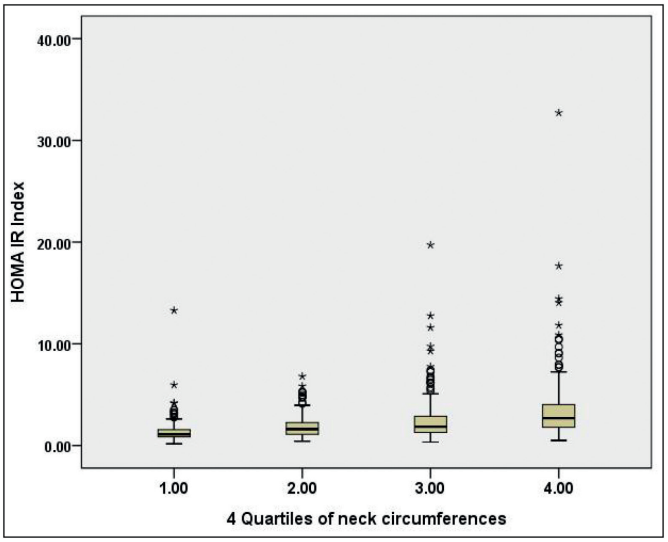
NC by BMI.



Neck Circumference by BMI.

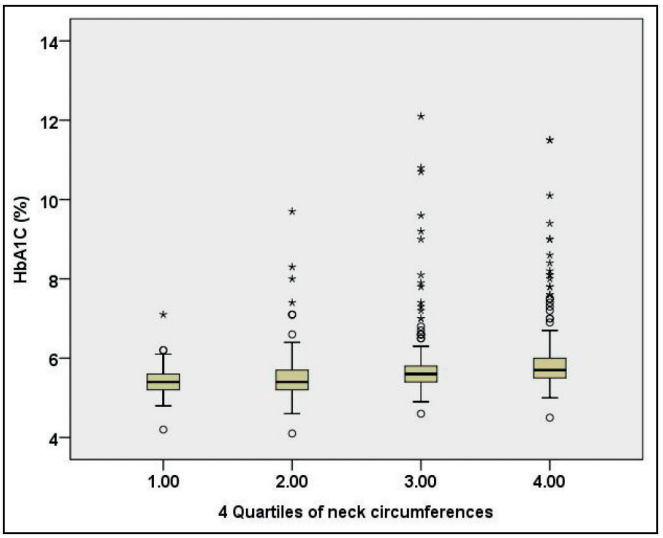
Fig. 2.

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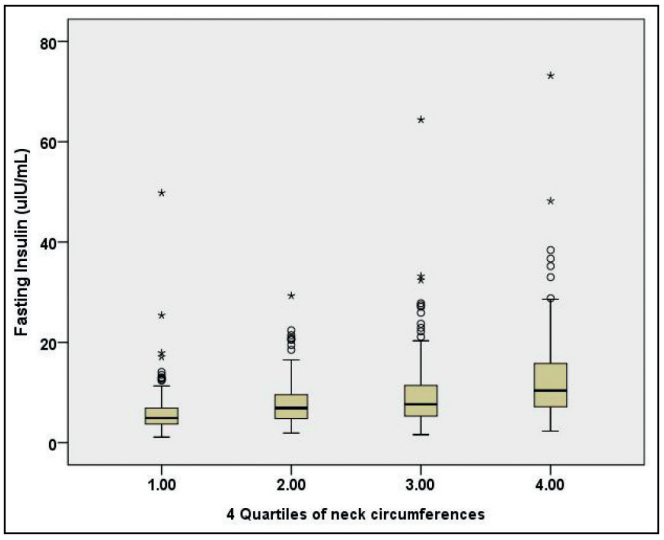
HOMA IR according to the Quartile of Neck Circumferences.

Fig. 3.



Hemoglobin A1C Concetration According to Quartiles of Neck Circumferences.

Fig. 5.



Insulin concentration according to the Quariles of Neck Circumferences.

Fig. 4.

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Tab. 1.

Controlled Variables			Neck Circumferences
Age, Sex, Total Cholesterol, TG, Systolic Pressure, Diastolic Pressure, Waist Circumferences, Energy Intake, Carbohydrate, Fat, Protein intake	HOMA IR Index	Corr.	.222
		P	.018
	Fasting Plasma Glucose	Corr.	.176
		P	.061
	Glycated Hemoglobin	Corr.	.176
		P	.062
	Insulin	Corr.	.221
		P	.0018
	HDL-Cholesterol	Corr.	-.227
		P	.015
	BMI	Corr.	.490
		P	.000
	LDL-Cholesterol	Corr.	.049
		P	.603
		df	112

Association between metabolic variables and neck circumferences after Controlled Variables.

GC2.042

BMI Trajectories and the Influence of Missing Data

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Introduction: Body Mass Index (BMI) trajectories have been estimated in various ways. These estimates are important to understand how BMI develops over time and for use in cost-effectiveness analysis. However, missing data is often stated as a limitation in studies that analyse BMI over time and there is little research into how missing data can influence these BMI trajectories. The aim of this study is to determine how much influence missing data can have when estimating BMI trajectories and to explore the effects this has on subsequent analysis.
Methods: This study uses data from the English Longitudinal Study of Aging (ELSA). First, a growth mixture model (GMM) is used to estimate distinct BMI trajectories in adults over the age of 50. Next, methods that assume data is missing at random (MAR) are used: complete case analysis and multiple imputation. Finally, methods that assume data is missing not at random (MNAR) are implemented: Diggle Kenward and Roy methods. Estimated trajectories from each method are then used to predict the risk of developing type 2 diabetes (T2DM) using discrete-time survival analysis.
Results: The same four distinct trajectories are identified using each of the methods to account for missing data: stable overweight, elevated BMI, increasing BMI, and decreasing BMI. However, the likelihoods of individuals following the different trajectories differs between the different methods.
Results show that the influence of BMI trajectory on T2DM is reduced after accounting for missing data. More work is needed to understand which methods for missing data are most appropriate and give the most reliable results.
Conclusion: Missing data can significantly influence estimations of BMI trajectories. Therefore, when using BMI trajectories to inform cost-effectiveness analysis or policymaking, missing data should be considered. More research is needed to examine the extent to which accounting for missing data might influence the cost-effectiveness of policies, for example, weight management interventions.

GC2.043

Impact of on cardiovascular risk in single-person households among Korean middle-aged adults: A nationwide cohort study (2009-2015)

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Objective: To examine impact of cardiovascular incidence in living alone and using a representative population data in Seoul Korea
Methods: The study population aged 40-69 years who enrolled in the national health checkup program between 2009 and 2015 and who didn't had MI or stroke at baseline using the Korean National Health Insurance Service database and resident registration data. Hazard ratios (HRs) were estimated from Cox proportional hazard models.
Results: Among 1,679,942 individuals of single-person household, total of 12,855 cases of incident MI and 16,919 case of incident stroke during the mean follow-up period of 5.21 years. After adjustment for age, gender, smoking, alcohol intake, physical activity, income level and chronic metabolic disease such as hypertension, diabetes mellitus, dyslipidemia, the risk of developing CVD for those who lived alone at baseline compared with multiple person household 2.15(95% confidence interval (CI), 2.09-2.21) in MI, 1.81(95% confidence interval (CI), 1.77-,1.85) in stroke.
Conclusions: Single person household was positively associated with incident CVD risk.

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Tab. 1. Association between single-person household and cardiovascular risk.

Table 2 . Association between single-person household and cardiovascular risk

			N	event	Incidence rate (per 1000 person-years)	Hazard ratios (95% confidence intervals)			
						non-adjusted	Model 1	Model2	Model 3
MI	Non SPH	Non MetS	8,988,882	33,210	0.69253	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
		MetS	3,320,906	37,030	2.0849	3.007(2.963,3.052)	2.37(2.335,2.406)	2.363(2.328,2.399)	1.979(1.947,2.012)
	SPH	Non MetS	1,150,921	5,761	0.9609	1.393(1.355,1.433)	1.264(1.229,1.3)	1.181(1.148,1.214)	1.177(1.144,1.211)
		MetS	529,021	7,094	2.5681	3.72(3.626,3.817)	2.776(2.705,2.849)	2.585(2.518,2.653)	2.15(2.093,2.209)
Stroke	Non SPH	Non MetS	8,988,882	43,216	0.90161	1(Ref.)	1(Ref.)	1(Ref.)	1(Ref.)
		MetS	3,320,906	46,133	2.60054	2.881(2.844,2.919)	2.115(2.087,2.143)	2.094(2.067,2.122)	1.661(1.637,1.685)
	SPH	Non MetS	1,150,921	7,576	1.26451	1.409(1.375,1.443)	1.204(1.175,1.234)	1.128(1.101,1.156)	1.126(1.099,1.154)
		MetS	529,021	9,343	3.38901	3.774(3.69,3.859)	2.475(2.42,2.532)	2.292(2.241,2.345)	1.811(1.768,1.854)

Data are obtained by using Cox hazard regression models and expressed as hazard ratios (95% confidence intervals)
SPH means group of the single-person household; MI means myocardial infarction,
M1 is adjusted for age and sex.
M2 is additionally adjusted for alcohol drinking, exercise, and smoking and income status
M3 is adjusted for metabolic diseases, including hypertension, diabetes, and dyslipidemia, in addition to the Model 3 variables.

Data are obtained by using Cox hazard regression models and expressed as hazard ratios (95% confidence intervals) SPH means group of the single-person household; MI means myocardial infarction, M1 is adjusted for age and sex. M2 is additionally adjusted for alcohol drinking, exercise, and smoking and income status M3 is adjusted for metabolic diseases, including hypertension, diabetes, and dyslipidemia, in addition to the Model 3 variables.

Tab. 2. Association between single-person household and CVD stratified by sex, age, life style, income, metabolic disease.

Table 3. Association between single-person household and CVD stratified by sex, age, life style, income, metabolic disease

		MI			STROKE		
subgroup	N	Incidence rate	HR (95% CI)	p for interaction	Icidence rate	HR (95% CI)	p for interaction
Male	813,281	1.841	1.138(1.11,1.166)	0.9793	2.262	1.148(1.123,1.174)	<.0001
Female	866,661	1.129	1.104(1.07,1.138)		1.636	1.086(1.059,1.115)	
Age 40s	651,667	0.799	1.174(1.126,1.224)		0.744	1.266(1.212,1.322)	<.0001
Age 50s	576,830	1.516	1.179(1.141,1.217)	<.0001	1.821	1.178(1.144,1.213)	
Age 60s	451,445	2.314	1.071(1.04,1.102)		3.690	1.053(1.029,1.077)	
Current Smoker	1525,685	1.465	1.142(1.12,1.166)	0.4448	2.445	1.104(1.072,1.136)	0.8254
Heavy Drinker	154,257	1.498	1.101(1.033,1.173)	0.3162	2.279	1.108(1.052,1.167)	0.6218
Physical activity	318,988	1.407	1.137(1.088,1.189)	0.5452	1.809	1.103(1.061,1.147)	0.1237
Low Income	619,550	1.730	1.224(1.187,1.263)	<.0001	2.300	1.2(1.168,1.233)	<.0001
Diabetes mellitus	199,825	3.035	1.137(1.094,1.183)	0.5914	4.451	1.098(1.063,1.134)	0.1487
Hypertension	519,408	2.250	1.125(1.094,1.156)	0.0051	3.395	1.128(1.103,1.154)	0.8701
Dyslipidemia	407,376	2.145	1.109(1.074,1.146)	0.0001	2.607	1.093(1.062,1.126)	0.0025

Data are obtained by using Cox hazard regression models and expressed as hazard ratios (95% confidence intervals)
This subgroup analysis of MI in SPH compared with non-SPH stratified by sex, age, life style, income, metabolic disease.
Incidence rate per10000erson-years.;SPH means group of the single-person household; MI means myocardial infarction; Heavy drinker : Alcohol consumption≥30 g/day), physical activity for the frequency of exercise ≥5 times/week in moderate intensity activities or ≥ 3times/ week in high intensity activities.
Low income indicated lower 20% of population and medical aid group. Diabetes : (1) at least one claim in a year for the prescription of diabetes medications under ICD-10 codes E11–14 or (2) fasting plasma glucose level ≥126 mg/dL. ,Hypertension : (1) at least one claim in a year for the prescription of hypertension medications under ICD-10 codes I10–I15 or (2) systolic/diastolic blood pressure ≥140/90 mmHg twice or more. ,Dyslipidaemia

Data are obtained by using Cox hazard regression models and expressed as hazard ratios (95% confidence intervals) This subgroup analysis of MI in SPH compared with non-SPH stratified by sex, age, life style, income, metabolic disease. Incidence rate per10000erson-years.;SPH means group of the single-person household; MI means myocardial infarction; Heavy drinker: Alcohol consumption≥30 g/day), physical activity for the frequency of exercise ≥5 times/week in moderate intensity activities or ≥ 3times/ week in high intensity activities. Low income indicated lower 20% of population and medical aid group. Diabetes: (1) at least one claim in a year for the prescription of diabetes medications under ICD-10 codes E11–14 or (2) fasting plasma glucose level ≥126 mg/dL., Hypertension: (1) at least one claim in a year for the prescription of hypertension medications under ICD-10 codes I10–I15 or (2) systolic/diastolic blood pressure ≥140/90 mmHg twice or more.,Dyslipidaemia: (1) at least one claim in a year for the prescription of dyslipidaemia medications under ICD-10 code E78 or (2) total cholesterol ≥240 mg/dL

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Tab. 3. Baseline characteristics of study subjects.

Table 1. Baseline characteristics of study subjects

	Single-person household (n=1,679,942)	Non-SPH[a] (n=12,309,788)	p-value
Sex(Male)	813281(48.41)	5938706(48.24)	<.0001
Age (Year)	52.66±8.74	50.66±8.17	<.0001
40s	651667(38.79)	5910731(48.02)	<.0001
50s	576830(34.34)	4180340(33.96)	
60s	451445(26.87)	2218717(18.02)	<.0001
Height (cm)	161.93±8.68	162.58±8.51	<.0001
Weight (kg)	63.01±10.89	63.51±10.79	<.0001
BMI[b] (kg/m2)	23.95±3.16	23.95±3.07	0.18
Waist circumference (cm)	80.89±8.87	80.55±8.74	<.0001
Fasting plasma glucose(mg/dL)	100.76±26.87	99.01±24.07	<.0001
Systolic blood pressure(mmHg)	123.76±15.58	122.68±15.08	<.0001
Diastolic blood pressure(mmHg)	77.29±10.39	76.68±10.22	<.0001
Serum total cholesterol (mg/dL)	201.44±37.76	199.36±36.49	<.0001
Serum HDL-C (mg/dL)	55.35±16.61	55.22±16.5	<.0001
Serum triglycerides (mg/dL)	143.94±99.92	135.97±93.83	<.0001
Obesity (BMI ≥25 kg/m2)	577513(34.38)	4171295(33.89)	<.0001
Abdominal Obesity[c]	2525938(20.52)	377538(22.47)	<.0001
Current smoker	478722(28.5)	2667733(21.67)	<.0001
Heavy alcohol consumption[d]	154257(9.18)	952347(7.74)	<.0001
Regular physical activity[e]	318988(18.99)	2423855(19.69)	<.0001
Household income(low)[f]	619550(36.88)	2410407(19.58)	<.0001
Hypertension(yes)[g]	519408(30.92)	3309618(26.89)	<.0001
Diabetes mellitus(yes)[h]	199825(11.89)	1181636(9.6)	<.0001
Dyslipidemia(yes)[i]	407376(24.25)	2564217(20.83)	<.0001

Data are expressed as the mean ± SD, or n (%). SD, standard deviation ; SPH means the group of the single – person household; Heavy drinker : Alcohol consumption≥30 g/day), physical activity for the frequency of exercise ≥5 times/week in moderate intensity activities or ≥ 3times/ week in high intensity activities.

Low income indicated lower 20% of population and medical aid group. Diabetes : (1) at least one claim in a year for the prescription of diabetes medications under ICD-10 codes E11–14 or (2) fasting plasma glucose level ≥126 mg/dL. ,Hypertension : (1) at least one claim in a year for the prescription of hypertension medications under ICD-10 codes I10–I15 or (2) systolic/diastolic blood pressure ≥140/90 mmHg twice or more. ,Dyslipidaemia : (1) at least one claim in a year for the prescription of dyslipidaemia medications under ICD-10 code E78 or (2) total cholesterol ≥240 mg/dL.

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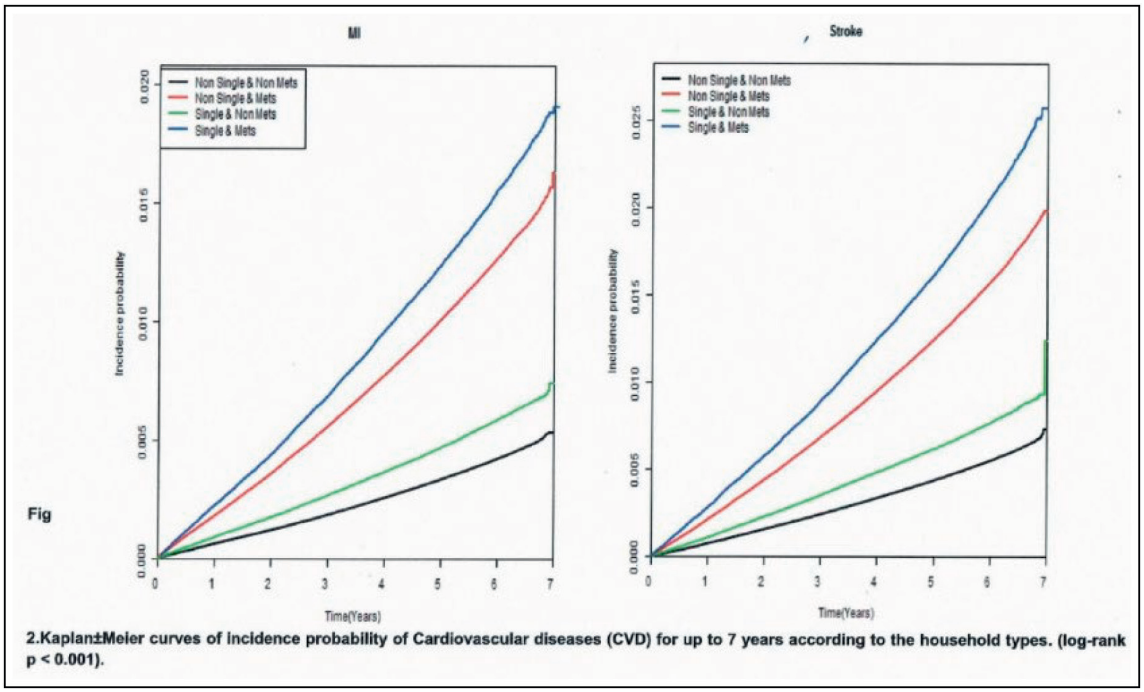


Fig. 1. Kaplan±Meier curves of incidence probability of Cardiovascular diseases (CVD) for up to 7 years according to the household types.

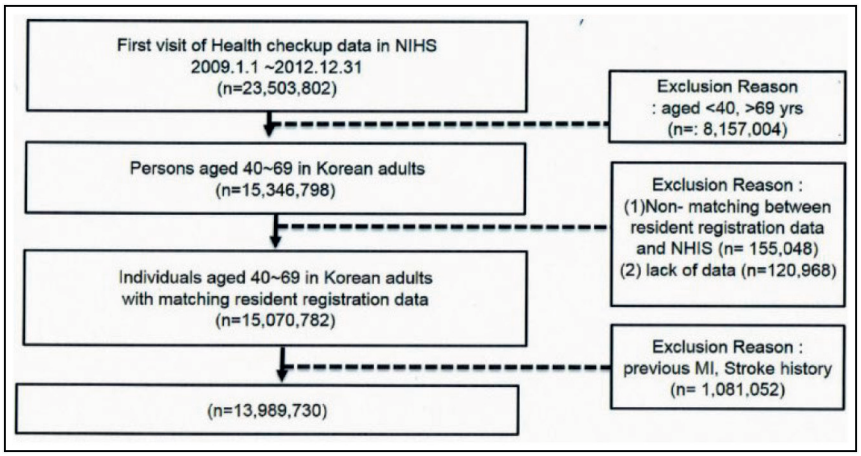


Fig. 2. Study population.

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GC2.044

Trends of Obesity and Related Diseases in South Korea: An Age-Period-Cohort Analysis

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Aim: This study aims to evaluate the temporal trends in obesity, obesity-related diseases, and mortality in South Korea

Methods: We used age-period-cohort modeling to examine trends in disease incidence and mortality, utilizing data from the National Health Insurance Service-National Sample Cohort. The analysis included calculating overall annual percentage changes (net drifts), age group-specific annual percentage changes (local drifts), longitudinal age curves, period relative risks (RRs), and cohort RRs.

Results: Between 2005 and 2019, an increase in age effects on obesity was observed, peaking at ages 71-73. The highest incidence rates for dyslipidemia, diabetes, and hypertension were noted in the 50s, followed by a steady decline. Notably, net drift values for obesity (men, 2.1% [95% CI=2.0 to 2.2]; women, 0.7% [0.6 to 0.8] per year) and dyslipidemia (men, 2.2% [1.9 to 2.6]; women, 0.6% [0.2 to 1.0%] per year) were positive, indicating increasing trends. Annual percentage changes in obesity rates increased across all age groups in men. Rate ratios for obesity and dyslipidemia were lower in earlier periods and higher in later ones, while for diabetes, hypertension, cardiovascular deaths, and all-cause mortality, the trend was the opposite. The most recent birth cohorts (1997-1999)

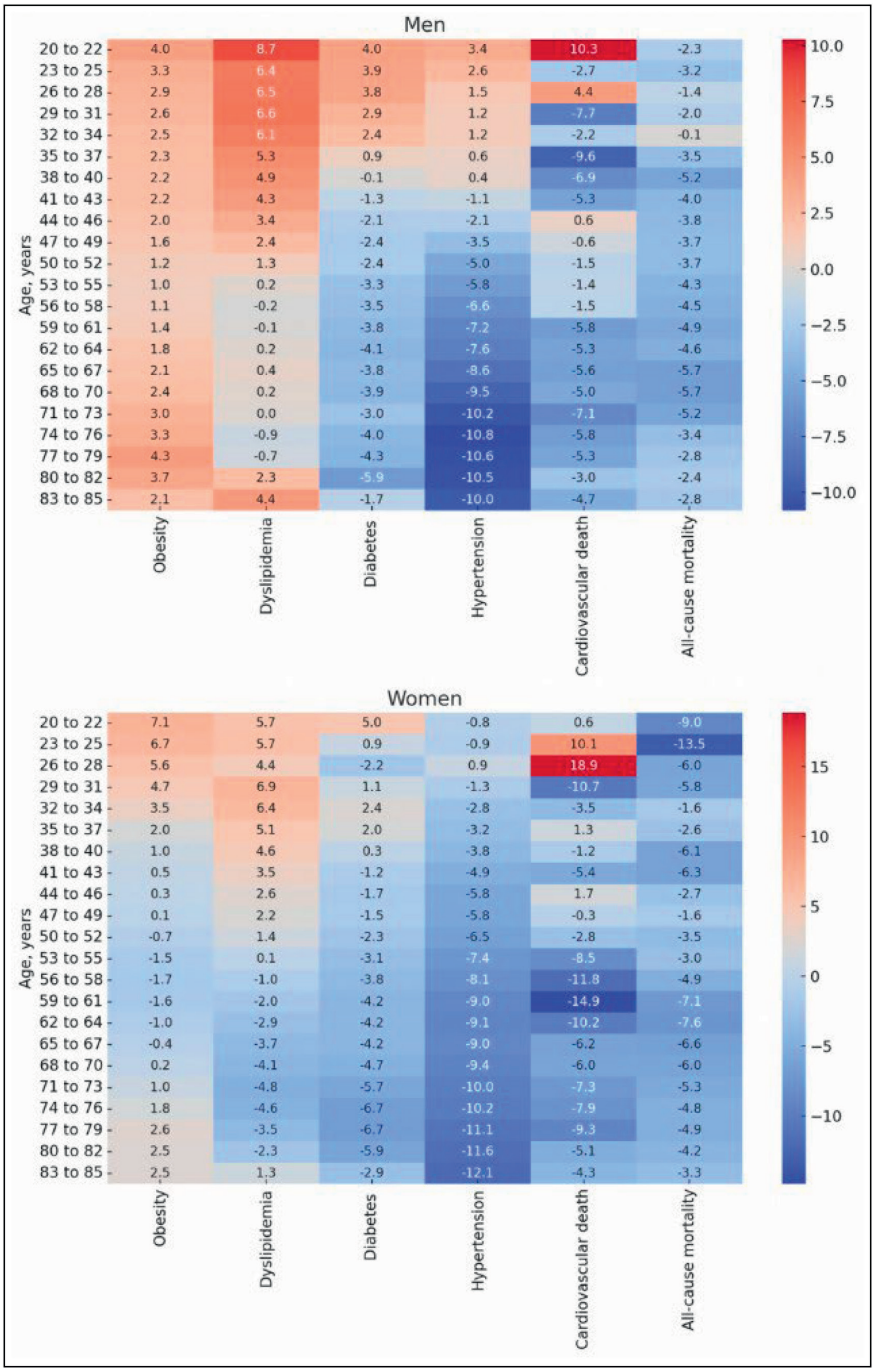


Fig. 1. Age-group specific annual percent changes in obesity, obesity-related diseases, and mortality.

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showed the highest cohort RRs for obesity and dyslipidemia but marked declines in other diseases and mortality rates.
Conclusions: While there has been an overall improvement in disease and mortality rates, significant challenges remain, particularly in managing obesity and dyslipidemia. These findings underscore the need for targeted interventions in recent birth cohorts in South Korea to mitigate these issues.

GC2.045

Association between temporomandibular disorders and obesity

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This study investigated the relationship between TMD and body mass index (BMI) in a large representative sample of the South Korean population using data from the Korea National Health and Nutrition Examination Survey (KNHANES).
Men and women with TMD showed decreased prevalence of abdominal obesity. Women with TMD had lower BMI and lower waist circumference compared with the group without TMD. However, males with TMD didn't show any statistically significant difference between BMI, and waist circumference compared with the group without TMD, although there were similar tendencies in the females with TMD.
Overall, TMD was associated with decreased BMI and waist circumference in women.

GC2.047

Association between Body Mass Index and Aortic Aneurysm and Dissection Mortality in Koreans

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[2]Department of Preventive Medicine and Public Health, College of Medicine, Catholic Kwandong University, Republic of Korea
[3]Department of Neurology, International St. Mary's Hospital Catholic Kwandong University College of Medicine
[4]Division of Cardiology, Department of Internal Medicine, Ewha Womans University College of Medicine, Seoul Hospital, Seoul, Korea

Introduction: Aortic aneurysm and dissection (AAD), a critical cardiovascular condition, poses a substantial risk of fatality. Establishing the association between body mass index (BMI) and AAD is essential for the prevention of AAD in the general population.
Methods: We utilized nationwide cohort data including participants in the national health examination between 2003 and 2006, and tracked their mortality until 2018. We excluded those with known CVD or cancer at the baseline. Individuals (n=14,876,281) were grouped into 7 categories based on BMI (unit, kg/m^2), with the reference group set at a BMI of 25-27.4. The clinical endpoint was death from AAD. Cox hazard model was used to calculate hazard ratios for the association.
Results: During a mean follow-up of 13.7 years, 4060 individuals died of AAD. A reverse J-shaped association, indicating a gradual increase in risk with higher BMI beyond BMI ≥22, was demonstrated (Figure 1). After adjusting for possible covariates (age, sex, smoking habit, alcohol consumption, income level, and physical activity), the adjusted HRs (95% confidence intervals) for AAD mortality were as follows: 0.89 (0.76-1.05) for BMI <18.5, 0.72 (0.64-0.80) for 18.5-20.9, 0.71 (0.64-0.78) for 21-22.9, 0.88 (0.81-0.96) for 23-24.9, 1.00 for 25-27.4 (reference group), 1.15 (1.03-1.30) for 27.5-29.9, and 1.64 (1.40-1.92) for BMI ≥30.
Conclusion: Our study underscores the significance of BMI as a potential risk factor for AAD mortality in the general population. It emphasizes the necessity for targeted interventions, particularly for individuals with higher BMI, to mitigate adverse outcomes associated with AAD.

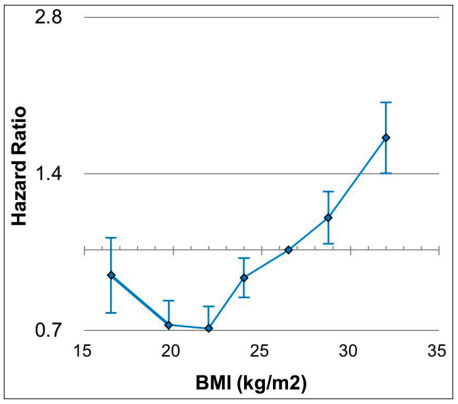


Fig. 1. Association between body mass index and aortic aneurysm and dissection mortality.

GC2.048

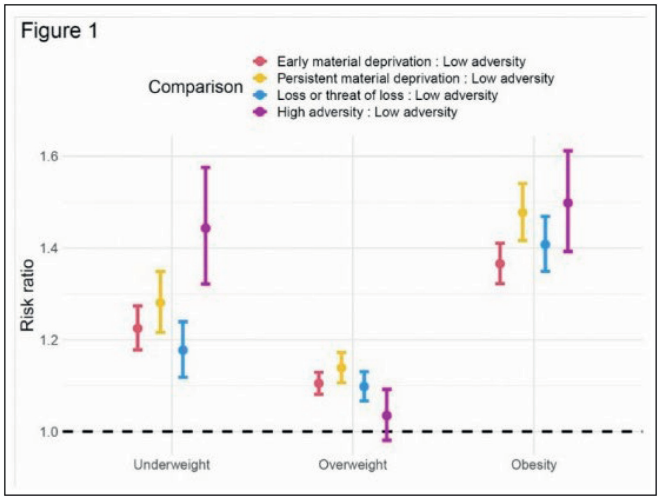
Childhood Adversity Trajectories and Weight Status in Young Adult Men: A register-based study including 359 783 Danish Men

Wimmelmann, C. L.[1]*; Sejling, C.*[2]*; Clarke, R. B.*[2]*; Elsenburg, L.*[2]*; Sørensen, T. I.*[2]*; Rod, N. H.*[3]

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Background: The path to young adult obesity may be established during childhood, making it central to study childhood predictors of body mass index (BMI) in young adulthood. Childhood adversity has been defined as intense stressors or traumatic events that disrupt a child's sense of safety and stability, which may have mental and physiological consequences that extend into adulthood (1). Previous studies have consistently found an association between childhood adversity and overweight and obesity in adult life (2). However, there is a need for larger population-based studies using prospectively obtained adversity trajectories across childhood to confirm these associations. Moreover, childhood adversity may also be associated with underweight, which is less often studied. The aim of the current study is to investigate the association between childhood adversity trajectories from 0-15 years with weight categories in young adult men.
Methods: The Danish Life Course Cohort (DANLIFE) (3) was linked with the Danish Conscription Registry (4) resulting in a study sample of 359.783 men, who have been assigned to one of five previously identified adversity trajectories from 0-15 years: 'low adversity', 'early material deprivation', 'persistent material deprivation', 'loss or threat of loss', and 'high adversity' (1). Height and weight in young adulthood were assessed at a draft board examination at age 18-26 years. Multinomial regression models were used to investigate associations of adversity trajectories with weight categories in young adulthood.
Results: The 'low adversity' group had higher risks of underweight, overweight, and obesity compared with the four other adversity groups. The 'high adversity' group showed the strongest associations with both underweight (1.44 (1.32, 1.58)) and obesity (1.49 (1.39, 1.61)) when adjusted for parental origin, birth year, age at draft board examination, and maternal age.
Conclusion: Childhood adversity from 0 and 15 years of life was associated with a higher risk of underweight, overweight, and obesity in this large prospective sample of young adult men.

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Associations of childhood adversity trajectory groups with underweight, overweight and obesity among 359 783 men from the DANLIFE cohort. The figure presents risk ratios (RR) with 95% Confidence Intervals (CI) for underweight, overweight, and obesity for each adversity group compared with the low adversity group. The RRs are adjusted according to Model 1: Birth year, age at draft board examination, parental origin, and maternal age

Fig. 1.

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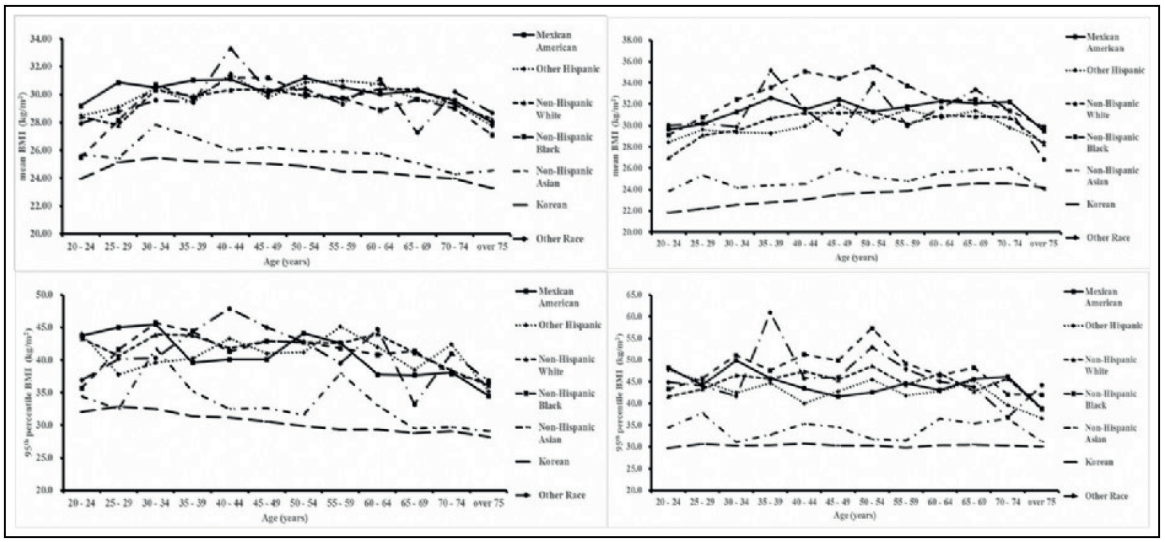
GC2.049

A binational study examining racial and gender differences in adult body mass index and waist circumference between Korea and the United States

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[3]Center for Digital Health Kyung Hee University Healthcare System

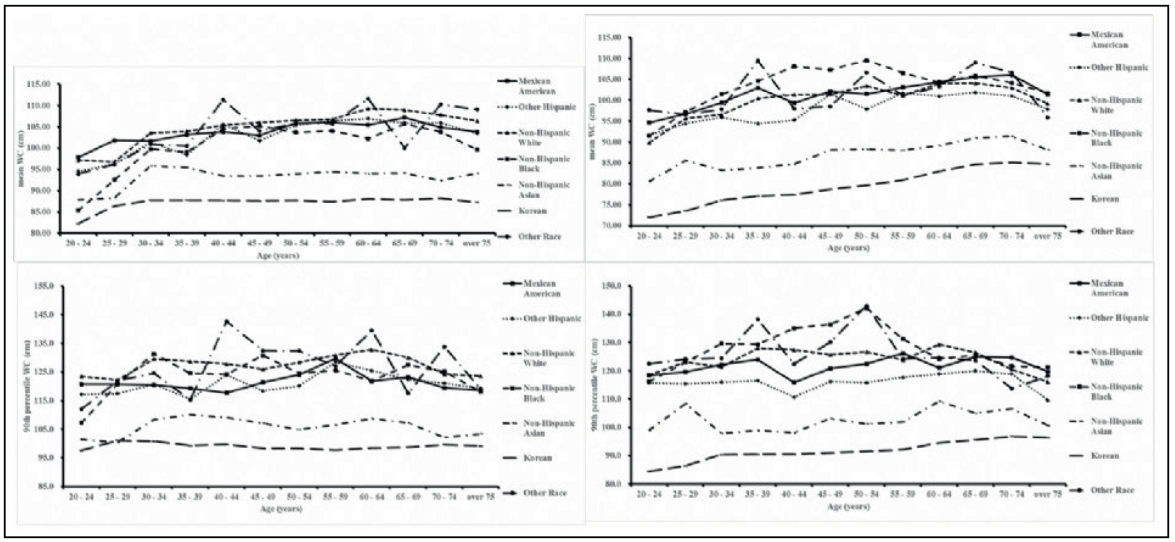
Introduction: The ethnic and sex differences in the distributions of body mass index (BMI) and waist circumference (WC) among adults are largely unknown. Therefore, we aimed to investigate the percentiles of BMI and WC in groups divided according to age, sex, and ethnicity.
Methods: We conducted a population-based binational study of adults aged ≥ 20 years based on data from two sources: US National Health and Nutrition Examination Survey (2015 to 2020) and Korea National Health and Nutrition Examination Survey (2016 to 2019).
Results: Weight, height, and WC were measured in 13,144 American adults and 30,191 Korean adults. Overall, BMI increased at younger ages and decreased at older ages, which indicates a reversed U-shaped relationship, and differed in terms of age, sex, and ethnicity. Women in the other Hispanic, non-Hispanic white, non-Hispanic black, and "other ethnic groups" showed a common BMI peak at ages 50-54 years. The patterns of WC distribution were similar to those of BMI distribution.
Conclusion: In this binational representative study, we found varied distributions of ethnic and sex differences in BMI and WC. Considering the differences in these distributions may help improve individual and personalized treatment strategies.



(a) mean BMI of men (b) mean BMI of women (c) BMI of the 95th percentile of men (d) BMI of the 95th percentile of women.

Fig. 1. BMI distribution by age and ethnicity from NHANES and KNHANES.

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(a) mean WC of men (b) mean WC of women) (c) WC of the 90th percentile of men (d) WC of the 90th percentile of women.

Fig. 2. WC distribution by age and ethnicity by NHANES and KNHANES.

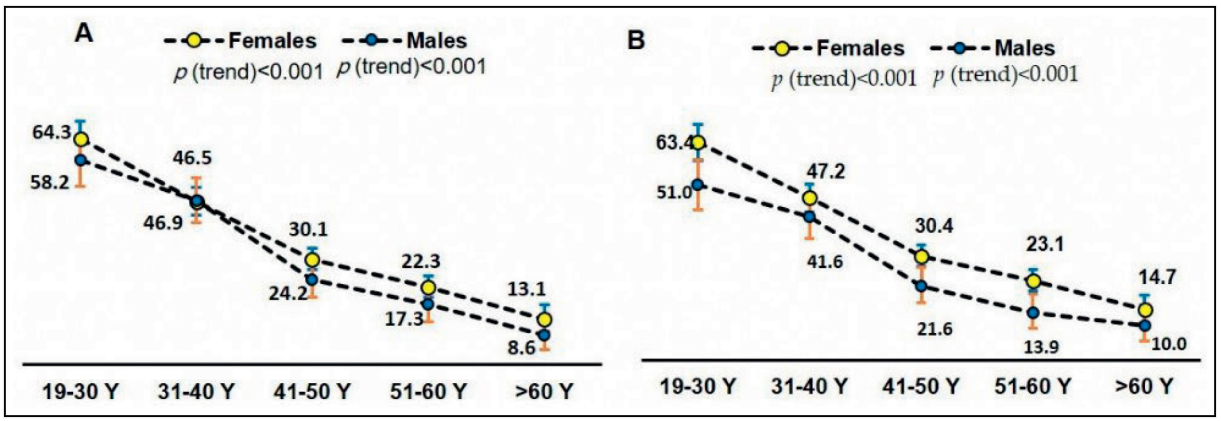
GC2.050

Prevalence and Trends of the Metabolically Healthy Obese in an Arab Population

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[2]Chair for Biomarkers of Chronic Diseases, Biochemistry Department, College of Science, King Saud University, Riyadh, Saudi Arabia

Introduction: The metabolically healthy obesity (MHO) phenotype represents a complex and distinctive phenome-non, the prevalence of which remains unknown in the Saudi Arabian adult population. The present study aims to fill that gap.
Methods: A combined total of 10220 Saudi adults from 2 independent cohorts [2008-2019, N=7896 (2903 males and 4993 females), and 2021-2023, N=2324 (830 males and 1494 females)] aged 19-70 years old, 9631 (3428 males and 6203 females) of whom were included. Anthropometric data were measured and fasting blood samples were collected to assess circulating glucose and lipids using routine methods. Obesity was defined as body mass index (BMI) ≥30kg/m^2. Screening for MHO was done twice using the empiric definition proposed by Zembic and colleagues, and the criteria by the National Cholesterol Education Pro-gram's Adult Treatment Panel III (NCEP ATPIII).
Results: Over-all, 3949 (41.0%) participants, classified as obese, were used to investigate the prevalence and trends of MHO; 37.3% (95% confidence interval, CI, 30.6% - 44.8%) of whom were considered MHO using the empiric definition and 37.3% (95% CI, 30.8% - 44.8%) using NCEP-ATPIII. The over-all age-adjusted prevalence of MHO in the Saudi adult population was 15.3% (95% CI, 12.3-19.1) and 15.4% (12.9%-18.3%) by the two definitions respectively. Females had a significantly higher age-adjusted prevalence of MHO than males (OR=1.5 (95% CI, 1.1 - 2.0), p=0.009). MHO prevalence substantially increased over time from 2008-2023 (p<0.001) for both definitions.
Conclusion: In summary, the study highlights for the first time the prevalence and trends of the MHO phenotype among Saudi Arabian adults, opening new doors for obesity research in this homogenous ethnic group.



The age-specific prevalence of MHO overall according to different definitions among Saudi adults with obesity was plotted.

Fig. 1. Age-specific prevalence of MHO using the A) Empiric definition and B) NCEP ATP III [30] (B) among subjects with obesity.

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GC2.051

Post-quarantine changes of body weight gained during the COVID-19 quarantine among the Lithuanian adult population

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Introduction: In Lithuania, the COVID-19 quarantine lasted from 16 March 2020 until 1 July 2021. Previous studies found that unfavourable changes in nutrition and reduced physical activity during the quarantine were associated with body weight gain across various populations. There is a significant lack of data regarding the persistence of changed lifestyle habits and body weight. This study aimed to examine post-quarantine changes in body weight gained during the COVID-19 quarantine among the Lithuanian adult population.

Methods: The cross-sectional study was performed on a random sample of Lithuanian residents aged 20 to 64. Face-to-face interviews were conducted within households countrywide in 2023. The questionnaires included questions on changes in lifestyle habits and body weight during and after the COVID-19 quarantine. Body mass index (BMI) was calculated using self-reported height and weight. Overweight was defined as a BMI of 25-29.9 kg/m^2, and obesity as a BMI of ≥30 kg/m^2. A total of 1500 individuals (742 men and 758 women) participated in the survey.

Results: An increase in body weight during the quarantine was reported by 22.7% of participants. The odds of body weight gain were associated with age, increased quantity of food eaten and frequency of snacking, increased consumption of confectionery, sweetened drinks and home-delivered food, as well as reduced physical activity. Body weight gained during the quarantine persisted among 64.3% of the participants in the post-quarantine period. More women (70.1%) than men (57.4%) maintained increased body weight (p=0.015). Highly educated individuals were less likely to maintain gained body weight than low educated (odds ratio 0.543; p=0.017). The persistence of gained body weight was associated with maintenance of a high amount of food eaten (37.3%), frequent snacking (36.9%), increased meat consumption (57.7%) and confectionery consumption (40.5%). The persistence of reduced physical activity was reported by 45.8% of participants who maintained gained body weight after the quarantine.

The prevalence of overweight in the post-quarantine period was 46.9% among men and 54.3% among women, and the prevalence of obesity was 12.1% among men and 14.8% among women. The odds of the increase in body weight during the COVID-19 quarantine were 2.7 times higher among the respondents with overweight and 3.1 times higher among those with obesity than among the individuals with normal body weight in the post-quarantine period.

Conclusions: Increased food intake and reduced physical activity during the quarantine led to weight gain. Many individuals who gained body weight during the quarantine indicated the persistence of unhealthy lifestyle habits post-quarantine. The targeted interventions are needed to help individuals develop and maintain healthy lifestyle habits, even in times of crisis.

GC2.052

Fib-4 score is an Early Predictor for End-Stage Liver Disease in Young Adults: A Nationwide Retrospective Study

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[3]Meir Medical Center, Department of Research, Clalit Health Services, Israel
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Background: Non-alcoholic fatty liver disease (NAFLD) is common and underdiagnosed among young adults with or without metabolic syndrome. A small fraction of this population will develop liver specific morbidity and mortality. FIB-4 is a non-invasive fibrosis scoring system recommended in patients with high risk for advanced fibrosis in NAFLD, older than 35 years. We assessed whether FIB-4 score, is an independent predictor of hard clinical outcomes of cirrhosis and its complications in young adults in the community setting.

Methods: This retrospective study used data from Clalit Health Services, Israel's largest health care organization, included adults below the age of 40 with a calculated FIB-4 score between 2005 to 2020. People with a diagnosis of malignancy or chronic liver disease, other than NAFLD, were excluded from the study. The primary outcome event was the first diagnosis of cirrhosis, cirrhosis related complication (liver failure, esophageal varices) or hepatocellular carcinoma (HCC), using a validated set of ICD and procedure codes. The association between FIB-4 score and liver specific events was analyzed using a cox-model.

Results: Among 950,141 people, with a median follow up of 12.8 years (IQR 9.3-14.8), 430 (0.05%) people developed an end-stage liver disease. Among those, 359 (83.5%) developed non-HCC hepatic failure, and 71 (16.5%) developed HCC. The median time to event was 8.4y (IQR: 4.7-11.2). The majority of those who developed end stage liver outcome had normal liver enzymes and no NAFLD diagnosis at baseline. FIB-4 score of 1.3 or more, was an independent predictor of the primary outcome, HR 4.17 (95% CI 2.89-6.01, p-value < 0.001). Obesity was another significant predictor, HR 1.74 (95% CI 1.32-2.31, p-value <0.001). Men and women showed comparable event rates.

Conclusion: Elevated Fib-4 score is an early independent predictor of end stage liver disease in young adults without known chronic liver diseases in the community setting.

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GC2.053

Trends in childhood BMI, overweight, and obesity among 7-year-old girls during the last six decades

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Background: Childhood obesity is associated with increased risk of adult obesity and future disease. The aim with the present study was to describe the trend for childhood BMI, overweight, and obesity among seven-year-old girls in Sweden born between 1946 and 2006.
Methods: We collected information on BMI at seven years of age from archived school health records in the population-based BMI Epidemiology Study (BEST) cohort for all girls born every five years between 1946 and 2006. We included thirteen birth cohorts with 750 girls each (total n=9750), and used birth cohort 1946 as reference.
Results: In the reference cohort, the mean childhood BMI at seven years of age was 15.50 (SD=1.58) kg/m² and for every decade until 2006, there was an increase in childhood BMI of 0.14 kg/m² (95% CI: 0.13;0.16). Mean childhood BMI increased significantly ($p<0.05$) from birth cohort 1971 compared to the reference cohort. We also observed an increasing trend in the frequency of both overweight and obesity until birth year 1996, compared with the reference cohort. A maximum prevalence of overweight (16.4 %) and obesity (7.7 %) was seen for 1996. After 1996, there was a decline in both mean BMI ($p<0.001$) and the prevalence of overweight including obesity ($p<0.01$) when comparing 1996 with both 2001 and 2006.
Conclusions: In the present study, we describe the trend in childhood BMI, overweight, and obesity among girls during the last six decades, capturing both the rise and the recent decline. Given the association between childhood BMI and adult future disease, monitoring of the obesity epidemic is important for prediction of future disease burden.

GC2.055

Prevalence and incidence of obesity in Germany - a cross-sectional cohort study based on claims data

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Introduction: Available evidence on the prevalence and incidence of obesity in Germany is characterised by outdated databases, heterogeneous obesity identification methods and limited stratification by obesity class. This observational study analyses the prevalence and incidence of patients living with obesity, stratified by obesity class.
Methods: This cross-sectional, observational study used routinely collected claims data of the statutory health insurance (SHI) system in Germany. The WIG2 database includes core data on 4.5 million publicly insured German residents, and full billing information of utilised health services in hospitals, the outpatient sector, and pharmaceuticals. Eligible individuals had to be continuously-insured in the study year and year prior, and were included between 2016 and 2021. Individuals diagnosed with obesity (ICD-10-GM E66), were selected and stratified into four subgroups; BMI classes I, II, III and those without specified obesity class.
Results: Of the available 3,244,611 individuals in the database (2021), 283,079 met the inclusion criteria (insured for entire observation year or deceased; ≥ 2 outpatient or 1 inpatient diagnosis in the observation year; ≥ 18 years of age; no pregnancy diagnosis). We observed a linear increase of obesity prevalence in adults throughout the study period from 2016 (9,791 per 100,000) to 2021 (10,687 per 100,000), except for the year 2020. Besides this increase in prevalence, we observed that the group of individuals with obesity but without specified obesity class slightly decreased over time, from 49.3% (2016) to 41.1% (2021). The latter represented the largest group of patients with obesity. Incidence remained robust across obesity classes and year, except for class III. Here, the incidence increased from 245 (2017) to 330 per 100,000 (2021).
Conclusion: In our claims data analysis, we calculated the obesity prevalence to be 10.7%. In light of significantly higher obesity prevalence observed in other studies (19% [1], 23% [2], and even 32% [3], using surveys or specific measurements), undercoding in SHI claims data is likely. Also the observed increase in obesity class III prevalence indicates a need to intensify both the prevention and treatment of obesity. Future research should leverage data-driven attempts to identify and quantify patients with obesity even without any obesity encoding, and to characterise those with documented obesity but without specified obesity class.

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GC2.056

Changes in BMI after type 2 diabetes diagnosis in Spain: evidence from real-world data

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Introduction: Studies exploring changes in body-mass index (BMI) after type 2 diabetes diagnosis are scarce. The objective of this study was to estimate these changes and describe differences by socio-demographic characteristics and pre-diagnosis BMI status.
Methods: We used data from 196,594 adult individuals (18-90 years old) registered at the Information System for Research in Primary Care (SIDIAP) between January 1, 2006 and December 31, 2017. Individuals were included to the study if they had a type 2 diabetes diagnosis during the study period and if they had at least one BMI measurement before and after diagnosis. We kept the BMI measure closest to the median for every person each year. Two subpopulations were selected, one with individuals having at least one BMI measurement after 1 year of diagnosis (N=81,501) and another one with at least one BMI measurement after 5 years of diagnosis (N=53,513). We calculated the individual difference in BMI between each time period and at the moment of diagnosis and calculated the median for each subpopulation. Additionally, we stratified our results by sex, socioeconomic status, BMI status at diagnosis and age group.
Results: The median BMI at diagnosis was 30.32 kg/m² (IQR = 27.39; 33.83) and it was slightly higher for both subpopulations (30.78 for the 1year and 30.8 for the 5 years). After 1 year, the median of differences of BMI with respect to the moment of diagnosis was -0.31 kg/m² (-1.24;0.44). This reduction in BMI was more evident in women than

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men (-0.4 [1.39;0.41] vs. -0.23 [-1.11;0.49]) and in individuals with obesity (BMI>30 kg/m^2) at diagnosis compared to individuals with a BMI <25 kg/m^2 (-0.44 [-1.52; 0.38] vs. 0 [-0.7; 0.73]). After 5 years, the median difference to baseline was of -0.69 kg/m^2 (-2.08;0.58). Sex differences were also evident after 5 years, showing women were more likely to reduce their BMI than men (-0.88 [-2.44;0.51] vs. -0.55 [-1.8;0.63]). Similarly, we also observed that BMI reduction was more noticeable in individuals with obesity at diagnosis compared to individuals with a BMI below 25kg/m^2 (-1.02 [-2.6; 0.38] vs. 0 [-1.07; 1.16]). After 5 years, the smallest reduction in BMI was observed for individuals aged 40-64 years old compared to 18-39 and those aged 65 or more (-0.56 [-1.95; 0.74]; -0.77 [-2.48; 0.72] and -0.82 [-2.2; 0.39], respectively). Overall, no differences by socioeconomic status were observed.

Conclusion: In our investigation, we noted a consistent decline in BMI one year and five years post type 2 diabetes diagnosis, with a more pronounced decrease observed among women and individuals initially living with obesity. These findings, though requiring replication, offer valuable insights for tailoring group-specific recommendations aimed at weight reduction in individuals with type 2 diabetes.

Conflict of Interest: None Disclosed

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GC2.057

Exploring comorbidity patterns in obesity subgroups of people living with obesity in Germany - a cross-sectional cohort claims data study

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Introduction: Although available evidence suggests that excessive body weight increases the risk of diseases like cardiovascular diseases and type 2 diabetes (T2D), there is limited understanding on how obesity severity, indicated by obesity classes I (BMI of 30 to < 35), II (BMI of 35 to < 40) and III (BMI of 40 or higher), contributes to the morbidity burden.

Methods: This cross-sectional, observational study used routine claims data of the statutory health insurance (SHI) system in Germany. The WIG2 database includes data on 4.5 million publicly-insured German residents representative of the German SHI population [1]. Individuals diagnosed with obesity (ICD-10-GM E66), were selected and stratified into four subgroups; BMI classes I, II, III and individuals without specified obesity class. Adding to the list of 12 pre-defined obesity-related comorbidities, [2] the most prevalent comorbidities (top 20 ICD-10 diagnoses per observation year) were analysed.

Results: We identified 286,079 patients with obesity aged 6 or older, of the 3,244,611 people in the database in 2021. The average age of those living with obesity was 57.8 years. In 2021, the largest subgroup was those without a specified obesity class (39.5%), followed by classes I (25.0%), II (19.6%) and III (15.9%).

Most prevalent comorbidities in all individuals living with obesity (top 20) were hypertension (73.2%), lipid disorders (47.0%), and back pain (45.2%). We found that 89.1% of individuals living with obesity had at least one out of the 12 predefined conditions.

The prevalence of comorbidities differed slightly between obesity subgroups (I, II, III and without specified obesity class). However, the prevalence of T2D (I: 35.0%; II: 41.1%; III: 45.1%), depression (I: 19.0%; II: 21.7%; III: 25.3%) and sleep apnoea (I: 12.7%; II: 17.0%; III: 23.2%) increased with increasing obesity class. Patients without a specified obesity class had nearly identical comorbidity patterns as those coded with obesity class I.

Conclusion: We found obesity-related morbidity patterns already observable in patients with obesity class I. Although the ranking of prevalent comorbidities in individuals with obesity is comparable to other epidemiological studies [3], we found generally higher frequencies.

The identified patterns of comorbidities may be used to further understand characteristics of patients with and without specified obesity class, and similarities among obesity classes, and to help identify those with prevalent obesity and obesity-related morbidity burdens in health care databases, which are not yet encoded for obesity.

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GC2.059

Association of body mass index (BMI) with all-cause mortality among older adults with and without diabetes in Hong Kong

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Background and Objective: Emerging evidence suggest people with overweight and mild obesity have better survival in the elderly. The optimal body mass index (BMI) in older adults remains to be a matter of controversy. Here, we aimed to investigate the association of BMI with all-cause mortality among older adults with and without diabetes and to identify optimal BMI associated with the lowest mortality risk in elderly.

Methods: Participants were recruited from the Undiagnosed heart Failure in frail Older individuals (UFO) study which is a prospective cohort study of community-dwelling older adults in Hong Kong who were aged ≥60 years at study entry. BMI was measured at baseline, and was analyzed as a continuous variable. Cox proportional hazards regression models with restricted cubic spline functions were constructed to explore the association of BMI with all-cause mortality after adjusting for sex, age, smoking status, alcohol drinking status, medical history of heart disease, hypertension and diabetes.

Results: A total of 1,024 participants were included in the present study (mean age: 77.2±9.0years, 35.9% were men, 19.9% had smoking history, BMI: 24.2±3.6kg/m^2, median serum creatinine 75.0 (interquartile range 63.8-90.3) μmol/L, 20.1% had diabetes, 59.2% had hypertension, and 7.4% had ischemic heart disease). During a median follow-up of 2.2 years (interquartile range 1.4-4.1), 45 participants died. We observed a non-linear relationship between BMI and the risk of all-cause mortality, with the lowest risk at a BMI of 23-24 kg/m^2 for the overall study population (P for non-linearity <0.001). Each standard deviation increase in BMI was associated with a 33% (HR: 0.66, 95% CI: 0.53, 0.83) decrease in the risk of all-cause mortality among individuals with a BMI <23kg/m^2. By contrast, there was no significant association between BMI and all-cause mortality (HR: 1.08, 95% CI: 0.95, 1.23) for those participants with BMI ≥23 kg/m^2. The non-linear relationship between BMI and all-cause mortality was observed in both participants with and without diabetes. However, the optimal BMI for the lowest mortality was lower (23-24kg/m^2) in elderly with diabetes compared with those without diabetes (24-25kg/m^2) (P < 0.05 for interaction).

Conclusion: We observed a non-linear association between BMI and all-cause mortality among Hong Kong Chinese older adults. Optimal BMI for lowest mortality was lower in individuals with diabetes than in those without diabetes.

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GC2.060

Metabolically healthy and unhealthy women and men with normal weight, overweight and obesity – The Tromsø Study 2015–2016

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Introduction: Metabolically healthy (MH) individuals exhibit normal levels of key risk factors for cardiovascular disease, including blood pressure, triglycerides, high-density lipoprotein cholesterol (HDL-C), and blood glucose. Some individuals with overweight and obesity are metabolically healthy, while some individuals with normal weight are considered metabolically unhealthy (MU).
Aim: Investigate the prevalence of MH and MU in a general population in categories based on body mass index (BMI) and waist circumference (WC). Further, to compare MH and MU according to metabolic characteristics and to assess potential anthropometric differences between them.
Methods: Participants from the seventh survey of the Tromsø Study (2015-2016, n=20,583) aged 40-99 years were classified as MH or MU, using two different definitions. Participants were considered MU if presence of: Definition A) ≥1 of 4 or, Definition B) ≥2 of 4 of the following components of metabolic syndrome, excluding WC: 1) systolic blood pressure ≥130 mmHg and/or diastolic blood pressure ≥85 mmHg, 2) HDL-C <1.0 mmol/l in men and <1.30 mmol/l in women, 3) non-fasting triglyceride levels ≥2.0 mmol/l and 4) HbA1c ≥6.0% (and/or medical treatment for these conditions). Prevalence of MH and MU was assessed according to WHO-defined categories of normal weight, overweight or obesity defined by BMI and by risk of metabolic complications based on categories of WC. We assessed potential differences in age-adjusted blood pressure, triglycerides, HDL-C, HbA1c, high-sensitivity C-reactive protein, WC, and BMI between MH and MU participants in categories of BMI. We assessed differences in body composition measures from dual-energy X-ray absorptiometry (android-, gynoid-, visceral- and total fat mass) between MH and MU individuals in categories of BMI in sub-analyses (n=3,648). All analyses were stratified by sex.
Results: The prevalences of MH and MU were highly dependent on the definition used. The prevalence of MU was lower in women compared to men. Among participants with obesity defined by BMI, 82% women and 90% men were MU according to definition A. By definition B, the corresponding prevalences of MU in participants with obesity defined by BMI were 50% in women and 62% in men.
Prevalence of MU was positively associated with higher categories of BMI and WC. Across all categories of BMI, being MH was associated with more favorable levels of all anthropometric and metabolic measurements compared to their MU counterparts. In sub-analyses, being MH was associated with higher levels of gynoid fat mass, and lower levels of android and visceral fat mass, compared to MU participants.
Conclusion: Prevalence of MU increased with higher categories of BMI and WC. Overall, MH participants showed favorable levels of anthropometric and metabolic characteristics compared to their MU counterparts.

Conflict of interest: None Disclosed

Funding: No funding to report

GC2.062

Inverse association of extremely high high-density lipoprotein cholesterol and all-cause mortality in Korean population without or with Type 2 Diabetes: Korean Genome and Epidemiology Study-Health Examinees (KoGES-HEXA) cohorts

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Background: High density lipoprotein(HDL) cholesterol is associated with low risk of mortality and cariovascilar disease(CVD). However, extreme high HLD-choelsterol has not been well investigated in relation to all–cause mortality. We investigated the longitudinal effect of very high HLD-choelsterol on all–cause mortality in a significantly large cohort of Korean adults and type 2 diabetes patients.
Methods: Data were assessed from 122,641 Korean participants over 40 years of age from the Korean Genome and Epidemiology Study-Health Examinees (KoGES-HEXA) cohort data, linked with the death certificate database of the National Statistical Office. The participants were grouped into four according to HDL-cholesterol quartiles. We used multivariate Cox proportional-hazard regression models to prospectively assess hazard ratios (HRs) for all-cause mortality with 95% confidence intervals (CIs) over an 11-year postbaseline period.
Results: During the mean 11.7 years of follow-up, number of deaths from any cause were 4,735 (2,806 in men and 1,929 in women). The association between HDL cholesterol and all cause mortality was U shape for both general population and T2DM patients. When compared with reference group the HRs for mortality were 1.33 (95% CI, 1.04–1.70) in Q4 after adjustment for metabolic parameters in men, but the Q3 did not show statistical significance towards increases for incident mortality respectively. In subgroup analysis T2DM patients (n=10,013), very high HDL-cholesterol was associated with mortality (HR, 1.21, 95% CI, 1.05–1.47) after adjustment for the same confounding variables.
Conclusions: Extreme high HDL-choelsterol paradoxically may be increased risk factor for all-cause mortality in general population and T2DM. This implies that control of extreme HDL-cholesterol could potentially benefit to both healthy population and T2DM.

GC2.063

Prevalence of metabolic syndrome in obesity clinic patients - real world data from a tertiary care hospital in Greece

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Introduction: To investigate the prevalence of metabolic syndrome in patients living with obesity in a tertiary care hospital outpatient clinic. Metabolic syndrome is defined as the coexistence of obesity-related cardiovascular risk factors such as abdominal obesity, impaired glucose tolerance, hypertriglyceridemia, reduced HDL and arterial hypertension. Although there is much debate about the accurate clinical definition of the metabolic syndrome, it is commonly accepted that these comorbidities increase the risk of developing type 2 diabetes mellitus and cardiovascular disease.

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Methods: A review of patient records in the obesity clinic of a tertiary care hospital was performed and demographic and body measurements, personal history, medication and laboratory findings were collected to allow the diagnosis of metabolic syndrome in patients according to the five criteria of the International Diabetes Federation (IDF).
Results: Of the total 104 patients, 91 patients for whom the data were available to allow a diagnosis of metabolic syndrome to be made were included in the study. The mean age of the patients was 53 years (±11.7), with 59 female (64.8%) and 32 male (35.2%) patients. The distribution of patients in the stages of obesity according to body mass index (BMI) was 17 with BMI 30-34.9kg/m^2-Stage I, 20 with BMI35-39.9kg/m^2-Stage II and 43 with BMI>40kg/m^2-Stage III, while 11 patients were overweight BMI25-29.9kg/m^2. The individual history showed that 34 patients suffered from arterial hypertension, 11 from type 2 diabetes mellitus and 29 from dyslipidemia.
A diagnosis of metabolic syndrome was made in 68 patients (74.7%), while 23 patients (25.3%) did not meet the diagnostic criteria. The rates of diagnosis of metabolic syndrome at different stages of obesity were 64.7% in stage I, 65% in stage II and 86% in stage III, while 63.6% of overweight patients were diagnosed. 25% of patients diagnosed with metabolic syndrome met 3 criteria, 33.8% met 4 and 41.2% met all 5 criteria for diagnosis.
Conclusions: More than 70% of patients with obesity have metabolic syndrome, with the percentage reaching 86% when BMI is >40kg/m^2. Importantly, 40% of patients with a diagnosis of metabolic syndrome meet all criteria which increases the cardiovascular risk of these patients.

GC2.064

Combination of uric acid and hemoglobin levels predicts the incident risk of ischemic heart disease rather than uric acid alone in non-diabetic Koreans: a longitudinal study using National Health Insurance data

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Uric acid has been related to cardiovascular disease (CVD). Recently, slightly elevated hemoglobin (Hb) was also shown to be associated with CVD. We prospectively investigated the joint effect of uric acid and elevated Hb by comparing the uric acid only within the normal range on incident ischemic heart disease (IHD) risk in a large cohort of non-diabetic Korean adults using National Health Insurance data. We assessed 16,786 participants (8,595 men and 8,191 women) without diabetes using extensive cohort data. High Hb was defined as ≥ 16.4 g/dL in men and 13.8 g/dL in women (> 75th percentile). We analyze two different methods. First, the participants were divided into quartiles according to uric acid levels. Second, subjects were also divided into quartiles: reference (group 1), high uric acid and normal Hb (group 2), normal uric acid and high Hb (group 3), and normal uric acid and high Hb (group 4). We evaluated hazard ratios (HRs) with 95% confidence intervals (CIs) for IHD, using multivariate Cox regression analysis, over a 50-month follow-up. During the follow-up, 345 (1.9%) participants developed IHD. In the analysis using both uric acid and Hb, compared with the reference group, the HRs for IHD were 1.37 (95% CI, 1.01–1.86) in the second group, 1.63 (95% CI, 1.21–2.21) in the third group, 1.86 (95% CI, 1.30–2.67) in the fourth group and after adjusting for IHD risk factors. Patients with high uric acid are more likely to develop incident IHD than control subsequently. Moreover, we confirmed the joint effects of high uric acid and high hemoglobin on incident IHD. Awareness of these interactions is essential for clinicians. Risk factor management and screening for IHD are part of the routine management of patients with high uric acid and Hb.

GC2.065

Cross-sectional study of body composition in Hungary Comprehensive Health Screening Programme during the Covid-19 pandemic (2020–2022)

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Introduction: Hungary Comprehensive Health Screening Program has provided an opportunity to track the prevalence and trend of obesity based on anthropometric and bio-impedance measurements by same method. In addition to about 40 types of screening tests, the Obesity Working Group also places emphasis on obesity and the prevention of its comorbidity.
Objective: In our present study, we wanted to analyse in detail the results of bio-impedance measurements, study the characteristics of obesity by gender and age groups, and study the relationships of various obesity parameters (BMI, BFP).
Material-Method: Body composition analysis was performed using InBody 720 bio-impedance method: N = 29.669, age min-max: 19-74 years. Men: N = 13.336, average age: 41.4±12.1 years, height: 178.9±7.3 cm, body weight: 88.9±16.3 kg, BMI: 27.8±4.7 kg/m^2. Females: N = 16.333, age: 44.1±12.7 years, height: 165.3±6.7 cm, body weight: 72.3±16.0 kg, BMI: 26.4±5.7 kg/m^2.
Results: We have found during the Covid-19 increased prevalence by BMI (Tables 1, 2) and by BFP (Tables 3, 4) in both sexes and age groups.
Conclusions: The prevalence of overweight (BMI 25-30 kg/m^2) was 44.6% in men, 29.9% in women; According to BFP, men: 27.6%, women: 24.2%. The prevalence of obesity (BMI>30 kg/m^2) was 27.3% in men, women: 23.3%; based on BFP in men:.37.3%, in women: 23.6%. Obesity prevalence is already ≥ 20% in men ≥19 y age groups and in women ≥35 y age groups. The studied obesity parameters (BMI, BFP) in all age groups show a strong correlation in both sexes in our material. The group of young men aged 19 to 35 y attracting attention also in this latest study.

Tab. 1. Distribution (%) of BMI by age groups in men.

Age	Under 18.5	18.5-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-	30.0-
19-24	3.1	46.2	31.4	12.9	4.9	1.4	19.3
25-34	1.2	37.0	40.9	14.4	4.9	1.5	20.9
35-44	0.5	26.2	47.7	19.0	5.0	1.7	25.7
45-54	0.2	20.8	46.6	24.2	6.3	1.9	32.3
55-64	0.1	14.3	47.5	27.5	8.1	2.4	38.0
65-74	0.2	19.0	46.3	27.2	6.2	1.1	34.5
All	0.7	27.4	44.6	19.9	5.7	1.7	27.3

Tab. 2. Distribution (%) of BMI by age groups in women.

Age	Under 18.5	18.5-24.9	25.0-29.9	30.0-34.9	35.0-39.9	40.0-	30.0-
19-24	6.8	62.5	19.5	7.1	1.8	2.3	11.1
25-34	5.4	58.2	22.5	8.2	3.6	2.1	13.9
35-44	2.6	51.0	26.3	11.9	5.6	2.6	20.1
45-54	1.0	38.1	33.3	17.9	6.6	3.1	27.6
55-64	0.8	27.6	38.1	22.7	7.7	3.1	33.4
65-74	0.7	23.3	42.8	24.2	7.4	1.7	33.3
All	2.6	44.2	29.9	15.0	5.7	2.6	23.3

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Tab. 3. Distribution (%) of BFP by age groups in men.

Age	Underfat	Normal	Overfat	Obese	All
19-24	4.3	43.5	19.4	32.9	100.0
25-34	2.0	37.5	25.3	35.2	100.0
35-44	1.5	32.2	29.6	36.6	100.0
45-54	1.7	32.2	29.0	37.1	100.0
55-64	0.9	24.7	30.2	44.1	100.0
65-74	2.0	28.1	26.0	44.0	100.0
All	1.8	33.3	27.6	37.3	100.0

Tab. 4. Distribution (%) of BFP by age groups in women.

Age	Underfat	Normal	Overfat	Obesity	All
19-24	14.2	48.2	20.4	17.2	100.0
25-34	13.8	46.9	20.3	19.0	100.0
35-44	12.4	46.4	20.9	20.3	100.0
45-54	8.2	40.8	26.0	24.9	100.0
55-64	4.0	34.8	29.8	31.4	100.0
65-74	5.5	29.4	32.0	33.0	100.0
All	10.0	42.2	24.2	23.6	100.0

GC2.066

Metabolic health and obesity-related cancer: variation by sex/gender and body mass index

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Background: The purpose of this study is to determine if metabolic health reduces the risk of obesity-related cancers among participants with healthy, overweight, or obesity based on body mass index (BMI) stratified by sex/gender. The study also examines whether obesity-related cancers are associated with risk of cancer-specific and all-cause mortality by BMI category and sex/gender.
Methods: Data obtained from participants, 20 years and older (n= 20,694), in the National Health and Nutrition Examination Survey (NHANES) (2011 – 2018). Obesity-related cancers included breast, colorectal, liver, gallbladder, pancreas, esophageal, uterine, and kidney cancers. Participants were categorized according to metabolic health using cardiometabolic abnormalities associated with metabolic syndrome: central obesity, elevated blood pressure, elevated fasting glucose, elevated triglyceride, and low high-density lipoprotein; metabolic healthy participants had 2 or less abnormalities. Multivariate logistic and Cox regression models were used to estimate odds of obesity-related cancers associated with metabolic health and risk of cancer specific and all-cause mortality, respectively, stratified by sex/gender and BMI category (healthy "18.5 to 24.9 kg/m^2", overweight "25 to 29.9 kg/m^2", and obesity "> 30 kg/m^2").
Results: In all BMI categories, women, who are metabolically healthy (MH), had statistically significantly reduced risk of obesity related cancer compared to women who are metabolically unhealthy (MUH) ($p<0.01$). For men, MH was associated with reduced odds of obesity-related cancer in those with overweight BMI (adjusted OR: 0.21, 95% CI: 0.05 - 0.82), compared MUH. In addition, women with obesity and diagnosed with obesity-related cancer had an increased risk of cancer mortality (adjusted HR: 3.18, 95% CI: 1.01 – 10.02). However, men who had a healthy BMI and diagnosed with obesity-related cancer had increased risk of cancer mortality (HR: 10.16, 95% CI: 2.67 - 38.67) and all-cause mortality (adjusted HR: 3.23, 95% CI: 1.03 - 10.16)
Conclusion: These results suggest that obesity-related cancer risk is lower among women who are MH, including those with overweight and obesity, than women who are MUH. Of participants with obesity-related cancer, men with healthy BMI have an increased risk of death, further highlighting the significance of metabolic dysfunction regardless of overweight or obesity status.

GC2.067

Associations between circumference measurements and visceral adipose tissue/subcutaneous adipose tissue levels in women of later reproductive years

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Introduction: The obesity epidemic is a global health concern, however, effects of excess adiposity on cardiometabolic health in women of later reproductive years remains under-researched. Adipose tissue distribution is a mediator of the relationship between obesity and cardiometabolic health, and is classified as subcutaneous (SAT) or visceral (VAT). VAT has a high cardiometabolic risk profile, making accurate quantification clinically important. Gold standard measures of body fat distribution, such as Computed Tomography, Magnetic Resonance Imaging and Dual X-ray Absorptiometry (DXA) are limited by cost and radiation exposure. Body Mass Index (BMI) is a commonly used surrogate marker of adiposity, but does not account for fat distribution. We aimed to explore associations between circumferences and body fat distribution in assessing cardiometabolic health as defined by the measurement of blood lipid profile parameters in Irish women of later reproductive years.
Methods: A secondary analysis of 389 women of average age 43 years from the longitudinal ROLO birth cohort study (Randomised cOntrol trial of Low glycaemic index diet for the prevention of recurrence of macrosomia). DXA was performed and circumference measures recorded at the neck, mid-upper arm, thigh, and umbilicus to the nearest 0.1 mm. Non-fasting blood samples were analysed to determine lipid profile. Multiple linear regression models for each circumference were used and adjusted for confounders chosen a priori.
Results: In summary, neck and thigh circumference best predicted VAT while abdominal circumference best predicted SAT. Thigh and arm circumference were the only measures which significantly predicted total cholesterol level. The only statistically significant predictors of LDL cholesterol were neck and arm circumference.
Conclusion: Circumference measurements may have increased clinical applicability in predicting cardiometabolic health in women of later reproductive years, supplementing the use of BMI in assessing body fat distribution and lipid profiles.

Conflict of Interest: None disclosed.

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Tab.1. Anthropometric measures as predictors of cardiometabolic indices.

	VAT				SAT				Total cholesterol				LDL cholesterol			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 3		Model 1		Model 3	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p
BMI	0.835	<0.001**			0.879	<0.001**			0.104	0.075	0.073	0.212	0.147	0.012*	0.109	0.061
Abdominal circumference	0.774	<0.001**	0.209	<0.001**	0.841	<0.001**	0.323	<0.001**	0.082	0.163	-0.067	0.551	0.140	0.016*	0.009	0.937
Neck circumference	0.758	<0.001**	0.306	<0.001**	0.693	<0.001**	0.089	0.032*	0.158	0.007**	0.137	0.112	0.203	<0.001**	0.178	0.038*
Thigh circumference	0.476	<0.001**	-0.306	<0.001**	0.608	<0.001**	-0.089	0.030*	-0.051	0.382	-0.180	0.039*	0.001	0.991	-0.146	0.093
Arm circumference	0.693	<0.001**	-0.005	0.931	0.742	<0.001**	0.036	0.467	0.142	0.015*	0.228	0.027*	0.185	0.001**	0.248	0.016*

Model 1: crude model. Model 2: Adjusted for BMI. Model 3: Adjusted for BMI (where applicable), age, parity, ethnicity, smoking status, physical activity, education level, Hasse and Pratschke Deprivation Index score, and ROLO intervention grouping.

GC2.068

Feasibility and usability of myfood24 dietary analysis software in assessing diets of Nigerian adults: a pilot study of myfood24 West Africa

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Introduction: An accurate and efficient assessment of diet is needed to understand the links between diet and health- and nutrition-related diseases in Nigeria, particularly with the rising trend in non-communicable diseases with over 20% of the adult population with either overweight or obesity. The new myfood24 West Africa online tool was piloted to assess its usability in a healthy adult population in Nigeria
Methods: Participants were University staff members recruited from Michael Okpara University of Agriculture Umudike, Abia State in south-east Nigeria. Participants were at least 18 years, not pregnant, not had childbirth in the last 3 months, and were not diagnosed with diabetes. myfood24 West Africa is an online dietary assessment software including a large database of local Nigerian and West African foods. A pre-recorded video demonstration of food recording with myfood24 was sent to participants. One-day 24-hour recall was self-recorded by either participants or by the researcher on behalf of the participants. Participants who used myfood24 on their own provided feedback on usability.
Results: 179 adults were recruited for the study and a total of 1345 food/drink entries were made with a median number of 7 (IQR: 5, 9) food/drink entry per day per participant. 62% and 52% were living with obesity and overweight, respectively. Mean energy intake was 1844 (SD 781) kcal; with energy coming from 28% fat, 62% CHO; 9% protein. 37% skipped meals and 43% of energy intake was consumed at dinner. 53 (30%) participants used myfood24 on their own, with a mean age of 38.5 ± 8.7 years. There was no significant difference in the energy intake (p=0.67) and body mass index (p=0.82) of participants who used myfood24 on their own and those who did not. 39 out of 53 participants completed the user questionnaire. The mean system usability score was 74 (95% CI 65, 83), indicating a good usability. Participants found the tool easy to use and estimate portion sizes of local foods; it was educative showing levels of macronutrient consumed; and more efficient than manual recording of foods but a few local foods were missing.
Conclusion: myfood24 West Africa can be used to efficiently assess the diets of Nigerian adults facilitating ongoing research. The feedback will inform future updates of the database.

GC2.069

Causal associations of general and central adiposity with plasma levels of 2923 proteins in Chinese adults

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Introduction: Adiposity is an established risk factor for multiple diseases, but the causal relevance of different adiposity types involving with circulating protein biomarkers has not been systematically investigated, particularly in Chinese populations who have relatively low mean levels of adiposity. The aim of the study was to identify plasma proteins significantly associated with general (BMI, BF%) and central adiposity (WC, WHR), to clarify the causal relevance of these associations, to assess whether proteins causally affect the levels of adiposity, and to compare and replicate the associations in a European-ancestry population.
Methods: We analysed data from 3977 participants from a case-cohort study within CKB (1951 incident IHD cases and a randomly selected subcohort of 2026 participants), without prior cardiovascular disease, no history of lipid-lowering drug use at the time of sample collection, but had genome-wide genotyping data available. Linear regression was used to examine the associations of general and central adiposity with protein biomarkers, Mendelian randomisation (MR) was used to assess the associations with genetically-predicted adiposity measures and enrichment analyses to explore the likely functional mechanisms of these proteins. Two-sample MR was used to assess the protein-to-adiposity associations and colocalisation analyses to assess whether adiposity and proteins have a shared signal at cis-pQTLs. For replication, we used UK Biobank, examining the same 2923 OLINK proteins in ~35,000 participants. To correct for multiple testing we used Benjamini-Hochberg False Discovery Rate (FDR).
Results: The measured BMI (mean 23.9 kg/m^2), BF% (25.4%), WC (81.9 cm) and WHR (0.89) were significantly associated (FDR<0.05) with levels of 1809, 1838, 1808 and 1736 proteins, respectively. Genetically-predicted adiposity measures were significantly associated with 399, 239, 436 and 283 proteins, respectively, with 80 proteins associated with all and 275 with only one adiposity trait. Among the 80 overlapping proteins, individual associations were more strongly associated with central than with general adiposity. Over 90% of the associations were replicated in Europeans (mean BMI 27.4 kg/m^2). Enrichment analyses of the significantly associated proteins in MR analyses demonstrated their involvement in multiple biological mechanisms, including atherosclerosis, lipid metabolism, inflammation and immune response. Two-sample MR analyses using cis-pQTLs identified in GWAS found 30/2 proteins significantly affect levels of BMI/WC, with 11 showing evidence of colocalisation and seven

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(ITIH3, CFB, EFEMP1, TXNDC15, SERPINF2, FN1, OGN) replicated in separate MR using different cis-pQTLs identified in the UK Biobank.
Conclusion: Among relatively lean Chinese adults, adiposity likely causally affected the levels of >650 proteins implicated in atherosclerosis, lipid metabolism, inflammation and immune response. Moreover, we identified 31 proteins that affect levels of adiposity. These findings identified potential novel mechanisms and targets for improved treatment and prevention of obesity and associated diseases.

GC2.070

Development of body mass index by education through adult life and in older age among Finnish women and men

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Introduction: Educational gradient in body mass index (BMI) is well established: lower education is associated with higher BMI in high- and middle-income countries. However, there is a lack of understanding regarding how BMI develops through adult life and in aging by education, and more specifically, when the inequalities emerge, widen or narrow in adulthood, and what are the gender differences in this development. We examined how BMI developed in two Finnish age cohorts among women and men by their level of education.
Methods: For the older age cohort, we used five phases of the Helsinki Health Study (HHS) surveys, conducted in 2000–2022 (Phase 1: age 40–60 years, 79% women). For the younger cohort, initiated in 2017, we used two phases (2017–2022) of the HHS surveys (Phase 1: age 19–39 years, 79% women). Repeated survey data included information about sociodemographic factors, education, and height and weight to compute BMI. Education was divided into low (high school or less) and high (university degree). We used linear regression analyses with smoothed values to illustrate the development of BMI in two age cohorts by education, for women and men separately. We further divided these age cohorts into five age groups, age ranging overall from 19 to 84 years between 2000 and 2022.
Results: In each group, BMI rose rather sharply in early adulthood and midlife, then plateaued and started to slowly decrease. However, the rise was notably sharper among those with a lower education, particularly among early midlife women and men. BMI was highest in low-educated early midlife women and low-educated midlife men, while midlife women with high education had the lowest BMI. Young men gained weight similarly independent of their education.
Conclusions: The development of BMI during adulthood and towards the older age is highly shaped by education. Most women and men gain weight until late midlife, but educational differences mainly emerge after young adulthood and then remain relatively consistent until older age.

GC2.071

Sugar intake in a sample of young British university students according to participants with obesity and ethnic background

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Introduction: University represents a key transition into adulthood with important associated concerns including poor-quality diets. To assess intake of sugars and their relation to obesity in a young population of students at De Montfort University (DMU, UK).
Methods: Comprehensive nutrient intake was collected from 111 (18-23 yrs-old; 78 female) DMU students from three geographical/ethnic backgrounds (41 Asia, 41 Africa, 27 Europe), using a validated variant of the EPIC-Norfolk Food Frequency Questionnaire. Questionnaires were processed with Nutritics software and BMI was calculated using height/weight, measured appropriately by a qualified nurse.
Results: 25.7% and 8.3% of this population were categorised as persons with overweight or obesity, respectively. Dietary intake of carbohydrates (393.93 vs. 283.70 g/day; p-value=0.0004), carbohydrates as monosaccharide equivalents (418.59 vs. 301.11 mg/day; p-value=0.00038), sugars (174.19 vs. 132.03 g/day; p-value=0.013), free sugars (83.82 vs. 55.96 g/day; p-value=0.017), glucose (28.28 vs.22.19 g/day; p-value=0.029) and fructose (30.43 vs. 23.58 g/day; p-value=0.032) were significantly higher in males, possibly explaining the significantly higher intake of energy (3064.9 vs. 2310.8 kcal/day; p-value=0.0011) seen in men. Further studies would be required to explain the higher intake of sugars in the male participants, as they are usually reported to be higher in females. The dietary intakes of galactose and sucrose did not show sex differences. Conversely, the intakes of these nutrients did not show statistical differences according to participants with obesity or ethnic background, perhaps due to the low number of participants within these different groups.
Conclusion: British university students monitored eat more carbohydrates, total sugars, fructose and sucrose than those reported in American college students (20.1 years old.) The reference intakes of total sugars (90 g/day) and free sugars (30 g/day) were also notably higher in DMU students, suggesting a high risk of obesity in this population that should be tackled by implementing strategies to promote healthier dietary and lifestyle behaviours.

GC2.072

Association of abdominal obesity to metabolic syndrome antecedents in Panamanian college students

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Introduction: Abdominal obesity is the excess of deposits of fat in the abdominal region and it is an independent risk factor for cardiovascular disease. In Panamá, in 2015, According to the PREFEC study, 27,08% of the

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adult population had abdominal obesity. The World Health Organization specifies that hypertension is a metabolic risk factor for non-communicable diseases and it is the leading cause of premature death in the world. Scientific literature has established an association between abdominal obesity and hypertension. This study aims to determine the association between abdominal obesity and hypertension, high blood cholesterol, and diabetes mellitus in Panamanian college students.

Methods: The sample comprises 448 college students (319 women, 129 men; median age 20 years) from four different cities of a private university in Panamá. Every participant in the study signed written consent. Abdominal obesity was established as a waist circumference of ≥80 cm in women and ≥90 cm in men (Seca 201). High arterial pressure, diabetes mellitus, and high blood cholesterol antecedents were established with the basic questionnaire in the STEPS World Health Organization tool U Mann-Whitney and Chi-squared tests were used to compare differences by sex. Descriptive, as well as bivariate and multivariate analysis, were realized using logistic regression models.

Results: 37.05% of participants had abdominal obesity (no statistically significant difference was found by sex). 28.67%, 25.66%, and 28.79% of the students surveyed reported a history of high arterial pressure, diabetes mellitus, and high blood cholesterol respectively (no statistically significant difference was found by sex). After adjusting by sex, age, and socioeconomic level, abdominal obesity was associated with hypertension antecedent (OR= 2.08, CI 95%: 1.20 - 3.58, p= 0.008).

Conclusion: Students who evidenced abdominal obesity were more likely to have a hypertension history. The study recommends implementing strategies that promote healthy living habits to reduce future cardiovascular risk in the Panamanian university population.

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GC2.073

Prevalence of overweight, obesity and related factors among medical residents

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Introduction: Obesity is a public health problem with alarming growth today, presenting at early age, with a complex interaction between socioeconomic, cultural, psychological and genetic factors. Recognizing medical residents as a vulnerable population due to their lifestyle, diet and academic responsibility, currently there is not enough information about the prevalence and behavior of obesity in students doing their medical residency, therefore, a study was carried out with the objective of evaluate the prevalence of overweight, obesity and related factors among medical residents.

Methodology: Observational, descriptive, cross-sectional study, carried out on students admitted to medical residency at three universities in Bucaramanga, Colombia in 2023. Fifty-two students signed the informed consent and completed questionnaires about sociodemographic factors, lifestyle, mental health (perceived stress, anxiety and depression), physical activity (International Physical Activity Questionnaire-IPAQ), anthropometric measurements and body composition using InBody brand impedance, model 120. The data were collected and analyzed using the STATA program, version 16.

Results: 52 students from 12 programs participated, 58% were women, mean age was 28 years old (SD: 3.5 years old). Prevalence, according to body mass index, of overweight was 38.4% and obesity was 7.6%, with a higher prevalence in men than women (63% Vs 37%; p: 0.02). The mean abdominal perimeter was 81.5 cm (SD: 12.3 cm). In relation to physical activity 57% had low physical activity, with an average of 7.8 hours (SD: 2.5 hours) of sitting time per day. When evaluating the percentage of body fat, we found an average of 28% (SD: 8.1%) with a prevalence of high percentage of fat in 75% of participants. A high percentage of visceral fat was found in 71% of the participants.

Factors such as being in a stable relationship (p:0.05) or having children (0.005) had higher prevalences of overweight/obesity, while demographic variables such as age, social stratum, were not related to higher prevalence. Behaviors such as vaping, smoking and alcohol consumption were not related to changes in weight or higher percentages of fat, however, overweight and obesity were more prevalent among consumers of psychoactive substances (p: 0.02). Physical activity in this study was not related to lower percentages of body fat and abdominal perimeter was significantly related (p: 0.001) to a high amount of body fat. There was no relationship between the depression, anxiety and perceived stress scales with overweight or obesity. Finally, a history of mental illness was related to a higher percentage of visceral fat (p: 0.03)

Conclusions: A change in the paradigm is necessary, recognizing obesity as a disease with serious implications in the organic, mental and sociocultural dimensions of the population. This study showed a high prevalence of overweight and obesity compared to the general population. It is essential to recognize factors associated with their presentation in order to achieve their prevention and early detection.

GC2.074

Associations of local and systemic corticosteroids use and changes in weight and waist circumference: the Lifelines cohort study

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Introduction: The use of corticosteroids (CS), even locally administered forms, has been associated with higher BMI and waist circumference (WC) on a cross sectional level. However longitudinal data are scarce, particularly for locally administered forms. In this study we aim to investigate the longitudinal association between systemic and local corticosteroid use and changes in both weight and WC over prolonged periods of time.

Methods: We assessed courses of weight and WC in 81,361 individuals (mean age 46 years, mean BMI 26 kg/m^2, 41% male, mean follow-up time 3.6 years) participating in the Lifelines Cohort Study, using linear regression analyses. Sensitivity analyses were performed by stratification for sex and by BMI class (<25 kg/m^2 vs. ≥25 kg/m^2). Additionally, in a subset of patient we assessed short-term (12 weeks) changes in weight using linear mixed effect models.

Results: Individuals reporting any new use of CS gained significantly more weight compared to individuals without CS use at follow-up (beta 0.029 kg/year, p=0.048) and also within the subgroup of individuals with new local CS use at follow-up (beta 0.033 kg/year, p=0.031). For WC, use of new systemic CS at follow-up was associated with increased WC (beta 0. 181 cm/year, p<0.001), whereas discontinuation of CS use at follow-up

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was associated with decrease in WC (beta -0.084 cm/year, p=0.019). Within female participants and individuals with BMI ≥25 kg/m^2, CS use was particularly associated with changes in weight and WC, but not in males and participants with BMI< 25kg/m^2. Short term weight-inducing effects of CS use were not observed in the first 12 weeks after start of local or systemic CS.

Conclusion: Here, we show that corticosteroid use, even locally administered forms are associated with long-term changes in weight and waist circumference. Furthermore, we show that weight gain occurs mostly in females and individuals with overweight or obesity. Our results highlight the importance of critically evaluating chronic use of both systemic and local corticosteroids, as discontinuation may have a beneficial effect on measures of obesity in selected patients.

GC2.075

Impact of changes in metabolic syndrome and obesity status on type 2 diabetes risk in young adults: a nationwide population-based study

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Introduction: We aimed to examine the association between the changes in metabolic syndrome (MetS) and obesity status and the risk of type 2 diabetes in individuals aged 20 to < 40 years.

Methods: We identified 3,588,104 participants aged 20 to < 40 years who underwent two biennial health examinations between 2009 and 2014 from the National Health Insurance Sharing Service database. They were followed up until December 31, 2020, considering newly-diagnosed type 2 diabetes as the primary endpoint. Individuals were categorized into four groups based on their baseline obesity and MetS status. Each group was further divided into four subgroups based on obesity/MetS status after two years.

Results: During the 7.64-year follow-up, approximately 2.2% of the participants developed type 2 diabetes, with the highest risk observed in those presenting MetS and obesity at baseline (HR 17.34 [95% CI 17.00–17.69]); the others had an increased risk of type 2 diabetes if either condition developed during follow-up. The risk decreased when the underlying MetS or obesity was resolved in all groups. Conversely, individuals whose MetS/obesity status changed from No/Yes to Yes/No (HR 1.58 [95% CI 1.40–1.80]) were at increased risk than those who maintained baseline status.

Conclusion: The coexistence of MetS and obesity increased the risk of type 2 diabetes. Reversing MetS status reduced this risk in those individuals with obesity; however, developing MetS after resolving obesity increased the risk. Obesity and metabolic parameters must be comprehensively managed to prevent type 2 diabetes in young adults.

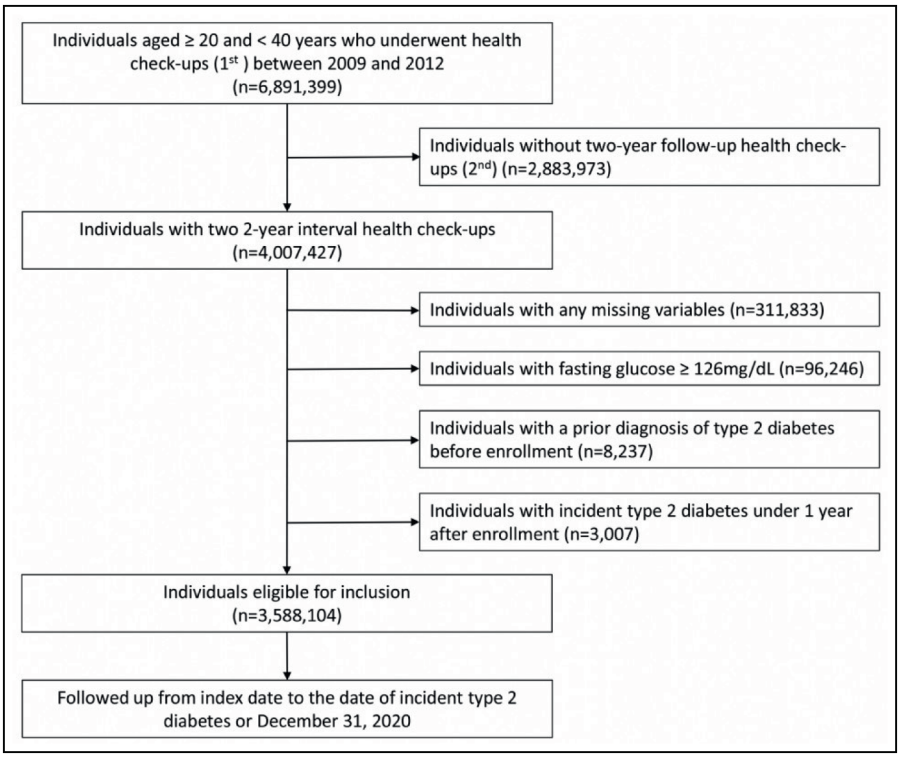
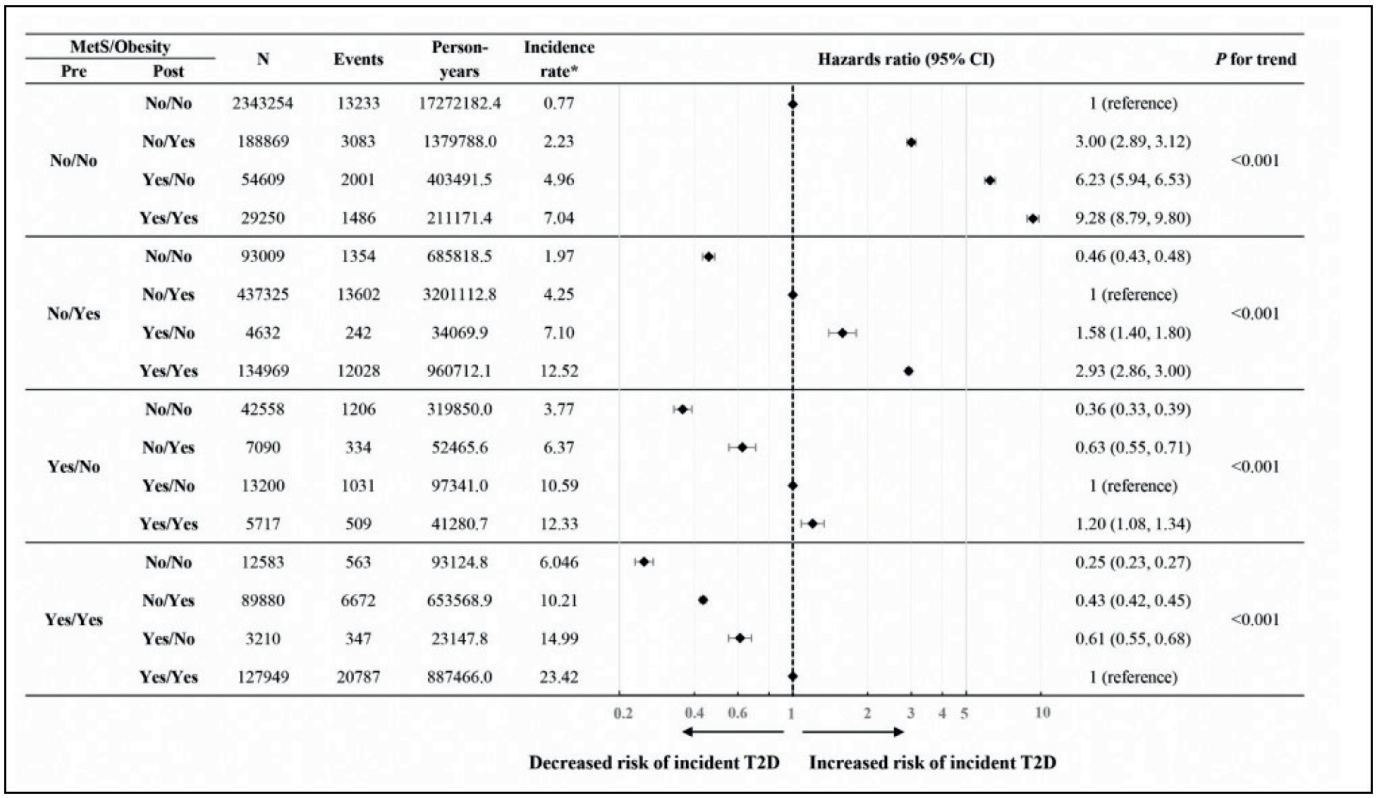


Fig. 1. Flowchart of the study population.

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The hazard ratio (HR) and 95% confidence interval (95% CI) of incident type 2 diabetes were analyzed using a multivariable-adjusted proportional hazards model and adjusted for age, sex, smoking status, alcohol consumption, and income status.
*incidence per 1000 person-years

Fig. 2. Hazards ratio of incident type 2 diabetes according to changes of MetS and obesity status between baseline and post-2-year follow-up.

GC2.076

How has the COVID-19 pandemic affected national trends in adult body mass index and obesity?

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Introduction: This study aimed to investigate the mean BMI change and long-term national prevalence of obesity among Korean adults (aged 19 years and older) through a nationally representative study.
Methods: We examined large-scale data representative of the general population from the 2009-2021 Korean Community Health Survey (KCHS). A total of 2,805,131 adults participated in the study. The dependent variable is self-reported BMI, and the independent variable is the survey period.
Results: Overall average BMI remained high from 2009 to 2019, but the difference in pre- and post-pandemic trends decreased for all groups. (Men βdiff, -3.718; 95% CI, -6.205 to -1.231; Women βdiff –7.912, 95% CI, -10.340 to -5.484). In particular, women experienced a faster rate of decline in their pattern of BMI increase. Obesity prevalence was higher in men and gradually increased over time but was noticeably lower during the pandemic compared to the pre-pandemic period. The COVID-19 pandemic has affected the prevalence of obesity in both men and women, especially among participants in the young age group (19-39 years old; OR, 1.205), with smoking (OR, 1.402; 95% CI), and with low-incomes (<3 million won/month).
Conclusion: Our findings suggest the need for individualized weight management policies during the pandemic, especially for vulnerable groups.

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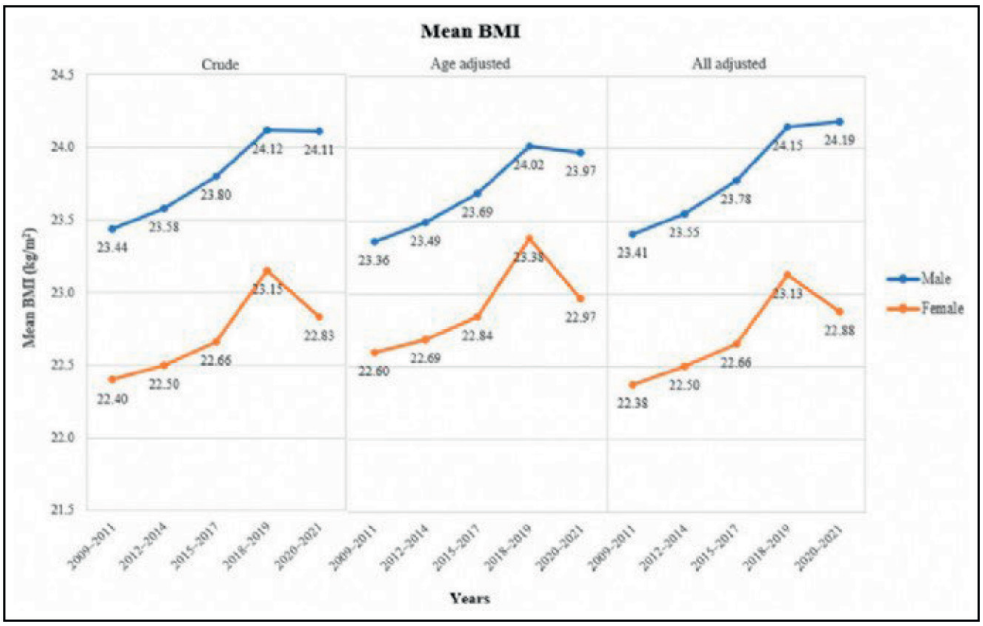


Fig. 1. Average body mass index (BMI) trends in Korea (2009-2021).

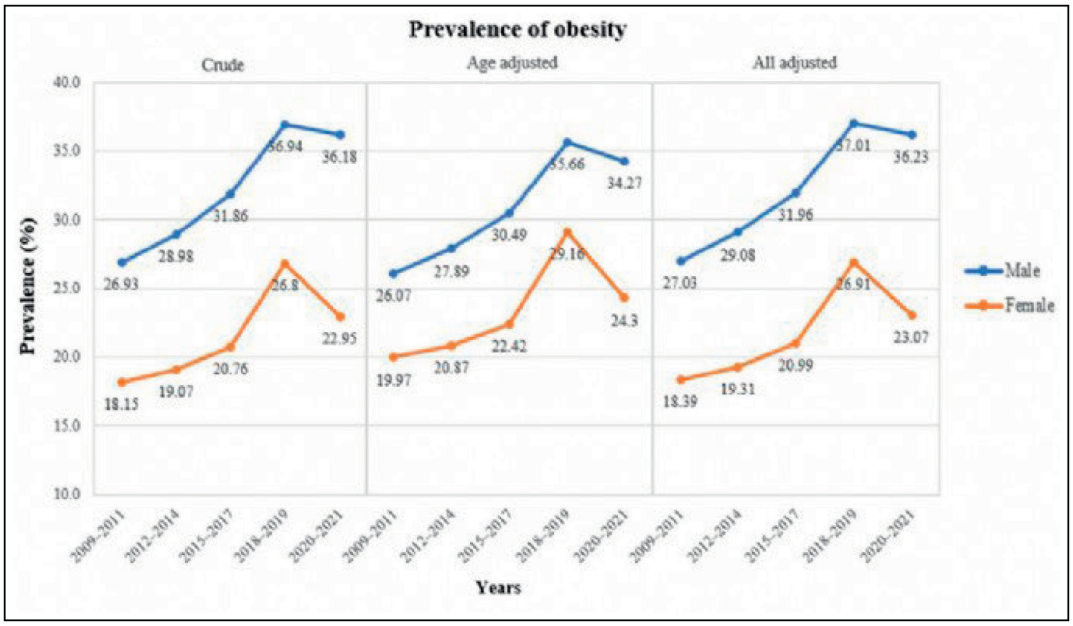


Fig. 2. National trend of obesity in South Korea (2009–2021).

GC2.078

Prevalence of non-communicable diseases are related to food environments in Iran: An ecological study

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Background: Urbanization and life expectancy has recently increased in Iran. Parallel to these developments, unhealthy diets, and lack of physical activity have also increased which resulted to higher prevalence of non-communicable diseases (NCDs). So we investigated the relationship between food environments and risk of NCDs in Iran.
Methods: The present ecological study was conducted using the data of STEPS study and food environments information from the country's guilds. Demographic and biochemical information of 31050 Participants were included the analysis. Multinomial linear regression was used to assess the relationships. The role of potential confounders such as sex, age, wealth index and physical activity were controlled in the adjusted models.
Results: After adjusting for confounders, significant and negative relationships were observed between fish and chicken shops density with abdominal obesity prevalence (β= -16.42, P=0.027), fruit and vegetable shops density with stage II hypertension (HTN) prevalence (β= -11.82, P=0.003) and total cholesterol level (β= -15.90, P=0.008). Also significant and positive relationships were found between confectioneries density with stage II HTN prevalence (β=15.63, P=0.002), pre-diabetes prevalence (β=17.34, P=0.031), and hypertriglyceridemia prevalence (β=26.62, P<0.001). Moreover there was significant relationship between fast food restaurants density and mean of BMI (β=2.28, P=0.009) also other restaurants density and pre-diabetes prevalence (β=20.08, P=0.003).

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Conclusion: We found that higher density of healthy food environments such as fruit, vegetable, chicken and fish markets were related to lower prevalence of some NCDs, while higher density of unhealthy food environments such as confectionery, fast foods, and other restaurants were related to higher prevalence of them.

GC2.079

Unveiling the Carbon Footprint of Obesity: A literature review

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Introduction: Greenhouse gas emissions (GHGE) are one of the main causes of global warming and the food production significantly contributes to it. Obesity could have an impact on GHGE since people with obesity 1) produce and exhale more CO2 during the resting metabolism than those with normal weight, 2) tend to rely more on motorized vehicles for transportation (which also increases fuel requirement due to the increased body weight), and 3) elevated food consumption is associated with a higher carbon footprint (dietary GHGE). The purpose of this study is to conduct a review of the scientific literature regarding the increased GHGE associated with overweight (OW) and obesity (OB).
Methods: Critical review of related articles published in PubMed up to 31.12.2023.
Results: In 5 studies, the dietary intake of people with OB and OW was determined using a Food Frequency Questionnaire (FFQ), a 24-hour dietary recall or a food diary, and the additional greenhouse gas emissions (GHGE) resulting from the excess food consumption were estimated based on Life Cycle Assessment (LCA) data. 6 studies estimated the theoretical additional CO2 footprint of the dietary excess associated with obesity and extrapolated this to the general population using regional or global obesity prevalence data. One study measured the reduction in metabolic CO2 production through indirect calorimetry after weight loss from a hypocaloric diet in study participants with obesity and diabetes mellitus. Another study compared obesity prevalence in various US states with their respective greenhouse gas emission (GHGE) data from the Environmental Protection Agency (EPA). Another study estimated the increased fuel consumption due to higher vehicle usage and greater body weight in people with obesity. In all the analyzed surveys, study participants with OW and OB had higher GHGE than persons without overweight. Obesity appears to be linked to a ~20% increase in GHGE compared to the normal-weight condition. Globally, obesity contributes to ~700 MT of GHGE/year, accounting for about 1% of manmade emissions. A 10 kg weight loss in all persons with OB/OW would lead to a reduction of ~49.5 million metric tons of CO2 per year.
Conclusion: The alarming increase in global obesity prevalence also has significant effects on the global climate. Policies to prevent and treat obesity therefore may have additional positive effects on the environment. Nevertheless, these facts should not lead to additional stigmatization of people with obesity.

GC2.080

Socioeconomic differences in family food environments, and associations with BMI amongst 5-11-year-old children in London: a cross-sectional study

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Introduction: Disparities in childhood obesity are widening across England despite decades of childhood obesity prevention policies and interventions. The Family Food Experience Study-London is a multi-disciplinary project using complex systems approaches to explore how contexts in which existing childhood obesity interventions are delivered might influence families across the socioeconomic spectrum (SES). This study aimed to (1) identify aspects of the home food environment and cultural norms/behaviours around food that vary by family-level and neighbourhood-level indices of deprivation; and (2) explore if these contexts and deprivation interact with existing interventions to shape child weight and family outcomes.
Methods: A diverse sample of families, across the Income Deprivation Affecting Children Index (IDACI; n=652; with a child aged 4-11) were recruited through primary schools within four London boroughs. Primary caregivers completed a survey on the home family food environment and several domains of family SES, child eating behaviour, and child height and weight; 30.6% were administered in-person and 69.4% via telephone. Complex samples generalised linear models (GLMs) examined cross-sectional associations between a composite measure of family- and neighbourhood-level SES (IVs) with family food culture-related outcomes and child BMI (DVs). Interaction analyses were subsequently undertaken to test whether the effectiveness of childhood obesity interventions at the i) school, ii) local community, and iii) retail/food shop levels vary with the context of deprivation. All analyses were adjusted for clustering at the school-level, and child sex, age, and ethnicity. Only standardised betas with an effect size of >0.10 are reported.
Results: Families with lower family- and neighbourhood-level SES had a more obesogenic home food environment (β=-0.20, p<.001). Families of lower SES showed more obesogenic child eating behaviours, including more emotional overeating (β=-0.12, p<.001), greater food responsiveness (β=-0.12, p<.01), and greater desire to drink (β=-0.28, p<.001). Lower SES was also related to more obesogenic parental feeding practices, including greater use of emotional (β=-0.10, p<.05) and instrumental feeding (β=-0.10, p=.01), greater pressure to eat (β=-0.13, p=.001), less modelling of healthy eating (β=0.10, p=.04), and less restriction of unhealthy foods (β=0.10, p<.02) or control around meals and snacks (β=0.18, p<.001). Lower SES was associated with children's reduced preference for snack (β=0.18, p<.001) and starchy foods (β=0.10, p<.01), and higher child BMI-SDS (β=-0.16; p=.001). Interaction analyses are ongoing.
Conclusion: Several key family food-related behaviours varied with family-level indices of deprivation. The well-established association between SES and childhood obesity may therefore operate via the cultural food norms and behaviours related to feeding. Moreover, the contexts in which children live may pose challenges for interventions that aim to reduce social inequalities in childhood obesity, and these should be considered when delivering interventions to help address dietary inequalities.

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GC2.081

'Adverse effects' of judgmental food labelling program

Tamir, O.[1]; *Menachem, D.*[1]; *Kolobov, T.*[1]; *Assaf Furman, S.*[1]; *Baron Epel, O.*[2]

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[2]Research Center for Evaluation of Health Promotion Interventions, School of Public Health, University of Haifa, Israel

Introduction: Food labelling programs are aimed at improving food selection and consumption by the public. Studies to evaluate the judgmental labeling of food products in Israel show positive impact on purchasing and consumption habits. However, little is known about its potential negative, undesirable and unintended aspects.
Methods: A descriptive cross-sectional study using an online self-report questionnaire. Data on purchasing and consumption habits, perceptions of the food product labelling, and the impact of labelling were collected from 3,292 Israeli Jewish and Arab adults. Data was analyzed by sub-group (Jewish non-Orthodox, Jewish Orthodox, and Arab) using descriptive statistics, calculating correlation coefficients, and comparing proportions. Alpha Cronbach was calculated for the complex variables built from several items. Linear regression was calculated to describe the relationships between the dependent variable with independent variables. Findings were discussed with health promotion advocates, policy makers, and policy implementation supervisors.
Results: Survey results from the Israeli sample revealed five major adverse effects: 1. Decrease in purchase of products with a green label due to a misconception that they are more expensive. 2. Confusion regarding recommended foods due to misunderstanding of labels and their absence on certain products. 3. Negative feelings/aversion regarding red labeled products. 4. Disregard of labels due to lack confidence in their scientific basis. 5. Negative eating behaviors and feelings due to labels. Consistency was found in some of the effects among the sub-populations in the study. Differences were mainly associated with socio-demographic parameters. Multivariate linear regression was calculated for each population group for negative eating behaviors and feelings due to the labels as the dependent variable. The models revealed three similar independent variables predicting negative behaviors in Jewish non-Orthodox, Jewish Orthodox, and Arab adults: conducting healthy lifestyle, undesired eating habits and behaviors, and being influenced by the labels when purchasing food.
Conclusions: The regulation has several unintended negative effects on the public mainly due to gaps in knowledge and understanding. Proactive education is needed regarding the rationale for the food labelling regulation, the professional definitions according to which the labels were determined, the meaning of each label, and the meaning of their absence. These issues should be publically addressed using various means and methods tailored to the specific characteristics of each population group, with particular focus on those who are more likely to be negatively influenced by the regulation.

GC2.082

Georgia chalenge to implement food Guidelines and Food system during svhool for Health of children

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Scientific Midical Center of Grigol Robakidze University, Tbilisi, Georgia

Case: This special module on children's nutrition during school hours aims to generate information to understand the existing practices and barriers. Since 2021 the Government has pursued implementing school doctors / medical service system in school by activity of "Health and Safe School". In line with its mandate, Healthy and Safe School & Georgian School Doctor's Association are supporting the Government & School Doctors to offer medical service to children and adolescents in schools according to national standards of medical service in school, which also includes food monitoring in school study to measure progress and identify critical issues.
Analyzing the statistical result of research studies of UNICEF, NCDC.ge and National Statistical office of Georgia shows that the frequency of deprivation differs a lot across child and family needs. For example, 5.6% of children are unable to eat fruits and vegetables on a daily basis because their families cannot afford it, but the corresponding figures are 24.4% in relation to having a meal with meat or a vegetarian alternative every day
The results show that nutrition during school hours is a significant challenge as only a little more than a quarter of children (27%) eat every day during school hours. More alarmingly, more than a third of children (34.9%) never eat during school hours.
Materially deprived children are far more likely to never eat during school hours (44.9%) than non-deprived children (28.4%). The most common barriers to eating during school hours are the absence of food vendors in the close proximity (reported in 36.4% of cases when children do not eat during school hours) and lack of money (20.6%). 83.2% of parents/family members believe that schools should feed children and 74.2% of them are willing to pay for it if the prices are affordable.
NUTRITION DURING SCHOOL HOURS, Eating regularly throughout the day is an important part of a healthy diet, especially for children. Unlike most European countries, In Georgia there is no organized system of feeding children at school. By study of NCCD.ge show high number of diseases that are linked with nutrition & eating disorders, behavioral changes. From the total number of 263 investigations of behavioral and emotional disorders in children and adolescents, 158 (60%) were children from 1-14 years of age and 101 (38%) from 14-19 years of age.
Together with Different Professional organizations "Health and Safe School" collaborate with government to resolve this issue. The educational committee of the parliament of Georgia undertakes a thematic inquiry of the school doctor practice, and the respective challenges. Within the inquiry, the hearing was held with the Principals and Doctors of public schools reporting about the sanitary-hygienic norms and the functioning of the medical service offsite meetings and visited public schools to study the infrastructure and speak with the school Principals and doctors
Conclusion: Analyze all statistical data: currently main mission for build school food system are food policy for schools and implementation of education modules of healthy eating for children and adolescents.

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GC2.083

Towards measuring food insecurity stigma: development and validation of the Food Insecurity Self-Stigma Scale and the Food Support Experiences Scale

Taylor, N.; Boyland, E.; Hardman, C. A.

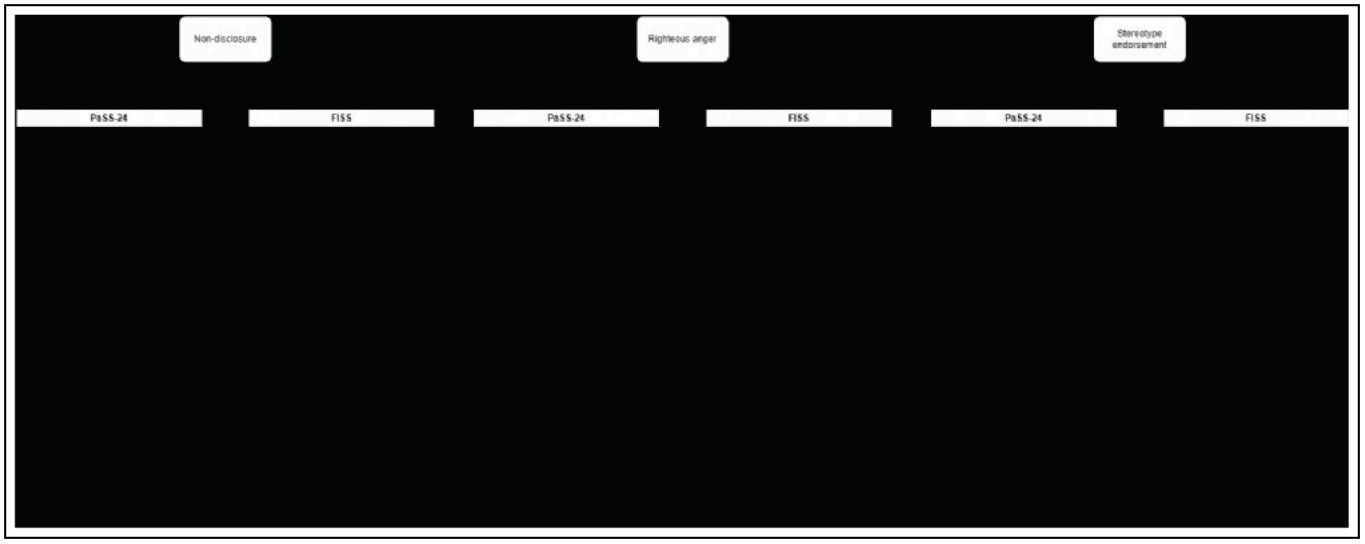
Department of Psychology, University of Liverpool, UK

Within high income countries such as the UK, food insecurity has been linked to poorer diet and higher levels of obesity. Individuals experiencing food insecurity often have little option but to consume a cheap, energy dense but nutrient poor diet due to issues of affordability and accessibility. This lack of agency is exacerbated in cases of severe food insecurity, in which food support must be accessed in order to satisfy household food needs. Individuals experiencing severe food insecurity are at a disproportionately high risk of developing obesity, which has been linked to significant negative psychological impacts as a result of associated shame and stigma. However, the experience of food insecurity and accessing food support itself can also be highly stigmatising, compounding the negative impacts upon psychological and emotional wellbeing. Being able to quantify this stigma may contribute towards reducing these impacts.

This study aimed to develop and validate two novel scales which enable the quantification of two aspects theoretically linked to stigma within the food insecurity and food support context: (1) the Food Insecurity Self-Stigma Scale (FISS), which measures the level of self-stigma (internalisation of negative stereotypes) that individuals experiencing food insecurity feel regarding their food insecure status; and (2) the Food Support Experiences Scale (FSES), which measures the psycho-social experiences (including the experience of self-stigma) when individuals access a food support service.

English speaking participants who identified as having experience of food insecurity completed the new FISS (N=211) and FSES (N=123) measures, alongside validation measures including the Rosenberg Self-Esteem scale, the Depression, Anxiety and Stress scale, and the International Physical Activity Questionnaire. A small number of participants (FISS: N=14; FSES: N=8) also completed the new scales again after a two- to nine-week interval.

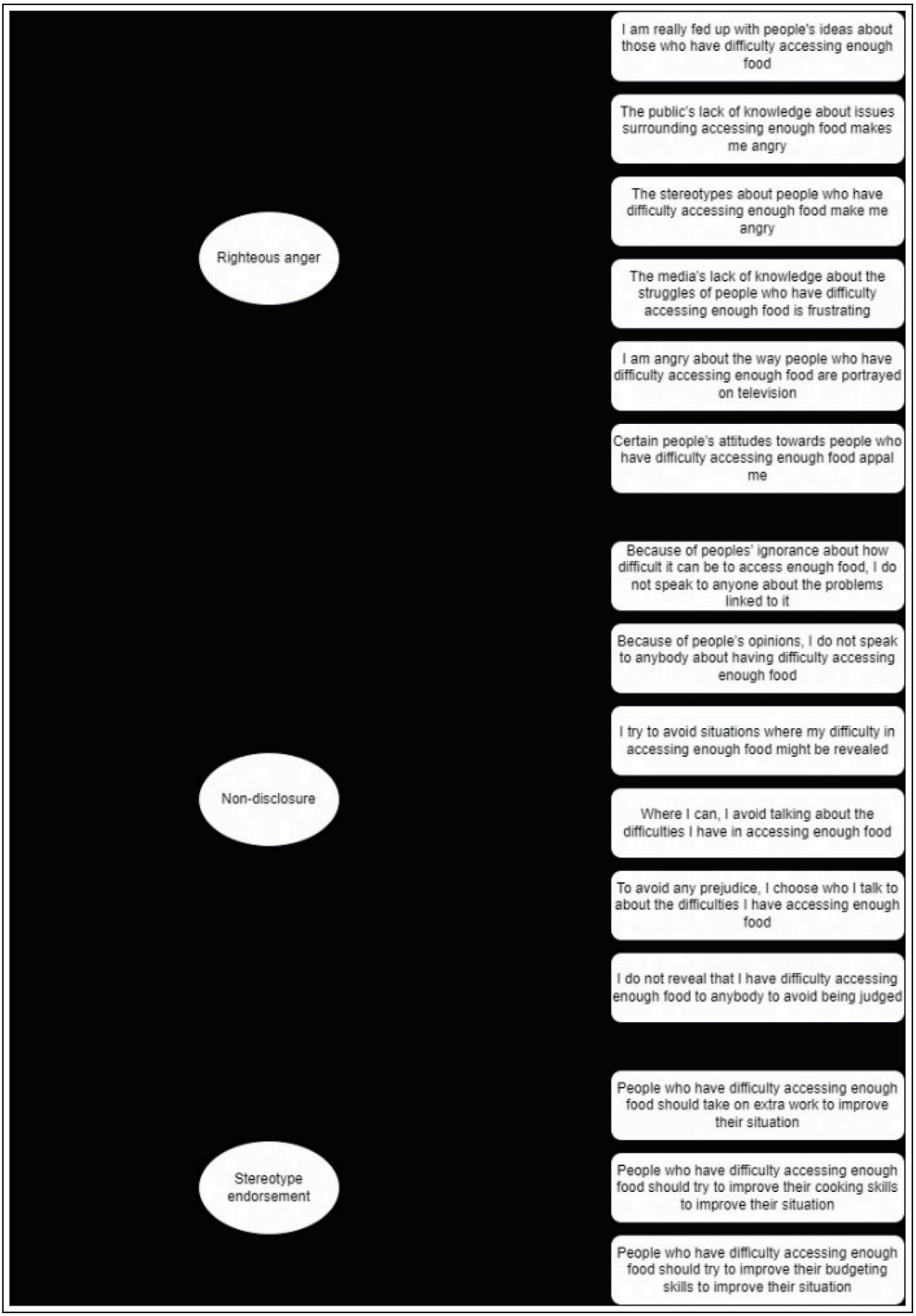
Through exploratory factor analysis, three-factor structures were indicated to best account for the data in both the FISS and FSES. Confirmatory factor analysis revealed a good fit of the three-factor model for the FISS, comprising of 15 items across the three factors (righteous anger, non-disclosure, and stereotype endorsement). Meanwhile, an acceptable-to-poor fit of the three-factor model was revealed for the FSES, comprising of 23 items across the three factors (self-approval and disclosure, dietary and interpersonal satisfaction, and perceived effectiveness and impact). Both scales demonstrated good internal reliability and test-retest reliability. The FISS may benefit from further divergent validity testing, while the FSES may benefit from further psychometric validation in a larger sample. The FISS and FSES provide valid tools for quantifying aspects of stigma relating to the experience of food insecurity and accessing food support respectively. These two scales may provide an important step towards developing new interventions which reduce this psychological burden and work to promote psychological wellbeing within populations experiencing food insecurity.



This figure shows how items on the PaSS-24 scale (Golay et al., 2021) were transformed in the development of the FISS.

Fig. 1. PaSS-24 to FISS item transformation diagram.

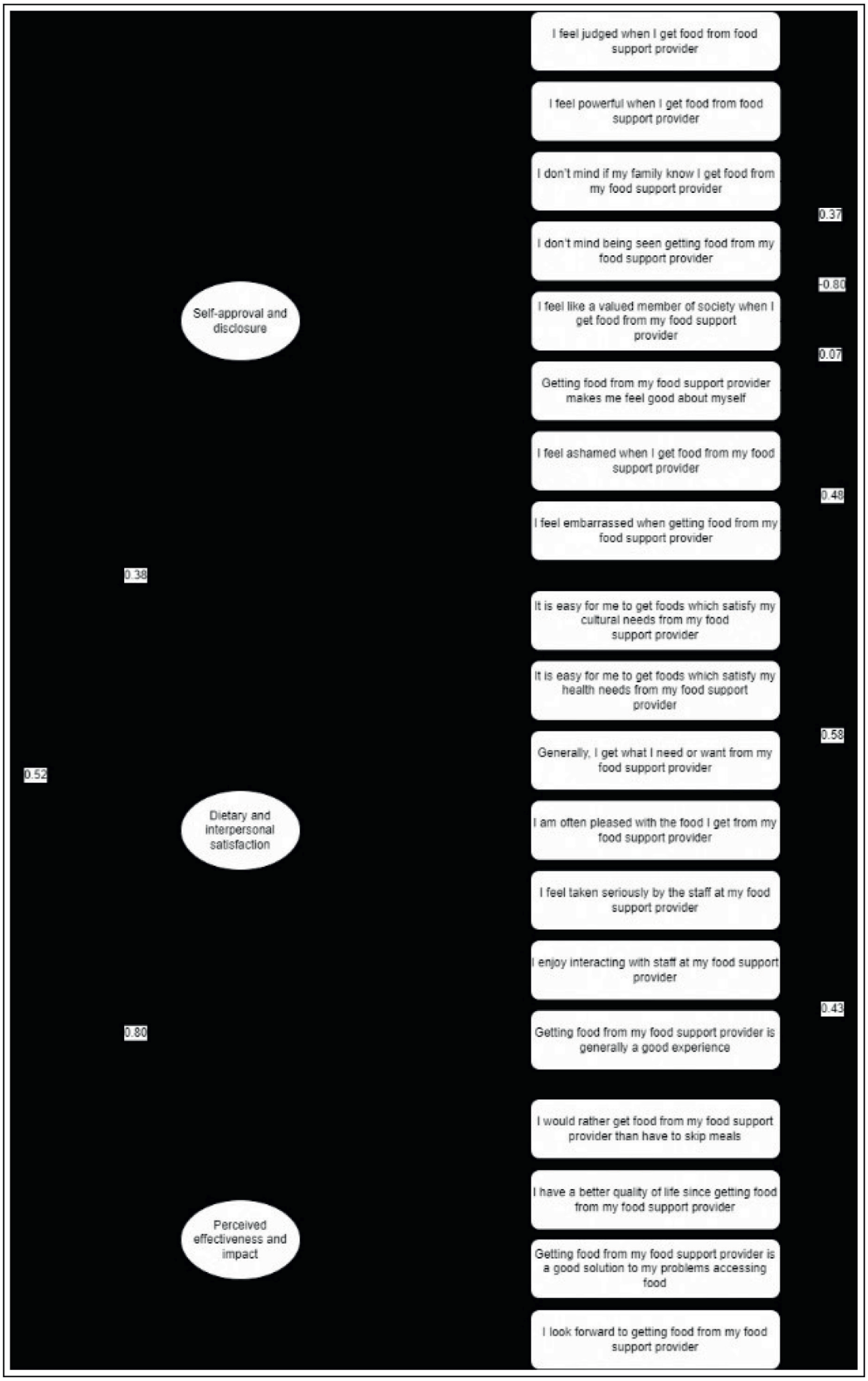
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FISS factor model with standardised factor loadings (single-headed arrows) and covariances (double headed arrows).

Fig. 2. FISS factor model.

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FSES factor model with standardised factor loadings (single-headed arrows) and covariances (double-headed arrows).

Fig. 3. FSES factor model.

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Tab. 1. FISS item factor loadings.

Item	Factor 1: Righteous anger	Factor 2: Non-disclosure	Factor 3: Stereotype endorsement
Because of peoples' ignorance about how difficult it can be to access enough food, I do not speak to anyone about the problems linked to it	-0.01	0.81	0.14
I am really fed up with people's ideas about those who have difficulty accessing enough food	0.72	0.07	0.09
People who have difficulty accessing enough food should take responsibility for their situation	-0.29	0.13	0.39
Because of people's opinions, I do not speak to anybody about having difficulty accessing enough food	0.04	0.76	0.02
The public's lack of knowledge about issues surrounding accessing enough food makes me angry	0.76	-0.13	-0.10
People who have difficulty accessing enough food are less useful to society	-0.38	-0.14	0.20
I try to avoid situations where my difficulty in accessing enough food might be revealed	-0.04	0.82	-0.04
The stereotypes about people who have difficulty accessing enough food make me angry	0.71	0.14	-0.07
People who have difficulty accessing enough food should take on extra work to improve their situation	-0.41	0.06	0.41
Where I can, I avoid talking about the difficulties I have in accessing enough food	0.10	0.77	-0.06
The media's lack of knowledge about the struggles of people who have difficulty accessing enough food is frustrating	0.77	0.05	0.05
People who have difficulty accessing enough food should try to improve their cooking skills to improve their situation	0.07	-0.05	0.69
To avoid any prejudice, I choose who I talk to about the difficulties I have accessing enough food	0.12	0.67	0.00
I am angry about the way people who have difficulty accessing enough food are portrayed on television	0.72	0.04	0.10
People who have difficulty accessing enough food should try to improve their budgeting skills to improve their situation	0.01	0.01	0.79
I do not reveal that I have difficulty accessing enough food to anybody to avoid being judged	-0.05	0.78	-0.08
Certain people's attitudes towards people who have difficulty accessing enough food appal me	0.71	0.03	0.00
People who have difficulty accessing enough food should be grateful for the help they receive, even if it is poor quality or does not suit their needs	-0.03	-0.11	0.34

Factor loadings for each FISS item. Items with factor loadings < 0.4 were discarded (Stevens, 2002). Items with two or more factor loadings of > 0.32 were also discarded (Tabachnick and Fidell, 2001).

Tab. 2. FSES item factor loadings.

Item	Factor 1: Self-approval and disclosure	Factor 2: Dietary and interpersonal satisfaction	Factor 3: Perceived effectiveness and impact
It is easy for me to get foods which satisfy my health needs from my food support provider	0.04	0.62	0.07
It is easy for me to get foods which satisfy my cultural needs from my food support provider	0.28	0.43	0.05
Generally, I get what I need or want from my food support provider	0.07	0.63	0.13
I am often pleased with the food I get from my food support provider	-0.02	0.62	0.07
Getting food from my food support provider makes me feel in control	0.35	0.05	0.60
I don't mind being seen getting food from my food support provider	0.85	0.01	-0.02
I don't mind if my family know I get food from my food support provider	0.41	0.07	0.28
I would rather get food from my food support provider than have to skip meals	-0.15	0.32	0.57
I feel ashamed when I get food from my food support provider*	0.78	-0.35	0.04
I feel powerful when I get food from food support provider	0.82	-0.12	0.22
Getting food from my food support provider is a dignified experience	0.44	0.40	0.21
I feel indebted to my food support provider when I get food from them*	0.20	-0.54	-0.26
Getting food from my food support provider makes me feel good about myself	0.61	0.23	0.17
I feel equal to others when I get food from my food support provider	0.70	0.33	-0.17
I have a better quality of life since getting food from my food support provider	-0.02	-0.04	0.95
I feel like a valued member of society when I get food from my food support provider	0.82	0.21	0.03
I feel embarrassed when getting food from my food support provider*	0.82	-0.02	-0.21
I feel taken seriously by the staff at my food support provider	-0.02	0.93	-0.05
I feel judged when I get food from my food support provider*	0.46	0.23	0.05
Getting food from my food support provider is a good solution to my problems accessing food	0.28	0.12	0.56
I look forward to getting food from my food support provider	-0.11	0.28	0.66
I enjoy interacting with staff at my food support provider	0.17	0.62	0.03
Getting food from my food support provider is generally a good experience	0.11	0.69	0.23

Factor loadings for each FSES item. Items with factor loadings < 0.4 were discarded (Stevens, 2002). Items with two or more factor loadings of > 0.32 were also discarded (Tabachnick and Fidell, 2001) *Item reverse scored in order for inter-correlations to remain positive.

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GC2.084

Being fed but still left hungry: is the UK free school meal allowance sufficient to buy a healthy, tasty and sustainable meal?

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Introduction: The English government funds free school meals (FSM) to pupils from low-income families (annual household earning <£7400). In secondary schools, this equates to a daily allowance of £2.53, though this may vary across schools. There is limited evidence to suggest that the FSM allowance is sufficient to allow young people to choose healthy options. This study worked with young people to investigate the types of food on offer within the FSM daily budget and whether this budget allowed them to choose healthy, tasty, and sustainable food.
Methods: Pupils (n=42), aged 11-15 years, across 7 schools were recruited as citizen scientists to capture information on, and perceptions of, the food available at their schools. Eligible schools had to have over the national average of FSM eligibility of 24%. Young people attended a research training day before the research commenced. They were provided with a daily budget equivalent to the FSM allowance at their school (£2.15 - £2.70) for one week and were asked to try and buy healthy, tasty and sustainable meals. Young researchers completed daily food diaries, and reported on whether the food filled them up, the cost of food bought, and their opinions on food quality. Pupils also participated in a focus group with other young researchers at their school. Qualitative data was thematically analysed, and overarching themes were determined.
Results: Four main themes emerged from the research: (1) Pupils had restricted choices and had to opt for meal deals, including a mains, a dessert, and possibly a drink. In some instances, non-meal-deal items offered healthier alternatives. (2) Pupils did not always have access to their allowance during breaktimes, meaning they often had no access to food or drink until lunch. (3) Young researchers did not have access to clear pricing to help inform their food choices. Pupils felt pressured to make quick decisions (which may not be the healthiest) or had to return food items at point of purchase, leading to embarrassment. (4) There was a lack of fruit, vegetables and salad in all schools. In fact, in 4 out of 7 schools, no fruit was purchased over the entire week by any of the young researchers. Other concerns included a lack of access to free and clean drinking water, and short lunch breaks (~30 minutes, including queuing times). The latter led to unhealthy food choices ('grab and go'), or insufficient time to finish one's meal.
Conclusion: The current FSM allowance may be insufficient for pupils to buy healthy, tasty and sustainable meals. However, additional barriers within schools may also hinder access to healthier food. Findings of this research have contributed to national advocacy campaigns, including a parliamentary event that was attended by 16 Members of Parliament, and 4 Lords, calling for a better deal for free school meals. Research recommendations call for an amendment to the School Food Standards to include two portions of vegetables with every meal, ensure schools have sufficient funding to provide access to free, clean and maintained drinking water, and to extend free school fruit and vegetable provision to all year groups.

GC2.085

Increasing children's access to a hot healthy meal: Implementation and evaluation of auto-enrolment processes for Free School Meals (FSM)

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Introduction: Receiving a Free School Meal (FSM) reduces financial burden on families, provides a daily hot meal, alleviates symptoms of food insecurity and provides funding to schools to support children from disadvantaged backgrounds. In England, almost 25% of children are entitled to means tested FSM, but 10% of families do not apply. This equates to ~215,000 children who could, but do not receive FSM and schools missing out on linked deprivation funding. In this action-oriented work, we aimed to support and evaluate the set-up of auto-enrolment processes for FSM, whereby entitled children are identified from welfare datasets to avoid relying on families to directly apply.
Methods: Four workstreams include: (1) implementation support (2) implementation evaluation (3) impact evaluation and (4) advocacy for policy impact. A toolkit, (with templates and case studies) has been developed to support local governments to set up auto-enrolment processes; whilst workshops facilitate shared learning. Qualitative frameworks guide the implementation evaluation, which includes documentary analysis and stakeholder interviews with government stakeholders (n=15). Impact evaluation gathers routinely collected data from local governments to assess FSM registrations, school meal uptake, delivery costs, opt-out rates and pupil premium data (associated funding provided to schools), in addition to conducting interviews with school stakeholders (n=15) and parents (n=15). Findings are shared throughout the research to encourage discussion and action learning with national stakeholders and policymakers.
Results: In year 1 of implementation, 8 out of 21 local authorities that we worked with launched FSM auto-enrolment (with at least 6 preparing to launch in year 2), and 5 provided early impact data. An additional 2,814 children were identified and registered to receive FSM (providing a boost of £4.7M Pupil Premium and £1.3M FSM funding to schools). Case study data suggests that higher rates of children who were auto enrolled were lone parents or from ethnic minority communities. Our policy advocacy workstream has formed a national working group including representatives from local authorities, educational bodies, school food partners and national Chief Scientific Officers, welfare departments and local government associations.
Conclusion: Early evidence shows that FSM auto-enrolment results in substantial positive impact for families and schools and highlights inequalities in those entitled but not registering for FSM. However, the process incurs onerous governance and administration by local governments. This evidence is supporting national advocacy to introduce a centralised approach by 2025. In this, we recommend collaborative working across government agencies to agree how welfare data can be accessed and used to support local governments to ensure that as many families as possible who are entitled to FSM receive them without relying on families having to directly apply. Findings have been shared with the Department for Education and the Department of Work and Pensions, including key recommendations to legislate a central process for auto-enrolment of FSM.

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GC2.086

Socioeconomic and health predictors for food insecurity, and implications for dietary inequality during the COVID-19 pandemic in Czechia

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Background: Food insecurity is a profound public health concern. It is affected by social determinants of health and leads to malnutrition and hence poor health. COVID-19 impacted people disproportionately and exacerbated preexisting social and health inequalities. The aim of this study was to understand how socioeconomic and health conditions affected food security and diet in Czechia during the pandemic.
Methods: Data on a representative panel of Czech adults from a longitudinal survey, Life During the Pandemic collected in October 2022 as part of a Czech longitudinal survey were analyzed. Binary logistic regression was performed to evaluate whether food insecurity during the pandemic was associated with socioeconomic factors (sex, age, education, income, number of children, size of municipality) and health factors (BMI, mobility, and self-perceived health). The association between food insecurity and fruits and vegetable consumption, as well as growing own food in a garden was also explored.
Results: Younger people aged 20-34 years, lower education attainment, and people with limited mobility and poor self-perceived health had higher odds of reporting food insecurity. The lowest income group was associated with 7.0 times higher likelihood of reporting food insecurity as compared to the high-income group (95% CI 4.83, 10.26). Food insecurity was also associated with not eating fruits and vegetables daily, and those who didn't grow own food had higher odds of reporting food insecurity. People with overweight and obesity had higher odds of not eating fruits and vegetables daily, however, after controlling for income and self-perceived health, BMI was not a predictor for fruits and vegetable consumption, but education attainment remained as a strong predictor for fruits and vegetable consumption.
Conclusions: Our study suggests that younger people and socially, economically vulnerable groups of people were more likely to experience food insecurity and limited consumption of fruits and vegetables during the pandemic. Policies that support these groups and reduce inequality in education and income are needed to reduce food insecurity and to improve quality of diet. Growing own food may reduce impacts of food insecurity. Encouraging people to grow own food either in their own garden or in allotments may prepare us for unprecedented food insecurity.

GC2.087

Working alongside local communities to address food insecurity

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Introduction: When communities partake in research this can often help mobilise and empower others whilst leading to a deeper exploration of the topic of interest. Implementing a co-production approach has been shown to provide a platform on which to draw upon lived experiences in a safe way, capable of creating new meaning and insight. It is also particularly useful when tailoring interventions to meet community needs (Vargas et al, 2022). This project recruited peer researchers from a local community in the North East of England, UK to engage in research to understand more about the Eco Shop, a model of social supermarket which redistributes surplus food at reduced process to tackle food insecurity.
Methods: Two peer researchers were recruited from all managers and/or volunteers responsible for the day to day running of Eco Shops. They contributed towards all phases of the research process including, project development, data collection/refining of tools, analysis and dissemination. Supported by the wider research team, peer researchers carried out interviews (n=23) with members of the Eco Shop community to explore their views and feelings around the model to understand more about how they operate and are used. In January 2024 themes identified in interviews will be sense checked and explored further in a focus group meeting with the wider Eco Shop community.
Results: Themes generated from interviews included; implementation of the model and adaptations, cost of living, pressures associated with managing and running an Eco Shop, customer preference and attunement and repurposing of shop surplus. Eco Shops that revised their ways of working based on customer need and provided additional services to promote socialisation and life skills appeared to thrive in contrast to those who did not. Additionally, this depended heavily on the enthusiasm and dedication of workers. A topic guide is currently being developed in collaboration with the peer researchers and will form the basis of discussions at the focus group meeting.
Conclusions: This research will provide an understanding of the best ways to help Eco Shops adapt to meet the needs of the communities they serve. Data gathered by peer researchers offers a deeper understanding from the perspective of those involved with the running of Eco Shops, providing scope to improve access and availability to produce, whilst potentially reducing any associated stigma. Furthermore, it demonstrates how using peer researchers can elicit valuable information, adding a new level of complexity and depth to findings.

GC2.088

PRECIS: Building the business case for community-based obesity prevention

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Introduction: Decades of research has demonstrated that community-based interventions for obesity prevention (CBIs) can be effective, feasible and acceptable to stakeholders. Evidence on the economic credentials for CBIs is however limited, and does not comprehensively incorporate the wide range of costs and benefits possible from multi-stakeholder, multi-level interventions. An objective of the PRecision Evidence for Childhood obesity prevention InterventionS (PRECIS) Australian National Health and Medical Research Council-funded grant (NHMRC-GNT2002234) is to identify and quantify the broader impacts of CBIs, further building the business case for community-based obesity prevention.
Methods: Mixed-methods research. A systematic review summarised the evidence for the costs, and cost-effectiveness of CBIs. A scoping review of the literature and trial registrations identified the broad range of outcomes currently being evaluated in CBIs. Semi-structured interviews with key CBI stakeholders will identify the most important broader benefits, and their key indicators. Finally, economic modelling will explore the impact of incorporating co-benefits on the cost-effectiveness of CBIs, expanding an existing multiple cohort Markov model (ACE-Obesity Policy model).
Results: The systematic review identified 17 studies building the investment case for CBIs. Five studies were full economic evaluations, which included a relatively narrow range of benefits into the analyses. The scoping review identified considerable heterogeneity in the outcomes reported in CBIs – 140 unique outcomes across 18 outcome domains, reported from 43 CBIs. Preliminary findings from thematic analysis of qualitative interviews suggest varying perceptions of the most important benefits of CBIs among stakeholders. Challenges in incorporating broader benefits of CBIs into economic evaluation include gaps in the methods for quantification of some co-benefits.

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Conclusions: The way that CBIs for obesity prevention are currently valued needs improvement, so that the business case includes the full range of likely benefits. This research program will build the evidence for the broader benefits of CBIs for obesity prevention, so that this information can be used to better inform resource allocation decisions.

GC2.089

Willingness to pay for early childhood obesity prevention intervention outcomes – Findings from a discrete choice experiment

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Introduction: There are a large range of possible outcomes from early childhood obesity prevention interventions, including changes in body weight, diet and physical activity. Given scarce resources, the preferences and values that different stakeholders place on these outcomes should be taken into account in resource allocation decisions. Yet to date, there is limited evidence on the preference and value of outcomes from early childhood obesity prevention interventions, from the perspective of parents/caregivers of children aged from birth to five years. The aim of this paper is to estimate the preferences for and value of different outcomes from early childhood obesity prevention interventions, using a discrete choice experiment (DCE).
Methods: Parents of children aged between birth and five years were recruited via a panel company, and asked to choose which of two early childhood obesity prevention interventions (Intervention A or B) or a 'neither' (opt out) option were most preferred. Interventions were described by six attributes (intervention cost, target population, and four outcome attributes (effect on the child's diet, effect on how physically active the child is, effect on the child's wellbeing, effect on the child's healthy growth)), with varying levels. Attributes and levels for inclusion in the DCE were informed by the literature and a Delphi study. The d-efficient design of the DCE was constructed using Ngene software. The survey was administered in Qualtrics and pilot-tested in 45 participants, before being conducted in the full sample (n=470). Multi-nomial logit models were estimated, using Nlogit software. The study was approved by the Deakin University Human Research Ethics Committee.
Results: Data analysis of the full study sample (n=470) is currently underway and full statistical results will be available for presentation at the conference. Preliminary analysis suggests that intervention effect on healthy growth was the most important influence on intervention choice, followed by physical activity, diet and wellbeing. Parents preferred interventions conducted in the general population, as compared to targeted interventions or interventions conducted in special groups. All results were statistically significant at the 1% significance level. Preferences by demographic characteristics are currently being estimated, and willingness to pay for outcomes will be presented.
Conclusions: Effect on healthy growth was the most important influence on parent/caregiver choice to participate in an early childhood obesity prevention intervention. This information is important in informing the design and development of interventions, as understanding which outcomes are most preferred is critical for maximising parent/caregiver engagement. This information is also important for informing resource allocation decisions, so that decision makers have a rigorous understanding of the value that stakeholders such as parents/caregivers place on the range of potential outcomes.

Conflict of Interest: None

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GC2.090

Patient pathways and economics of tumor-related hypothalamic obesity in Germany – a representative claims data analysis

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Introduction: Hypothalamic obesity (HO) is defined as abnormal weight gain resulting in severe persistent obesity due to physical damage of the hypothalamus. It poses substantial burden to patients, relatives and health systems. Yet, data on the economics of HO are lacking.
Methods: We developed an algorithm for the standardized identification of tumor-related HO patients in the German healthcare system and analyzed patient pathways, healthcare resource utilization (HCRU), and costs using a retrospective claims database-matched cohort study (n=5.2 million) covering 2010-2021. We included patients with a prior HO-associated tumor diagnosis (n=37), compared them with matched non-HO-obesity patients and reported HO diagnosis validations (incident obesity and diabetes insipidus diagnosis and desmopressin prescription within the quarter of surgery/radiotherapy or the following four quarters). Excess HCRU and costs were calculated for eight quarters following the initial HO-associated hospitalization with surgery/radiotherapy.
Results: 40% of validated HO patients received the diagnosis during the index hospitalization or follow-up, while 34% were diagnosed at an outpatient GP visit. HO patients had higher costs (€24,800) during the index quarter of tumor surgery/radiotherapy compared to non-HO-obesity patients. Excess costs remained high in the first year (+€19,900) and halved in the second year (+€10,700). Inpatient treatment costs were the main drivers, with outpatient physician and medication costs increasing gradually. In the first year after index event, HO patients had an average of 4.6 hospitalizations more than non-HO-obesity patients (+2.8 hospitalizations in the second year). Within two quarters after the index event, HO patients had an average of 4 more outpatient physician visits; in subsequent quarters, excess utilization gradually declined to +2 contacts per quarter but remained significantly higher.
Conclusion: To our knowledge, this is the first claims database analysis of tumor-related HO patient pathways and economics, indicating a substantial economic burden of HO, that needs to be further analyzed.

GC2.091

Current Obesity Treatment Setting Preferences by Primary Care Physicians

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Background: Primary care physicians (PCP) play a crucial role in managing patients' health including those living with Obesity (PwO). In Israel, where every citizen is insured by one of the four available HMOs, obesity affects approximately 17% of the adult population. Thus, as it is very common for PCPs to manage PwO, understanding PCPs' attitudes and treatment preferences regarding PwO is essential.
Methods: We conducted a web-based anonymous questionnaire distributed electronically to PCPs across the country. The questionnaire referred to 3 domains – treatment settings, treatment preferences and attitudes.
Results: The questionnaire was completed by 61 PCPs, 55 (90%) are specialists in Family Medicine or Internal Medicine with an average of 15.7±10.2 years of experience. 89% of PCPs did not have dedicated training in obesity medicine and 26% stated they live with obesity or overweight.
57% stated they prefer treating and managing their PwO themselves while the rest prefer their PwO managed in a secondary care multi-disciplinary clinic.

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Physicians were considered the preferred case-managers by 77% of PCPs and only 23% thought of the dietitian to be the case manager. While 95% of PCPs recognized obesity as a chronic disease, only 77% felt comfortable initiating conversations about obesity with their patients and only 54% felt comfortable consulting regarding bariatric surgery.
All PCPs had prescribed an AOM during the last year and 95% prescribed at least one off-label treatment. 14.8% considered stopping the AOM when their PwO achieve their target weight loss but only 33% consider weight loss to be the main treatment goal. Most PCPs stated quality of life parameters as their main treatment goal.
Conclusions: This study highlights substantial variations in treatment attitudes and goals among PCPs, which could potentially impact the management of PwO. Understanding these differences is crucial for implementing comprehensive and patient-centered obesity management strategies within primary care settings.

GC2.092

Age differences in the association between body mass index and risk of cardiovascular death in people with diabetes: a cohort study based on uk biobank

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Introduction: The optimal body mass index (BMI) range for people with diabetes may vary by age. We aimed to explore the age differences in the association between BMI and risk of cardiovascular death in people with diabetes.
Methods: Data were obtained from the UK Biobank, a large-scale, population-based, prospective cohort study that includes over 500,000 participants between the ages of 37 and 73. Baseline survey was conducted between 2006 and 2010, and followed up for a median of 12.52 years. People diagnosed with type 2 diabetes mellitus (T2DM) at baseline were included in the study. The primary outcome of interest in this study was mortality attributed to cardiovascular disease. The population is mainly divided into the elderly(age > 65 years)and the middle-aged (age≤65 years). The Cox regression model was applied to analyse the relationship between variables such as BMI, waist circumference, and waist-to-height ratio and the risk of cardiovascular death. Hazard ratios (HR) with 95% confidence intervals (CI) were adjusted for baseline variables including age, sex, smoking history, alcohol consumption, level of physical exercise, and history of cardiovascular diseases. The p-trend was used to present the results of the Cox regression analysis. Restricted cubic spline (RCS) and mean smooth curve analyses were used to demonstrate the relationship between changes in BMI, waist circumference, and WHR and the risk of cardiovascular death. The optimal BMI cut-off point was also calculated in different age groups.
Results: A total of 22,874 people with baseline T2DM were included in this study. During the follow-up period, 891 people died from cardiovascular diseases. Using the group with BMI < 25.0 kg/m² as a reference, the middle-aged group with BMI ranging from 25.0 kg/m² to 29.9 kg/m² had an HR (95% CI) of 1.13 (0.76-1.66). In the elderly group with BMI between 25.0 and 29.9 kg/m², the HR (95% CI) was 0.72 (0.47-1.12). A U-shaped relationship was observed between BMI and the risk of cardiovascular death. Upon stratification by age (65 years), the U-shaped curve relationship persisted in the age-specific subgroups. For the middle-aged group, the optimal BMI cut-off was 24.0 kg/m², whereas for the elderly, it was 27.0 kg/m². In people aged ≤ 65 years, a BMI range of 23.0 to 25.0 kg/m² was associated with the lowest relative risk of cardiovascular death. Conversely, for those aged > 65 years, the BMI range of 26.0-28.0 kg/m² demonstrated the lowest relative risk.
Conclusion: Our study demonstrates that for individuals under 65 years old, maintaining a BMI within the normal range of 23–25 kg/m² is advisable. Conversely, for those over 65 years old, a moderately overweight status with a BMI of 26–28 kg/m² appears to be more favourable. Different with middle-aged individuals with T2DM, for older individuals who are moderately overweight, maintaining rather than reducing weight may be a more practical goal for cardiovascular death.

GC2.093

" I have not been doing it because of my fear of something happening". Exploring Perspectives on Healthy Dietary Behavior and Physical Activity in Mexican Pregnant Women and Healthcare Professionals – A Qualitative Study

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Background: Mexico has some of the world's highest prevalence rates of overweight, obesity, and non-communicable diseases. Existing efforts to address rising incidence rates have shown limited effectiveness. Timely health-promoting initiatives to break the curve are urgently needed.
Pregnancy is considered one of the most important phases during the life course for health in both women and offspring. Maternal weight, diet, and physical activity during pregnancy affect the mother's and offspring's health. Despite the importance of obtaining and engaging in healthy behaviors during pregnancy to prevent overweight, obesity, and non-communicable diseases, little is known about which factors impact these behaviors among pregnant women in Mexico.
Aim: This study explored perspectives on factors impacting healthy dietary behaviors and physical activity in pregnancy from pregnant women and healthcare professionals in Mexico.
Methods: We conducted semi-structured interviews with 11 pregnant women and 12 healthcare professionals working in prenatal care. Data were analyzed using qualitative content analysis in a stepwise inductive approach.
Results: Three overall themes emerged, classifying factors at the individual, relational, and healthcare system levels. At the individual level, challenges with lack of time and competing priorities, as well as knowledge of healthy dietary behaviors and physical activity were identified. On the relational level, influencing factors encompassed financial, social, and emotional support, along with descriptive norms. At the healthcare system level, guidelines for physical activity during pregnancy and the quality of care were discerned.
Conclusion: The study identified factors impacting healthy dietary behaviors and physical activity in pregnancy in Mexico. Important considerations for future interventions include addressing socio-cultural norms around healthy dietary behavior and physical activity in pregnancy and involvement of the pregnant women's families, closest social networks, and the healthcare professionals working at the prenatal care unit.

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GC2.094

Timing based clustering of childhood BMI trajectories reveal differential maturational patterns; Study in the Northern Finland Birth Cohorts 1966 and 1986

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Introduction: Variability between two or more trajectories, such as the childhood body mass index (BMI) trajectories, can be separated into two components: phase variability on the x-axis (time dimension) and amplitude variability on the y-axis (BMI dimension). Considering childhood BMI, phase variability is often apparent as a shift, stretch, or shrinking between trajectories that otherwise seem to follow a similar shape. To-date, the approaches to model longitudinal changes of BMI in population of children have not considered phase variation. With maturation thought of as a process moving towards the final state - adult BMI, here we wanted to assess whether children can be divided to latent groups that reflect similar maturational age regarding childhood BMI. Differences in maturational age are measured by phase distances of the childhood BMI trajectories. We hypothesised that there are latent groups with distinct childhood BMI timing patterns.
Methods: We used data from two general population birth cohort studies born in Northern Finland in 1966 and 1986 (NFBC1966 and NFBC1986). We fitted individual height (n=6329) and weight (n=6568) curves using B-splines. Height and weight measurements were interpolated in 34 matching time points from three months to 16 years, and BMI values calculated. The repeated BMI estimates were then used to define pairwise phase distances of 2999 females and 3163 males, which were used as a similarity measure in k-medoids clustering. Median and IQR were reported per cluster of main time-related features of the trajectories, such as slopes before and after the infancy peak.
Results: We observed three clusters of children, that exhibited similar trajectories in both sexes. The clusters were named according to their size as *Type 1* (N♀=1566; N♂=1669), *Type 2* (N♀=1028; N♂=973) and *Type 3* (N♀=405; N♂=521). Trajectories of cluster *Type 1* were similar in shape to what is typically illustrated as the childhood BMI trajectory in literature. Trajectories clustered to *Type 2* had the steepest slope from 3 months to the infancy peak (in females, *Type 2* median slope was 3.3 kg/m^{2}year vs. 2.3 kg/m^{2}year in *Type 1* and 2.6 kg/m^{2}year in *Type 3*). Slope from the infancy peak to adiposity rebound was also steeper in trajectories of *Type 2* than trajectories in the other two clusters (in females, *Type 2* median slope was -0.8 kg/m^{2}year vs. -0.6 kg/m^{2}year in *Type 1* and *Type 3*).
Conclusion: Our results highlight that children have different patterns in their BMI development, and that differences in timing should not be disregarded. Future research is needed to determine possible health consequences of the found timing patterns in later life. Study of phase differences could be adapted to other longitudinal phenomena including different developmental processes to assess patterns in their timing.

GC2.095

Social community as a method of effective weight control

Chaikina, A.; Alimenko, I.

Food and Weight Community

Introduction: The "Food and Weight" community was created as a social network for people trying to lose weight, where each person would have their own profile, their own story, and their own set of programs to help solve the problem. The "Food and Weight" community simultaneously addresses 2 tasks: 1) treating obesity as a chronic disease prone to relapse and progression (ICD-10 code E66.0), and 2) treating eating disorders (ICD-10 code F50.4) as neurotic reactions. According to the WHO's definition of health, we should focus on maintaining health in 3 dimensions: biological health (weight reduction), social health (building mature relationships), and psychological health (strong self-esteem, emotional control, self-respect, ability to and understand one's needs). In the "Food and Weight" community, we address all of these tasks. We have a basic program that teaches proper eating habits, conscious awareness of obesity as a chronic disease, and basic skills for dealing with emotional eating.
Methods: The community's work is organized by a psychologist, psychotherapist, and curators using the software products Get Course, Zoom, and WhatsApp. Meetings are conducted in a group format, and each participant also receives personalized support from an individual curator. We identify 3 styles of dietary patterns – person with simple overeating, person with emotional overeating, and person with "food-addiction" – and select the depth of work according to the scale of eating disorders. For the first group, we offer different dietary styles, work with desserts, cheat meals, and days of indulgence. For the second group, we focus on self-esteem, emotions, and communication. For the third group, we provide group-based long-term therapy, support, and the development of a critical attitude toward addiction. We identify 5 types of appetite: 1) emotional appetite, 2) external appetite, 3) restrictive appetite, 4) traumatic appetite (when people fall into "traumatic funnels"), and 5) subcortical appetite (when we eat due to physiological discomfort). Working with these 5 types of appetite permeates the entire work with eating disorders. We evaluated the statistics of community members over 3 years, from 2020 until December 2023. During this time, more than 700 people participated in the community. This study includes the results of weight loss and maintenance over 3 years for 66 participants.
Results: The dynamics of weight over 3 years are presented in the graph 1. The main weight loss occurs in the first 6 months, after which the weight fluctuates within a range of 1.5 kg, which can be considered an effective maintenance of results.
Conclusion: The use of social communities through social networks and conducting psychological work in them shows high effectiveness not only in the short term but also in the long-term maintenance of weight. Most importantly, long-term therapy based on the principle of Step by Step: not giving up, sticking together, and overcoming food addiction as a complex dependency with both chemical and behavioral components.

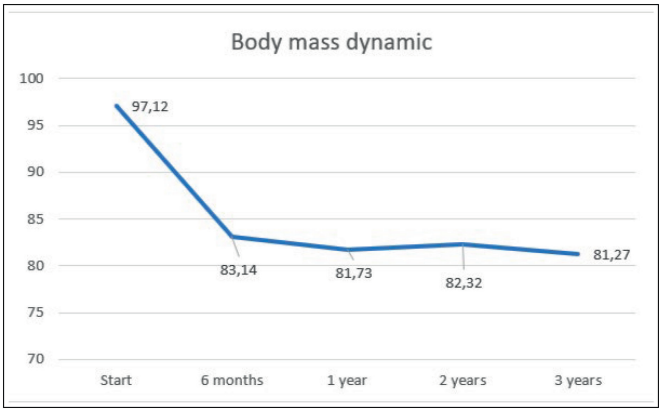


Fig. 1. Body mass dynamic.

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GC2.096

The Association between Healthy Eating Habits and Gait-speed in Older Adults with Obesity

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Introduction: A slow gait-speed is associated with poorer clinical outcomes and higher rates of mortality in elderly. For this reason in this study we aimed to identify some healthy eating habits that can be associated with better gait-speed performance in older adults with overweight or obesity in community dwellings.
Methods: Participants underwent a complete body composition measurement by means of Tanita MC-780MA bioimpedance (BIA), a Healthy Eating scoring system was retrieved from the Mini Nutritional Assessment (MNA) and the 4-metre gait-speed test was performed. Participants were considered on Healthy Eating if they adhered to the following habits: (i) Consumption of ≥ 2meals/day; (ii) Introduction ≥ 2 serving per day of fruits and vegetable; (iii) Drinking from 3 to 5 cups of fluids/day; and (iv) containing ≥2 protein sources of among the following: "one serving of dairy per day" OR "2 or more servings of legumes and eggs per week" OR "meat, fish or poultry everyday".
Results: Of the total sample of 222 participants were of mean age of 67.6±6.6 years and body mass index (BMI; Kg/m²) of 31.9±4.5 kg/m², 77 (34.7%) of them met the criteria for reduced gait-speed test and 145 were with normal gait-speed. Those with slower gait-speed had lower Healthy Eating total score when compared to those with normal gait-speed (2.99±1.12 vs. 3.37±1.07; p<0.05). Moreover, participants with slower gait-speed were more likely to fall below the median of the Healthy Eating score compared to those with normal gait-speed (70.1% vs. 51.7%; p<0.05) and more likely to be nutritionally at risk (22.1% vs. 10.3%; p<0.05). Finally the Logistic regression analysis after adjustment for socio-demographic variables, body fat percentage, BMI, and appendicular skeletal muscle mass, showed that the risk of having a slow gait-speed was 75% lower among those with higher Healthy Eating score (OR=0.25; 95%CI=0.11–0.53) indicating that having higher Healthy Eating score is associated with increased gait-speed tests.
Conclusions: Older adults in community dwellings with overweight or obesity who adhered to Healthy Eating habits displayed a lower risk of having slower gait-speed.

GC2.097

Breastfeeding patterns and maternal risk of coronary heart disease

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Introduction: Lactation is an essential component of the reproductive cycle, and evidence suggests that it may confer protection against cardiovascular diseases post weaning. However, beyond protection from breast cancer, long-term health benefits of breastfeeding for mothers are largely unknown. Importantly, women with obesity breastfeed for shorter durations. This study aimed to examine the association between breastfeeding patterns and coronary heart disease (CHD) among mothers with information on a range of potentially confounding variables including pre-pregnancy body mass index (PP-BMI).
Methods: We included 6,007 mothers from the Copenhagen Perinatal Cohort who gave birth during 1959-61 in Denmark. Information on duration of exclusive and any breastfeeding was assessed by a physician interviewing the mothers at the infant's 1-year examination. Patterns of duration and intensity of breastfeeding were identified using latent class trajectory modeling. CHD diagnoses were obtained from 1977 to 2022 in the National Patient Register (n=1281). Hazard ratios (HR) and 95% confidence intervals (CI) for CHD were estimated by Cox proportional hazards regressions with adjustment for social status and education, PP-BMI, maternal diabetes, smoking during pregnancy, and parity, preterm birth, and birth weight of the child.
Results: In this population, 11% percent of the women had pre-pregnancy overweight or obesity. We identified four trajectories of breastfeeding: No breastfeeding (38.5% of the population); early weaning (26.4%); intermediate weaning (20.1%); and late weaning (15.0%). In the unadjusted analysis, there was a significant and inverse trend between breastfeeding patterns and maternal risk of CHD (P=0.03). Compared to mothers who did not breastfeed, risks of CHD were lower in women who breastfed for longer periods and/or more intensively; the HR was 0.87 (95% CI: 0.76-0.99) for the early weaning trajectory group, 0.83 (0.71-0.97) for the intermediate weaning trajectory group and 0.82 (0.70-0.97) for the late weaning trajectory group in the unadjusted analyses. After adjustment for potential confounders, the overall association was no longer significant (P=0.55) and the results attenuated; the HR for maternal CHD was 0.92 (95% CI 0.80-1.06) for the early weaning trajectory group, 0.92 (95% CI 0.79-1.07) for the intermediate trajectory group and 0.99 (95% CI, 0.83-1.18) for the late weaning trajectory group.
Conclusion: We found that breastfeeding patterns of a longer duration and higher intensity of breastfeeding is associated with a lower risk of maternal CHD. Adjustment for demographics, metabolic risk during pregnancy including PP-BMI, and reproductive history weakened the described associations. These findings suggest that these factors may explain the protective effect of breastfeeding on maternal CHD risk.

GC2.098

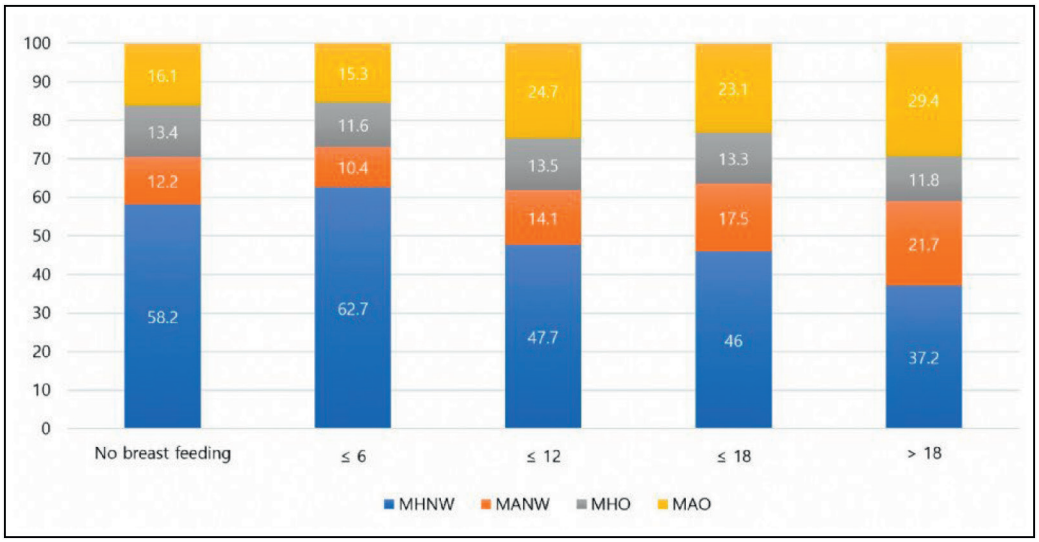
Association between breastfeeding duration and body size phenotype in postmenopausal women

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Introduction: Breastfeeding has been widely recognized as a crucial factor in promoting infant and maternal health. It is associated with a decreased risk of breast and ovarian cancers, as well as a faster recovery from childbirth. However, evidence regarding obesity, especially in the context of different body size phenotype, is limited. Therefore, we investigated the association between breastfeeding duration and body size phenotype in postmenopausal women.
Methods: This research utilized dataset from the Korean National Health and Nutrition Examination Survey (KNHANES) conducted between 2019 and 2021 by the Korean Ministry of Health and Welfare. Of 22,559 participants, data for 3,814 postmenopausal women were included. The various body size characteristics were categorized as metabolically healthy normal weight (MHNW), metabolically abnormal normal weight (MANW), metabolically healthy individuals with obesity (MHO), and metabolically abnormal individuals with obesity (MAO), based on both body mass index and the presence of metabolic syndrome. The breastfeeding duration per child were categorized into 5 groups: non-breastfeeder, breastfeeding for 1-6 months, for 7-12 months, for 13-18 months, and for >18months.
Results: The prevalence of breastfeeding duration per child for non-breastfeeder, those breastfeeding for 1-6 months, 7-12 months, 13-18 months, and more than 18 months was 11.3%, 17.0%, 41.2%, 8.5%, and 15.0%, respectively. A longer breastfeeding duration was associated with older age, higher body mass index, elevated blood pressure, and lower family income. After adjusting for confounding factors, including age, smoking,

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Proportion of body size phenotype according to breastfeeding duration. MHNW, metabolically healthy normal weight; MANW, metabolically abnormal normal weight; MHO, metabolically healthy individuals with obesity; MAO, metabolically abnormal individuals with obesity.

Fig. 1.

Tab. 1. Characteristics of the study population according to breastfeeding duration.

Table 1. Characteristics of the study population according to breastfeeding duration

	No breast feeding	≤ 6	≤ 12	≤ 18	> 18	*P*-value
Number (%)	464 (11.3)	697 (17.0)	1690 (41.2)	347 (8.5)	616 (15.0)	
Age (years)	60.1 ± 8.0	59.2 ± 6.9	65.6 ±7.8	67.9 ± 8.3	72.7 ± 7.2	0.000
BMI (kg/m^2)	23.5 ± 3.3	23.5 ± 3.0	24.3 ± 3.4	24.4 ± 3.0	24.6 ± 3.6	0.000
WC (cm)	81.7 ± 9.0	18.3 ± 8.4	84.6 ± 9.2	85.4 ± 8.6	86.4 ± 9.2	0.000
SBP (mmHg)	120.6 ± 17.3	119.8 ± 16.3	126.3 ± 17.3	128.7 ± 17.5	130.3 ± 16.5	0.000
DBP (mmHg)	74.7 ± 9.5	74.8 ± 9.1	75.0 ± 9.2	74.3 ± 9.2	73.4 ± 9.0	0.000
FPG (mg/dL)	102.2 ± 21.3	102.1 ± 19.1	104.5 ± 20.7	104.4 ± 27.6	104.0 ± 21.5	0.000
HbA1c (%)	6.0 ± 0.8	6.0 ± 0.7	6.1 ± 0.8	6.0 ± 0.9	6.1 ± 0.8	0.020
LDL-C (mg/dL)	40.7 ± 5.5	38.2 ± 5.0	40.0 ± 3.2	116.3 ± 37.3	113.5 ± 36.6	0.000
HDL-C (mg/dL)	55.6 ± 12.9	56.3 ± 13.0	53.3 ± 12.1	53.2 ± 11.9	50.7 ± 11.7	0.000
TG (mg/dL)	124.2 ± 74.0	113.7 ± 67.1	120.4 ± 77.0	119.0 ± 67.9	122.9 ± 69.4	0.000
Family income percentile (%)						0.000
< 25	14.2	13.5	26.5	33.4	51.0	
25-50	22.3	19.0	28.7	30.9	24.3	
50-75	26.2	29.5	23.3	18.9	16.2	
≥ 75	37.3	38.0	21.5	16.9	8.6	
More than high school education (%)	78.8	79.1	46.3	34.6	13.1	0.000
Residence in urban area (%)	88.0	85.2	79.2	80.0	67.2	0.000
Smoking						0.284
Never	91.6	92.5	94.9	94.9	93.2	
Past	3.9	4.3	3.2	3.2	3.4	
Current	4.5	3.2	1.9	1.9	3.4	
Alcohol drinking (Yes, %))	85.8	86.6	74.6	69.0	59.2	0.000
Regular exercise[a] (yes, %)	37.9	41.4	35.5	35.3	23.6	0.000
Total energy intake (kcal)	1580.0 ± 635.1	1587.4 ± 620.1	1477.3 ± 544.2	575.2 ± 32.5	1306.6 ± 472.3	0.000
Carbohydrate intake (g)	247.3 ± 105.9	250.9 ± 140.6	242.1 ± 92.1	246.4 ± 96.8	226.4 ± 82.8	0.000
Protein intake (g)	57.0 ± 26.9	59.1 ± 29.0	54.1 ± 25.0	51.9 ± 25.7	44.8 ± 21.8	0.000
Fat intake (g)	38.4 ± 25.1	37.7 ± 24.1	31.7 ± 21.2	30.5 ± 22.6	24.0 ± 17.4	0.000
Metabolic phenotype						0.000
MHNW	58.2	62.7	47.7	46.0	37.2	
MANW	12.2	10.4	14.1	17.5	21.7	
MHO	13.4	11.6	13.5	13.3	11.8	
MAO	16.1	15.3	24.7	23.1	29.4	

Data are expressed as the mean ± SE for continuous variables and as weighted percentages for categorical variables.

BMI, body mass index; DBP, diastolic blood pressure; FPG, fasting plasma glucose; MANW, metabolic abnormal normal weight; MAO, metabolic abnormal obese; MHNW, metabolic healthy normal weight; MHO, metabolic healthy obese; SBP, systolic blood pressure; TG, triglyceride; WC, waist circumference.

[a]Regular exercise was defined as engaging in physical activity for at least 2.5 hours of moderate-intensity physical activity per week or 1.25 hours of high-intensity physical activity.

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Tab. 2. Association between breastfeeding duration and body size phenotype.

Table 2. Association between breastfeeding duration and body size phenotypes

	Fully Adjusted OR (95% CI)				
	MAO		MANW		MHO
MAO/MHNW		MANW/MHNW		MHO/MHNW	
No breast feeder	Reference	No breast feeder	Reference	No breast feeder	Reference
≤ 6	0.907 (0.599-1.372)	≤ 6	0.845 (0.552-1.294)	≤ 6	0.790 (0.510-1.223)
≤ 12	1.339 (0.919-1.952)	≤ 12	0.830 (0.569-1.209)	≤ 12	1.173 (0.781-1.762)
≤ 18	1.191 (0.748-1.895)	≤ 18	1.804 (0.556-2.113)	≤ 18	1.245 (0.747-2.074)
> 18	2.040 (1.211-3.434)[a]	> 18	1.231 (0.690 -2.196)	> 18	1.760 (0.968-3.199)
MAO/MANW		MANW/MHO			
No breast feeder	Reference	No breast feeder	Reference		
≤ 6	1.072 (0.640-1.794)	≤ 6	1.101 (0.651-1.863)		
≤ 12	1.751 (1.106-2.770)[b]	≤ 12	0.614 (0.359-1.049)		
≤ 18	1.299 (0.645-2.614)	≤ 18	0.708 (0.300-1.667)		
> 18	1.574 (0.888-2.790)	> 18	0.613 (0.265-1.418)		
MAO/MHO					
No breast feeder	Reference				
≤ 6	1.155 (0.690-1.934)				
≤ 12	1.134 (0.686-1.874)				
≤ 18	0.868 (0.433-1.742)				
> 18	1.163 (0.627-2.157)				

CI, confidence interval; MANW, metabolic abnormal normal weight; MAO, metabolic abnormal obese; MHNW, metabolic healthy normal weight; MHO, metabolic healthy obese; OR, odds ratio. Logistic models are adjusted for age, sociodemographic factors (place of residence, family income, and education), lifestyle behaviors (smoking status, alcohol consumption, regular exercise).

Statistically significant between-group difference: [a]p=0.07, [b]p=0.017

alcohol consumption, family income, education, place of residence, and exercise, the multivariate logistic regression analysis revealed that breastfeeding duration of more than 18 months is associated with the MAO phenotype (Odds ratio: 2.04, confidence interval: 1.211-3.434).

Conclusions: In postmenopausal women, the long duration of breastfeeding was identified as independent risk factors for MAO phenotype. To improve public health, increased attention and successful strategies for recognizing body size phenotype associated with breastfeeding could offer valuable clinical implications.

GC2.099

TikTok's Impact on Science Outreach for People with Obesity: An Experience-Based Analysis

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Background: The growing obesity epidemic, particularly among young people, represents a global challenge that requires innovative approaches. Over 90% of teens have at least one social media account, and their social media presence continues to grow. Food and beverage brands capitalize on this trend by marketing their products on social media to teens. Depending on the nutritional value of the products marketed, the influence of social media advertisements may contribute to the risk of developing adverse health outcomes such as obesity, hypertension and type 2 diabetes. However, on the other side, social media tells us media can represent a potentially engaging way to support adolescents and young adults in maintaining a healthy diet and learning about nutrition.

Materials-Methods: The research is based on an integrated analysis of diffusion and engagement metrics obtained from a TikTok medical account talking about obesity treatment.

This experiential perspective offers further understanding of the scope and impact of science outreach on social media.

Results: Videos concerning treatment of patients with obesity can reach 1.000.000 persons and during live sessions on tiktok as much as 2000 people can participate and make 1questions to the obesity specialist.

Conclusions: The broad participation in such events reflects a growing public interest in scientific information on obesity on social platforms. Data analysis indicates a variety of users, including young people and adolescents, highlighting the effectiveness of this communication modality in addressing the issue of youth obesity.

Social media is emerging as a powerful vehicle for communicating scientific data in an accessible and engaging way. The broad reach of such platforms offers the opportunity to reach diverse audiences, including youth and adolescents, which is crucial in the context of youth obesity.

This study highlights the urgent need to fully exploit the potential of social media in scientific dissemination on obesity, highlighting their ability to educate and positively influence health decisions. The author's personal experience testifies to the success of this strategy, underlining the relevance and effectiveness of social media as a communication tool in the fight against obesity.

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GC2.100

The use of machine learning model to detect body hate and obesity stigma in social media

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Introduction: It is estimated that nearly 970 million people worldwide struggle with mental illnesses, and one in four individuals will be affected by mental illness at some point in their lives. Furthermore, more than 14% of deaths can be attributed to mental disorders. Research has also confirmed that social media may have a negative impact on mental health, potentially contributing to self-harm and suicidal behaviors. Among the

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array of digital threats, one that emerges as particularly consequential is the phenomenon of body shaming and the perpetuation of weight stigma. The insidious and oftentimes anonymous character of social media provides a conducive environment for the expression of criticism and cruelty, where users, especially those already predisposed to mental health vulnerabilities, become targets for body hate, discrimination, and ridicule. This is why we have decided to develop a plugin that can detect instances of body hate, weight stigma, and obesity-related issues in popular social media forums

Methods: We utilized a machine learning model to bolster our website plugin, enabling the detection of body hate and obesity stigma. To do so, we employed a pre-existing corpus available on Kaggle and opted for the Random Forest learning method developed in Python. The corpus consisted of sentences gathered from Facebook and Twitter, and all sentences were in English.

Results: The developed method was implemented in the website plugin and utilized to detect instances of body hate, with a focus on YouTube comments. The model achieved an accuracy of 92.64%, a precision of 92.13%, a recall of 92.03%, and an F-score of 92.08%

Conclusion: Machine learning models, specifically designed and trained for text emotion analysis, can play a pivotal role as integral components of website plugins. These models are instrumental in recognizing instances of weight and obesity stigma, which can be harmful to individuals and society at large. By employing these tools, we have the opportunity to shed light on this pervasive issue, ultimately contributing to greater public awareness about the consequences of body hate and the importance of fostering a more inclusive and empathetic digital environment. This innovative approach not only serves as a means of early detection but also as a means of education and advocacy. By alerting users to instances of weight and obesity stigma, we can engage them in a dialogue about the importance of mental health and self-esteem, especially among the most vulnerable populations. In doing so, we can empower individuals to support one another and challenge harmful stereotypes and behaviors that contribute to mental health challenges. As we move forward in the digital age, the development and integration of such website plugins are a crucial step in harnessing technology for the betterment of society. By fostering empathy, reducing stigma, and promoting mental health awareness, these tools can help create a more compassionate and supportive online community.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC2.101

Plea for the permanent integration of plastic surgery in obesity centers

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The massive weight loss after bariatric surgery often leaves patients with excess skin, which leads to functional and health restrictions. These complaints, in turn, can lead to a reduction in psycholgoical well-being (1). Body contouring procedures (BCP) can be used to remove excess skin and reconstruct the body proportions. However, as these procedures are usually regarded as purely aesthetic, they are not covered by health insurance and patients must apply for reimbursement.

Initial contact between the plastic surgeon and the post-bariatric patient often only takes place after completed weight loss and health problems have already emerged.

The current study investigated the value of BCP from the perspective of patients and the impact of satisfaction with the outcome of BPC on psychological well-being. The extent to which early involvement of plastic surgery can benefit the mental health of post-bariatric patients is investigated.

Methods: An online survey was used to collect data on the engagement and satisfaction with the outcome of post-bariatric reconstructive surgery. The post-bariatric patients were also asked about their depressive experience, self-esteem, and body image.

Results: 345 (90.4% female) participants were included in the study. Respondents had undergone their bariatric surgery at least two years ago. On average, patients had lost 65.78 kg (SD= 22.81 kg) in weight and now had an average body mass index of 32.20 (SD=7.42). 92.5% of patients had either already undergone BCP, were considering it or were undecided about it. Only 7.5% of respondents stated that they did not intend to undergo BCP. 88.6% of patients who had undergone one or more BCP were somewhat satisfied, satisfied or very satisfied with the results.

Satisfaction with the result of BCP correlates negatively with depression ($p<.001$), insecurity about one's own body ($p<.001$) and body accentuation ($p=.009$). In contrast, there is a positive correlation between outcome satisfaction and patients' self-esteem ($p<.001$) and feelings of attractiveness ($p<.001$).

Conclusion: Post-bariatric BCP is an important part of obesity treatment. The high proportion of patients who are still undecided about BCP highlights the relevance of a detailed and early consultation for post-bariatric patients. Prior to bariatric surgery, a plastic surgeon can provide information about excess skin after weight loss and treatment options. The correlation between patient satisfaction with the result of BCP and psychological well-being implies the need to educate patients about possibilities and limitations of reconstructive surgery. This can prevent unrealistic expectations and dissatisfaction with results on the part of patients. BCP not only makes an important contribution to physical health but also to the psychological well-being of post-bariatric patients and should therefore be integrated into the interdisciplinary treatment concept of obesity centers at an early stage.

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GC2.102

Association between Psychological Stress and Obesity according to Age: A Cross-sectional Study

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Background: There were few studies for the association between psychological stress and obesity according to age. In this study, we determine the relationship between obesity and psychological distress in a nationally representative sample of Korean.

Methods: This population-based cross-sectional study comprised 1891 participants (aged 19 years or older) in the Korea National Health and Nutrition Examination Survey from 2019 to 2021. Self-perception of stress, and diagnosis of depression by a physician were assessed for determination of psychological distress. To determine the effect of age in the relationship between obesity and psychological distress, we divided participants to three groups by age (young; 19-39, mid; 40-64, old; 65 years old and over). Obesity is defined as a body mass index over 25 kg/m^2, and central obesity is defined as a waist circumference 90 cm and over in men and 88 cm and over in women.

Results: Obesity and central obesity are associated with Self-perception of stress [hazard ratio(HR)=1.247; 95% confidence interval (CI): 1.148-1.354, HR=1.296; 95%CI: 1.188-1.415, respectively] and heavy drinking of alcohol (HR=1.211; 95%: 1.078-1.360, HR=1.261; 95%: 1.114-1.428,

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respectively), resistance exercises (HR=0.771, 95%: 0.701-0.847, HR=0.655; 95%CI: 0.594-0.722, respectively), but
not diagnosis of depression (HR= 1.121; 95%: 0.938-1.340, HR=1.132; 95%: 0.945-1.357). And this associations between obesity or central obesity and self-perception of stress are prominent in young age group (HR=1.515; 95%CI: 1.294-1.773, HR=1.532; 95%: 1.292-1.816, respectively) and mid age group (HR=1.133; 95%: 1.014-1.265, HR=1.224; 95%: 1.094-1.370) but is not significant in old age group (HR=0.863; 95%: 0.718-1.037, HR=0.949; 95%CI: 0.791-1.140).
Conclusions: Self-perception of stress is associated with obesity. However, this association was significant in young and mid age group. Our study suggests the need for the different approach by age for people with obesity.

GC2.103

Navigating Body Image and Weight in Menopause: A Compassionate Approach

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Menopause is a critical life stage for women, often marked by physical and psychological shifts, with weight gain being a primary concern. This presentation delves into the complexities of managing body image and weight during perimenopause and menopause, advocating for realistic expectations and personalized healthcare.
Abdominal weight gain in perimenopause and menopause is a significant issue for many women, impacting their self-esteem. While healthcare professionals tend to reassure patients about the normality of such changes, this approach may not fully address underlying body image concerns. We explore the psychological implications of these changes and emphasize the need for setting realistic expectations for body image during menopause. It is difficult for many patients to challenge longstanding beliefs about body image. Patient education alone is often inadequate and we will highlight effective counselling strategies.
The presentation also examines how body image issues during perimenopause and menopause affect patient expectations and influence healthcare professionals' decisions. Often, there is hesitancy in offering obesity treatments when body image concerns are primary, despite medical indications. We highlight the necessity for a more compassionate and personalized approach to weight management in menopausal women.
This session emphasizes a holistic approach, integrating physical, emotional, and psychological care aspects. It also addresses societal and cultural influences on women's body perceptions during menopause. We provide practical strategies for healthcare professionals, including effective communication techniques, strategies for healthy weight management, and ways to empower women to positively embrace menopause.
By equipping healthcare providers with the necessary tools and knowledge, we aim to support menopausal women in navigating this transition with active strategies and compassion, leading to improved health outcomes and well-being.

GC2.104

Psychosocial Stress and Incident Cardiovascular Disease among Korean Adults: A Community-Based Prospective Cohort Study

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Introduction: There is a growing interest in understanding the crucial links between psychological health factors and the risk of cardiovascular disease (CVD). Notably, the updated cardiovascular health (CVH) metrics, referred to as "Life's Essential 8," do not encompass psychosocial stress as a component. This study aims to investigate the association between psychosocial stress and the risk of developing CVD in the Korean adult population.
Methods: The study includes 9149 participants from the Korean Genome and Epidemiology Study Ansung-Ansan cohort, of whom 8833 had no history of CVD at baseline. CVH metrics were assessed using eight baseline metrics following modified American Heart Association recommendations. Psychosocial stress was quantified using the Psychosocial Wellbeing Index Short Form (PWI-SF). Cox proportional hazards models were employed to assess CVD risks, adjusting for age, sex, CVH metrics (Life's Essential 8 score), and renal marker.
Results: Over a median follow-up of 13 years, 628 new cases of CVD were identified. After adjusting for potential confounders, the PWI-SF score exhibited a significant association with an increased risk of CVD (HR = 1.01, 95% CI = 1.00–1.02, P=0.030).
Conclusion: Our findings indicate that higher psychosocial stress levels are independently associated with an elevated risk of CVD, irrespective of conventional CVH metrics. Emphasizing favorable mental health and managing clinical risk factors in midlife may contribute to improved cardiovascular outcomes.

GC2.105

Personality traits and quality of life outcomes following bariatric surgery: A cross-sectional study investigating social support as a mediator

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Introduction: Bariatric surgery is the gold standard treatment for severe obesity, often resulting in weight loss with improvement in obesity-related comorbidities and quality of life (QoL). Despite this, QoL outcomes remain variable over time and the factors which influence this remain unclear. This study aimed to examine how personality traits are associated with QoL outcomes, and whether social support mediates these relationships.
Method: Patients who underwent bariatric surgery N = 253 (n = 13 males [5%], n = 240 females [95%]), aged 22 – 78 years (M = 42.47 years, SD = 10.98) were recruited online. The Big Five Inventory, Multidimensional Scale of Perceived Social Support, and WHO Quality of Life-BREF were used to assess associations between personality traits, social support and QoL outcomes. Data were analysed using regression and mediation analyses.
Results: Associations between agreeableness and all QoL outcomes (environmental, physical, psychological, and social QoL) were mediated by perceived social support. Agreeableness was linked to lower levels of perceived social support, which in turn was associated with higher environmental, psychological, and social QoL, and lower physical QoL. Similarly, associations between extraversion and all QoL outcomes were mediated by perceived social support. Extraversion was linked to lower levels of perceived social support, which then was associated with higher environmental, psychological, and social QoL, and lower physical QoL. Also, associations between neuroticism and all QoL outcomes were mediated by perceived social support. Neuroticism was linked to higher levels of perceived social support, which in turn was associated with higher physical QoL, and lower environmental, psychological, and social QoL. Conscientiousness and openness were significantly associated with QoL outcomes. Social support did not mediate these associations.
Conclusions: We have provided evidence for the nuanced role of agreeableness, extraversion, neuroticism, and conscientiousness among physical QoL within a sample of patients who underwent bariatric surgery. Also, the link between personality traits and environmental QoL is highlighted. This research extends the current literature by indicating how FFM traits and social support are associated with QoL outcomes presenting relevant implications for post-surgical adjustment. Further, longitudinal investigation is necessary to support these findings overtime.

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GC2.106

The Role of Self-Criticism on Early Adverse Experiences and Disordered Eating in Adolescence

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[2]University of Porto, Faculty of Psychology and Education Sciences

Introduction: Adolescents are identified as a high-risk group for engaging in disordered eating behaviors (DEB). DEB have longstanding connections with adverse childhood experiences (ACE), as individuals who were exposed to ACE may recur to DEB as a maladaptive strategy to regulate trauma-related emotions (Donahue et al., 2018). Similarly, DEB have been linked to self-criticism, with individuals engaging in these behaviors to alleviate the negative affect caused by the negative perception about the self (Conceição et al., 2022). This study aims to assess a mediation model proposing self-criticism as a mediating factor between ACE, difficulties in emotion regulation (DER), and DEB, measured as disordered and grazing eating.
Methods: A total of 365 adolescents (55.3% females) aged between 12 and 20 years old (M = 15.6, SD = 1.73) fulfilled a set of self-report questionnaires assessing sociodemographic and clinical data, ACE (Adverse Childhood Experiences Questionnaire), DER (Difficulties in Emotion Regulation Scale), self-criticism (Forms of Self-Criticizing and Reassuring Scale), disordered eating (Eating Disorder Examination – Questionnaire) and grazing eating (Repetitive Eating Questionnaire). Structural Equation Modeling was used for data analysis.
Results: ACE and DER showed significant associations with self-criticism, which, in turn, was linked to DEB. The models accounted for 62.3% of the variability in self-criticism scores (r2SC = 0.623), 49.2% in disordered eating scores (r2DE = 0.492) and 26.1% in grazing eating scores (r2RE = 0.261). Self-criticism fully mediated the effects of ACE ($\beta\hat{}$ = 0.191; p <.001) and DER ($\beta\hat{}$ = 0.551; p <.001) on disordered eating and partially mediated the effects of ACE ($\beta\hat{}$ = 0.073; p = 0.020) and DER ($\beta\hat{}$ = 0.210; p = 0.010) on grazing eating.
Conclusions: The study findings highlight that, during adolescence, ACE and DER significantly contribute to the development of self-criticism, which may culminate in DEB. Thus, it is crucial to design interventions to prevent DEB that target emotion regulation and self-criticism, while also addressing ACE's harmful impacts.

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Conflict of Interest: None disclosed.

Funding: This study was conducted at the Psychology Research Centre (CIPsi/UM) School of Psychology, University of Minho, supported by the Foundation for Science and Technology (FCT) through the Portuguese State Budget (UIDB/01662/2020), and by a grant to Sílvia Félix (2020.07384.BD).

GC2.107

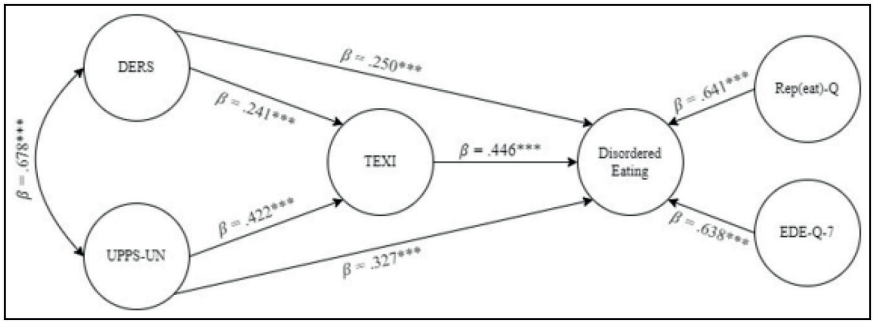
The mediation role of executive functions in the relation between emotion regulation and negative urgency in disordered eating among community adolescents

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Introduction: Adolescence is a vulnerable timeframe to the development of disordered eating. This could be particularly intensified by the enhanced emotional reactivity that occur among adolescents, paired with their lack of pre-frontal neuronal maturation, and consequent difficulties in executive functions. However, there is not yet enough exploration of the interactions between disordered eating, emotion activation/regulation and executive functions in adolescents. This study aims to use structure equation modelling to the direct, total, and indirect effects of emotion regulation and negative urgency – via executive functions – on disordered eating.
Methods: A total of 365 community adolescents attending middle or high school participated in the present study (M = 15.60 years old; SD = 1.73). Participants completed a set of self-report questionnaires assessing difficulties in emotion regulation, negative urgency, executive functions (i.e., working memory and inhibition), and disordered eating (i.e., grazing eating behavior, dietary restraint, shape/weight overvaluation, and body dissatisfaction).
Results: The model tested showed acceptable fit indexes ($\chi2(3139)$ = 6709.99; p <.001; CFI =.980, TLI =.979; RMSEA =.056; SRMR =.072) and suggested that executive functions partially mediated the effect of difficulties in emotion regulation and negative urgency on disordered eating. Also, the model explained 37.4% of the variability of executive functions and 76.9% of the variability of disordered eating.
Conclusion: The findings indicate that individuals with difficulties in emotion regulation and negative urgency are more likely to engage in disordered eating, particularly if they also present difficulties in executive functions. Thus, it is important to consider the role of executive functions in interventions targeting disordered eating in these population.

Conflict of Interest: None disclosed.



Note. For simplicity, only relevant latent variables were shown in the figure. However, the latent variable "Difficulties in Emotion Regulation" was composed by other five latent variables that represented DERS subscales (i.e., emotional acceptance, goal-directed behaviors when distressed, impulsivity control, emotion regulation strategies, and emotional clarity), with each of these one being composed by the indicators' correspondent to subscales items. The latent variable "Executive Functions" was composed by two other latent variables, namely, working memory and inhibition (TEXI), with each one being composed by the indicators' correspondent to subscales items. Grazing was composed by the two subscales of Rep(eat)-Q (i.e., compulsive grazing and repetitive eating), with each one being composed by the indicators' correspondent to subscales items. *** = p ≤ 0.001.

Fig. 1. Structural equation model tested.

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Funding: This study was conducted at the Psychology Research Centre (CIPsi/UM) School of Psychology, University of Minho, supported by the Foundation for Science and Technology (FCT) through the Portuguese State Budget (UIDB/01662/2020), and by a grant to Sílvia Félix (2020.07384.BD). The funding body had no role in the design, collection, analysis, and interpretation of the data nor in the writing of the abstract or the decision to submit it for the present congress.

GC2.108

Unveiling Predictive Factors and a Sustainable Healthy Diet for Long-Term Reduction in Waist Circumference in a Large Longitudinal Study

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Abdominal obesity is a predominant risk factor for various metabolic disorders and results from a complex interplay of genetic and environmental factors. We aimed to comprehensively investigate the genetic, biochemical, and environmental factors associated with sustained reductions in abdominal obesity over five years. The study also sought to develop and validate a predictive waist circumference (WC) reduction model using machine learning (ML) techniques. The investigation involved initial and 5-year follow-up assessments of demographic, anthropometric, biochemical, and dietary factors in a city-hospital-based cohort (n = 50,331). Food intake over the previous year was assessed using a validated semi-quantitative food frequency questionnaire (SQFFQ). The Korean Healthy Eating Index (KHEI), dietary patterns, and glycemic index were calculated from the SQFFQ data. Genetic factors were calculated using the polygenic risk scores (PRS) for abdominal obesity. Novel biomarkers influencing WC were identified using ML approaches. Reduction in WC exhibited an inverse association with the risk of metabolic syndrome and its components. Genetic factors did not affect WC significantly. Daily energy intake did not differ between those with and without WC reduction. However, KHEI, which represents diet quality, demonstrated a positive association with WC reduction. Among various dietary patterns, the Korean-balanced diet(KBD) was positively associated with decreased WC, but an inverse association was observed with the Western-style diet and rice-main diet. However, the PRS for abdominal obesity did not significantly impact the decrease in WC. The area under the receiver operating characteristic curve in the prediction models ranged from 0.793 to 0.866. The biomarkers in the models were associated with the components of metabolic syndrome, dietary patterns, alcohol consumption, and smoking status, but not PRS. In conclusion, adopting a high-quality diet, including KBD, leads to a sustainable decrease in WC, irrespective of genetic influences. These results could be applied to develop effective strategies for preventing and managing abdominal obesity.

GC2.109

Impact of Neotame or Stevia Rebaudioside M vs sucrose-sweetened biscuits on postprandial appetite, endocrine response and food reward in adults with overweight/obesity – a randomised crossover trial from the SWEET Project

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Introduction: Sweeteners and sweetness enhancers (S&SE) are used to replace caloric sugars and maintain sweet taste in a wide range of products, but little is known about their underlying effects on appetite, endocrine responses or subsequent food reward in reformulated solid foods.
Method: In this double-blind, multi-site, randomised crossover trial, 53 healthy adults (33 female, 20 male) with overweight/obesity in England and France consumed biscuits with fruit filling containing 1) sucrose, or reformulated with either 2) Stevia Rebaudioside M (StRebM) or 3) Neotame daily during three, two-week intervention periods with a two-week washout. The primary outcome was composite appetite score. Secondary outcomes included postprandial endocrine responses (glucose, insulin, ghrelin, glucagon-like peptide-1 (GLP-1), pancreatic polypeptide (PP)) and food reward (explicit liking and implicit wanting for fat or sweet tasting food) measurements.
Results: Each formulation elicited an equivalent acute reduction in a combined appetite score (3-hour postprandial net iAUC). Postprandial insulin (2-hour iAUC) was lower after Neotame (95% CI (0.093, 0.166); $p < 0.001$; $d = -0.71$) and StRebM (95% CI (0.133, 0.205); $p < 0.001$; $d = -1.01$) compared to sucrose, and glucose was lower after StRebM (95% CI (0.023, 0.171); $p < 0.05$; $d = -0.39$) but not after Neotame (95% CI (-0.007, 0.145); $p = 0.074$; $d = -0.25$) compared to sucrose. There were no differences between S&SE or sucrose formulations on ghrelinGLP-1 or PP iAUCs. The biscuit formulations were similarly liked after one bite vs consumption of a full portion (3 biscuits). There were no pre- to post-intake differences in either explicit liking or implicit wanting for high fat relative to low fat or sweet relative to savoury foods.
Conclusion: Biscuits reformulated to replace sugar with StRebM or Neotame produce similar effects on appetite and endocrine responses, acutely and after two weeks' exposure, but clinically reduced postprandial insulin and glucose responses in adults with overweight or obesity.

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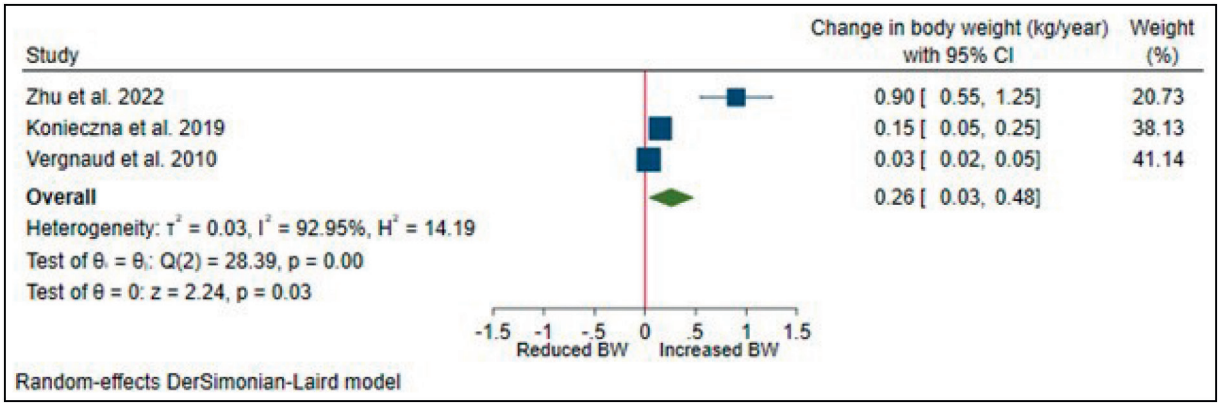
Processed meat intake and changes in weight and waist: Systematic literature review, meta-analysis, and GRADE assessment of cohort studies of adults

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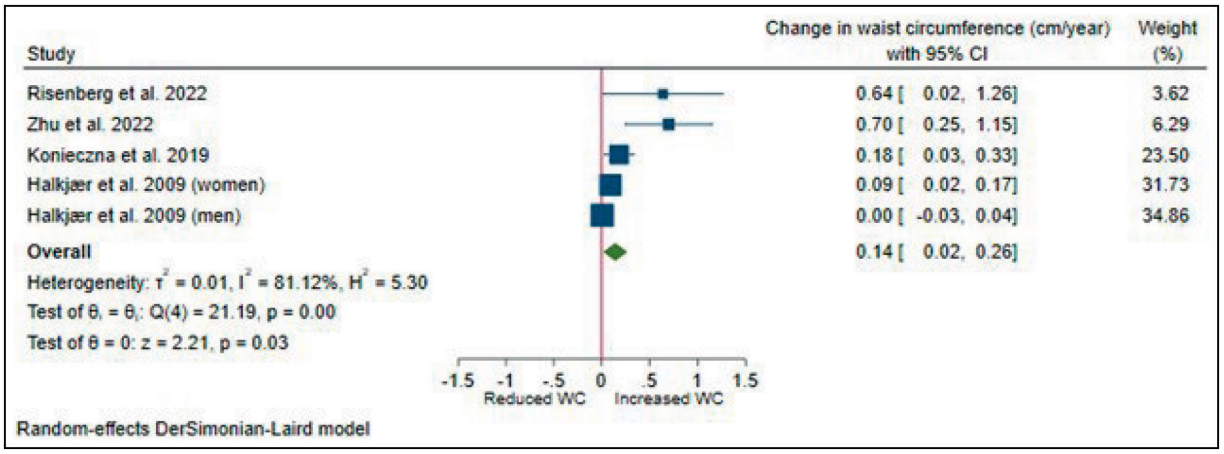
Objective: to estimate the association between processed meat intake (including studies specifically mentioning "processed meat" and/or listing processed meat items (bacon, ham, sausages, luncheon meats, etc.) and subsequent change in weight and waist circumference among adults by summarizing evidence of cohort studies.

Background: Previous reviews indicate that abstaining from processed meat may play a part in weight management, however the certainty in these results have not been assessed systematically.
Methods: A systematic literature search was performed in Embase and Medline via Ovid (including the Cochrane Database of Systematic Reviews) from inception to May 2022. Cohort studies were considered relevant if they reported the associations of interest. The certainty in the estimates was assessed by the GRADE (Grading of Recommendations, Assessment, Development, and Evaluations), and risk of bias was assessed using ROBINS-I.
Results: The search resulted in a total of 2,424 potential records, of which 11 cohort studies (6 unique studies) were eligible for inclusion. Three studies (n=381,291) were included in the random effect model of body weight resulting in a summary increase of 0.26 kg/year per 1 daily serving of processed meat (95% CI: 0.03, 0.48; τ2: 0.03; I2: 92.95 %). Four studies (n=51,310) were included in the random effect model of waist circumference resulting in a summary increase of 0.14 cm/year per 1 daily serving of processed meat (95% CI: 0.02, 0.26; τ2: 0.01; I2: 81.12 %). In both outcomes there was low certainty in the estimate, due to serious risk of bias.
Conclusion: the analyses suggested a very weak association between increased processed meat intake and subsequent increase in weight and larger waist circumference. However due to methodological limitations the certainty of these results is low, and cautious interpretation of the results is warranted.



Forest plot of change in body weight (kg/year) per 1 serving (50 g) of processed meat (n=381,291). All studies included in the meta-analysis reported models that were adjusted for age, sex (or stratified by sex), smoking and physical activity.

Fig. 1.



Forest plot of change in waist circumference (cm/year) per 1 serving (50 g) of processed meat (n=51,310). All studies included in the meta-analysis reported models that were adjusted for age, sex (or stratified by sex), smoking and physical activity.

Fig. 2.

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GC2.111

Meeting UK dietary recommendations: a service evaluation of Slimming World member intakes

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Introduction: As well as encouraging weight loss, it is important weight management programmes enable service users to establish healthier eating behaviours to support optimal health and long-term weight loss maintenance. For example, it is important to ensure adequate protein intake to minimise loss of lean mass. Previous research found members were meeting UK dietary recommendations (Coe et al, 2019). This research evaluates, on a larger scale, nutrient intakes of Slimming World members and compares to UK dietary recommendations.

Methods: Adults accessing Slimming World's group support programme or digital service for >4 weeks were invited to complete a short survey and report their food intake over 3 days (2 weekdays and 1 weekend day) using myfood24, a validated online dietary assessment tool. Dietary intakes were compared against UK dietary recommendations and mean general population intakes, as reported in the National Diet and Nutrition Survey (Public Health England, 2020).

Results: 707 members (96.6% female) completed the survey and 3 days of food diaries. Mean age was 53.0±11.2 years. Mean daily energy intake was 1361±350.7kcal.

Mean percentage of daily energy obtained from carbohydrates, protein and fat were 47.3±8.0%, 26.7±5.1%, and 25.1±6.0% respectively.

Compared to the UK general population, members were consuming a lower proportion of energy from fat (25.1% vs 34.1%) and saturated fat (8.8% vs 12.3%). Intakes were in line with UK recommendations of <35.0% and <11.0% of total daily energy respectively.

Members were consuming a greater proportion of total daily energy from protein than the general population (26.7% vs 17.0%). Mean protein intake was 89.4±25.5g/day, higher than general population intakes of 76.0g/day.

Members' mean fruit and vegetable was 8.0±4.2 portions/day, with 75.5% meeting the '5 a day' recommendation, compared to 33.0% of the general population.

Mean fibre intake was 25.6±9.9g/day, higher than general population intakes of 19.7g/day.

Mean salt intake was 5.0±2.0g/day, in line with UK recommendations of <6g/day and lower than general population intakes (8.4g/day).

Conclusion: This analysis of dietary intakes found that despite a reduced energy intake, members are consuming a diet in line with current UK dietary recommendations and of better nutritional quality than the UK population. Adequate protein intake is essential to minimise the loss of lean mass while in an energy deficit, required for weight loss, and these findings suggest that members' mean protein intake was sufficient.

These results reaffirm and build on previous research that Slimming World members are supported to eat a healthy, balanced diet while managing their weight.

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GC2.112

The relation of emotional state and appetite traits across sex, age and professional specialty groups among college students

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Introduction: A person's appetite traits have an impact on their overall well-being. Literature suggests that further factors should be investigated in order to promote best health practices. This study aimed to detect the relationship between stress, anxiety, Body Mass Index (BMI), and appetite traits and to determine differences across sex, age, and professional specialty.

Methods: A cross-sectional design was employed. A total of 224 college students of health-allied and non-health-allied professional specialties participated in the study. Data collection was held through the self-reported Adult Eating Behaviour Questionnaire (AEBQ), measuring eight appetite traits (four regarding food approach and four regarding food avoidance), and the self-reported Depression, Anxiety, and Stress Scale (DASS-21). Also, participants reported their weight, height, sex, and age. Independent Samples T-test and Mann-Whitney test were run to detect differences in BMI, appetite traits, and emotional states between groups. Pearson correlation was conducted to explore relationships among continuous variables. Regression analysis was held to detect significant predictors of appetite traits. All analyses were held with SPSS v26.

Results: Most of the participants, 61.6% (n=138) identified themselves as female and 50% stated they were studying in a health allied professional specialty. Approximately 54.4% indicated having a healthy weight. The mean age was 21.94 years (SD=3.18). Analyses demonstrated statistically significant differences between sex and age groups only on BMI ($p<0.01$), while professional specialties had a significant effect on BMI ($p=0.012$) and appetite traits ($p<0.05$ in 6 of 8 AEBQ subscales), but not on emotional states. Anxiety and Stress were related to various appetite traits and BMI. Regression analysis indicated that stress levels can significantly predict food avoidance traits ($p<0.01$) and anxiety levels can significantly predict food approach traits ($p=0.007$) after controlling for studying specialty and BMI effects.

Conclusion: The study supports prior research evidence suggesting a relationship among BMI, eating behaviour, and emotional states, and highlighting the role of anxiety and stress in specific appetite traits. These findings provide health professionals with valuable insights to improve patient care, develop tailored interventions, and advance their overall understanding of these complex interactions in the realm of healthcare. Further research is still recommended.

GC2.113

Evaluation of Body Mass Index, Hand Grip Strength and Some Other Anthropometric Measurements in Adult Celiac Patients: Example of Istanbul, Turkiye

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Introduction: While a gluten-free diet may be effective for body weight loss in individuals without celiac disease, a gluten-free diet in patients with celiac disease may cause body weight gain by improving the intestinal mucosa and increasing absorption. However, conflicting results of the gluten-free diet on anthropometric indicators such as weight, body mass index, and body fat percentage have been recorded in the literature. On the other hand, it is known that malnutrition causes muscle loss in celiac patients. The earliest malnutrition occurs in muscle cells and muscle cell functions are affected. Therefore, measuring muscle strength is a sensitive method for assessing nutritional status. In this context, determining hand grip strength is a simple, quick and easy to apply, inexpensive and effective method used to determine nutritional status. In this context, this

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study aimed to evaluate the hand grip strength and other anthropometric measurements of adult celiac individuals according to gender and body mass index.

Methods: This study was conducted with volunteer individuals aged 18-65, who were members of the European Side Celiac Association in Istanbul and diagnosed with "Celiac Disease". As a result of power analysis, the sample size was calculated as at least 270 people for a 5% type 1 error level and 95% power for the dependent groups t test. The study protocol was carried out in accordance with the guidelines set by the Declaration of Helsinki and was found ethically appropriate by the Haliç University Non-Interventional Clinical Research ethics committee at its meeting dated 24.04.2023. The data collection form and anthropometric measurements applied in the study were taken by face-to-face interview method.

Results: The average age of 270 individuals with celiac disease was 30.74±9.99. In this study, the majority of which were women, the average body mass index of the individuals was 22.10±3.70. A moderate positive relationship was determined between the patients' BMI and age, a high positive relationship with MUAC, and a very low positive relationship between body fat and body muscle mass. A weak, statistically significant positive relationship was found between the age of the patients and MUAC. A very high, statistically significant relationship was found between the patients' right and left hand grip strengths.

Conclusion: There was no difference in body mass index (kg/m^2) according to gender. It was determined that the MUAC average and body muscle mass percentage were higher in men, and the body fat percentage was higher in women. A relationship was determined between the patients' BMI and age, MUAC, body fat and body muscle mass.

Tabs.

Tablo 1. General characteristics of the patients

	Total $\bar{x}$ ± SD or N(%)	Female, $\bar{x}$ ± SD or N(%)	Male, $\bar{x}$ ± SD or N(%)
N	270	202(74.8)	68(25.2)
Age	30.74±9.99	31.27±9.97	29.16±9.95
Body mass index (kg/m^2)	22.10±3.70	21.86±3.66	22.81±3.74
Body mass index (kg/m^2) Participants with underweight	47(17.4)	40(19.8)	7(10.3)
Participants with normal weight	163(60.4)	121(59.9)	42(61.8)
Participants with overweight	60(22.2)	41(20.3)	19(27.9)
Body weight (kg)	62.21±13.10	58.40±10.49	73.56±13.57
Body height (cm)	167.62±9.95	163.63±6.68	179.49±8.54
Mid-upper arm circumference (cm)	29.61±6.51	27.54±5.78	35.76±4.33
Body fat (kg/%)	13.99±6.45	14.48±6.40	12.51±6.42
Body muscle mass (kg/%)	24.85±7.34	23.86±6.78	27.77±8.17
Left arm hand grip strength (kg)	24.11±6.23	24.44±6.55	23.13±5.10
Right arm hand grip strength (kg)	28.16±8.40	28.68±8.87	26.59±6.63

Table 2. Patients' views on gluten-free diet	
Are you on a gluten-free diet?	
Yes	204(75.6)
No	20(7.4)
Sometimes	46(17.0)
Do you get dietary counseling?	
Yes	67(24.8)
No	203(75.2)
What do you dislike most about gluten-free products?	
Taste	109(40.4)
Smell	32(11.9)
Structure	94(34.8)
Other	35(13.0)

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Can you easily access gluten-free products?	
No	115(42.6)
Yes	136(50.4)
Sometimes	19(7.0)

Table 3. The correlation status between the patients' anthropometric measurement values (n=270)

		Body height	BMI	Age	MUAC	BF	BMM	Right HGS	Left HGS
Body Weight	r	0.517**	0.775**	0.317**	0.844**	0.112	0.283**	-0.011	-0.016
	p	**0.001**	**0.001**	**0.001**	**0.001**	0.067	**0.001**	0.858	0.795
Body height	r		-0.043	-0.196**	0.319**	-0.133*	0.147*	-0.026	0.003
	p		0.484	**0.001**	**0.001**	**0.029**	**0.016**	0.669	0.966
BMI	r			0.523**	0.792**	0.243	0.227**	0.028	0.016
	p			**0.001**	**0.001**	**0.001**	**0.001**	0.650	0.794
Age	r				0.316**	0.088	0.064	-0.002	0.007
	p				**0.001**	0.149	0.298	0.976	0.910
MUAC	r					0.072	0.279**	0.017	0.009
	p					0.238	**0.001**	0.777	0.889
BF	r						0.082	-0.050	-0.067
	p						0.180	0.409	0.274
BMM	r							0.078	0.093
	p							0.201	0.129
Right HGS	r								0.945**
	p								**0.001**

Spearman test. **p<0.01, *p<0.05 Abbreviation: r=Correlation Coefficient, BMI=Body Mass Index, MUAC=Mid Upper Arm Circumference, Body fat (kg/%)=BF, Body muscle mass (kg/%)= BMM, Right HGS= Right Hand Grip Strength, Left HGS= Left Hand Grip Strength

GC2.114

Determination of obesity-related nutrition habits of university students according to cigarette addiction level

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Introduction: Cigarette consumption, which is one of the most important causes of early death, has many negative effects on human health, especially cardiovascular diseases, respiratory system diseases and cancer. In line with the studies in the literature, it is seen that smoking also affects the eating habits of individuals. This study aimed to determine the obesity-related eating habits of students according to their cigarette addiction level. In addition, obesity-related eating habits were determined according to their smoking/non-smoking status, and students' compliance with the Mediterranean diet was evaluated according to their smoking/non-smoking status and eating habits.

Methods: This study was conducted with 370 volunteer students studying at Haliç University, aged 17 and over, smoking or non-smoking, and without any chronic disease.MEDAS, 3-Factor Eating Behavior Scale, Fagerstron Nicotine Dependency Test were applied to the students who agreed to participate in the study. Three-Factor Nutrition Questionnaire examines uncontrolled eating behavior; emotional eating behavior and restrictive eating behavior. Fagerström Nicotine Dependency Test consists of six questions and examines three groups as low, medium, and high. MEDAS score is evaluated as low compliance, medium compliance and high compliance. SPSS Statistics 25.0 was used to evaluate the data obtained. In all statistical analyses, the confidence interval was evaluated at 95% and the significance level was $p<0.05$ or $p<0.01$.

Results: This study was conducted with 370 university students and the average age of the participants was 21.24± 1.73; The average BMI is 22.17± 3.69. While the students' average MEDAS score was 7.20± 2.34, their emotional eating score average, one of the subheadings of the Three-Factor Eating Questionnaire used to evaluate obesity-related eating habits, was 7.91± 3.57; The mean score of restrictive eating was 17.21±3.40 and the mean score of uncontrolled eating was 11.9±2.07. It was determined that 55.7% of the participants did not smoke, and according to the Fagerström Nicotine Dependency Test, 20.8% were low-level, 14.8% moderate-level and 9.2% were high-level nicotine dependent. A weak negative relationship was found between the participants' body weights and emotional eating scores. A weak negative relationship was found between the participants' BMI levels and emotional eating score, and a very weak negative relationship was found between the restrictive eating behavior score. A very weak negative correlation was found between people's MEDAS scores and uncontrolled eating scores.

Conclusion: This study revealed that emotional and restrictive eating behaviors may be related to students' body mass index. In addition, this study determined that uncontrolled eating behaviors may have an impact on students' compliance with the Mediterranean diet. University students have the potential to make informed choices and the motivation for a healthy lifestyle. Therefore, if college students are supported in eating healthy, non-smoking and adapting to the Mediterranean diet, they may be more inclined to adopt a healthier lifestyle.

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Tab. 1.

Table 1. General information of university students(n=370)

Categories	Sub-Categories	n (%)
Gender	Male	92 (%24.9)
	Female	278 (%75.1)
Smoking Status	Non-smoker individuals	206 (%55.7)
	Individuals with low nicotine addiction	77 (%20.8)
	Individuals with medium nicotine addiction	53 (%14.3)
	Individuals with high nicotine addiction	34 (%9.2)
Body Mass Index Status	Individuals with underweight	49 (%13.2)
	Individuals with normal weight	262 (%70.8)
	Individuals with overweight	46 (%12.4)
	Individuals with obesity	13 (%3.5)
Medas Score	Low (0- 5)	85 (%23)
	Medium (6-9)	234 (63.2)
	High (10+)	51 (13.8)

Tab. 2.

Table 2. MEDAS and 3-Factor Eating Questionnaire average scores according to cigarette addiction levels

All Individuals (n=370)		Mean ± Std. Deviation
Age		21.24± 1.73
MEDAS Score		7.20± 2.34
Body Mass Index (BMI)		22.17± 3.69
emotional eating point		7.91± 3.57
restrictive eating point		17.21±3.40
uncontrolled eating point		11.9± 2.07
Subcategory: Cigarette Addiction		**Mean ± Std. Deviation**
İndividuals with low nicotine addiction(n=77)	emotional eating point	8,08±2,53
	uncontrolled eating point	12,14±2,05
	restrictive eating point	17,17±2,72
	BMI	21,67±3,72
	MEDAS Score	7,36±2,51
İndividuals with medium nicotine addiction(n=53)	emotional eating point	7,6±3,3
	uncontrolled eating point	11,53±1,8
	restrictive eating point	16,53±2,25
	BMI	22,4±3,34
	MEDAS Score	7,53±2,17
İndividuals with high nicotine addiction(n=34)	emotional eating point	7,03±2,63
	uncontrolled eating point	11,65±2,96
	restrictive eating point	15,68±4,46
	BMI	22,03±3,48
	MEDAS Score	7,12±3,09
non smoker (n=206)	emotional eating point	8,09±4,07
	uncontrolled eating point	12,08±1,96
	restrictive eating point	17,67±3,59
	BMI	22,33±3,79
	MEDAS Score	7,08±2,19

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Tab. 3.

Table 3. Correlation coefficients and p values between individual's test scores and general knowledge

		weight (kg)	height (cm)	Body Mass Index (BMI)	MEDAS Score	emotional eating point	uncontrolled eating point	restrictive eating point
Age (year)	r	-0.022	0.012	-0.033	0.015	0.090	0.159**	-0.085
	p	0.668	0.819	0.521	0.775	0.082	**0.002**	0.101
weight (kg)	r		0.638**	0.862**	-0.027	-0.226	-0.133	-0.132
	p		**0.001**	**0.001**	0.607	**0.001**	0.011	0.011
height (cm)	r			0.197	0.002	-0.017	-0.106	-0.063
	p			**0.001**	0.975	0.751	0.041	0.226
Body Mass Index (BMI)	r				-0.016	-0.275	-0.110	-0.135
	p				0.764	**0.001**	0.034	**0.009**
MEDAS Score	r					-0.076	-0.134*	0.093
	p					0.146	**0.010**	0.075
emotional eating point	r						0.309	0.210
	p						**0.001**	**0.001**
uncontrolled eating point	r							0.175
	p							0.001

**p< 0.01, *p< 0.05 level

GC2.115

Validity of the PortionSize™ and MyFitnessPal© smartphone apps in semi-free-living conditions: Implications for app development

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Introduction: PortionSize™ is a new smartphone app to track food intake that relies on food photography, augmented reality, and templates representing different portion sizes to facilitate users' food intake estimates. MyFitnessPal© is a commercial app that tracks food intake based on user's estimates of portion size or by scanning barcodes on packaged foods. Both apps provide real time feedback about food intake. PortionSize also provides feedback on intake of MyPlate food groups (e.g., intake of fruits). The validity of both apps was examined in semi-free-living conditions with food provision.

Methods: Adult participants were provided with a cooler each day that contained prepared and pre-weighed foods with about 30% more energy than estimated energy requirements. Participants were asked to eat only food from the cooler, and the cooler was returned the next day, allowing researchers to weigh leftovers and calculate energy intake. In a within-subjects randomized counterbalanced design, participants used PortionSize during one three-day period and MyFitnessPal during the other three-day period. The periods were separated by about one week. Before each period, participants were trained how to use the respective app. Participants completed satisfaction surveys after using each app. Two one-sided t-tests, with equivalence bounds of ±21%, were used to test for equivalence between mean energy intake estimated with the apps compared to directly weighed foods (i.e., weigh back).

Results: 45 participants were enrolled, 1 dropped out, and 2 participants' data were not analyzed due to data quality issues. The analysis sample (n=42) was majority female (52.4%) and White (81%), with similar representation of people with normal weight, overweight, and obesity. Mean (SD) age, weight, and body mass index were 43.2 (10.3) years, 83.2 (22.7) kg, and 28.6 (6.9) kg/m^2, respectively. PortionSize underestimated energy (kcal) intake by 20.1% compared to weigh back [1602 (634) vs. 2005 (704) kcal, respectively]. MyFitnessPal underestimated energy intake by 1.0% compared to weigh back [2045 (631) vs. 2066 (646) kcal, respectively]. MyFitnessPal ($p<0.001$) but not PortionSize ($p=0.44$) was equivalent to weigh back. User satisfaction ratings were higher for MyFitnessPal vs. PortionSize.

Conclusion: In semi-free-living conditions, MyFitnessPal, but not PortionSize, accurately estimated energy intake. MyFitnessPal is a refined commercial app that is easy to use, and it included a barcode scanner that automatically determined energy intake for some foods. PortionSize is in development, is not as refined or user-friendly as MyFitnessPal, and relies on novel but more burdensome methods for portion size estimation. Indeed, user satisfaction ratings were better for MyFitnessPal vs. PortionSize, and we found in a previous study that more burdensome apps are less preferred. The MyFitnessPal results suggest that more robust validation studies are warranted, particularly since earlier validation studies found disparate support for the validity of self-report methods. Conversely, PortionSize requires refinement and perhaps changes to its portion size estimation methods.

GC2.116

A decrease in ultra processed food intake is associated with improvements in metabolic parameters during a combined lifestyle intervention

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Introduction: Ultra-processed foods (UPF) are products that have undergone an industrial formulation process, contain cosmetic additives and contain little if any whole foods. A higher intake of UPF is associated with obesity and related elevated metabolic parameters such as glucose and insulin levels. The existing literature is limited but seems to indicate favorable changes in glucose and insulin levels after reducing UPF intake. These effects haven't been studies yet in combined lifestyle interventions or studies with a longer follow-up period. Therefore, this study aims to investigate the relation between UPF intake and metabolic parameters in people living with obesity following a 1.5 years combined lifestyle intervention.

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Methods: Data of 64 patients with obesity (≥30kg/m^2) participating in a combined lifestyle intervention with cognitive behavioral therapy at the Obesity Centre CGG, Rotterdam, The Netherlands was collected at start and end of the program (1.5 years later). Food intake was obtained by 24-h food records and classifying the food items into one of the four NOVA categories, ranging from unprocessed food (NOVA1) to ultra processed food (NOVA4). Then, the percentage of energy consumed from the UPF category compared to the total energy consumed was calculated. Body weight (kg) and waist circumference (cm) were measured at the outpatient clinic and fasted blood samples were drawn to measure glucose and insulin levels. Lineair regressions were performed to explore associations between changes in UPF intake and changes in the metabolic parameters, corrected for age and sex.
Results: UPF intake decreased from 59.6% at baseline to 53.2% at the end of the program (p=0.001), while an increase of 7.1% in the unprocessed food category was observed (p<0.001). A decrease in UPF was not associated with changes in weight or waist circumference (respectively β = 0.24, 95% CI = -0.02 to 0.21 and β = 0.06, 95% CI = -0.12 to 0.17). However, changes in fasting glucose and insulin levels showed a positive association with changes in UPF intake (respectively β = 0.264, 95% CI = 0.00 – 0.02 and β = 0.30, 95% CI 0.10 to 2.67).
Conclusion: This study shows that a lower intake of ultra processed food is associated with a decrease in fasting glucose and insulin levels in patients living with obesity following a combined lifestyle intervention. Although no association was found between a lower UPF intake and changes in body weight or waist circumference, it would still be interesting to explore the relationship between UPF and body composition to assess whether there are differences in fat mass or fat-free mass.

GC2.117

Comparison of parental feeding practices in school-aged children with autism spectrum disorder and neurotypical ones: a pilot study

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Introduction: Parental feeding practices seem to be a major factor in shaping children's eating habits (Scaglioni et al., 2008). Parents of children with Autism Spectrum Disorder (ASD) face several challenges in feeding their children (Kral et al., 2015). There is limited data on whether their feeding practices differ from those of parents of neurotypically developing children. Thus, aim of the present study was to compare the feeding practices of parents with school-aged children having ASD and those of neurotypical ones.
Methods: Twenty-four school-aged children with normal Body Mass Index (BMI) and ASD were matched for sex and age to 24 children without ASD. Cole's cut-off points for BMI for overweight and obesity by sex for children and adolescents were used to assess the weight status of the children. Children's height, weight, age, and diagnosis of ASD were obtained from parents, through a relevant questionnaire. Parents of all children completed, also, the Comprehensive Parental Feeding Questionnaire (CPFQ), a validated tool that assesses 6 parental feeding practices: "monitoring" (score 0-16), "child control" (score 0-20), "emotion regulation/ food as reward" (score 0-24), "pressure to eat" (score 0-12), "restriction" (score 0-40), and "healthy eating guidance" (score 0-56) (Michou et al., 2019). The normality of the variables was tested using the Kolmogorov-Smirnov test. All hypotheses were tested at a 5% significance value. All analyses were performed using SPSS v.29.0.
Results: The two groups did not differ in age (p = 0.969) and BMI (p = 0.182). Between-group analyses showed that no statistically significant differences were present for monitoring (p = 0.804), use of food as a reward (p = 0.534), pressure to eat (p = 0.395), restriction (p = 0.515), and healthy eating guidance (p = 0.428). The two groups differed only on child control practices, with parents of children with ASD scoring higher than parents of neurotypical ones (11.3 ± 4.2 vs. 8.9 ± 2.7, p = 0.024). Further analysis revealed that of all parameters assessed under the umbrella of 'child control' feeding practice, a statistically significant between-groups difference was found only for "allowing children to leave the table when they are full, even if other family members are still eating" (p = 0.006).
Conclusion: Feeding practices for school-aged children with normal BMI seem to not differ between parents of children with and those without ASD. Further research is warranted to verify the findings in larger scale studies, in other body weight status populations, and to explore causal relationships.

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GC2.118

Dietary Pattern, Mood and Ultra-Processed Food Consumption

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Introduction: Increased ultra-processed food (UPF) consumption has been shown to decrease dietary quality (1) and has been associated with mood in recent years (2,3). In this abstract, we aimed to show UPF consumptions according to dietary pattern and mood groups.
Methods: A total of 595 university students (67.2% female) aged 19-25 years participated in this study. Data were collected through a questionnaire form. Dietary pattern and mood were assessed using the food-mood scale, and data on UPF consumption were collected using a food consumption frequency form based on the NOVA classification. UPF consumption was represented as proportion of total energy. Data were tested by ANOVA using SPSS 21 statistical package program.
Results: For the "healthy pattern" of the food-mood scale, UPF consumption were high those with low exercisers than moderate and high exercisers, low and moderate consumers of whole grain products than high consumers, low and moderate consumers of dark green leafy vegetables than high consumers, and low and moderate consumers of legumes than high consumers (p<0.05). For the "breakfast pattern", UPF consumption were high those with low and moderate consumption of milk and dairy products than high consumption, those with low and moderate consumption of fruits than high consumption, and those with low and moderate consumption of nuts than high consumption (p<0.05). For the "Western pattern", UPF consumption were high those with low and moderate consumption of rice and/or pasta than high consumption; those with low and moderate consumption of meat, chicken or turkey than high consumption; those with high consumption of fast-food and/or ready-to-eat foods than low and moderate consumption; and those with high consumption of sugary foods than low and moderate consumption (p<0.05). For the "supplement pattern", UPF consumption were high those with low vitamin or mineral supplement users than those with high users. UPF intakes were significantly different in those with low (37.7±13.77%), moderate (42.9±13.26%) and high (45.6±14.65%) mental distress (p<0.001).
Conclusion: In the healthier dietary pattern lower UPF consumption were observed. Individuals with high mental distress were found to have higher UPF consumption. Strategies to reduce UPF consumption need to be developed.

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GC2.119

Validity and reliability of Turkish version of the SEES

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Introduction: Emotional eating is the tendency to eat in response to emotions. The fundamental concepts of emotional eating, its possible mechanisms, and developments in research in this area require the development of psychometric scales. The Salzburg Emotional Eating Scale (SEES) is important in that it includes positive and negative emotions, as well as indicating the change in the amount of eating. This study aims to establish the Turkish validity and reliability of SEES.
Methods: The study began with obtaining permission for Turkish validation and reliability testing of SEES. Translation and back-translation involved expert panels, ensuring linguistic accuracy and cultural relevance. An initial sample of 38 individuals assessed the Turkish version's appropriateness. Feedback was incorporated after consultation with the scale's developers. The main study involved participants from Namık Kemal University, adhering to strict inclusion/exclusion criteria. Ethical approval was secured from the university's ethics board. Data collection occurred between March and May of the 2020-2021 academic year, using an online platform with Google Forms. Initial responses from 416 individuals were received, with 113 excluded for not meeting criteria or participating multiple times. The data of 303 individuals were utilized for the initial study phase. For test-retest reliability, the scale was reapplied to 30 participants from the initial phase. Demographic information was gathered using a researcher-created form, and participants completed the "SEES" and the Emotional Eating subscale of the Dutch Eating Behaviour Scale. Statistical analyses, including reliability, and validity were conducted using IBM SPSS 22 and AMOS 24, employing a significance level of $p < 0.05$.
Results: The language and content validity score of the scale (content validity index score) is > 0.83. The scale has four subscales as a result of explanatory factor analysis. The four subscales of the scale explain 79.06 % of the total variance. The factor loads of the scale items ranged from 0.393 to 0.931. Results from the confirmatory factor analysis using the Bootstrap method show that $\chi 2/sd$, CFI, RMSEA values are respectively 2.468; 0.967; 0.074. The CFI value of 0.96 suggests that this model moderately fits the data. Cronbach α and McDonald's Omega internal consistency coefficients are between 0.913 and 0.943. The correlation coefficients obtained for the subscales in the invariance analysis have been between 0.490 and 0.825. In parallel form analysis, a significant correlation is found between the sadness, anger, anxiety subscales of SEES and DEBQ emotional eating subscale.
Conclusion: In conclusion, this study affirms that the SEES can be considered a valid and reliable instrument in the Turkish language. It is anticipated that its application will contribute meaningfully to research areas associated with emotional eating in Turkiye.

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GC2.120

Differences in parental feeding practices between adolescents with and without autism spectrum disorders: a pilot study

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Introduction: Feeding is more demanding for youngs with Autism Spectrum Disorders (ASD) compared to their counterparts. The present analysis aimed to explore differences in parental feeding practices between adolescents with and without ASD.
Methods: Nine normal-weighted adolescents were matched for age, sex, and body mass index (BMI), with nine neurotypical ones. The parents of all adolescents completed questions on demographic and anthropometric parameters regarding themselves and their children, as well as the validated Comprehensive Parental Feeding Questionnaire (CPFQ). This tool assesses 6 parental feeding practices: "monitoring" (score 0-16), "child control" (score 0-20), "emotion regulation/food as a reward" (score 0-24), "pressure to eat" (score 0-12), "restriction" (score 0-40), and "healthy eating guidance" (score 0-56). The normal distribution of variables was tested with Kolmogorov–Smirnov test. All hypotheses were tested at a 5% significance level. The analysis was performed on SPSS v.29.0.
Results: Between-group analysis showed that parents of adolescents with ASD performed less control over their child's eating (10.1 ± 1.5 vs. 12.6 ± 2.7, p=0.027) and more restriction (23.9 ± 7.6 vs 14.7 ± 10.0, p=0.043) compared to those of neurotypical ones. Further analysis showed that parents of adolescents with ASD seem to provide smaller meal portions (p=0.040) and restrict the amount of food in the following meal in case their child has eaten more than usual at a specific eating course, more often than parents of their neurotypical counterparts (p=0.008).
Conclusion: Primary findings showed that parents of normal-weight adolescents with ASD exercised less control and more restraint over their child's eating compared to parents of adolescents without ASD.

GC2.121

Adherence to a dietary risk score and hypertension risk among adults in Nigeria

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Introduction: Poor diet is a major modifiable contributor to hypertension in West African countries 1. This study aimed to develop a dietary screening tool for clinical practice that can (i) rapidly and accurately identify people at elevated risk of hypertension and (ii) guide clinicians towards effective personalised dietary advice.
Methods: After constructing and validating a brief 23-item food frequency questionnaire (FFQ) for clinical practice in Nigeria and receiving favourable feedback from people and clinicians 2, the FFQ was administered to 151 men and women in Rivers State University Teaching Hospital, Port Harcourt, Nigeria to construct the Nigerian diet risk score for hypertension (NiDRS) through the use of multiple logistic regression models and internal validation using measures of discrimination and calibration to facilitate its use in a clinical setting. Finally, mediation analysis was used to explore biomarkers' roles in the NiDRS-hypertension relationship in a subsample of the population (n=94).
Results: Each incremental increase in the overall NiDRS was associated with a 2-fold increase in odds of overall hypertension (OR: 2.04, 95%CI: 1.16, 1.3.58, p=0.01), with the highest score category associated with >18-food increased odds of hypertension, compared to lowest NiDRS (OR: 18.27, 95%CI: 1.33, 251.21, p=0.030). The NiDRS demonstrated good discrimination with an AUC of 0.91% and a Brier score of 0.10 with a high sensitivity (0.85) and specificity (0.94) and a positive net benefit. In addition, via mediation analysis, we report that total cholesterol (50%), triglycerides (47%), LDL-c (49%), VLDL-c (17%), CRP (68%), and homocysteine (71%) mediate the effect of NiDRS on hypertension in a positive direction.

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Conclusion: The NiDRS is a valuable tool for clinicians to identify individuals at risk of hypertension and discuss dietary prevention strategies to address the rising prevention of hypertension and its associated complications in Nigeria.

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Conflict of Interest: None Disclosed

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GC2.122

Ultraprocessed food intake and eating behaviour in bariatric surgery candidates

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Introduction: One of the main drivers of the obesity epidemic is the obesogenic food environment, which promotes the consumption of highly palatable and energy-dense foods that can be eaten to satisfy physiological hunger and also for their hedonic or rewarding effects.
Highly palatable foods include ultra-processed foods (UPFs) which are able to interfere with satiety signals and their satisfying nature can cause real addiction and reward resulting in an increase in overall food intake wich in turn can produce an energy surplus and increase the risk of overeating and obesity.
Methods: The aim of this study was to assess Mediterranean Diet (MD) adherence and UPFs consumption in relation to eating behaviour (EB) in people living with obesity before bariatric surgery.
175 participants (114 F) with Body Mass Index (BMI) ≥ 35 kg/m^2, attending at Outpatients Clinic of the I.P. "Diet Therapy in transplantation, renal failure and chronic pathology", University of Naples Federico II, were recruited.
At baseline (T0), all participants received psychiatric counseling and then they were stratified according to EB patterns: 61,1% Gorging, 22,2% Grazing, 8% Sweeteating, 9,1% Binge Eating.
Moreover, anthropometric evaluation, as well as PREDIMED and Nova Food Frequency Questionnaire (NFFQ) for the evalution of adherence to the MD and the assessment of UPFs consumption were administered.
Results: Participants showed a low adherence to the MD (PREDIMED score: 5,4± 1,6) and high consumption of UPFs (27,5±14,2% daily intake) and as BMI and UPFs consumption increased, a decrease in PREDIMED score was observed.
In addition, among different EB groups, greater consumption of UPFs was observed in grazing (30,4±13,8% daily intake) and binge eating (30,9% ±18,2% daily intake) compared to gorging (26,7 ± 12,9 daily intake) and sweeteating (24,2 ±4,2% daily intake). No significant difference was observed regarding MD adherence, indeed in all groups PREDIMED score was ≤ 5.
Conclusion: This preliminary study revealed an association of UPF intake with different EB patterns. Further research on larger population are needed to confirm our results and to better clarify metabolic and neurobiological effects of UPFs intake on EB.

Conflict of Interest: No conflict of interest to declare.

Funding: No funding to report

GC2.123

The Ketogenic Diet for Type 2 Diabetes Management

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Introduction: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and elevated blood glucose levels. The management of T2DM typically involves lifestyle modifications, pharmacotherapy, and dietary interventions. Currently, it is widely accepted that ketogenic diets are efficacious in weight loss interventions. Over 90% of diabetic patients are overweight or have obesity, and there exists a clear connection between type 2 diabetes and obesity. Studies have demonstrated that even a moderate 5% reduction in weight can notably enhance HbA1c levels in patients with obesity and diabetes. The ketogenic diet (KD), a low-carbohydrate, high-fat diet, has gained attention as a potential therapeutic option for T2DM management. This comprehensive review aims to evaluate the evidence regarding the efficacy and safety of the ketogenic diet in the management of T2DM [1].
Methods: This review systematically analyzes existing literature, encompassing studies published from January 2000 to June 2023, retrieved from databases such as PubMed and Medline. Additional data sources include national health surveys conducted by governmental and international organizations. Through rigorous study selection criteria, this review incorporates methodologically sound research while excluding studies with limited intervention duration, non-peer-reviewed sources, or focus on type1diabetes.
Results: Numerous studies, including randomized controlled trials, have investigated the effects of the ketogenic diet on T2DM. The findings suggest that the ketogenic diet may improve glycemic control, reduce insulin resistance, and facilitate weight loss in individuals with T2DM. Additionally, favorable changes in lipid profile, including reductions in triglyceride levels and increases in high density lipoprotein cholesterol, have been observed. However, concerns have been raised regarding the long-term sustainability, potential nutrient deficiencies, and adherence challenges associated with the ketogenic diet [2].
Conclusion: In conclusion, the available evidence suggests that the ketogenic diet may have potential benefits in the management of type 2 diabetes. However, due to the limitations of existing studies and the need for further research, it is important to approach the implementation of the ketogenic diet in T2DM management with caution. Clinicians and individuals with T2DM should carefully evaluate the potential risks and benefits, and personalized approaches should be employed to optimize the therapeutic outcomes.

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GC2.124

Consumers' Understanding and Opinions of Food Reformulation and Preference for Reformulated Baked Goods

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Introduction: The availability of energy-dense and nutrient-poor foods contributes to the prevalence of overweight, obesity, and chronic diseases. Food reformulation has the potential to improve nutrient profile and downstream health benefits. We explored consumers' understanding and

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opinions of food reformulation and preference for reformulated baked goods.
Methods: An online survey distributed to UK adults explored the understanding of reformulation (good knowledge/partial knowledge/no knowledge). Food neophobia was evaluated using 10 items on a 7-point Likert scale and categorised as "more neophilic", "neutral", and "more neophobic" based on quartiles of the total sum. Agreement on opinions about food reformulation was measured with 14 items on a 5-point Likert scale. Participants were asked to make a choice between two hypothetical baked goods, 'Product A' (reformulated) and 'Product B' (regular). Relationships between variables were explored with χ^2.
Results: Survey respondents (n=869, 65% women) were mostly British (62%), had a median age of 33y (IQR 27-43), median BMI of 25 kg/m^2 (IQR 22–29), and were educated up to university level (70%, n=611). Respondents' attitudes towards foods were neutral (49%, n=427), "more neophobic" (27%, n=232) or "more neophilic" (24%, n=210). Overall, 72% (n=626) of respondents reported no prior knowledge of reformulation. More than half of respondents lacked knowledge across the "more neophilic" (69%, n=145/210), "neutral" (71%, n=303/427) and "more neophobic" (77%, n=178/232) food attitudes (p=0.02). Only 16% (n=135) had good knowledge of food reformulation. After an introduction to what food reformulation is, most respondents (59%) agreed that reformulated foods are better for health (median 4, IQR 3-4). This opinion was not influenced by sex (p=0.29), BMI (p=0.67), or knowledge of reformulation (p=0.38). There was no consensus on superiority/inferiority in appeal, taste, price, and quality of reformulated foods or whether reformulation "will take away freedom of choice", "is just another marketing strategy", "won't make any difference to population's health" (median 3, IQR 2-4 across all items). However, respondents agreed that food reformulation "could be used by supermarkets" as a strategy to increase price" (median 4, IQR 3-4).
When asked to choose, most respondents (57%, n=491) preferred the reformulated baked option compared to 25% (n=217) for the regular. Consumers' food attitudes influenced choice, with the "more neophilic" (69%, n=144) group strongly preferring the reformulated option (p<0.001). However, the level of knowledge of food reformulation did not affect choice (p=0.18).
Conclusion: Perceived understanding of reformulation, which was poor in this group, could pose a potential challenge to integrating reformulated foods into the diet. While most consumers acknowledged the health benefits, opinions varied concerning other aspects of reformulated foods. Further work should focus on informing consumers about the techniques and purposes of reformulation and explore the role of trust, knowledge, and socio-economic factors.

GC2.125

High-protein ketogenic diet versus low-calorie, low-sodium, high-potassium mediterranean diet in patients with overweight/obese with normal-high blood pressure or grade I hypertension

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Introduction: Dietary therapy in patients with obesity or overweight and high-normal blood pressure (systolic 130-139 and/or diastolic 80-89 mmHg) or grade I hypertension (SBP 140-159 and/or DBP 90-99 mmHg) with low-moderate cardiovascular risk should be used at least for the first three months, according to the current 2023 ESH and previous ESC/ESH guidelines. However, guidelines do not indicate a specific type of diet. Today "ketogenic" diets (Keto) are very popular because are believed to lead to larger weight loss mostly as fat loss. Most of these Keto are based on ketogenic food products very rich in proteins and fats. The objective of this observational real-life study based on good clinical practice was to compare a high-protein Keto using commonly available natural foods versus a low-calorie, low-sodium, high potassium Mediterranean diet (Medit), evaluating the effects on blood pressure, body weight, main biomarkers, and bioelectrical impedance analysis (BIA).
Methods: Fifteen non-diabetic patients (11 males and 4 females, mean age 48±10), without pharmacological treatments, were initiated, alternatively, 8 in Keto and 7 in Medit, and completed the first observational period of 3 months. Patients were studied after clinical examination and office blood pressure measurements. Blood analysis, BIA (Imp DF50) and ambulatory blood pressure monitoring (Spacelabs devices model 902227) were carried out before and after three months of diet.
Results: After three months of diet body weigh went with Keto from 101±13 to 90±12 kg (p< 0.001) and with Medit from 92±15 to 83±15 Kg (p<0.003). Waist circumference (WCirc) changed with Keto from 109±6 to 96±6 cm (p<0.001) and with Medit from 108±9 to 97±10 cm (p=0.004). Twenty-four hours mean SBP went with Keto from 124±12 to 115±5 mmHg (p = 0.036) and 24h mean DBP from 80±10 to 73±6 mmHg (p = 0.046). With Medit 24h mean SBP went from 120±9 to 112±10 mmHg (p=0.280) and 24h mean DBP from 76±3 to 71±7 (p<0.091). With Keto the free fat mass went from 66.4 to 67.2% and with Medit from 62.9 to 65.2%. With Keto the fat mass went from 33.5 to 32.7% and with Medit went from 37 to 34.7%. Insulinemia and HOMA index were significantly reduced with the Keto diet but not with the Medit diet.
Conclusions: In this small group of diet-compliant patients, similar body weight losses of about 10 kg were achieved after three months without differences between diets and is very likely that this was the main driving factor in BP reduction as well as other clinical meaningful improvements. In this short-term comparison, a keto diet using common foods was superior to a Medit diet on lowering BP, insulin levels and an insulin-resistance index. These data reinforce the link between insulin resistance and BP. The study is currently ongoing to evaluate a larger number of patients in a longer term.

GC2.127

Knowledge and Awareness of nutrition and weight management in a cross-sectional survey of adults with and without thyroid disease

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Introduction: Thyroid function influences body composition, and people with thyroid disease (TD) may experience challenges with weight management while also seeking (dietary) strategies to manage their condition. Therefore, it is important to understand knowledge and awareness of thyroid health and the role of diet and weight management, which we assessed in UK adults with and without TD.
Methods: In an online survey (June 22-April 23), knowledge was evaluated via 26 questions (23 true/false/not sure; 3 multiple-choice) about the thyroid gland, TD, thyroid function and nutrition, and thyroid function and body composition. Overall and subtopic knowledge scores were normalised to 100. Awareness of thyroid health, nutrition and diet, and TD questions was measured using 15 questions assessing combined awareness and understanding, awareness without understanding, and unawareness. Differences between groups were assessed with χ^2 and Mann-Whitney U test.
Results: Survey respondents (n=1007, 51% people without TD) had a median age of 44y (IQR 32-56). The main TD reported were hypothyroidism (n=310/499, 62%) and Hashimoto's disease (n=88/499, 18%), with TD diagnosed 1 to 62 years ago (median 10 years). Median BMI was 26 kg/m^2 (IQR 22–31), with 28% living with overweight (n=285/1007) and 29% with obesity (n=293/1007). Respondents with TD were older (49 (39-58) vs 38 (28-51), p<0.001), with a higher BMI (27 (23-33) vs 25 (22-29), p<0.001). There was a greater proportion of people living with obesity in the group with TD (36% vs 23%, p<0.001).
The median overall knowledge score was greater for people with TD (64 (55-73) vs 48 (39-61), p<0.001), across subtopics on the thyroid gland

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and TD (50 (38-63) vs 46 (34-52), p<0.001), thyroid function and nutrition (50 (38-63) vs 43 (34-50) p<0.001), and thyroid function and body composition (59 (51-67) vs 34 (23-40) p<0.001). Best answered questions in both groups related to weight management ("Poor thyroid health can make it harder to keep to a healthy weight", correct in 91% with TD vs 68%) and nutrition ("Too much iodine can be harmful to the thyroid", correct in 68% with TD vs 46%). Many (14-77%) were unsure of the correct answer for most questions, and 12 out of 26 questions were answered either incorrectly or not (unsure) by >50%.
As expected, awareness of thyroid health and TD was greater in people with TD, with the highest awareness and perceived understanding of the thyroid gland (78% vs 44%, p<0.001) and hypothyroidism and its symptoms (76% vs 32%, p<0.001). Awareness of iodine was similar in both groups (~88%) with no difference in perceived understanding (47% vs 48%, p=0.88). While 79% of people with TD were aware of the role of diet in thyroid function, only 69% of people without TD did, with a difference in perceived understanding (40% vs 26%, p<0.001).
Conclusion: This survey highlights significant knowledge gaps and awareness disparities regarding thyroid function, nutrition, and weight management and indicates the need for targeted information efforts to improve understanding of a common condition and promote informed choices, particularly in managing weight and adopting suitable diets.

GC2.128

Conflict of Interest and Obesity Prevention: The Importance of Raising Awareness among Healthcare Students

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Introduction: Mexico has a high consumption of sugar-sweetened beverages, with 7% of deaths attributed to their intake. The rising obesity epidemic in the country may be linked to conflicts of interest (COI) within the ultra-processed products (UPP) industry. This industry employs various tactics, including targeting healthcare students, creating an evident COI. Hence, it is crucial for health science undergraduates, to be familiar with COI. Integrating COI into the undergraduate curriculum is essential to prevent manipulation, ensure ethical decision-making, and safeguard against industry interference
This study aims to analyze the current literature on health science students' familiarity with COI, emphasizing the need for education on COI in university curricula to prioritize human and planetary health. Recognizing that COI extends beyond financial influences, the study advocates for developing strategies to counteract COI's impact.
Methodology: A scoping/narrative review was conducted, focusing on COI in health science students' curricula. The PubMed database was searched using terms like "COI," "undergraduate health students," "medical education" and "healthcare professionals"
Studies from the last five years were prioritized, but older articles were included due to limited recent information. Inclusion criteria involved analyzing COI perspectives and industry interference in curricula. Exclusion criteria were studies not assessing COI in academic environments.
Results: Of 323 studies retrieved, 21 were included after screening. COI was defined as a situation compromising judgment due to personal, financial, or social factors. While commonly linked to financial influences, COI can involve non-financial aspects like employment opportunities, personal relations, and collaborations in research. The pharmaceutical and UPP industry sponsors events, supports research, and infiltrates universities, impacting students' training.
Students identified COI in various industry-sponsored spheres, recognizing its existence but often not perceiving it in themselves. Studies revealed a significant industry presence in health professionals' continuous education programs. Initiatives like the AMSA scorecard evaluated COI policies in medical schools, influencing awareness and policy development globally.
Conclusion: The study emphasizes the urgent need for robust policies and educational measures to protect healthcare students in Mexico from COI, going beyond financial considerations. Current COI policies at universities vary in strictness, indicating a need for comprehensive strategies, including awareness campaigns, disclosure policies, and redesigned academic programs.
Future strategies should address students' limited COI knowledge, leveraging successful initiatives like the AMSA scorecard. The study proposes a detailed evaluation of students' perceptions at Tecnológico de Monterrey School of Medicine and Health Sciences to inform educational and awareness strategies. Continuous review of educational policies is crucial to instill a conscious and ethical institutional culture against external influences on future health professionals' training.

GC2.129

Fear of Falling in Adults Under 50 who are Overweight or Obese

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Background: Approximately 77% of elderly individuals report a fear of falling; this concern, initially identified primarily in older adults, is now increasingly recognised in those who are overweight or obese, indicating a comparable risk level. Fear of falling, a psychological concept originally observed in older populations, is associated with a range of negative outcomes, including functional impairments, reduced mobility, diminished quality of life, and a higher risk of mortality. Understanding the fear of falling beyond the elderly significantly impacts younger populations with weight issues. Recognising this fear in diverse groups is vital for developing targeted prevention and intervention strategies, thereby enhancing overall health and well-being across different demographics. This expansion of research scope underscores the need for comprehensive healthcare approaches that consider psychological factors alongside physical health, particularly in weight management and fall prevention programs.
Objectives: We intend to delve deeper into the research surrounding the psychological concept of 'Fear of Falling', a topic predominantly studied and addressed in literature and clinical practice concerning older adults. Our study investigates if individuals under 50 years of age, particularly those who are overweight or obese, also recognise a fear of falling and explores how this fear manifests in their daily lives. This expansion aims to understand the broader implications of this fear across different age groups and physical health statuses.
Design: Twelve overweight or obese adults participated in individual interviews. The focus of the interviews was to explore whether there was a fear of falling amongst the population and whether fear of falling would form barriers that led to activity avoidance. Analysis was conducted using Thematic Analysis.
Results: Four subordinate themes captured the specific experiences of fear of falling for adults under 50 with overweight and obesity. 1) Falling or nearly falling from fear or anxiety; 2) Dizziness (clumsiness) and embarrassment; 3) Being unnerved by stairs. 4) Avoidance of activity.
Conclusion: We found that the fear of falling among overweight and obese individuals aged under 50 was linked to various experiences and perceptions, including actual falls or near falls triggered by fear or anxiety, feelings of dizziness or clumsiness, a sense of embarrassment, avoidance of certain activities, and discomfort or apprehension when encountering stairs. We uncover a complex interplay between psychological elements and environmental contexts in shaping the fear of falling in this demographic. The results indicate a distinctive "avoidance-vigilance-response" behavioural pattern. This pattern highlights the way anxiety can disrupt working memory and focus, subsequently elevating the risk of falls and intensifying the fear of falling in these younger adults who are overweight

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or obese. The findings emphasise the significant role of psychological states in influencing physical safety and well-being, underlining the need for targeted interventions.

GC2.130

Public Perception on GLP1 receptor agonists: Leveraging Sentiment Analysis and BERTopic Modeling on Twitter Data

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Introduction: Obesity is a growing global concern, associated with increased morbidity, mortality and negatively impacting quality of life. Pharmacotherapy to help achieve body weight normalization has been an important field of research to try to curb the obesity pandemic. GLP-1 receptor agonists (GLP1-RA) have emerged as a promising solution. There is increasing evidence of their effectiveness. This has contributed to a massive increase in demand for these drugs that led to a global shortage. However, there are also growing concerns regarding GLP1-RA safety, cost, equity, and availability. With the advent of social media, individuals frequently turn to platforms like X (previously: Twitter) to express their views and share experiences regarding health issues, including anti-obesity drugs. Understanding public sentiment and the topics of discussion can provide valuable insights for healthcare providers, policymakers, and pharmaceutical companies. This study seeks to analyze sentiment and topic modeling within X (Twitter) discussions about GLP-1 RA, capturing the public's perception and the prevailing discourse.
Methods: Our analysis covers a dataset of 8,953 tweets collected from December 15th, 2023 to January 10th 2024, with a focus on the main GLP1 RA on the market (liraglutide, semaglutide, and dulaglutide).
Data collection utilized the Python library Tweepy and the Twitter API, with a pre-tested query to capture discussions around GLP1 RA.
We applied roberta-xlm twitter, a transformer-based language model, for sentiment analysis, categorizing the tweets into positive, negative, and neutral sentiments. BERTopic, an algorithm for deriving thematic structures from extensive textual data, was employed for topic modeling.
Results: Sentiment analysis showed a higher prevalence of negative (44.5%) and neutral (44.6%) sentiments compared to positive ones (10.9%), indicating mixed public reactions. Topic modelling revealed ten major themes which included the effectiveness of GLP1 RA, concerning side effects including hair loss and suicidal thoughts, and severe adverse reactions like coma associated with counterfeit medication use. Other identified themes encompassed cuts in government healthcare funding, personal narratives of drug use, and viewpoints from within the pharmaceutical industry. The use of word clouds offered a visual interpretation of the key terms tied to these themes, with 'Ozempic' emerging as the most frequently mentioned medication. Sentiment analysis depicted a diverse array of opinions: while some tweets praised these medications as groundbreaking, others criticized them with negative descriptors such as 'fake,' 'craze,' 'cosmetic,' and 'scam.'
Conclusion: The analysis highlights the complexity of public opinion on anti-obesity medications. While there is a significant amount of scepticism and neutral stances, positive sentiments reflect successful personal outcomes and support for these medications. These insights can guide healthcare providers and pharmaceutical companies in addressing public concerns and improving communication strategies regarding treatment options for obesity.

GC2.131

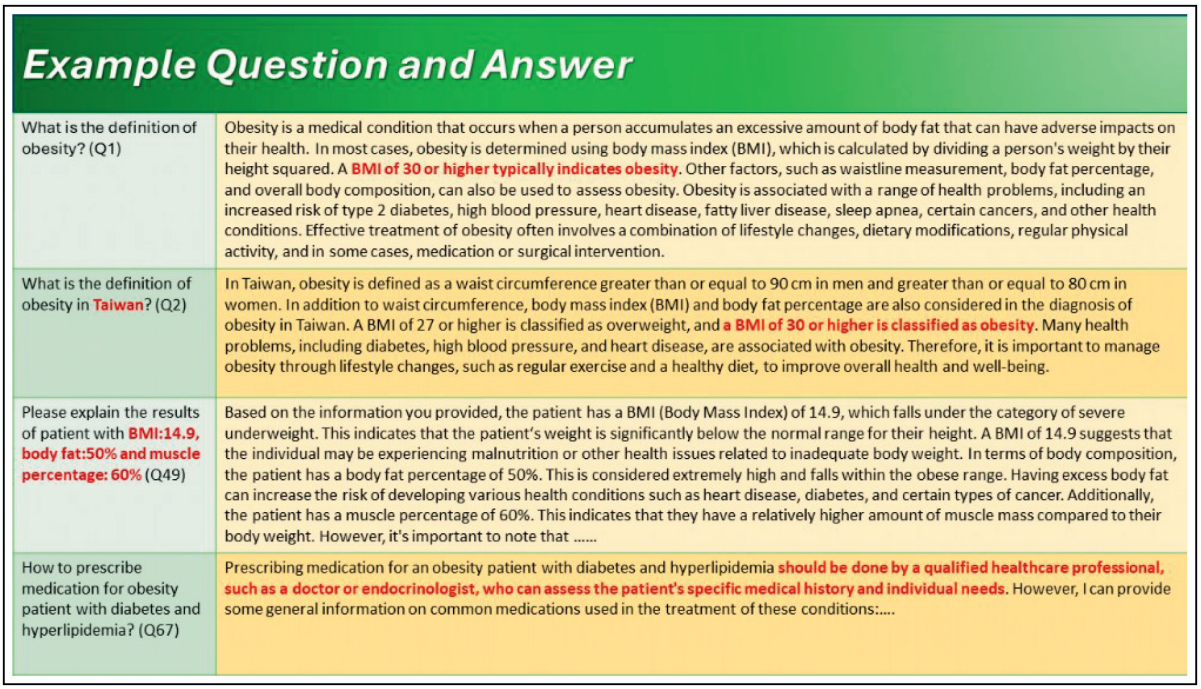
Explore ChatGPT's Effectiveness in the Medical Realm: An In-depth Study in the Field of Obesity Medicine

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Introduction: ChatGPT, an advanced language model, has numerous potential applications in the medical field. It can enhance clinical documentation by swiftly extracting crucial information and generating notes, saving time and improving accuracy. However, the domain knowledge of ChatGPT has not been thoroughly validated. Therefore, we conduct a performance evaluation in the field of obesity.
Methods: ChatGPT is evaluated with different types of questions, including definitions, explanations of body composition and lab data, treatment suggestions, and detection of pitfalls and dangerous signs. The answers provided by ChatGPT are reviewed and scored by two expert medical doctors on a scale of 0 to 5. Statistical software is used to analyze the results quantitatively and qualitatively.
Results: ChatGPT scores high in questions of general definition. However, it struggles with the local definition of obesity and overweight in Taiwan, often providing either the American definition or an incorrect threshold.
ChatGPT performs well in explaining single abnormality in lab and body composition reports. However, it struggles when facing with multiple abnormalities, providing confusing explanations by addressing each parameter individually without considering them as a whole. The model also lacks the ability to identify potential incorrect lab data, resulting in poorly scoring in this section.
ChatGPT consistently recommends diet controlling and behavior changing as the primary approach for initial treatment and subsequent suggestions for patients with obesity. It also suggests disease controlling for patients with comorbidities like diabetes. However, when asking about medication usage and dosage adjustments during follow-up, ChatGPT acknowledges its limitations as an AI model without the ability to prescribe medicine. As a result, relevant answers are lacking.
The limitations of ChatGPT are apparent in both pitfalls and dangerous sign detection testing. In a simple scenario involving a patient under GLP-1 treatment who experiences epigastric pain, rebounding pain, and increasing amylase level, ChatGPT is able to warn about the possibility of acute pancreatitis. However, in real-world clinical situations often occur with multiple symptoms and illnesses, ChatGPT often addresses each symptom-disease pair separately without considering the bigger picture. As a result, ChatGPT receives worse scores for complex situations than simple symptoms.
Conclusion: ChatGPT holds potential in improving various aspects of the medical field, including clinical documentation, patient assistance, medical education, and drug discovery. However, the evaluations in the field of obesity reveal some limitations. While ChatGPT performs well in general definition questions and explaining single abnormality in lab data, it struggles with local definitions, interpreting multiple abnormalities, and recognizing incorrect lab results. Additionally, its responses regarding medication usage and dosage adjustments are limited, and it has difficulty comprehensively addressing complex symptoms presentations.

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Example Question and Answer

What is the definition of obesity? (Q1)	Obesity is a medical condition that occurs when a person accumulates an excessive amount of body fat that can have adverse impacts on their health. In most cases, obesity is determined using body mass index (BMI), which is calculated by dividing a person's weight by their height squared. A **BMI of 30 or higher typically indicates obesity**. Other factors, such as waistline measurement, body fat percentage, and overall body composition, can also be used to assess obesity. Obesity is associated with a range of health problems, including an increased risk of type 2 diabetes, high blood pressure, heart disease, fatty liver disease, sleep apnea, certain cancers, and other health conditions. Effective treatment of obesity often involves a combination of lifestyle changes, dietary modifications, regular physical activity, and in some cases, medication or surgical intervention.
What is the definition of obesity in **Taiwan**? (Q2)	In Taiwan, obesity is defined as a waist circumference greater than or equal to 90 cm in men and greater than or equal to 80 cm in women. In addition to waist circumference, body mass index (BMI) and body fat percentage are also considered in the diagnosis of obesity in Taiwan. A BMI of 27 or higher is classified as overweight, and **a BMI of 30 or higher is classified as obesity**. Many health problems, including diabetes, high blood pressure, and heart disease, are associated with obesity. Therefore, it is important to manage obesity through lifestyle changes, such as regular exercise and a healthy diet, to improve overall health and well-being.
Please explain the results of patient with **BMI:14.9, body fat:50% and muscle percentage: 60%** (Q49)	Based on the information you provided, the patient has a BMI (Body Mass Index) of 14.9, which falls under the category of severe underweight. This indicates that the patient's weight is significantly below the normal range for their height. A BMI of 14.9 suggests that the individual may be experiencing malnutrition or other health issues related to inadequate body weight. In terms of body composition, the patient has a body fat percentage of 50%. This is considered extremely high and falls within the obese range. Having excess body fat can increase the risk of developing various health conditions such as heart disease, diabetes, and certain types of cancer. Additionally, the patient has a muscle percentage of 60%. This indicates that they have a relatively higher amount of muscle mass compared to their body weight. However, it's important to note that .....
How to prescribe medication for obesity patient with diabetes and hyperlipidemia? (Q67)	Prescribing medication for an obesity patient with diabetes and hyperlipidemia **should be done by a qualified healthcare professional, such as a doctor or endocrinologist, who can assess the patient's specific medical history and individual needs**. However, I can provide some general information on common medications used in the treatment of these conditions:....

Regarding the definition questions, ChatGPT 3.5 achieves good scores when discussing general definitions such as obesity, overweight, diabesity, and childhood obesity (Q1). However, when it comes to the local definition of obesity and overweight in Taiwan, ChatGPT 3.5 still outputs the American definition or an incorrect threshold (Q2). Furthermore, ChatGPT 3.5 lacks the ability to identify possible incorrect lab results, such as body fat: 50% and muscle percentage: 60% in a patient with BMI of 14.9 (Q49). Moreover, when we inquire about medication usage and dosage adjustments during follow-up, ChatGPT 3.5 often lacks of relevant answers and responds by stating that it is an AI model without the ability to prescribe medicine (Q67).

Fig. 1. Examples of our questions and the answers of chatGPT.

GC2.132

Sustainable Approaches to Achieving Weight Loss in Chronic Obesity

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Context: In the background of addressing obesity as a persistent medical condition, a nuanced and comprehensive therapeutic approach becomes imperative.
Objetive: Review the therapeutic arsenal encompasses tailored lifestyle modifications, incorporating dietary interventions and personalized exercise regimens, along with cognitive behavioral therapy, pharmacotherapy, and strategic consideration of bariatric surgery.
Method: This exhaustive review meticulously synthesizes evidence sourced from rigorous randomized controlled trials, insightful observational studies, and meticulous meta-analyses.
Results: Over a meticulous one year trajectory, lifestyle interventions meticulously yield an approximate 5% reduction in body weight. Despite the intrinsic susceptibility to weight regain, the profound impact on mitigating risks associated with type 2 diabetes and cardiovascular diseases is undeniable. Bariatric surgery, a strategic intervention, may yield a decade-long excess weight loss exceeding 50%, demanding stringent vigilance against potential regain. Optimal weight maintenance necessitates a meticulously designed multifaceted program, integrating bespoke dietary strategies, personalized exercise protocols, and judicious pharmacotherapy, complemented by the nuanced incorporation of behavioral therapy as an invaluable adjunct.
Conclusions: The pinnacle of obesity management rests upon the expertise of a seasoned multidisciplinary clinical team proficient in the seamless integration of personalized dietary interventions, bespoke exercise regimens, and strategic pharmacotherapy. Bariatric surgery, an orchestrated intervention, assumes a targeted role in the management of type 2 diabetes, requiring discernment and precise clinical judgment.

GC2.133

South Asian individuals' experiences on the NHS low calorie diet programme: a qualitative study in community settings in England

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Background: Existing literature examines barriers to the provision of ethnically diverse dietary advice, however, is not specific to total diet replacement (TDR) interventions. There is a lack of literature from the United Kingdom (UK), limiting the potential applicability of existing findings and themes to the UK context. Evidence suggests ethnically diverse populations face barriers in accessing and adhering to behavioural weight management or diabetes support programmes, leading to suboptimal outcomes and increased health disparities. Understanding the reasons for poorer uptake and adherence in these populations is critical to developing targeted interventions and improving health equity. This study addresses this gap in research by interviewing participants of South Asian ethnicity who have undertaken the National Health Service (NHS) Low Calorie Diet programme (LCD) for people with type 2 diabetes living with overweight or obesity. This study explores factors that may affect the uptake and acceptability of its total diet replacement, food re-introduction and

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weight maintenance stages. This aims to provide rich data that can inform effective tailoring of future programmes with South Asian participants.
Objective: To explore the perspectives of individuals of South Asian ethnicity on an NHS programme using total diet replacement approaches for the management of T2D.
Design: A qualitative research design was employed which centres the subjective views of the participants while recognising that these experiences may be shaped by underlying structural, cultural, and contextual factors.
Setting: Individuals in the community undertaking the NHS LCD programme.
Participants: Twelve one-to-one interviews were conducted with individuals from a South Asian ethnicity participating in the NHS LCD. Amongst those of South Asian ethnicity recruited, there were a mixture of self-reported cultural identities including Muslim or Pakistani (n=6), Indian (including Gujurati and Hindu) (n=4) and Bangladeshi (n=2). These identities were as self-reported by the participants as descriptions of ethnicity, reflecting differing interpretations of this term in the participants surveyed.
Main Outcome Measures: Qualitative semi-structured interviews conducted through different stages of the programme. Reflexive thematic analysis was used to analyse the transcripts.
Results: Key themes highlighted positive and negative experiences of the programme: 1. More work is needed in the programme for person-centeredness 2. It's not the same taste. 3. Needing motivation to make changes and feel better. 4. A mixed relationship with the coach. 5. Social experiences. 6. Culture-related experiences.
Conclusion: There is a need for tailored and culturally appropriate T2D interventions for South Asian individuals which have a focus on being person-centred. This study provides important experience-based evidence of the need for culturally tailored T2D programmes. Action to address these findings and improve the tailoring of the NHS LCD may improve experience, retention and outcomes on the programme for people of South Asian ethnicity and thereby reduce inequalities.

GC2.134

Weight Loss Targets Realization by Patients Living With Overweight or Obesity – Real World Data

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Background: Belong is a digital platform which provides professionally moderateddigital communities for several chronic conditions. This platform connects patients, healthcare professionals and care management solutions.
MyWeight (MW) is a new patient community in Belong, which debuted in November 2022, providing the platform for people living with overweightor obesity (PwO).
There is limited data available on current trends inpatients' weight loss goals (WLG), and it is believed that non-realistic WLG are prevalent among PwO.
Methods: We examined real-world individuals' self-reported goals and practices using a digitally distributed questionnaire administered to MW users during registration. The questionnaire collected users' demographics, obesity status, comorbidities and WLG.
Results: 8,277 users joined MW and 4,205 provided anthropometric data. 3,006 (71.5%) users were considered as PwO with 1,347 having obesity and 1,659 overweight (44.8% and 55.2% respectively). Within our cohort of 3,006 PwO 81% were females and the average age was 46. 761 (25.3%) users reported at least one obesity related comorbidity (ORC). Users who stated higher WLG have also reported higher incidence of ORC (43%, 38%, 29%, 21% for >20Kg, 10-20Kg, 5-10Kg, <5Kg WLGs respectively) and were more prone to consider treatment with anti-obesity medications (26%,15%,7%,3% respectively).
Conclusions: Our data suggests realistic trends in patients self-set weight loss goals, considering obesity related comorbidities and the use of anti-obesity medications. This could imply a better understanding of obesity treatment goals by patients.

GC2.135

Patients living with obesity's perceptions regarding access to obesity care

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Introduction: Early detection and support of patients living with obesity (PwO) could help improve the success of obesity treatment and management outcomes. The treatment delay, the period between obesity onset and treatment start, is unknown in Belgium. Our aim was to explore the perceptions on this treatment delay by PwO.
Methods: Consecutive patients visiting the obesity clinic of the University Hospitals of Brussels between December 12, 2023 and January 9, 2024 were invited to participate in this cross-sectional qualitative study. PwO were interviewed, and data were transcribed and analysed using thematic analysis according to Qualitative Analysis Guide of Leuven (QUAGOL). The first section of the semi-structerd interview guide focused on help-seeking behaviour by the patients. PwO were interviewed concerning the patient delay, defined as the period that the patient is aware of living with his/her condition, and finding care for these conditions. The second part probed the actions of the healthcare practitioners (HCP) consulted. Here, the HCP delay, defined as the period starting from the moment a patient makes an appointment for his/her condition, and receiving appropriate care, was queried.
Results: A total of 15 PwO (8/15 (53%) female, mean ±SD age 40 ±17 years) were interviewed before data saturation was reached. The journey of PwO towards appropriate obesity care seemed complex, often with multiple HCPs being involved. Inefficient referral from first line care dietitians to multidisciplinary obesity treatment was mentioned as the main cause for this patient delay. PwO indicated feeling discouraged due to limited effectiveness of dietary guidance provided by first line care dietitians, resulting in disengagement from the healthcare system and thus further increasing the patient delay. The HCP delay was not perceived as a barrier by PwO. Five themes were identified as the trigger for seeking obesity care: Referral from first line care, family, friends and schools; Health complications; Financial limitations as a result of dietary costs; Negative self-image due to body image; Elevated motivation driven by factors such as a supportive partner, the desire for children, prioritization of health, and the aspiration to attain a slimmer physique.
Conclusion: A delay in successfully managing PwO should not be ignored, as it not only impacts PwO as clearly shown in this study but perhaps also could influence the success of obesity management. Efforts should be made to improve screening, patient symptom assessment, obesity awareness and referral to a multidisciplinary obesity treatment. Improved communication and further education between primary care, allied health professionals and specialized care is imperative to lower the time to access appropriate obesity care.

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GC2.136

Effects of online vs. face-to-face exercise programs on body composition parameters in three Portuguese adult women with obesity: A case report

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Introduction: The case study aims to assess and compare the effects of a 12-week exercise program delivered online versus in-person on body composition parameters in three Portuguese adult women with obesity.
Methods: The study included three adult women with grade II obesity (age, 46 ± 7.81 years; BMI, 35.93 ± 0.75kg/m^2). Perimeter and height measurements were collected with a tape measure and stadiometer to the nearest 0.1 cm (cm), respectively. Body composition parameters were assessed through bioelectrical impedance analysis (BIA) using the TANITA® MC 780. This research was approved by the ethics committee of the University of Évora (no. 22175).
Each participant reviewed their program, the participant A (in-person), participant B (online), and participant C (no exercise). Each session comprised three phases: first phase: 5-minute warm-up at 65% of HRmax; second phase: 35 minutes at 75-95% of HRmax, incorporating high-intensity functional training (HIFT) and high-intensity interval training (HIIT) protocols. If a participant reached failure, moderate-intensity continuous training (MICT) was introduced. The exercises included 6 exercises of 15 to 25 repetitions for HIFT or 20 second each with a 10-second rest for HIIT. Rest between sets was 1 minute at 65% of HRmax. Intensity and sets varied over weeks: i) weeks 1-4, 2 to 3 sets at 75-85% of HRmax; ii) weeks 5-8, 3 to 5 sets at 85-90% of HRmax; and iii) weeks 9-12, 5 to 7 sets at 90-95% of HRmax, or until fatigue. In the remaining time of the 2nd phase, the MICT protocol was used, maintained at 50-70% of HRmax, in walking form; and third phase: 5-minute active recovery at 65% of HRmax.
Both participants (A) and (B) utilized the Polar M430 to monitor their heart rate. Additionally, Participant B was required to submit a video of the exercises performed during the initial session for postural correction.
Results: We observed a total body weight loss (%) from pre to post for both participants: Participant A (-8.78%), Participant B (-8.70%), and Participant C (0.23%). The BMI decreased for grade I obesity: (A) 32.40 kg/m², (B) 33.60 kg/m², and (C) remained unchanged. The participant fat mass (%) decreased for (A) -17.03%, for (B) -6.70%, and for (C) -1.23%. The fat-free mass (%) increased for (A) 7.81%, for (B) 5.29%, and for (C) 0.84%. Waist circumference reduced by (A) -18.33%, (B) -11.71%, and (C) -3.85%. Hip perimeter decreased by (A) -4.17%, (B) -12.80%, and increased by (C) 3.42%. Thigh perimeter decreased by (A) -5.80%, (B) -13.89%, and increased by (C) 5.17%. The ratio between waist and hip circumference in Participant (A) decreased from 1 to 0.85, in Participant (B) increased from 0.89 to 0.90, and in Participant (C) also decreased from 0.89 to 0.83.
Conclusion: Both exercise programs administered to the participants with obesity led to significant reductions in body composition parameters, encompassing total body weight, fat mass, lean mass, and fat-free mass, when compared to a sedentary control group.

GC2.137

Bioelectrical impedance vector analysis (BIVA) for assessing hydration status in university athletes before and after training

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Introduction: Adequate hydration is essential for athletes specifically before and after training, during competitions and in extreme conditions. Hydration assessment is performed using a variety of tools, and the combination of several techniques is recommended to accurately measure water losses and gains that greatly impact athletes' performance. The aim of this study is to assess the validity of bioelectrical impedance vector analysis (BIVA) as a tool for measuring hydration status in endurance and strength athletes pre- and post- training by plotting vectors variation by gender and sport and comparing it to reference methods.
Methods: 60 university athletes (50% strength, 50% women, age 21.0 ± 2.9 years, BMI 23.5 ± 2.8 kg/m^2), were evaluated on one experimental day, pre and post training. Urine samples were collected in the morning, prior to and after training for analysis of color and specific gravity (USG). Body weight changes were measured, sweat rate was calculated, and bioelectrical impedance analysis was performed prior to and post training to track changes in bioelectrical variables (R = resistance; Xc = reactance; Z = impedance vector; and PA = phase angle).
Results: Differences in PRE-POST PA values were significantly correlated with differences in body weight and USG (CC= 0.283 and 0.397; $p < 0.05$). Data analysis is still ongoing and differences between male and female athletes and between different type of sports (endurance vs strength) will be presented at the congress.
Conclusion: Bioelectrical variables (R, Xc, Z, and PA) assessment is gaining significant attention for the purpose of monitoring hydration levels in both healthy and unwell individuals. The impact of hydration on sports performance is undeniable, necessitating the development of easy and practical monitoring methods to ensure athletes can consistently perform at their peak.

GC2.138

Examining associations Between Parental Physical Activity Habits and Family Time Together: cross-sectional findings from the BeE-school project

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Introduction: Enhance our understanding of how individual physical activity habits within a family influence the quality of family time spent together is overlooked. This study explores the association between parents' physical activity habits and family time.
Methods: Conducted in primary schools facing social vulnerability, the study included 554 families with school-aged children. Parents documented their physical activity through the International Physical Activity Questionnaire (IPAQ), and additionally reported family time using a specific question from the Health Behaviour in School-Aged Children survey. Generalized linear models were developed, with standardized family time as the outcome and physical activity levels as predictors. The models were further adjusted for children's gender, age, and parents' education levels.
Results: Physically active parents spend more time engaging in family activities with their children (B = 0.349; 95% CI (0.161, 0.536) p<0.001).

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Additionally, active parents invest more time in physically active pursuits with their children (B = 0.491; 95% CI (0.310, 0.672) p<0.001)
Conclusion: Parental physical activity is significantly associated with time spent with family, including engaging in physically active pursuits. This underscores the importance of healthcare professionals promoting parental involvement in physical activities that ultimately may influence family dynamics and foster overall health behaviors for both the child and the family.

Conflict of interest: None Disclosed

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GC2.139

Comparison of 24-week polarized training vs. threshold training on body composition and cardiorespiratory fitness in adults with obesity

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Introduction: A weekly combination of a high volume of moderate-intensity continuous training (MICT) with a low volume of high-intensity interval training (HIIT) with a polarized approach (POL) induces greater improvements in body composition, maximal oxygen uptake (V'O2max) and ventilatory thresholds in well-trained athletes, compared to threshold training (THR), even if POL has never been applied in adults with obesity. Thus, the purposes of this study were to investigate changes in body composition, V'O2max and ventilatory thresholds induced by a 24-week either POL or THR program in adults with obesity under their normal living conditions. At the end of the the 24 weeks of training we added a running competition for increasing adherence of participants to training.
Methods: Twenty male volunteers (mean age 39.8±6.3 y; mean body mass index [BMI] 31.6±2.7 kg·m^{-2}) participated in this study (n: 10 POL, n: 10 THR), performed 3 sessions a week, for 24 weeks, supervised online by researchers. At baseline (PRE) and at the end of the training period (POST) body composition, physical capacities and expression levels of adiponectin were measured. POL group performed ~85-90% of total training below the first ventilatory threshold, and the remaining 10-15% above the second ventilatory threshold. The THR group performed ~65-70% of total training below the first ventilator thresholds, and the remaining 20-30% between the two ventilatory thresholds.
Results: At POST, body mass (BM) and fat mass (FM) decreased by -3.20±3.10 kg (P<0.05) and by -3.80±2.80 kg (P<0.05) in a similar way for POL and THR groups. V'O2max and V'O2 at RCP increased more in the POL group (+8.5±12.2 and +9.0±17.0 %, P<0.05) than THR group (+4.24±8.64 and +4.0±6.70%, P<0.05), while V'O2 at GET increased similarly in both groups (+12.8±12.0 %, P<0.05). Adherence to training was 92.3±10.1 and 87.7±10.8% of training sessions for the POL and THR groups, respectively (P=0.253). Also, seventeen of the twenty participants performed a challenge that is run a half marathon, a 30km, or a marathon, depending on the level reached at the end of the study.
Conclusions: POL and THR were equally effective in improving body composition in individuals with obesity. On the contrary, POL training improved V'O2max and V'O2 at RCP more than THR, without difference in V'O2 at GET. Thus, the results of this study could provide the foundation that over a long period of time (i.e., ≥ 24 weeks) POL training, represent a good alternative from the classical training methods applied in people with obesity like high intensity interval training (HIIT), or THR. Finally, the addition of a competition at the end of the study, has kept high the adherence to training that generally, tends to decrease after the first 2-3 months from the beginning of a training program in a supervised environment.

GC2.141

Trends of social inequities in sedentarism in Spain at the regional level 2001-2020

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Introduction: Physical inactivity is a top leading cause of death, and a main modifiable cardiovascular risk factor. There is evidence of socioeconomic inequities in physical inactivity, but there is a need to understand how these inequities change over time and space. Thus, our objective is to study social inequities in sedentarism in Spain between 2001 and 2020, by sex and region
Methods: We analysed data from 167,581 adults (aged 18 or older) obtained from the Spanish National Health Survey and the Spanish Module of the European Health Survey from 2001, 2003, 2006, 2009, 2011, 2014, 2017, and 2020. We measured socioeconomic position using the educational level operationalized into three categories (low, middle, high). We defined sedentarism as the practice of no physical activity in leisure time. All data were self-reported from the surveys. We carried out Poisson regression models to assess the relative risk of inequality (RRI) and the slope index of inequality (SII). We adjusted analyses by age and presented results overall and stratified by sex and region
Results: Overall, the RII of sedentarism in Spain was 2.33 (CI 95%: 2.13-2.55) in 2020, which had increased by 30% (+0.53) from 2001 (RII =1.80, CI 95%: 1.60-2.02). In sex-stratified results, the increase was higher among women (45%, +0.73), than among men (15%, +0.30). Across regions, Castilla y León showed the highest increase of RII: 18% (+0,32) from 2001 to 2020, while Galicia showed the greatest decrease in RII of sedentarism by a -15% (-0.30). Similar findings were found in the SII; SII of sedentarism changed in Spain (+27%, +7.56) from 27.65 (CI 95%:22.28-33.02) in 2001 to 35.21 (CI 95%:31.62-38.80) in 2020; this increase was also greater in women than in men.
Conclusions: Our findings showed a clear increase of social inequities in adults' sedentarism in Spain, both in absolute and relative terms. This increase was greater among women and showed variability between regions. Equity policies may reduce health inequities through increasing physical activity levels from a social justice perspective.

GC2.142

Comparison of conventional anthropometry and dual energy X-ray absorptiometry (DEXA)-derived measures of body composition and glycated haemoglobin (HbA1C) in a large, multi-ethnic cohort

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Background: No large-scale studies have compared body composition measures across multi-ethnic populations using Dual Energy X-ray Absorptiometry (DEXA) scans, and assessed if DEXA-derived measures provide more information than conventional anthropometry about the risk of type 2 diabetes.
Methods: DEXA scans were administered on 5,443 individuals from the Malaysian Cohort (36% Malay, 44% Chinese, and 20% Indians) between 2020 and 2023, mean age 58.1 [SD 7.8] years. Standardised sex-specific linear regression models compared conventional anthropometry and DEXA measures across ethnicities. After excluding diagnosed diabetes, multivariable linear regression models (adjusted for demographic and lifestyle factors) compared associations of body composition with glycated haemoglobin (HbA1C) across ethnicities.
Results: In terms of anthropometry, the Chinese were the leanest, Indian participants had the largest waist circumference (WC) but Malay men had the largest BMI. For DEXA measures, the greatest differences were observed for body fat, subcutaneous fat, arm fat, and leg fat, where Indian women reported approximately 1 SD more fat mass than Chinese

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women. Overall, there was approximately 2% more fat mass at equivalent BMIs for Indian compared to Chinese men, whereas for women, it was about a 5% difference. When comparing anthropometric and DEXA-derived measures with HbA1c, associations were largely similar for Chinese participants, but DEXA measures had stronger associations in Indian participants. For example, a 1 SD increase in waist circumference and waist-hip-ratio was associated with ~0.19 higher HbA1C in Indian women, but associations with visceral fat were 0.29 (0.18 to 0.41) and android/gynoid ratio were 0.37 (0.25 to 0.48). No anthropometric measures displayed protective associations with HbA1C, whereas gynoid fat %, leg fat % and lean body mass % were inversely associated with HbA1C. **Conclusion:** There were distinct patterns of body composition across ethnicities that were not captured by conventional anthropometry. Indians generally had a higher fat percentage than their Malay and Chinese counterparts, with the difference more prominent among women. Compared to conventional anthropometry, DEXA-derived measures showed stronger associations with HbA1c among Indian participants.

Figure 1. Fully adjusted associations of HbA_{1C} (%) with standardized conventional anthropometry and **DEXA-derived measures (%)** by ethnic groups and sex (n=4,308).

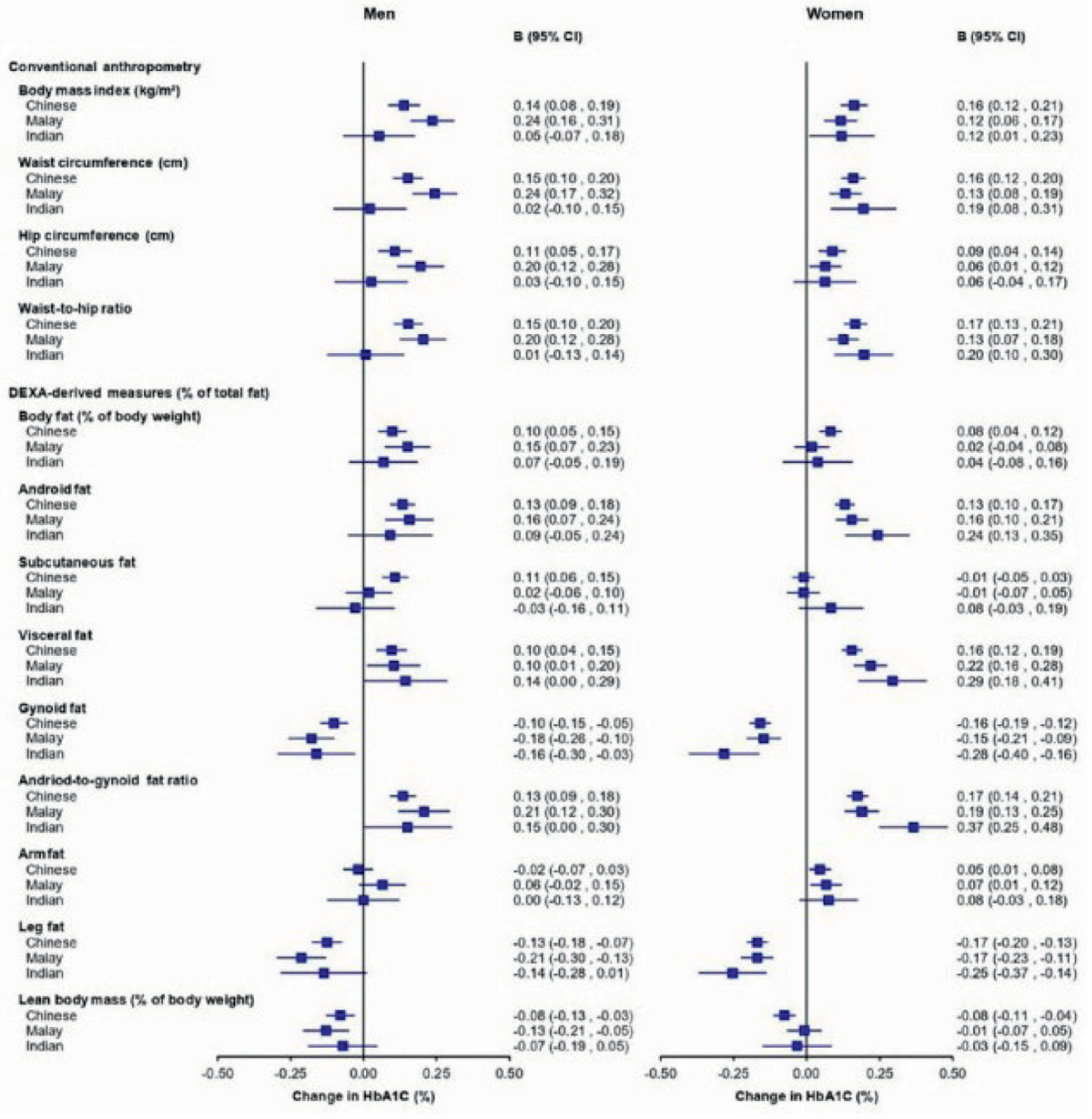


Fig. 1. Fully adjusted associations of HbA1C (%) with standardized conventional anthropometry and DEXA-derived measures (%) by ethnic groups and sex (n=4,308).

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GC2.143

Biomonitoring mercury in young students living with underweight and overweight at a British University

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Introduction: Hair mercury (Hg) levels are considered a good biomarker of exposure to this pollutant. To evaluate the exposure to Hg in undergraduate De Montfort University (DMU, UK) students.
Methods: Nutrient intake was collected from 111 (20.45 ± 1.17 yrs-old; 33 male and 78 female) DMU students from different ethnic backgrounds (41 Asia, 41 Africa, 27 Europe, 1 Central America and 1 Caribbean), using a validated variant of the Nutrition Norfolk Food Frequency Questionnaire. Hg was analysed in scalp-hair provided by 73 of the participants (58 female) by ICP-MS. BMI was calculated using height/weight, measured appropriately by a qualified nurse.
Results: Hg was detected in 63 hair samples (49 female; LoD=0.0310 μg/g) and was significantly higher in male participants (p-value<0.05; data presented as mean and range, in μg/g): [0.9794 (0.0891-6.6073) vs. 0.2956 (0.0443-1.6733)]. The concentrations of total-Hg are higher than the mean average reported in Polish individuals aged 21-22 years-old (0.436 vs. 0.150 μg/g) but lower than the geometric mean reported in Spanish individuals aged 18-29 years-old (0.30 vs. 1.65 μg/g). Based on BMI, 25.7% of the participants monitored living with overweight (from 25 to 30 kg/m^2), meanwhile, 9.2% and 8.3% living with underweight (<18.5 kg/m^2) or obesity (>30 kg/m^2), respectively. Levels of Hg detected did not show statistical differences based on the prevalence of underweight and overweight (p-value=0.226) after performing a Pairwise Wilcoxon Rank Sum Test. This result might be attributed to the low number of students monitored in each BMI category, as previous authors have reported higher levels of Hg in individuals with higher BMI, independently of their age or sex. Hg was only significantly correlated with chocolate intake (r=-0.2957; p-value<0.05). However, chocolate intake did not show differences due to sex in the population monitored (p-value=0.1631) or BMI category (p-value=0.4292). Similar results were observed for the intake of fish/seafood (the major source of Hg in the diet), i.e. intake did not show a significant effect due to sex (p-value=0.8260), ethnic background (p-value=0.5890) or BMI (p-value=0.5385). However, although the distributions are not significantly different (they have big dispersion), the average intake of fish was much higher in male participants (72.6563 vs. 53.9072 g/day), which could explain the sex differences found in total-Hg in hair.
Conclusion: Although the levels of Hg found in hair would highlight a generally lower exposure to Hg in the population studied when comparing with other studies on populations that traditionally eat more fish/seafood, some individuals presented higher concentrations of total-Hg than the USEPA recommended reference level (1 μg/g), individuals that should be followed up with dietary recommendations.

GC2.144

Streaming or Dreaming? A repeated measures study examining how objectively measured screen use influences sleep in young adolescents

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Background: In adolescents, insufficient sleep is a strong risk factor for obesity, and screen time before bed is thought to adversely affect both quantity and quality of sleep. However, studies to date have been limited to predominantly cross-sectional analyses using questionnaires which limits a comprehensive understanding of how screen time might impact sleep. The aim of this study was to determine how objectively-measured screen time before bedtime and shuteye time influenced sleep in young adolescents.
Method: A seven-night repeated measures design was used to examine the impact of evening screen usage on sleep quantity, quality and timing in 79 participants aged 11-14.9 years. Objective screen time data were captured using wearable and stationary video cameras, measuring from two hours before bedtime until the first time the adolescent tried to go to sleep (shuteye time) over four non-consecutive nights. Video data were coded using a reliable protocol (kappa = 0.9) to quantify both device type (8 options, e.g., phone) and activity type (9 options, e.g., social media). Sleep outcomes were measured objectively via AX3 accelerometer over the course of one week. Night to night variability in screen use was determined for all participants and related to sleep variability using a mixed-effects regression model, considering participant as a random effect and adjusted for weekends.
Results: Total screen use in the two hours before bed did not significantly affect total sleep time (TST), but did delay sleep onset by 31 mins (CI 95%: 9 to 54) and sleep offset by 27 mins (5 to 49) relative to nights without screen use. In general, stronger associations were observed between screen use and sleep when the screen use occurred between bedtime (getting into bed for the night) and shuteye time (start trying to go to sleep), rather than in the two hours before bedtime. A 40-minute (31 to 49) increase in shuteye latency and a 35-minute (20 to 50) delay in sleep onset were observed between nights with and without screen use, and every additional 10 mins of screen use was associated with a shorter TST of 3 mins (-6 to -1). Interactive screen use had a more detrimental effect on TST than passive screen use (differences in sleep time for each additional 10 mins of screen time: interactive -9 [-16 to -2] vs passive -4 [-7 to -0] mins), although they had broadly similar effects on delaying sleep onset and increasing sleep latency. Gaming while in bed reduced TST that night (-17 [-28 to -7] mins for every additional 10 mins of gaming) as did using multiple devices (multitasking) by 35 mins [-67 to -4] compared to nights without multitasking.
Conclusion: Using objective, accurate measures of screen use, our data reveal that screen time, particularly that which is interactive or involves multitasking, once in bed notably delays and/or shortens sleep time more than screen time in the hours before bed. These findings prompt a revaluation of current sleep hygiene recommendations around screen use before bed that aim to improve sleep in children and therefore reduce risk of obesity.

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GC2.145

Determinants of multimorbidity in low- and middle-income countries: A systematic review of longitudinal studies and the role of obesity

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Introduction: Multimorbidity—the co-existence of at least two chronic health conditions within the same individual—is an important global health challenge. In high-income countries (HICs), multimorbidity is dominated by non-communicable diseases (NCDs); whereas the situation may be different in low- and middle-income countries (LMICs), where chronic communicable diseases remain prominent. The aim of this systematic review, supported by the MUltimorbidity ThroUgh cApacity buiLding (MUTUAL) consortium, was to identify determinants (including risk and protective factors) and potential mechanisms underlying multimorbidity from published longitudinal studies across diverse population-based or community-dwelling populations in LMICs.
Methods: We systematically searched three electronic databases (Medline, Embase and Global Health) using pre-defined search terms and selection criteria, complemented by hand-searching. All titles, abstracts and full texts were independently screened by two reviewers from a pool of four researchers. Data extraction and reporting were according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Methodological quality and risk of bias assessment was performed using the Newcastle-Ottawa Scale for cohort studies. Data were summarised using narrative synthesis.
Results: The search yielded 1,782 records. Of the 52 full-text articles included for review, 8 longitudinal population-based studies were included for final data synthesis. Almost all studies were conducted in Asia, with only one from South America and none from Africa. All studies were published in the last decade, with half published in the year 2021. The definitions used for multimorbidity were heterogeneous, including 3 to 16 chronic conditions per study. The leading chronic conditions were heart disease, stroke and diabetes; and there was a lack of consideration of mental health conditions (MHCs), infectious diseases and undernutrition. Prospectively evaluated determinants included obesity, lifestyle behaviours, dyslipidaemia, childhood adversity, socio-economic status, markers of social inequities, and disability.
Conclusion: This review revealed a paucity of evidence from LMICs, and a geographical bias in the distribution of multimorbidity research. Longitudinal research into epidemiological aspects of multimorbidity is warranted to build up scientific evidence in regions beyond Asia. Such evidence can provide a detailed picture of disease development, with important implications for community, clinical and interventions in LMICs. Our findings can also provide insights that are beneficial for HICs dealing with similar issues or looking to support LMICs in addressing their healthcare challenges. The heterogeneity in study designs, exposures, outcomes and statistical methods observed in the present review calls for greater methodological standardisation while conducting epidemiological studies on multimorbidity. The limited evidence for MHCs, infectious diseases and undernutrition as components of multimorbidity calls for a more comprehensive definition of multimorbidity globally.

GC2.146

Insights from the European Liver Patients' Association's mobile testing at the European Parliament

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Background and Aims: In recent years, the European Union (EU) has witnessed a concerning rise in the incidence of fatty liver disease, a condition characterised by the accumulation of excess fat in liver cells. Obesity is associated with an increased risk of fatty liver. This health challenge has become increasingly prevalent, reflecting changes in lifestyle and dietary habits across the region. Of particular concern is the link between fatty liver and its potential to serve as a significant risk factor for the development of liver cancer. The escalating prevalence of fatty liver in the EU underscores the urgency of addressing lifestyle-related factors and implementing preventive measures to curb the progression of this condition. It was the aim of this project to raise awareness of how simple and effective early detection of liver disease can be using portable transient elastography (TE) within a community setting.
Method: The Liver4Life testing van (ELPA Member from the United Kingdom) was present at the European Parliament in October 2023 for 3 days to offer TE to the Parliament staff and the general public. ELPA representatives engaged with Members of the Parliament to build awareness of the upcoming event, and invites were sent to members who regularly engage with the liver health agenda. The van and gazebo were in the pedestrianised walkway outside the main entrance, and specific messaging was created and placed on the van. The ELPA TE device was managed by trained operators, including some Belgian Health Care Professionals, with access to M and XL probes. As this was an awareness-only event to promote the concept, a brief intervention on lifestyle was used when a high Controlled Attenuation Parameter (CAP) reading was identified. A lifestyle brief intervention was used if a high stiffness reading was identified. The person was provided with a self-referral letter inviting them to seek a medical consultation not only in Belgium since many people were from different countries due to the specific intercepted audience.
Results: The total number of completed and recorded TE examinations over the 3 days was 152. These were all adults; however, as it was an awareness event, no personal information was collected. Of the 152

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examinations, 19 (12.5%) people had stiffness readings in excess of 7.1Kpa, and these people were given self-referral letters after brief intervention advice. The highest stiffness reading over the 3 days was 10.9Kpa. The study also identified 47 (31%) people with a CAP reading of 275 or higher (UK criteria) and 106 (69.7%) people with a CAP reading of 225 or higher (Belgium criteria). Everyone with a CAP score of 225 or greater was given brief intervention lifestyle advice.
Conclusion: While the number of people with significant fibrosis was low, the number of people with raised CAP readings was higher than expected. Nearly all patients with high CAP results were unaware they had fat in the liver. Many suspected that they would have high readings due to their lifestyles, but people were hesitant to see the results. Altogether, these findings suggest an urgent need to take public health action to increase awareness.

GC2.147

Multi-level determinants of obesity

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Introduction: Obesity is a complex health issue influenced by multiple factors at different levels, such as individual, social, and environmental levels. However, most of the existing research on obesity in Ghana focused on single-level approaches to understanding the determinants of obesity. While this approach has increased our understanding of factors contributing to the risk of obesity, they assume that obesity is determined by single-level factors, limiting the scope of knowledge on the complexity and multi-level determinants of obesity. Accordingly, this study explored the determinants of obesity in Ghana using a multi-level approach. It examined whether multiple factors, including individual-level factors (e.g., age and sex) and area-level factors (e.g., the number of and distance to fast-food joints and restaurants) determine the risk of obesity.
Methods: The study accessed data from the Ghana Statistical Service for the individual-level variables and generated the area-level variables using the Geospatial Information Systems (GIS) software. Both data sources were focused on the three most populous metropolises in Ghana, i.e., Accra, Kumasi, and Tamale, capturing the diverse cultures, religions and lifestyle characteristics in Ghana. Multi-level regression models and Chi-Square tests were used to analyse the data in the Stata software version 17. The level of statistical significance was set at $p \leq 0.05$.
Results: The results showed individuals of the Muslim faith are at about 11% higher risk of obesity than those of the Christian faith ($p \leq 0.05$). Also, an increase in the number of fast-food joints within a 5km radius area increases the risk of obesity (OR = 1.006; $p \leq 0.05$). Further, an increase in the number of restaurants within a 2km radius decreases the risk of obesity (OR = 0.975; $p \leq 0.05$), while an increase in those located within 10km increases the risk of obesity (OR= 1.019; $p \leq 0.05$). However, for supermarkets, an increase in the number of those located within 2km radii increases the likelihood of obesity (OR = 1.104; $p \leq 0.05$), while an increase in the number of those located within 10km decreases the odds of obesity (OR = 0.918; $p \leq 0.05$).
Conclusion: Obesity in Ghana is influenced by multi-level factors, such as religion and the number of restaurants, supermarkets and fast-food joints in an area. Therefore, policymakers could explore multiple strategies, such as obesity education campaigns through religious leaders and government regulations of the location and services of food providers, to tackle obesity in Ghana.

GC2.148

The obesity landscape and perspective in Central and Eastern Europe

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Overweight and obesity affect almost 60% of adults and nearly one in three children in the WHO European Region (WHO report 2022). The situation in the Central and Eastern Europe in obesity prevalence is worse than in Western and Northern parts of EU countries. (e.g: CZ 66% of adults, SK 60 – 70% of adults), reflecting as well the higher cardiovascular diseases age-standardised prevalence rate, especially, in former socialistic countries. There is scarcity of data availability of obesity prevalence, there are not registries for obesity. System of obesity management is different in countries, and in many countries of this region it is just beginning to be built. The public health evidence is biased toward short term impacts of highly agentic, individual level interventions; however there are needed policy and practice aimed at structural changes, addressing complex local drivers of obesity, through the implementation of multiple strategies across multiple settings, which should be included in the national action plans on obesity. The basic pillars of structural changes should influence food industry, marketing, social environment, and out- and indoor facilities for physical activities. Complex systems and system thinking approaches can help during the preparation of action plans on obesity to understand the ways in which interventions influence systems, how those systems adapt in response, and what this means for public health evidence and action, in the light of an ideal future.

GC2.149

Common actions for the prevention of overweight and obesity among children in the Nordic countries

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Introduction: Childhood obesity is a most serious public health challenge, and the increasing prevalence of overweight and obesity among children in the Nordic countries is worrying. Children with overweight and obesity have a higher risk of carrying these conditions into adulthood, and recent evidence also indicates an association between the prevalence of obesity in childhood with a higher risk for developing some cancer forms in adulthood.
Methods: Cancer societies from Denmark, Sweden, Norway, Finland, and Iceland are collaborating in the conduction of a systematic umbrella review covering the evidence on six policy approaches: taxes and fiscal policies; marketing restrictions and regulations; early childhood prevention; school health; product labelling; availability and affordability. Two independent researchers searched the PubMed database for systematic reviews, meta-analyses and government published reports. The systematic search was supplemented with a grey literature search based on the Canadian Agency for Drugs and Technologies in Health's 'Grey Matters' tool supplemented with relevant websites from relevant organisations, and these were also systematically reviewed.
Results: The PubMed search yielded 4.061 potential hits and the grey literature search yielded further 447 potential hits. The umbrella review has so far included 112 articles covering the mentioned topics (final adjustments might ensue, since the review is still ongoing). Overall, most of the included reviews covered primarily intervention studies and less often real-world implemented policies. Only a few studies report results for weight-related outcomes, but results show that many of the reviewed policies impact both sales, buying-behaviour, and consumption among

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children, youth, and/or families with children, as well as reformulation of products in the food industry. Such parameters are relevant since, over time, they contribute to the management of a healthy weight and obesity prevention among children and youth. There are similar characteristics across both marketing, labelling, and fiscal policies with the highest health benefits: 1) they are implemented by legislation, rather than by volunteer industry agreements; 2) and the policy initiative is guided by a government-led nutrition profile, rather than focusing on single nutrients. The review is still ongoing, and further results and overall conclusions will be presented first-hand at the conference.

GC2.150

Taiwan Medical Association for the Study of Obesity (TMASO) Collaborating Centers for Obesity Management

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The prevalence of overweight and obesity is growing in Taiwan, reaching 50% in 2020. Obesity is also a global issue, associated with chronic inflammation, metabolic disease, and insulin resistance. In 2011, the European Association for the Study of Obesity (EASO) introduced the Criteria for EASO-collaborating Centres for Obesity Management to establish a structured evaluation of qualified collaborating centers for obesity[1]. These criteria serve as the leading standards for optimizing obesity management across various aspects.

The issue of overweight and obesity has also gained increasing attention in Taiwan in recent years. To provide better care for obesity management, the Taiwan Medical Association for the Study of Obesity (TMASO) initiated the drafting of criteria for collaborating centers for obesity in August 2023. We convened several experts to discuss criteria that are suitable for the local situation, fitting the national policy and grounded in evidence-based practices. Considering the accessibility of medical resources in Taiwan, we have designed distinct criteria for primary clinics and hospitals in certain areas. The number of new cases per year required for each may differ, and clinics may need to collaborate with other specialists, such as weight-reduction surgeons. On the other hand, medical centers should offer comprehensive medical services for obesity within a single institution. Following the evaluation based on the criteria, different levels of certification will be granted, and the certification results will be announced on the TMASO website. Once the criteria are finalized, the next step will involve a trial evaluation, with adjustments made based on the actual implementation.

Obesity is a significant health issue in Taiwan, and an increasing number of individuals with overweight and obesity require weight management consultation. The establishment of standardized and certified criteria for qualified centers is essential to ensure that individuals seeking weight management receive optimal and comprehensive care.

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GC2.151

Inclusive public health policies for obesity and eating disorders: a focus on children and adolescents

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Background: A chief focus of public health policies around body weight management and obesity is calorie restriction, as well as making calorie guidelines and information salient. As such, in England, the government recently introduced a mandatory requirement to display calorie information at the point of choice, such as on menus or food labels in out-of-home food businesses (>250 employees). There has been growing concern among eating disorders (EDs) professionals, people with lived experience and advocates that the focus on calorie counting may inadvertently increase preoccupation with food, weight and shape, leading to increases in disordered eating behaviours and cognitions among vulnerable groups, including children. Concern has been compounded by an increase in urgent and routine referrals for EDs among children and adolescents in several high-income countries over recent years. However, the specific impact of current obesity public health policies on ED risk in children is not known.

Aims: The Obesity Policy Research Unit is undertaking research which aims to discern how policies on weight and healthy eating that children are exposed to are understood, internalised, and acted upon. This research, will inform the development of inclusive public health obesity policies that do not cause inadvertent harm to children who are living with, recovering from, or at risk of, an ED.

Methods: The mixed methods research involves Patient and Public Involvement and Engagement (PPIE), and qualitative and quantitative studies with UK children and adolescents (aged 9-13 years). Firstly, qualitative research using focus groups is exploring how children understand, interpret, and internalise policies around weight (e.g. the National Child Measurement Programme) and healthy eating (e.g. traffic light labels and calorie labelling on menus), and how these are acted upon. Focus groups are being conducted in primary and secondary schools in London (n=80; 2 primary schools; 2 secondary schools). Secondly, a quantitative survey is being undertaken among ~3000 children, recruited from schools in urban and rural areas of the UK, via the National Institute for Health and Care Research Clinical Research Network. The quantitative survey will discern whether children with higher levels of body dissatisfaction or disordered eating report more awareness of, and have more negative emotions towards, public health policies around weight and eating. PPIE sessions with children, parents, teachers, and individuals with lived experience of EDs are being used to inform the research programme throughout, including the recruitment materials, development of the quantitative survey, and the interview schedule for the focus groups.

Potential Impact: EDs are increasing in prevalence among children and adolescents in many high- income countries. A move towards making obesity public health policies more considerate of children or adolescents who are living with, or at risk of, an ED could have wide benefits and would support the healthcare principle of 'first, do no harm'.

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GC2.152

Food insecurity as a driver of maternal obesity and related adverse pregnancy outcomes in high-income countries: a qualitative systematic review of pregnant women's experiences

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Background: Food insecurity in pregnancy it is significantly associated with maternal obesity and pregnancy complications, including gestational diabetes. These have life course implications for obesity and diabetes development for women and their children. However, little is known about pregnant women's experience of food insecurity and how it influences their diet and weight. This qualitative systematic review aimed to understand experiences of food insecurity to inform recommendations on support needs to mitigate the impact of food insecurity during pregnancy.
Methods: Searches included five databases (MEDLINE, Embase, Scopus, Web of Science, CINAHL, completed April 2023), grey literature, reference lists, citations, and contacting authors (completed June 2023). Studies reporting pregnant women's experiences of food insecurity in high-income countries since the global financial crisis of 2008 were eligible for inclusion. Data were coded using NVivo and analysed using thematic synthesis. Hand drawn thematic maps grouped and linked codes into connected themes and subthemes. (PROSPERO CRD42023404774).
Results: Searches resulted in 14,928 results and 21 included studies (n=11 in USA, n=4 in Canada, n=3 in UK, n=2 in Australia and n=1 in Germany). Findings identified three major themes: 1) barriers in food access, 2) impact on physical and mental health and 3) established coping strategies. Pregnancy exacerbated experiences of food insecurity, and the pending arrival of a newborn created additional financial concerns along with worries over providing adequate nutritional needs. Women frequently discussed barriers to fresh fruit and vegetables, resulting in poorer quality diets, and gaining excessive gestational weight, which, in turn, negatively impacts on how they perceive their body image. Reliance on others was a recurrent coping strategy to mitigate the impact of food insecurity.
Conclusions: Experiencing food insecurity has a substantial impact on women's diet and health, resulting in the need to develop coping strategies under challenging circumstances. The experiences of food insecurity among pregnant women suggest current support initiatives are not doing enough and further policy-related intervention is required. As food insecurity is a driver of obesity and related poor health, urgent public health intervention is needed to tackle increasing prevalence of food insecurity and related inequalities in pregnancy outcomes and life course health for women and their children.

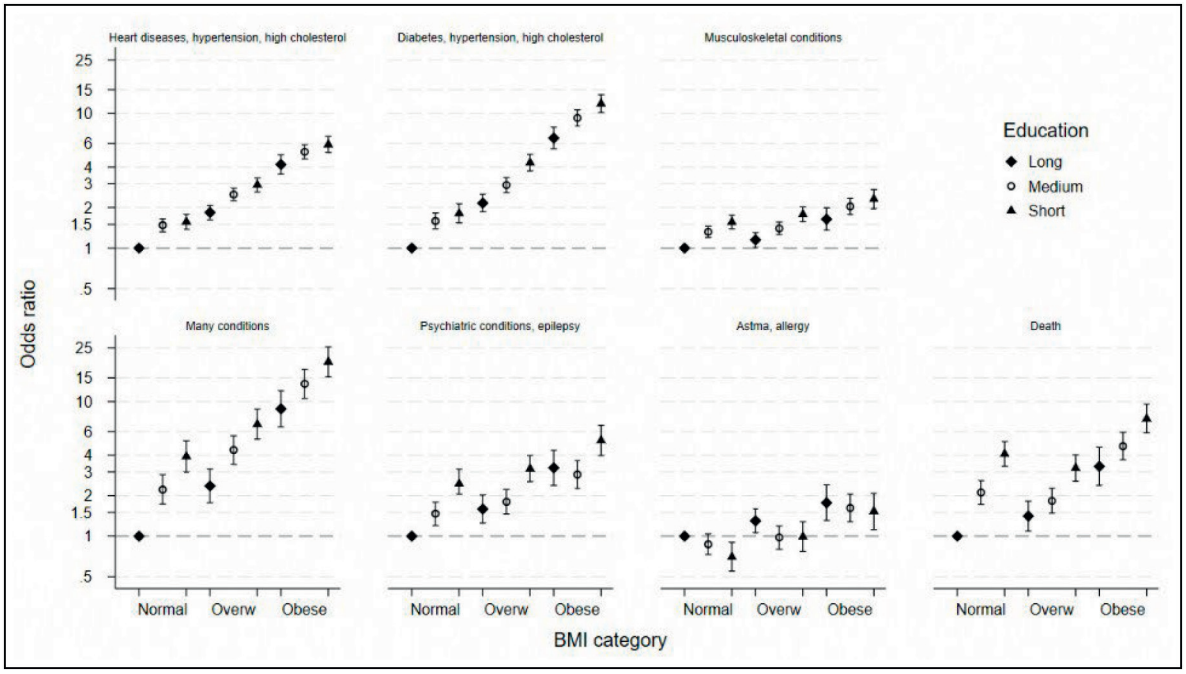
GC2.153

Differential effects of BMI on multimorbidity classes across socioeconomic position

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Introduction: Tackling socioeconomic inequalities in health is based on an understanding of how an individual's socioeconomic position (SEP) influences disease risk. Obesity has consistently been associated with multimorbidity, yet a high weight may have greater health consequences for some individuals than others. Social inequality has consistently been reported for both obesity and multimorbidity. Differential body mass index (BMI) and related risk factors across SEP groups are likely important mediating factors for the social inequality in multimorbidity. However,



Seven multimorbidity classes were identified using latent class analysis based on 47 chronic conditions. Persons deceased during follow-up comprised a separate class. Reference group: 'Few or no chronic conditions' (not illustrated), normal weight and long education. All ORs are adjusted for sex, age and ethnicity.

Fig. 1. ORs for belonging to multimorbidity classes and mortality according to BMI status and educational level.

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much less attention has been given to whether SEP interacts with obesity. We examined the association between BMI groups and multimorbidity across SEP. Additionally, we assessed whether the differential effects were explained by health behavioural factors.
Methods: The study population consisted of 55,204 individuals aged 32-56 years who participated in the Danish National Health Survey 2010, and who had <2 diseases at baseline. Survey information on weight, height, smoking, alcohol intake, physical activity, and diet was linked to national register-based information on sociodemographic factors in 2010 and diagnosis of 47 chronic diseases in 2018. BMI was categories as normal weight (BMI: 18.5-24.9), overweight (BMI: 25.0-29.9) and obesity (BMI: ≥30). SEP was classified based highest educational level completed and categorized as short), medium, and long. Multimorbidity classes were identified using latent class analysis and named 'No or few diseases', 'Heart diseases', 'Diabetes, hypertension, high cholesterol', 'Musculoskeletal diseases', 'Many diseases', Mental illness, epilepsy' and 'Asthma, allergy'. Multinomial logistic regression was used to examine associations of multimorbidity classes with BMI-SEP groups, with the class 'No or few diseases' as the reference, and adjusted for sex, age and ethnicity. In a second model, we additionally adjusted for smoking, alcohol intake, physical activity and diet. Interaction terms between BMI groups and SEP were additionally tested to assess effect modification.
Results: The association between BMI groups and multimorbidity was modified by SEP (p for interaction <0.5). The differential effects of BMI groups by SEP were expressed by increasing odds for four multimorbidity classes by higher BMI and lower education (figure 1). Hence, the highest odds were seen for individuals with obesity and short education. This pattern was most pronounced for the classes 'Diabetes, hypertension, high cholesterol' and 'Many diseases'. When adjusting for smoking, alcohol intake, physical activity, and diet, we found that the differential effects were partly, but not fully, explained by behavioural factors.
Conclusion: Knowledge of differential effects, and thus, identification of vulnerable groups is essential to prioritize health care and reduce inequality in health. We found that SEP modified the association between BMI and multimorbidity, and that, this was partly explained by behavioural factors. Future studies could explore the role of stigma and discrimination towards individuals with a high weight and low SEP leading to a higher disease burden.

GC2.154

Exploring healthcare experiences of older individuals with obesity and different socioeconomic backgrounds – a qualitative study on weight management

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Introduction: Existing research suggests socioeconomic disparities in obesity and also in healthcare access, utilization, and acknowledgment experiences. Given the intricate nature of obesity in healthcare, which demands a comprehensive understanding and approach due to its multifaceted nature and the various factors involved, there is a need for a more profound comprehension of how older individuals with obesity experience healthcare services. This study sheds light on how older individuals with obesity and different educational backgrounds describe their experiences with the healthcare service system for their weight management.
Methods: This qualitative interview study is a part of the Helsinki Health Study. The participants (N=20) were drawn from an ongoing cohort of retired former employees of the City of Helsinki, Finland. Participants with a body mass index over 30 were selected, ensuring a balanced representation, with half having lower education and half having higher education. Both men and women were represented. Face-to-face interviews were conducted between May and September 2023, with data analysis employing inductive thematic analysis.
Results: In this study, the investigated phenomenon was encapsulated by three main themes: 1) an inability to engage with the patient, 2) services mismatched with needs, and 3) facilitating conditions for individual successes. For example, participants vividly recounted moments when the healthcare personnel could not engage with them regarding weight management issues. They also described instances of their weight being ignored during appointments. Furthermore, those with lower educational backgrounds had particularly experienced a condescending attitude towards them when seeking care. Services were perceived as mismatched with participants' needs, and insufficient healthcare personnel resources led to varied experiences across different educational groups. Moreover, the healthcare system's role in facilitating conditions for individual success was realized differently for different educational groups: participants with higher education described broader experiences related to individual opportunities to acquire information and treatment within the healthcare service system.
Conclusions: The participants in this study stressed the importance of respectful engagement with the subject of (body) weight. They articulated a need for healthcare approaches that are tailored to their unique circumstances. Further research is crucial, examining diverse socioeconomic backgrounds and emphasizing older individuals to understand their abilities in accessing information and treatment in our increasingly digitalized world.

GC2.155

Parental lifestyle patterns during pregnancy mediate part of the association between parental education level and overweight in early childhood

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Introduction: In high-income countries, parental education level is inversely associated with the risk of childhood obesity, as early as preschool age. However, less is known regarding the causal pathways leading to such early social inequalities in health. Our study aims to assess the extent to which parental lifestyle patterns during pregnancy mediate the inverse association between parental education and childhood overweight.
Methods: Overweight was identified at 5 years (obesity included, International Obesity Task Force thresholds) in 8,584 children from the French national Elfe birth cohort. Parental education was determined by the highest level achieved by either parent. We used counterfactual mediation models with imputed missing values to assess the potential mediating effect of two parental lifestyle patterns during pregnancy identified in previous work (Lecorguillé et al. 2023) using principal component analysis. The first pattern is characterised by high parental smoking, low maternal diet quality and maternal sedentary behaviour. The second pattern is defined by low parental body mass index and high gestational weight gain.
Results: The first lifestyle pattern mediated (59.6%) of the inverse association between parental education level and the risk of childhood overweight (Indirect Effect β [95%CI] 0.26 [0.20;0.32]). The second pattern mediated a smaller portion of the same association (Indirect Effect β [95%CI] 0.03 [0.01;0.05]). Collectively these patterns mediated 62.8% (Indirect Effect β [95%CI] 0.28 [0.22;0.34]) of the total effect of parental education level on childhood overweight.
Conclusion: Nearly two-thirds of the association between parental education level and childhood overweight was explained by the combination of suboptimal parental lifestyle behaviours during pregnancy, beyond parental BMI status. These analyses will soon be replicated on 6,511 children from the Dutch Generation R study. The findings are expected to inform the development of multi-behavioural interventions, targeting both parents from pregnancy onwards, aiming to reduce social inequalities in childhood overweight from the start of life.

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GC2.156

Weight management practices, views, and experiences among adults living with poor socioeconomic circumstances and obesity: a qualitative systematic review

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Introduction: People living with poor socioeconomic circumstances are more vulnerable to unhealthy weight gain and obesity in high- and upper-middle-income countries, compared to those with advantaged socioeconomic circumstances. However, qualitative research evidence on the topic is lacking. It is suggested that people living with poor socioeconomic circumstances and obesity face many barriers to healthy weight management, such as financial barriers, lack of social support, and accessibility problems with healthy foods, exercise facilities, and healthcare services. This review aims, firstly, to systematically synthesize the best available qualitative evidence on the weight management practices, views, and experiences of adults living with poor socioeconomic circumstances and obesity. Secondly, the review aims to deepen our understanding of the common narratives of obesity according to these people.
Methods: We included qualitative studies from high- and upper-middle-income countries whose study population consisted of adults (aged 18–74 years, thus excluding older adults) living with poor socioeconomic circumstances (e.g., low education or income) and obesity, and whose phenomenon of interest was these people's weight management practices, views, and experiences. We conducted the searches in MEDLINE (Ovid), APA PsycINFO (Ovid), CINAHL (EBSCOhost), Scopus, Web of Science, the Finnish health sciences database MEDIC, Google Scholar, and ProQuest Dissertations and Theses, restricted to English and Finnish languages. Two researchers screen the papers, assess the methodological quality of the studies included, and extract the data, following the Joanna Briggs Institute's (JBI) procedures. A third author is consulted in case of any disagreements between the two researchers. We use a meta-aggregative approach for data synthesis and assess the confidence in the findings with the ConQual approach. The review protocol has been registered in PROSPERO (CRD42023407938).
Results: The searches yielded 1217 records in total. The records were exported to EndNote where duplicates (n=119) were removed. Then, the remaining records (n=1098) were imported to JBI SUMARI. After title and abstract screening, 938 records were excluded and 160 records were included for full-text screening. The following stages consist of full-text screening, critical appraisal of the studies, data extraction, data synthesis, and summarizing the findings, which are completed by early May 2024.
Conclusions: This review produces novel and valuable perspectives on how individuals living with poor socioeconomic circumstances and obesity view and experience their weight management. This helps researchers, policymakers, and social and healthcare professionals to design more effective individual- and community-level interventions, preventive acts to reduce obesity-related health inequalities, and appropriate support for weight management among the most vulnerable population groups.

GC2.157

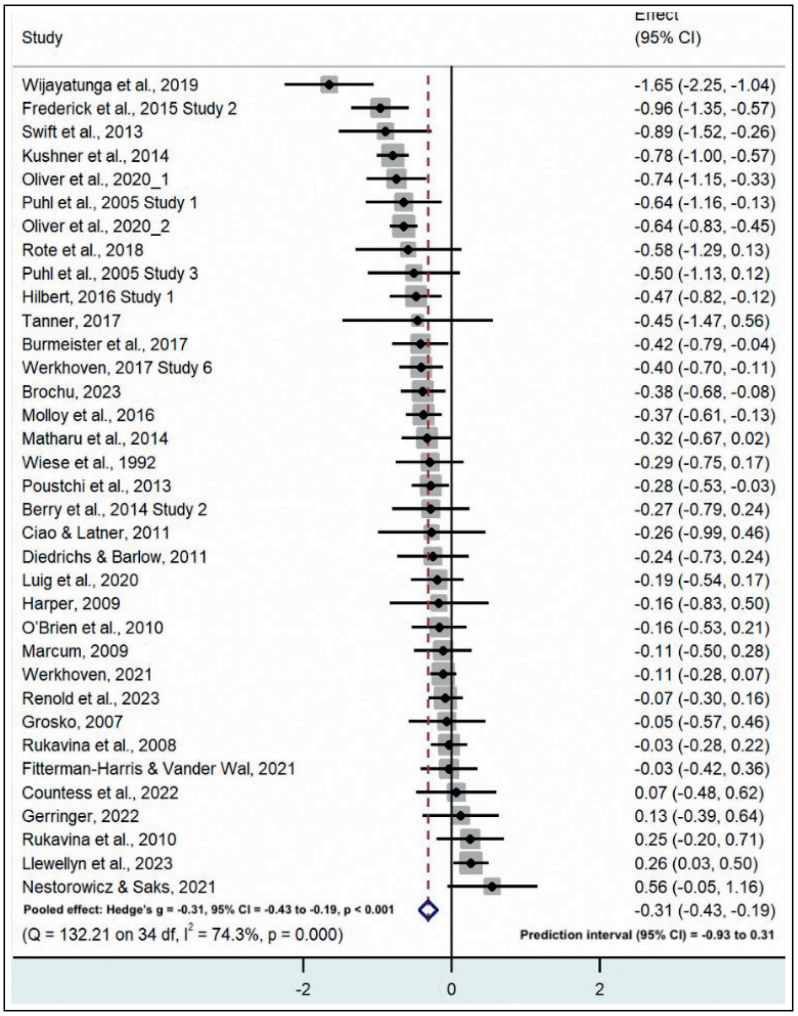
Weight Bias Reduction in Healthcare Students: A Systematic Review and Meta-Analysis

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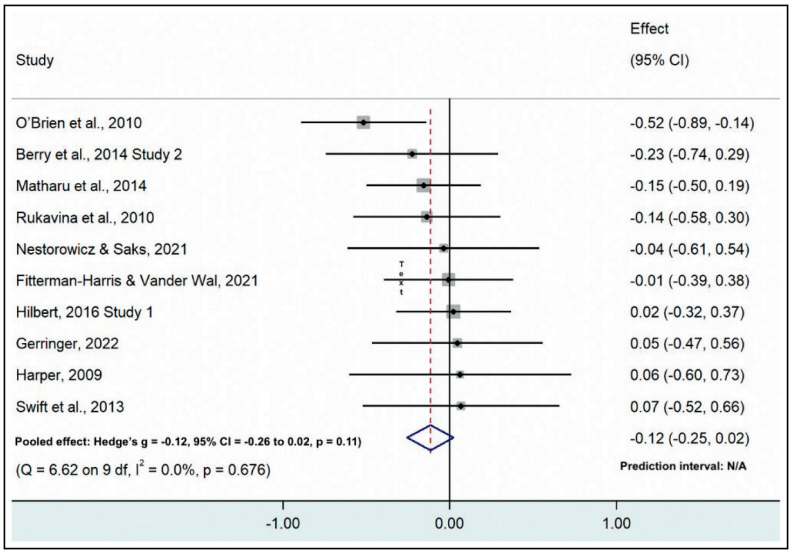
Introduction: Studies that have aimed to reduce healthcare students' explicit and implicit weight bias have found mixed success, making the combined efficacy of interventions unclear. We conducted a systematic review and meta-analysis to determine the efficacy of interventions aimed at reducing weight bias in healthcare students, and to explore factors that may impact intervention success.
Methods: Electronic and grey literature databases including MEDLINE, PsycINFO, ProQuest, and OpenGrey were searched using a combination of relevant search terms (e.g., 'weight bias', 'alter 'intervention' 'healthcare student'). Studies that tested the efficacy of interventions to reduce weight-biased beliefs and attitudes among healthcare students were included. We conducted random-effects meta-analyses to explore the efficacy of weight bias reduction interventions on students' explicit and implicit weight bias. Factors that may impact intervention efficacy such as intervention delivery method (in-person vs. online) and type (unidimensional vs. multifaceted) were also extracted from the included studies and were examined via sub-group analyses. We also conducted a narrative synthesis of the studies that were not able to be included in the meta-analyses.
Results: Of the 3,463 journal articles and dissertations screened, 67 studies (within 64 records) met inclusion criteria, with 35 studies included in the meta-analyses (explicit = 35, implicit (and explicit) = 10) and 32 studies included in the narrative synthesis (explicit = 32, implicit (and explicit) = 3). "Weight bias interventions had a small but positive impact, g = -0.31 (95% CI = -0.43 to -0.19, $p < 0.001$), in reducing students' explicit weight bias but there was no intervention effect on implicit weight bias, g = -0.12 (95% CI = -0.26 to 0.02, $p = 0.11$)." "There was considerable heterogeneity in the pooled effect for explicit bias (I^2 = 74.28, Q = 132.21, df = 34, p <0.001)." "All subgroup comparisons were not significant ($p > 0.05$) and were unable to explain the observed heterogeneity." Narrative synthesis supported the meta-analytic findings.
Conclusion: The small but significant reduction of explicit weight bias encourages the continued testing of weight bias reduction interventions, irrespective of variation in individual intervention components. Contrarily, reductions in implicit weight bias may only be possible from a large societal shift in negative beliefs and attitudes held towards people living in larger bodies. Future research should develop and test interventions (over extended time periods) that are designed to have a greater impact on reducing weight stigma. Future research should also examine whether reductions in weight stigma amongst healthcare students and practising professionals lead to a positive change in the delivery of care to people living with overweight or obesity.

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Forest plot displaying effect size (Hedge's g) and 95% CIs for studies included in the explicit weight bias meta-analysis Note: CIs to the left of 0.00 favour the intervention while CIs to the right favour the control/comparison.

Fig. 1. Forest Plot - Explicit Weight Bias.



Forest plot displaying effect size (Hedge's g) and 95% CIs for studies included in the implicit weight bias meta-analysis Note: CIs to the left of 0.00 favour the intervention while CIs to the right favour the control/comparison.

Fig. 2. Forest Plot - Implicit Weight Bias.

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GC2.158

Perceived Weight Stigma in Maternity Care: Women's Experiences and Needs During the Process of Childbirth

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Introduction: Weight stigmatization is prevalent in childbirth care, leading to discrimination and denial of treatment based on weight. These biased practices and institutional characteristics can negatively impact the quality of care, increasing risks for adverse outcomes in women with larger bodies. This study reviews research on the extent to which perceived weight stigmatization in maternity care affects the experience of perinatal care. Care needs of women with larger bodies for unbiased maternity care are discussed, and pathways for weight stigma-free perinatal care are outlined.
Methods: The literature review involved systematically searching five databases for relevant literature. Thematic synthesis, suitable for representing experienced care, was used to synthesize the data.
Results: A theoretical framework for studying needs-oriented maternity care in a stigma-free environment has been proposed by linking perceived weight stigma, modulators, such as internalized weight stigma, and the consequential reactions of women with larger bodies to their care needs during childbirth. Women with larger bodies experience weight stigma in communication, actions, and the care environment in maternity clinics. This leads to the risk of both medical under- and over-treatment with potential consequences for maternal and neonatal health. Informal coercion is also a concern in the care of women with larger bodies. To address this, women with larger bodies advocate for stigma-reduced and weight-inclusive care through continuous, women-centered, and sensitive support. Trained professionals and care models, such as midwives with advanced practice roles, are crucial in meeting these needs. Broadening the foundations of care according to international guidelines is seen as essential to enhancing the understanding of weight stigma among healthcare professionals.
Conclusion: Assessing the impact of perceived weight stigmatization in maternity clinics and its impact on the care needs of women with larger bodies sheds light on the urgently needed action to reduce weight stigma in maternity care.

GC2.159

A Comparative Analysis of Weight Stigma: Insights from Healthcare Professionals and General Population

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Introduction: Judgments and stereotypes about the body characterize weight stigma. Stigmatizing situations can occur in different environments, such as in healthcare settings. This study aimed to compare experiences related to weight stigma in a sample of healthcare professionals (HP) and general population (GP).
Methods: A total of 547 HP (361 women; mean BMI = 27.2 kg/m²; SD = 6.5) and 330 GP (236 women; mean BMI = 30.5 kg/m²; SD = 8.1) were recruited online and answered items to evaluate weight stigma experiences during the past 12 months, based on previous multinational studies. The responses ranged from "never" to "many times", which were analyzed by response frequency and in a dichotomized manner (yes or no) and compared using the Chi-Square test.
Results: We found for the question *"Have you ever been teased because of your weight?"* that 13.3% (n = 73) of HP and 22.4% of GP (n = 74) reported "many times" with a significant difference (X^2 (4) = 12.466; p =.014). However, when we dichotomized comparing those who marked "never = no" with those who chose "some frequency category = yes", we had that 64.5% of HP (n = 213) and 69.4% of GP (n = 150) have already been teased due to their weight, without statistical difference (X^2 (1) = 1.406; p =.236). For *"Have you ever been treated unfairly because of your weight?"*, 8.0% (n = 44) of HP and 17.0% (n = 56) of GP reported "many times", with a significant difference (X^2 (4) = 16.775; p =.002), in the same way when we analyze in a dichotomized form we found that 41.7% of HP (n = 138) and 50.9% of GP (n = 110) have already experienced this situation with a significant difference (X^2 (1) = 4.497; p =.034). And about the question *"Have you ever been discriminated against because of your weight?"*, 8.8% (n = 48) of HP and 16.4% (n = 54) of GP reported "many times", with a significant difference (X^2 (4) = 15.306; p =.004), however we found that 43.9% (n = 145) of HP and 50.5% of GP (n = 108) have already suffered discrimination, without statistical difference (X^2 (1) = 2.224; p =.136).
Conclusion: Many HP and GP experience weight stigma. When we globally analyzed the frequency of those who have suffered teasing, unfair treatment, or discrimination, we found no differences between HP and GP, except for unfair treatment, of which GP presented a higher percentage in this sample. However, when we analyzed separately who often suffers these situations, we found that the GP reported a higher percentage of "many times" when compared to the HP group, indicating that in this sample this population is more affected by stigmatizing experiences.

GC2.160

Assessment of Social Isolation Risk of Individuals with Obesity: An Observational Cross-Sectional Study

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Introduction: Obesity is a disease that affects people globally but since considering this condition only as a medical problem may lead to underestimating the fight against obesity, it should be evaluated together with the social consequences. Individuals with obesity often face negative social stigma and may experience social isolation. This study aims to investigate the risk of social isolation among individuals following an obesity clinic.
Methods: The study included 276 participants and was conducted in the obesity outpatient clinic of a tertiary healthcare institution. Data were collected first 6 months period of 2023 using the social isolation scale developed by Çelikbaş and Tatar and case report form (1). The independent sample T-test was used to compare continuous data between two independent groups when normal distribution was achieved, and the Mann-Whitney U-test was used when it was not. For categorical data, the chi-square test was used. Statistical significance was determined at p<0.05(two-sided).
Results: The social isolation scale comprises 14 items, scored on a 3-point Likert scale from 1 to 3. The scale does not include any reverse items. A high score on the scale indicates a high degree of social isolation. Upon examining the scale items, it becomes apparent that internal emotions, such as self-pity and detachment from life score higher; while more passive emotions, such as exclusion, feeling unloved, humiliated, and abandoned, score lower. This suggests that obesity affects social perception, leading individuals to judge themselves. However, cultural norms may mitigate the exclusion and marginalization of those who have these perceptions. Upon examining the comparative analyses, it is evident that social isolation scores increase significantly with BMI according to WHO's obesity classification (H = 9.664; p = 0.046). The highest score is observed in individuals has severe obesity, highlighting obesity as a factor that exacerbates social isolation. When comparing the working status and social isolation scores, retirees had significantly lower scores while those unemployees had significantly higher scores (H = 6.182; p = 0.045). This difference may be explained by the fact that those who work have more opportunities to socialize, thus reducing the risk of becoming isolated. When comparing the psychiatric disease status and total social isolation scores, it is evident that individuals with psychiatric illnesses have

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significantly higher scores (z=-1.931; p=0.045). There was no significant relationship found between education, family type, income level, childhood obesity, and social isolation.

Conclusion: Obesity is a disease that increases the risk of social isolation. Self-judgment behavior may occur in individuals with obesity. The risk of social isolation increases with increasing body mass index, decreasing participation in business life, and increasing presence of psychiatric disease.

Reference

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Tab. 1. Social Isolation Scale Results.

Scale Items	Average Score	Standart deviation
Ignored	1,47	0,74
Pushed to Loneliness	1,45	0,74
Not Finding Intimacy	1,44	0,72
Detached from Life	1,48	0,74
Unloved	1,26	0,57
Abandoned	1,23	0,55
Not Accepted	1,35	0,67
Unliked	1,47	0,72
Not Respected	1,34	0,65
Unnoticed	1,37	0,67
Refuge in Solitude	1,54	0,79
Excluded	1,31	0,63
Humiliated	1,26	0,59
Self-Pity	1,57	0,78

Tab. 2. Comparison Analyses.

Variable	N	Median Rank
Normal	8	124,94
Overweight	37	111,66
Class-I Obesity	96	132,32
Class-II Obesity	59	144,46
Morbid Obesity	76	156,17
		H=9,664; p=0,046
Working	88	131,66
Retired	54	121,54
Unemployed	134	149,83
		H=6,182; p=0,045
No psychiatric illness	257	135,2
Presence a psychiatric illness	17	172,24
		z=-1,931; p=0,045

GC2.161

Across borders: public views on obesity, bariatric surgery, and patients in The Netherlands, France, and the United Kingdom

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Introduction: Bariatric surgery has emerged as an effective intervention for severe obesity; however, the procedure continues to face enduring stigma. Negative societal attitudes toward bariatric surgery have been observed on a global scale, yet international comparative studies are scarce. Furthermore, existing research frequently neglects to examine public perceptions of individuals undergoing this procedure.

Method: Our cross-sectional survey study sought to fill this knowledge gap by examining public perceptions and attitudes toward individuals who undergo bariatric surgery in three European countries: The Netherlands, France, and the United Kingdom. Furthermore, we investigated whether perceptions of obesity and bariatric surgery influenced attitudes toward individuals who had undergone bariatric surgery. A total of 1807 respondents filled in our survey of which 600 were in the Netherlands, 603 in France, and 604 in the United Kingdom.

Results: While negative attitudes toward individuals with obesity were prevalent across the three countries, surprisingly, respondents displayed positive attitudes toward those undergoing bariatric surgery. The perception of personal responsibility emerged as a key factor influencing attitudes toward these patients. Notably, the United Kingdom exhibited consistently more negative attitudes, potentially linked to variations in beliefs about personal responsibility or national perspectives on obesity and its treatments.

Conclusion: With 1807 respondents, our study challenges the commonly held belief that attitudes toward bariatric surgery and its patients are universally negative. The findings emphasize the importance of considering public perceptions of bariatric surgery patients when addressing the stigma associated with bariatric surgery. Further research is essential to fully understand the distinctions observed among the surveyed countries, shedding light on the complex interplay of cultural, social, and individual factors influencing attitudes toward obesity and its surgical interventions. This study contributes to novel insights, challenging preconceptions and advancing our understanding of the predictors of bariatric surgery stigma.

GC2.162

Unveiling societal biases: exploring factors behind discrimination against bariatric surgery patients in The Netherlands, France, and the United Kingdom

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Introduction: In the present study, we explored various reasons for the discrimination against individuals with obesity undergoing bariatric surgery among the public in the Netherlands, France, and the United Kingdom

Methods: As part of a survey study, we asked respondents whether they believed individuals with obesity who had bariatric surgery were discriminated against. Subsequently, we asked respondents why they

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believed individuals who had surgery might face discrimination. A total of 1807 respondents participated in the survey, representing 600 from the Netherlands, 603 from France, and 604 from the United Kingdom. The data analysis involved identifying and examining prevalent themes.

Results: Our findings show that individuals with obesity undergoing bariatric surgery encounter discrimination for various reasons. The general perception among the public is that discrimination against those who have undergone surgery is rooted in a combination of societal, cultural, and psychological factors. Specifically, negative societal stereotypes surrounding obesity, such as the perceptions of laziness, lack of self-discipline, and willpower, were identified as significant reasons for the discrimination faced by those who undergo surgery across the three countries. In France, cultural attitudes related to beauty standards and norms of bodily aesthetics were considered by a substantial part of the public as important reasons for discrimination. Notably in the Netherlands, there was a prevailing belief that individuals undergoing surgery for obesity face discrimination due to health misconceptions and misunderstandings about obesity. In their rationale, they highlight that individuals who discriminate lack understanding regarding the complexity that is obesity, fail to acknowledge obesity as a chronic condition and fail to understand the effort and perseverance it requires of patients 'post-surgery to lose and maintain weight loss.

Conclusion: This study represents a first step in documenting the reasons why individuals with obesity who undergo surgery are discriminated against. Additionally, our findings provide supporting evidence that the rationale and motivating factors behind the discrimination faced by individuals who undergo surgery may vary across countries. Recognizing the diverse societal attitudes and cultural perceptions highlighted in our study emphasizes the importance of tailored initiatives in education and advocacy. These efforts are essential to challenge negative stereotypes, address misconceptions, and promote understanding. By doing so, we can actively combat discrimination against those who seek or have undergone bariatric surgery.

Conflict of Interest: None Disclosed

Funding: This research was supported by a grant from the Wageningen School of Social Sciences (WASS).

GC2.163

Prevalence of explicit weight stigma in a target population of Italian Social Health Educators: an epidemiological study

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Introduction: Weight stigma is defined as discriminatory acts and ideologies towards people living with overweight or obesity.

It is an intrusive and socially accepted phenomenon, commonly reported in numerous domains of daily life such as the work environment, interpersonal relationships, education, and media.

Many studies have shown a greater prevalence of explicit weight stigma even in healthcare, from students to qualified healthcare providers.[1]

Social Health Educators in Italy haven't been a study target population yet, so we decided to design a specific study regarding this matter.

Methods: Students and graduated Social Health Educators (N.103) enrolled at the Universities of Padua and Trento in Italy, filled out an online anonymous survey. 28 people not enrolled/graduated in the specific university degree course were invited to participate as control group. To explain the purpose of the study a cover letter has been drawn up.

The survey was developed adapting validated assessment questionnaires used among students and other healthcare professionals.[1] The main drivers of weight stigma were explored through fifteen assertions on a five-point Likert based scale. Respondents also provided general demographic information (age, gender, study path and work field) including their perceived weight status and experienced stigmatization.

Results: Out of 103 respondents, 92% were female, aged between 21 and 29 years old. Of these, 75% were students and 24.3% had graduated. The respondents strongly disagreed with the idea that weight is controllable and that there is a lack of motivation for lifestyle changes.

Regarding the alleged stereotypical characteristics such as laziness, lack of compliance, weak willingness, the majority of responses were neutral. Only a small percentage (15% and 4%) totally agreed.

To define a possible self-perception bias, participants were asked their weight self-perception, and the majority defined as normal weight; however, 63% of respondents reported having experienced stigma almost once in a lifetime.

The answers from the comparison group showed poor awareness and sensibility concerning weight stigma compared to the target population.

Conclusions: The results showed that Social Health Educators are aware of the main drivers of weight stigma and the pathophysiological complexity of obesity. This can be attributed to the specific training and education courses including pedagogy, psychology and mental health, and internal medicine.

Social Health Educators can be considered as a trait d'union between the different healthcare professionals involved in the treatment path of people with overweight and obesity and their role could be considered in the management of patients suffering for obesity for the promotion of psychological wellbeing, advocacy and empowering.

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GC2.164

Stigma towards obesity in the population of medical doctors in Croatia

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Introduction: Obesity is one of the leading public health problems in the world, and despite modern treatment methods, it still represents a major therapeutic problem, in large part because the problem extends not only to the medical domain, but also to psychological and sociocultural aspects. The fact that body mass is related to caloric intake highlights the importance of lifestyle, as well as the necessity of changing it as an important treatment process. Precisely because of this, when something is related to lifestyle as a sociocultural phenomenon, stigma can often appear. The aim of this study was to determine how much stigma towards obesity is expressed among Croatian medical doctors.

Methods: An online questionnaire survey was conducted, and the sample presented here was collected over a one-week period in January 2024. The Universal Measure of Bias-FAT (UMB-FAT) questionnaire was used, which consists of 20 questions on a 7-point Likert scale, and the questions explore people's attitudes towards people with obesity.

Results: Overall, 137 Croatian doctors filled out the questionnaire [median age 31 (25-61) yr.; 29.9% with overweight, 4.4% with obesity]. Of that number, 11.7% of doctors deal with obesity in the scope of their every day work. Interestingly, 24.1% of them were teased for being overweight during their lifetime. When it comes to UMB-FAT domains, the average answer to the question "I try to understand the perspective of fat

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people" was 3.1 ± 1.5, while the question "I don't enjoy having a conversation with a fat person" had 5.9 ± 1.3. Overall, 70.8% of doctors believe that the stigma about obesity is significantly expressed in society, and 93.4% of them believe that obesity is a disease.
Conclusion: Although today the problem of obesity, as well as its treatment, is more aware than ever, it is still necessary to make great efforts to keep on dealing with this problem in order to reduce the stigma.

GC2.165

Exploring Body Dysmorphism Through WhatsApp Profile Pictures in Patients with Obesity: A Prospective Study

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Introduction: People living with obesity often suffer from body dysmorphia. Comparison with social media images can aggravate this pathological condition and cause the perpetuation of stigma towards people living with obesity. For this reason, persons with obesity can represent themselves on social media in a distorted way to avoid incurring social stigma linked to the pathology from which they are affected. The growing diffusion of social media platforms offers a unique opportunity to explore how patients perceive and represent their body image.
While some previous research has highlighted that some media portrayals of idealized bodies contribute to overestimation of fat or underestimation of muscle, other scientists suggest that the increased prevalence of obesity could explain underestimation of body fat as a form of renormalization In fact, today well-being is not defined only as being "physically healthy". Multiple factors can influence a person's well-being. Social media is strongly correlated with an individual's body dissatisfaction. High exposure to thin and toned body shapes has created new standards and "idealized" body types.
Aim of the Study: The present study aims to investigate the phenomenon of body dysmorphism through the analysis of WhatsApp profile images in individuals living with obesity.
Methods: The WhatsApp profile images of a sample of persons with obesity followed in our clinic were analyzed qualitatively, through a visual evaluation
Results: Significant evidence of body dysmorphia emerges through WhatsApp profile images, where patients tend to present a distorted image of their own body reality. Some participants prefer to use images of landscapes or objects or family members/pets, suggesting a desire to conceal their physical image. The correlation between the degree of obesity and the level of body dysmorphia was explored, highlighting significant associations.
Conclusions: This study highlights the presence of body dysmorphia in the WhatsApp profile images of patients with obesity, suggesting an interesting discrepancy between the personal perception of body image and physical reality. The identification of such patterns could have relevant implications for the clinical management of patients with obesity, opening new avenues for intervention and psychological support.

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GC2.166

Comparison of sustainable and healthy eating behaviors among different adult age groups in Türkiye

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Introduction: Many people around the world consume low-quality diets that cause micronutrient deficiencies as well as obesity and non-communicable diseases. The negative impact of poor diet quality is shown on both human health and the environment. Therefore, the EAT-Lancet Commission recommends a healthy and environmentally sustainable diet consisting of vegetables, fruits, whole grains, legumes, nuts, and unsaturated fats. Knowing the levels of sustainable nutrition behaviors in different groups in society is necessary to determine the target group needing intervention. Therefore, this study aims to compare sustainable and healthy eating behaviors among different adult age groups in Türkiye.
Methods: A non-probability sample of 441 adults aged 19 years and over (67.1% women) were recruited via an online survey between March 2023 and May 2023. The study was targeted at each respondent from the adult age group. Participants in the study were divided into four groups according to their ages: 19-34 years (n=164), 35-49 years (n=95), 50-64 years (n=89), and 65+ years (n=93). Age groups were compared regarding the Sustainable and Healthy Eating (SHE) Behaviors factors. The Sustainable and Healthy Eating (SHE) Behaviors Scale consists of 32 items, rated on a seven-point Likert scale (never to always). The items are distributed into seven factors: quality labels, seasonal food and avoiding food waste, animal welfare, meat reduction, healthy and balanced diet, local food, and low fat. Higher scores indicate increased sustainable and healthy eating behaviors.
Results: The total sustainable and healthy eating behaviors score of the 19-34 age group was lower than other age groups (35-49, 50-64, 65+ years; p<.001). When purchasing food, the 19-34 age group was less likely to prefer/mind items related to aspects such as regional certificates, organic food, and quality marks on labels (lower score on "Quality labels", p<.001). The young adult group (19-34 years) was paying less attention to the consumption of seasonal food products and food waste than the older groups (lower score on "Seasonal food and avoiding food waste", p<.001). The group also placed less emphasis on the selection of free-range eggs and sustainable fishing (lower score on "Animal welfare", p<.001) and were less likely to replace meat by a plant–protein source food products (lower score on "Meat reduction", p<.001). The 19-34 age group was less likely to choose healthy, nutritious, natural foods, generally indicating a balanced diet (lower score on "Healthy and balanced diet", p=.047). The oldest group (65+ years) preferred locally produced foods (higher score on "Local food") more compared to the younger groups (19-34 and 35-49 years, p<.001). The groups had no difference regarding the "Low fat" factor (p=.192).
Conclusion: Young adults should be given priority in sustainable and healthy nutrition behavior interventions. Sustainable nutrition can be incorporated into education in schools and universities. Digital channels such as social media can be used as intervention tools to increase young adult's interest.

GC2.167

Sustainable Health for everybody through sustainable behaviour (AlimSD)

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Introduction: In 2021, 16,7% of men and 17,4% of women in France were living with obesity. While the incidence of obesity has fallen among the most affluent populations, it continues to rise slightly among the most disadvantaged. In 2020, the Hauts de France region had the highest obesity prevalence and the second-highest poverty rate, with respectively

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22% and 17.2% of adults living with obesity or below the poverty line. The first challenge in dealing with obesity lies in the ability to reduce social inequalities as far as behavior is concerned; the second is to develop sustainable and local food systems and raise public awareness regarding eco-friendly eating habits. As obesity is a multidimensional and social disease, it requires a multidisciplinary network. The AlimSD project brings together a wide range of social workers, health professionals and local partners to support people living with obesity. Its first aim is to enable people to make lasting changes by encouraging them to gradually adopt healthier and eco-friendly eating habits. Its second aim is to optimize the territorial organization of care pathways to encourage early care and long-term support for people.

Methods: People were recruited by primary health care professionals and by social workers in a deprived area of Northern France. Inclusion criteria was BMI>30. On the one hand, participants took part in a 9-session group behavioral intervention delivered by a dietician, a psychologist and a physical activity coach, and on the other, they were offered support activities geared towards sustainable eating behavior and delivered by local partner associations (cooking workshops to encourage sustainable eating, low-cost baskets with organic food, gardening, adapted physical activity). Data collection: People were weighed at the beginning (V1) and end of cycle (V2). They answered questionnaires to assess physical activity (PA) (Ricci and Gagnon) and eating behavior (TFEQ). Semi-structured interviews were carried out between December 2022 and April 2023 with a sample of volunteer beneficiaries and stakeholders.

Results: Overall,: 77 persons were included (33% in situation of precarity) (BMI 37,2 (±7,6)kg/m^2). At V2, there was an increase in PA (<0,01), a decrease in Uncontrolled eating (p=0,02) and Emotional eating (p<0,01), and a non-significant decrease in BMI (from 37,2 (±7,6) kg/m^2 to 36,2 (±7,2) kg/m^2). Nineteen semi-structured interview were conducted and, they showed that stake holder find easier to reach people.

Conclusion: This study showed that the program was effective in reducing harmful eating behaviors and getting participants back into motion. However, to be effective in reaching deprived people, its deployment requires several key elements such as involving social centers and local associations, training GPs in referring participants to the program, fostering a benevolent, guilt-relieving approach centered on the individual, mobilizing all local partners as well as adapting the activities to the financial, geographical, and cultural resources of the participants.

GC2.168

Evaluation of Neophobia, Attitude Towards Cultured Meat and Meat Attachment in Young Adults: A pilot study

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Introduction: It is reported that cultured meat (in vitro, lab-produced meat) will be an alternative to traditional meat to meet the nutritional needs of the world's growing population. It is predicted that as the human population continues to grow, traditional meat will no longer be sufficient. Considering that cultured meat can be an alternative to traditional meat, it shows the need to examine approaches to traditional meat consumption on cultured meat. It is anticipated that the results of this study will inform future studies on the assessment of young adults' attitudes towards cultured meat, which is important in terms of sustainability, and the relationship between dependence on traditional meat and neophobic attitudes towards cultured meat. The results of the study are expected to inform the use of cultured meat in future generations.

Methods: Young Turkish adults who volunteered to participate were included in the study. The research data was collected using a face-to-face survey method. The survey form consisted of four sections: general information, questions about attitudes towards cultured meat, Meat Attachment Questionnaire, Food Neophobia Scale. Meat attachment and food neophobia increase with increasing scores on the Meat Attachment Questionnaire and the Food Neophobia Scale. Meat Attachment Questionnaire consists of four sub-scales: Hedonism, Affinity, Entitlement, Dependence. The results of the study were analysed using SPSS. A p-value of less than 0.05 was considered statistically significant.

Results: A total of 180 young adults, 147 females and 33 males, were included in the study. The mean age of the participants was 21.1±2.8 years. Food neophobia was found to be higher among those who thought that cultured meat was not sustainable (p = 0.04). It was found that those who thought cultured meat was tastier than traditional meat had a lower meat dependence score (p=0.03). It was found that the affinity score was higher among those who thought that cultured meat was healthier and safer than traditional meat (p=0.01). It was found that the affinity score was higher among those who did not think that cultured meat was better than traditional meat in terms of nutritional value (p=0.02).

Conclusion: As a result, it has been found that food neophobia and meat addiction may have an impact on young adults' attitudes towards cultured meat.

GC2.169

Obesity and its associated factors in Austrian nursing home residents – outcomes from the `International Prevalence Measurement of Care Quality´

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Introduction: The proportion of nursing home residents living with obesity is increasing internationally. This could impact the nursing care required, equipment and facilities provided, and morbidity in this setting. There is a limit of evidence on clinical consequences of obesity in Austrian nursing home residents and their care. More insight into the care needs of older people with obesity in nursing homes is needed to enable precise planning of care, targeted action related to obesity, and to support independence amongst residents. Therefore, the aim of this study was to examine selected care associated factors of obesity amongst nursing home residents in Austria.

Methods: Data from 1,189 Austrian nursing home residents (71.3% female, mean age 86.0 years), who participated in the "International Prevalence Measurement of Care Quality", were analyzed. We used data from nursing homes that participated in this cross sectional study from the years 2016-2019. Trained nurses in the voluntarily participating nursing homes conducted the interviews, reviewed data records and did the clinical examinations. By a tested and standardized questionnaire data on demographics, the measured BMI, medical diagnosis according to ICD-10, and care dependency were collected. Descriptive and logistic regression analyses were performed by IBM SPSS Statistics 26.

Results: The obesity rate was 17.1% amongst the investigated sample. Residents with obesity were less likely to living with dementia. The younger the residents and the lower the care dependency, the higher was the risk for obesity. Diabetes mellitus, endocrine, metabolic, and skin diseases were more prevalent in residents with obesity compared to residents without obesity (p<.05). Most residents with obesity had obesity class I (70.9%). Thus, two subgroups were built (class I vs. class II + III). Residents with obesity class II + III were more frequently care dependent for mobility, getting dressed and undressed, and personal hygiene compared to residents with class I (p<.05).

Conclusion: Several care related factors that are associated with obesity amongst nursing home residents in Austria were identified. The classification of obesity is important when planning care for older people living with obesity because residents with obesity classes II/III showed higher care needs compared to those with mild obesity. Based on our study results we also recommend to pay close attention to the skin care in older people living with obesity to prevent intertrigo or pressure injuries.

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GC2.170

Analysis of youth speeches about nutrition and food and their connections with health demands of the lgbtqiap+ population

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Introduction: Scarce or even absent public policies aimed at the health of the LGBTQIAP+ population, adding to the social exclusion, prejudice present on a daily basis, and the confrontation of violence generate an avalanche of vulnerabilities and precariousness regarding food and nutritional insecurity of this population. In this sense, the virtual space contributes to the sharing of information, knowledge and experiences, providing support networks and resolving doubts and questions. In view of this, the objective was to analyze the speeches of young people mediated in the cyberspace of Web Radio and in a dialogical intervention, in order to understand which food and nutritional problems are faced by this population. However, as an extension of this purpose, we sought to analyze which health demands are highlighted by young people who assume LGBTQIAP+ identities. Therefore, this study will be able to consolidate existing data and guide future researchers in reducing the inequities historically experienced by the youth population, in general, and specifically, LGBTQIAP+.
Method: Descriptive, documentary research, with a qualitative approach. It was carried out with young people who participated in the Program: "In Tune with Health - S@S", broadcast by Web Rádio AJIR-UECE and, in the second moment, we used a strategy that we called: "dialogical intervention", carried out in the second semester of 2022. The dynamics of the program prioritized dialogical interactions between invited professionals and university and school youth from the four major health regions of Ceará. Considering the speeches as practices of knowledge and power that generate effects in the production of self-care, through the participants' questions-discourses, we highlight that this methodological "tracing" as health communication practices, which was produced as web clinical care and educational.
Result: Young people take good care of their diet, but there is still a lack of knowledge about health demands when it comes to the LGBTQIAP+ population.
Conclusion: It is understood that gender identities are affected by poor diet, food insecurity, lack of access to basic health services and increased aesthetic demands on bodies. Therefore, it is necessary to build public policies that bring this population closer together, with self-care practices, in the face of health-disease demands produced in their daily ways of life.

GC2.171

Intentions, practices, and representations regarding breastfeeding among mothers experiencing social disadvantage: findings from the qualitative component of the ECAIL trial

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Introduction: The PrEgnanCy and eArly childhood nutrItion triaL (ECAIL; Clinicaltrials.gov NCT03003117) is currently being conducted among families experiencing social disadvantage. It primarily aims at assessing the effectiveness of a multi-behavioural intervention combining nutritional support and the facilitation of access to appropriate foods to promote healthy lifestyle behaviours and prevent obesity risk in young children. Pregnant women are recruited during their prenatal care at two main hospital maternity wards in northern France, then followed by dietitians at home until the child's second birthday. Given the scarcity of studies conducted in such underprivileged populations, the aim here was to explore the mothers' intentions, practices, and representations regarding breastfeeding.
Methods: Semi-structured interviews were conducted on a voluntary basis with 30 mothers participating in the trial. These interviews took place at the participants' homes, lasted on average 68 minutes (range 36 to 169 minutes) and were scheduled when the child was 18 to 24 months old. The interview guide covered various themes, including intentions regarding breastfeeding, practices, and associated representations. The interviews were conducted until data saturation was achieved, and once recorded, were transcribed and coded using NVivo software by a researcher in psychosocial sciences (DP).
Results: Nearly all participants (29/30) had intended to breastfeed their child. Regarding actual practices, 3 participants did not breastfeed, whereas 3 others were still breastfeeding at the time of the interview. Mothers who did not breastfeed mentioned a lack of milk as the main obstacle to initiating this practice. Having breastfed previous children in the past contributed to the success of breastfeeding. However, the return to work was a major obstacle to the continuation of breastfeeding, leading mothers to breastfeed for a shorter duration than they would have ideally wished. Participants cited the bond with the child and financial savings among the benefits of breastfeeding. Because breastfeeding was considered a natural mode of feeding, breast milk was perceived as suitable in terms of nutritional composition for the child's needs. Among the drawbacks to breastfeeding according to mothers was that it required their constant presence, creating a dependency relationship with the child and a feeling that their body no longer belonged to them entirely. Mothers also mentioned the pain associated with cracked nipples and engorgement, along with the resulting fatigue.
Conclusion: This qualitative study sheds light on obstacles and facilitators regarding breastfeeding practices, with some appearing to be more specific to the context of deprivation in which the mothers live. Further investigations are needed to determine the extent to which intentions, practices and representations are moderated by socio-economic, socio-demographic or socio-cultural traits of the participants. These findings will be valuable to guide tailored interventions supporting breastfeeding in diverse contexts while considering the specific realities of women experiencing social disadvantage.

GC2.172

Impact of the COVID-19 pandemic on the engagement of parents experiencing social disadvantage in the ECAIL trial: Findings from an interdisciplinary approach

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Introduction: The COVID-19 pandemic has been coupled with a deep socioeconomic crisis worldwide, along with a major increase in food insecurity. The PrEgnanCy and eArly childhood nutrItion triaL (ECAIL; Clinicaltrials.gov NCT03003117) is being conducted among families experiencing social disadvantage, known to be hard-to-reach. Its overarching aim is to assess the effectiveness of a multi-behavioural intervention combining nutritional support and healthy foods made available at a reduced price to promote healthy lifestyle behaviours and prevent obesity in young children. Pregnant women are recruited at two main hospital maternity wards in northern France (Lille and Valenciennes), then followed by dietitians at home until the child's second birthday. Collecting both quantitative and qualitative data, this study aimed to compare the eligibility and participation of women before and after the start of the COVID-19 pandemic, along with their social patterning.
Methods: We analysed 1,789 questionnaires distributed in the Lille investigation centre to screen eligible women. Because of the pandemic, recruitment in the trial stopped in March 2020 and resumed 6 months later. Inclusion criteria included any of the following indicators of vulnerability: social or medical benefits, unemployment, financial hardship, housing insecurity, or social isolation. We compared eligibility and participation rates along with the social patterning of women before (2017 to March 2020) and after the beginning of the pandemic (September 2020 to 2023). Additionally, to explore its impact on the implementation of

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the trial, a researcher in psychosocial sciences (DP) conducted a group interview with the five dieticians and their coordinator, all responsible for implementing the study. DP then transcribed and imported the group interview into NVivo software to identify key themes.
Results: Overall, 29.5% (n=941) of the women screened were deemed eligible before the pandemic and 33.6% (n=848) after (p=0.0007), with similar distributions of the various vulnerabilities: social or medical benefits (78.3%), unemployment (58.9%), financial hardship (24.4%), social isolation (14.8%) and housing insecurity (6.0%). Among eligible women, 24.7% (n=444) participated in the trial, with no difference in participation before and after the start of the pandemic. However, participants more frequently perceived financial hardship than did non-participants (33.5% vs 21.4%). The group interview revealed that participants were happy for visits to resume after the trial suspension because of their social isolation. Home visits seemed to take longer when they resumed and the COVID-19 questionnaire delivered before the visit seemed to help reduce cancellations and missed appointments.
Conclusions: The socioeconomic crisis resulting from the pandemic is reflected in the ECAIL trial by an increase in the eligibility rate but not the pattern of social vulnerabilities experienced by eligible women nor their participation rate. It did not impair women's engagement in this interventional research: home visits were rather perceived as an appropriate method to foster the adherence of parents to the trial.

GC2.173

Evaluation of Food Orientations with Disabled People

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Introduction: People with intellectual disabilities are a high-risk group for health problems. A healthy diet is important for these people to minimise health problems. The aim of this study was to evaluate the food orientations of disabled individuals.
Methods: People with a disability of 50% or more, living in Directorate of Disabled Life Care and Rehabilitation Centre with the consent of their parents or legal guardian were included in the study. Permission was obtained from the Provincial Health Directorate to conduct the study. Study data were collected by face-to-face survey method. The survey form consists of 2 parts. The first section contains general information (age, gender, disability rate). The questions in this section were asked of the participant's parents/legal guardian. The second section contains food visuals designed to assess the food orientation of people with disabilities. The questions in this section were asked of the participants. Visuals are prepared as healthy alternatives to unhealthy foods. Healthy and unhealthy food alternatives are popcorn-chips, apple-chocolate, rice pudding-baklava, bulghur pilaf-rice pilaf, wholemeal bread-white bread, Turkish coffee-sweetened instant coffee, boiled potatoes-fried potatoes, nuts-cookies, unsweetened tea-sweetened tea. The results of the study were analysed using SPSS.
Results: A total of 39 young adult females were included in the study. The mean age of the participants was 47.2±14.1 years. The disability rate of the participants is 64.6±11.9. When given the choice of popcorn or chips, 53.8% of participants chose chips. Between apple and chocolate, the majority of disabled people chose apple (53.8%). Compared to baklava, the majority (59.0%) chose rice pudding When given the choice of rice and bulgur pilaf, the majority chose bulghur pilaf (64.1%). Wholemeal bread was preferred to white or wholemeal bread by the majority of disabled people (59.0%). When asked to choose between soluble sugar and Turkish coffee, the majority chose Turkish coffee (51.3%). The majority (64.1%) chose French fries when compared to boiled. When asked to choose nuts or biscuits, the majority chose nuts (53.8%). Unsweetened tea was preferred by the majority (51.3%).
Conclusion: As a result, when evaluated in general, it was found that disabled people make healthier choices when evaluated in terms of glycaemic index, but choose foods with higher fat content and higher trans fat content.

GC3 – Childhood and Adolescent Obesity

GC3.001

"A balancing act": Parents' longitudinal perspectives of weight-related discussions with their children following obesity treatment

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Introduction: Weight-related discussions may profoundly affect children's body image and well-being but little is known about how parents frame these discussions with children who have undergone treatment for obesity. This study aims to explore how parents perceive and frame weight-related discussions, four years after their children started obesity treatment.
Methods: This qualitative study is part of the 4-year follow-up of the More and Less (ML) study, a randomized controlled trial (RCT) examining the effectiveness of a parental support program as part of obesity treatment for preschool-aged children (n=177) in Stockholm, Sweden. Semi-structured interviews were conducted with parents (79% mothers, 48% with a university degree, 47% with foreign background) of 33 children (mean age 9.3 years (SD 0.7), 46% girls) to explore long-term experiences of managing their children's weights. The interview transcripts were analysed thematically.
Results: Three main themes, encompassing three subthemes each, were identified: (1) Parental attitudes and concerns, consisting of the subthemes Uncomplicated conversation, Flying in the dark and Worrying about consequences; (2) The significance of time and context, with the subthemes A growing child, Gendered conversations and Being around others; and (3) Navigating weight stigma, with Promoting health, Fostering self-acceptance and Recognizing and coping with stigmatizing acts. In the first theme, parents emphasized the importance of discussing weight and health behaviours with their children, yet found it challenging due to uncertainties about how to approach it in a safe and sensitive manner. A few parents found the conversation manageable, saying that relating to their own experiences of having overweight or engaging in open communication with their child helped facilitate the conversation. In the second, parents said they engaged in weight-related conversations with their child more frequently as they matured, driven by their children's growing self-awareness. The parents also expressed how contextual factors, such as gender and the presence of others, shaped the conversation. Parents perceived boys as more resilient, thus exposing them to more negative weight talk. Third, parents employed strategies such as nurturing their children's self-confidence, downplaying the significance of appearance and emphasizing health when discussing weight with their children to shield them from weight stigma.
Conclusion: Few studies have investigated parent practices of care during their children's long-term obesity management process as the children grow older. We found that many parents need support to navigate weight-related discussions. Addressing weight stigma is part of children's obesity management process, as children may be bullied, teased, or experience discrimination across their lifespan and in different social settings. More research is needed to explore how young children undergoing obesity treatment experience weight stigma and to understand gendered differences in these experiences.

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GC3.002

Using Non-Violent Resistance (NVR), a relational approach to parenting for children with complex obesity-a review of engagement and feedback

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Background: The Complications from Excess Weight Service (CEW) in Nottingham, England provides multidisciplinary support to children and young people living with severe obesity and associated health complications. The service is in the 2nd year of a 3-year pilot and has explored innovative ways to meet the complex needs of this cohort. NVR represents a systemic and relational approach to addressing harmful patterns of behaviour and is used in Child & Adolescent Mental Health Services (CAMHS), Youth Justice and Social Care settings. NVR is a carer led intervention aiming to increase parental confidence, reduce feelings of helplessness and strengthen caring and respectful relationships in the family and wider communities. NVR was developed by Haim Omer in 1999 at the University of Tel Aviv and brought to the UK by Peter Jakob, Partnership Projects UK to support children with aggressive, self-destructive or controlling behaviour. This report will cover a pilot NVR parenting group held within context of children living with severe obesity.
Methods: The majority of families accessing the CEW service experience multiple stresses and are impacted by social and economic pressures. 8 families were invited to a 10 week course consisting of 10x2 hour long sessions in a community setting facilitated by a NVR trained Social worker, a Family Support Worker, and an Assistant Psychologist. The sessions used group discussion, homework tasks and taught content. Empathise was placed on parents regulating their own emotional responses, practicing self-care and extending support networks to address behaviour systemically. There was a focus on connective and attuned care. Sessions started with a review of application of NVR principles the previous week, successes were amplified and celebrated as parents gained confidence. Feedback was gathered throughout, based on parent discussions in group.
Results: 4 families (5 adults) completed the NVR Course, attending at least 7/9 of the sessions (excluding intro) with one attending 8/9 sessions. 3 of the families had previous or current CAMHS involvement and support from social care. The thematic analysis identified 4 key themes; influence of family, relational/behavioural change, dietary change, and shared experience. Parents reported reduced conflict and improved family relationships. They displayed increased levels of reflection in relation to their own and child's behaviour, feelings and needs, a greater sense of efficiency to support their health and wellbeing needs and improved communication with professionals.
Conclusion: Discussions with Partnership Projects suggest this is the first time NVR has been used with families in a group setting where Childhood Obesity is the presenting issue. Alongside obesity, the families attending were facing multiple challenges with their young person linked to neurodevelopmental difficulties, behaviour and emotional wellbeing. Feedback suggests that this unique approach can lead to increased parental confidence in managing harmful behaviours and thus provide additional support for children and young people living with complex obesity.
No conflict of interest or funding to declare

GC3.003

Breaking down barriers: a family-centred approach to supporting children and young people living with excess weight through the development of an outreach event

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Introduction: The Complications of Excess Weight (CEW) service is a nationally funded pilot in the UK aiming to support children and young people (CYP) living with health complications related to excess weight. Our CEW multidisciplinary team (MDT) supports 100 CYP per year across the West Midland region, which spans 13,000 square KM. Our cycle of care, centred around the needs of CYP, ensures families receive regular support from our MDT, using a biopsychosocial model. CYP in our service represent a vulnerable patient group, who often face stigma and isolation in the community. After a patient told us "I want to meet somebody like me," we decided to organise an outreach event. Promoting a whole family approach, the event was developed for CYP, their care givers and siblings.
Aims and Methods: We delivered a family-centred inclusive, educational outreach event for CYP in our service. The event was funded via the hospital's charity and co-created with our families. We arranged group workshops covering topics such as body confidence, sleep hygiene, crafts, interactive games, physical activity and a cookery session, delivered by external providers and members of the CEW MDT. The event was advertised during our contacts with families, via text messaging and telephone calls to promote attendance. To ensure the event was inclusive, we provided transport for families in need, ensuring provisions were in place for children with learning needs or neurodiversity, with breakout quieter spaces and sensory play. We performed a survey-based evaluation of the event capturing general demographics and feedback with 5 questions rated against a five-point Likert scale and free-text.
Results: Initially, 40 families (37.4% of our cohort) registered but the event was attended by 14 families (13.5%), totalling 50 guests. There was a mix of ages between 2-17 years and 50% of participants identified as non-White British. 78.5% lived in an area of high deprivation (decile 1-2) and 66% of participants reported a learning need or neurodivergence. Feedback questionnaires were completed with 100% of participants giving a 5/5 (highest) rating for the conduct of the event and the content and quality of workshops. One participant commented "We really enjoyed the day. It was good for our daughter to meet other teenagers in the clinic, so she knows she is not the only one." Reasons for non-attendance were related to illness, a clash of commitments, or the venue being too far from the patient's home.
Conclusion: Alongside targeted intervention, outreach events provide an opportunity for health education and motivation to address excess weight. The group setting enables a cohort of patients to be supported in

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a single session and provides an opportunity for peer support. Strategies, such as the provision of transport, can help to address health inequalities by engaging families who may otherwise have been unable to attend. However, this is challenging when supporting families over a vast area, and therefore, other opportunities to reach families in a group setting, such as online events, should also be considered.

GC3.004

Food Habits among Children and Adolescents with Obesity and Parental Nutritional Knowledge Prior to Receiving Paediatric Obesity Treatment

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Introduction: Clinical guidelines for paediatric obesity management recommend family-oriented treatments that support nutrition and play to assist behaviour change and enhance quality of life (1). Despite this, many parents struggle with food portion sizes and low cooking confidence (2, 3). The aims of this study were to:

I. Examine the nutritional quality of children's reported food and fluid intakes and parent nutritional knowledge before receiving obesity treatment
II. Determine if there was a relationship between parental knowledge and children's dietary habits.

Methods: Parents of children/adolescents aged 5-16years with a BMI≥98th centile referred to the EASO-COMS paediatric obesity service at CHI Temple Street were recruited from January-December 2017. Parents completed a 28-item food frequency questionnaire. Outcomes included frequency of consumption of meals, snacks, food groups (fruit and vegetables (FV), wholegrains, protein foods, dairy),takeaways, convenience foods,confectionary, and beverages. Parental knowledge of FV portions and reported adherence to Irish food-based dietary guidelines (FBDGs) were assessed. The relationship between parental cooking confidence and child dietary behaviours was also examined. Data were analysed using IBM SPSS version 27.0. A non-parametric test Kendall tau-b was used to determine if there was an association between FV consumption and parental knowledge score. Mann Whitney U Tests were used to explore differences in dairy intake between age groups (5-8years vs. 9-16years), in addition to cooking confidence and daily consumption of FV and dairy products and weekly consumption of takeaways and ready-made meals.
Results: Questionnaires were completed by n=45 parents. The mean child-age was 11 years (SD 3.15) and there were no significant differences in BMI SDS (p=0.241) between younger (n=11) and older children (n=33). 73% reported daily consumption of FV with a median serving of 1.57. Most (79.5%) parents were aware of daily FV recommendations, yet 80% did not correctly identify common FV portion examples, and only 4.5% of children consumed the recommended 5-7portions of FV daily.
Almost half the sample (n=21; 47%) consumed ≤1 serving of dairy (milk, cheese or yogurt) daily, with over 50% of 5-8 year olds and no 9-16year olds meeting the recommended intake of 3 daily servings from 5-8years and 5 daily servings from 9-18years. Fewer parents of 9-16year old children were aware of recommended dairy intakes than those with 5-8year olds (6% versus 27.7% of parents, respectively).
Cooking confidence was reported by parents as 'moderate' by 30%; high by 66% and one person reported 'low' cooking confidence. Reported takeaway and convenience meal consumption was significantly higher in 'low-moderate' group (Mean=30) than the 'high' confidence group (Mean=19) (p=0.007).
Conclusions: This study identified areas for targeting nutritional interventions including: guidance on meeting FBDGs and increasing FV and dairy intakes. Parental nutritional knowledge and cooking confidence and their impact on the dietary behaviours of children with obesity requires further exploration with a focus on nutrition/food literacy.

GC3.005

Physical activity and overnutrition amongst primary school children aged 8 - 11 years in Thika West Sub-County, Kenya

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Background: Overnutrition in childhood is a growing public health challenge in the 21st century as a risk factor for adult overnutrition and non-communicable diseases. If the status quo remains unchanged, it is estimated that by 2035, 51% of the world's population >5 years of age will be living with overweight or obesity. We sought to determine the prevalence of overnutrition among school-going children aged 8 - 11 years.
Methods: We employed a cross-sectional study design. We recruited 281 children aged 8 –11 from five schools in Thika West Sub-County. Physical activity level was evaluated using the physical activity questionnaire for older children (PAQ-C). Weight and height measurements for the children were assessed. The WHO growth standards of body mass index (BMI) for age z-scores were used as the reference indicator for nutrition status. Data was analyzed using univariate, bivariate and multivariate methods to determine associations between various variables with the main outcome.
Results: The prevalence of overweight and obesity was 10.3% and 0.7% respectively. Conversely, 22.4% of the children were underweight. About 13.5% of the children did not participate in PE classes. More than half (65.5%) of the children walked to school. The mean physical activity score for the children was 2.85. Nearly half (45.2%) of the children were not meeting the recommended ≥60 minutes of daily MVPA. Overnutrition was significantly higher among children in private schools compared to those in public schools (aOR 2.641; 95% CI = 1.013-6.887, p = 0.0047). There was a significantly higher prevalence of overnutrition amongst children who didn't walk to school compared to those who did. However, the difference was not statistically significant (aOR 2.017; 95% CI = 0.875-4.650, p = 0.1). Participation in PE classes and level of physical activity were not associated with BMI.
Conclusion: We found the coexistence of both undernutrition and overnutrition. Nearly half of the children were not meeting the physical activity recommendations. It is paramount that the existing school nutrition programs take up an integrated approach aimed at prevention, early detection, and effective management of both forms of malnutrition to achieve the SDG 2.2 targets.

GC3.006

Weight stigma prevalence, sociodemographic determinants, and associations with disordered eating in a representative sample of Spanish adolescents

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Introduction: Weight stigma, particularly weight bias internalization (WBI), has negative consequences for both physiological and psychological health. In pediatric populations, WBI has been significantly

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associated with disordered eating. However, research on weight stigma in adolescence, particularly from general populations, is scarce in the Mediterranean area. The main aim of this study is to describe the prevalence of experienced and internalized weight stigma among a representative sample of Spanish adolescents and determine its associations with sociodemographic variables, weight status, and disordered eating.

Methods: A cross-sectional study with a random multistage sampling was conducted among a sample of 1017 adolescents. Weight stigma experiences (WSE), their frequency and sources, WBI using the Spanish version of the Modified Weight Bias Internalization Scale (WBISM), and zBMI and weight status based on measured weight and height, were assessed. Additionally, three subscales of the Spanish version of the Eating Disorder Inventory-3 (EDI-3) (Drive for Thinness, Body Dissatisfaction, Bulimia), with which the overall score of the Eating Disorder Risk Index (EDRC) was estimated, the Spanish abbreviated version of the Body Shape Questionnaire (BSQ), and the presence and severity of binge eating based on DSM-V criteria were assessed. Adjusted odds ratios (AOR) between sociodemographic variables, weight status, experiencing weight stigma, and reporting high WBISM scores were estimated using multiple logistic regression models. Adjusted linear regression analyses explored the impact of WBISM scores on EDI-3 subscales, EDRC, and BSQ. Adjusted multinomial logistic regression assessed the link between WBISM scores and binge eating categories.

Results: The prevalence of WSE was 43.26% in the sample (75.8 in adolescents with obesity) and that of high levels of WBI was 19.47% (46.8 in adolescents with obesity). Other kids and school were the most prevalent sources of weight stigma. Girls had a significantly higher risk of experiencing weight stigma (AOR=2.6) or having high levels of WBI (AOR=6.3). Regarding weight status, a "J-shaped" pattern was observed in both WSE and high levels of WBI, with a higher risk in the lower weight statuses and, particularly, in the higher ones (AOR of WSE=7.5 and AOR of WBI=9.1 in those with obesity compared to normal weight). WBI was associated with a significant increase in all the scores of the EDI-3 subscales, EDRC, and BSQ, as well as a higher risk of moderate and severe binge eating, both in girls and boys, and regardless weight status.

Conclusion: This study provides for the first-time specific data on the prevalence and effects of weight stigma on disordered eating among Spanish adolescents. Considering the high prevalence of both experienced and internalized weight stigma among adolescents in Spain, especially in adolescents with obesity and girls, and its clear association with disordered eating, there is a need to implement preventive strategies. These strategies should comprehensively address weight bias and its internalization across the entire weight spectrum, while tackling all sources of stigma.

GC3.007

The prevalence of obesity among a huge sample of 5-20 years old Jordanian children and adolescents based on CDC criteria

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Background: The rise of obesity among children and adolescents remains a primary challenge for healthcare providers globally and in the Middle East. The aim of the present study is to determine the prevalence of obesity among 5-20 years old Jordanians based on CDC criteria.

Method: A total of 5722 Jordanians (37% males; 63% females) aged 2-20 years data were retrieved from Jordanian Ministry of Health electronic database (Hakeem), weight for age, and body mass index for age were analyzed comparatively for Jordanian children and adolescents against the international growth standards. The Z-score for each record was computed based on CDC equations. As per CDC classifications BMI for age percentiles, values ≥85th and < 95th is classified as overweight, value at ≥ 95th is classified as obesity.

Results: The average age of the evaluated sample was 12.33 ±4.39 years (10.79 ±3.39 and for males and 13.23 ± 4.66 for females). The mean weight and for males and females were 33.16±14.17 Kg and 133.54±17.17 cm for males 43.86 ±18.82 Kg and 142.19±18.35 for females, while for BMI the mean was for boys and girls 17.81±3.88 and 20.52±5.03 respectively. The results indicated that based on CDC criteria 8.9% of males were classified as children/adolescents with overweight and 9.7% were classified as children/adolescents with obesity, while in females 17.8% were classified as children/adolescents with overweight and 10.2% were classified as children/adolescents with obesity.

Conclusion: The results presented in this study indicated the high prevalence of overweight/obesity among Jordanian adolescents and children which must be taggled healthcare planners and providers

GC3.008

Weight trajectory patterns during three years of childhood obesity treatment: A Swedish prospective cohort study

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Introduction: Most studies on obesity treatment assessed population average of weight change. Yet, treatment effect is not uniform among children undergoing obesity treatment. We applied data-driven approach to explore weight trajectory patterns of real-life childhood obesity treatment in Sweden.

Methods: This was a 3-year cohort study of children starting obesity treatment at age 9-13 y and enrolled in the Swedish Childhood Obesity Treatment Register (BORIS) (1997-2019). The treatment consists of behavioural modification. BMI standard deviation score (SDS) at month 0, 6, 12, 18, 24, 30, and 36 were measured. Included were those with BMI SDS on ≥3 data points. Group-based trajectory modelling was used. Number of trajectories was determined by statistical criteria (1) and clinical plausibility.

Results: Of 2024 children (58% boys; mean age: 11.4 y), the proportion of class 1, 2, and 3 obesity was 66%, 27%, and 7%, respectively. Among children with class 1 or 2 obesity (n=1884), three trajectories were identified:

(i) 'Increasing BMI SDS'

This group, comprising 36% of children with class 1 or 2 obesity, had continuous BMI increase of +0.04 SDS/year on average.

(ii) 'Stable BMI SDS'

This group, comprising 48% of children with class 1 or 2 obesity, remained in the same obesity class at year 3. A minor BMI change occurred in year 1 (mean reduction -0.06 SDS), year 2 (-0.02 SDS), and year 3 (+0.01 SDS).

(iii) 'Decreasing BMI SDS'

This group, comprising 16% of children with class 1 or 2 obesity, achieved obesity remission. The greatest BMI reduction occurred in year 1 (-0.30 SDS), followed by year 2 (-0.18 SDS) and year 3 (-0.06 SDS). Compared to the other groups, those in 'decreasing BMI SDS' were more likely to be boys (p=0.003) and had class 1 obesity at treatment initiation (p=0.021). Among children with class 3 obesity (n =140), two distinct trajectories were observed. First, the 'stable BMI SDS' group (39% of children with class 3 obesity) with a minuscule BMI change of +0.005 SDS/year. Second, the 'decreasing BMI SDS' group (61% of children with class 3 obesity) decreased obesity class to class 2 at the end of follow-up. In the latter group, the greatest BMI reduction occurred in year 1 (-0.21 SDS), followed by year 2 (-0.13 SDS), and year 3 (-0.04 SDS). None of the groups achieved obesity remission at year 3.

Conclusion: Long-term care is necessary to attain obesity remission among school-aged children with obesity. Standard behavioural modification may be insufficient for most children as a trajectory of obesity remission after 3-years follow-up was observed in <20% of children with class 1 or 2 obesity and none of class 3 obesity group. Data-driven trajectory model can be used to explore distinct patterns of response to childhood obesity treatment.

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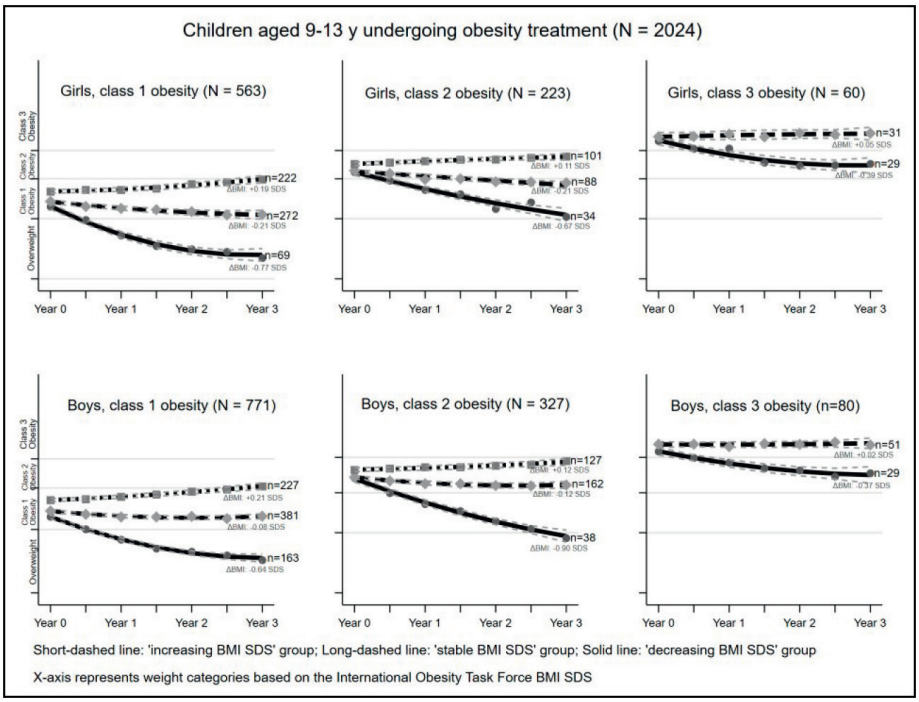


Fig. 1. 3-years weight trajectories of children aged 9-13 y undergoing obesity treatment, stratified by sex and obesity class.

GC3.009

Breastfeeding and cardiometabolic health at 9-11 years of age: findings from the ROLO longitudinal birth cohort study

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Background: Early postnatal life represents an important period of nutritional risk in the development of later health and disease. Breastmilk may confer protection against excess adiposity in childhood. However, less is known about other independent effects up to the preteen period, including cardiometabolic functioning[1–2]. This study aimed to investigate the impact of any breastfeeding exposure, and duration, on cardiometabolic outcomes at 9-11 years of age.

Methods: This is a secondary analysis of 362 preteens born into the ROLO longitudinal birth cohort study. Information on breastfeeding exposure and duration (weeks) was obtained at 6 months and 2, 5, and 9-11 year postnatal follow up visits. Preteen cardiometabolic health was assessed using anthropometry, dual-energy x-ray absorptiometry scans, blood pressure, and non-fasting serum biomarkers. Statistical comparisons explored differences in preteen cardiometabolic outcomes between those who received any breastmilk and those who did not. Crude and adjusted multiple linear regression models were used to explore associations between any breastfeeding exposure, and any duration (analysed as <2 months; >2 and <4 months; >4 months; and as a continuous variable), on preteen cardiometabolic outcomes.

Results: Of the 362 preteens included in this analysis, 63% (n=228) received any breastmilk for any duration and the median (IQR) duration of breastfeeding was 21.75 (8.70, 42.28) weeks. Preteens who received any breastmilk had lower mean (SD) body mass index z-scores (0.22 (1.07) vs. 0.6 (1.06), p<0.001), lower median (IQR) body fat (%) (23.35 (19.57, 30.20) % vs. 27.4 (23.6, 33.20) %, p<0.001), and lower median (IQR) serum leptin levels (3.01 (1.49, 8.34) ng/mL vs. 5.36 (2.13, 9.30) ng/mL, p = 0.031), compared to those who never received any breastmilk. After controlling for potential confounders, preteens who received any breastmilk had 2.87% lower body fat (%) than those who never received breastmilk (95% CI = -5.47, -0.27, p = 0.031). Any breastfeeding duration was not significantly associated with preteen cardiometabolic outcomes in crude and adjusted models.

Conclusion: Exposure to breastmilk in early life is associated with lower adiposity at 9-11 years of age, irrespective of duration. Public health strategies that promote and support breastfeeding initiation are vital to tackle early precursors of cardiometabolic disease in the first decade of life.

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Tab. 1. Associations between any breastfeeding exposure and cardiometabolic outcomes at 9-11 years of age.

	Ever breastfed			
	Unadjusted		Adjusted	
	B (95% CI)	P-value	B (95% CI)	P-value
BMI z-score	-0.38 (-0.75, 0.01)	0.041	-0.23 (-0.63, 0.16)	0.24
WC (cm)	-2.80 (-5.75, 0.13)	0.06	-1.38 (-4.35, 1.59)	0.36
Lean mass (kg)	-0.70 (-2.13, 0.71)	0.32	-0.37 (-1.55, 0.79)	0.52
Body fat (%)	-3.60 (-6.13, -1.08)	0.005	-2.87 (-5.47, -0.27)	0.031
SBP percentile*	-2.01 (-9.97, 5.95)	0.61	-3.95 (-13.2, 5.36)	0.40
DBP percentile*	-1.67 (-9.85, 6.51)	0.68	-2.53 (-12.1, 7.07)	0.60
HOMA-IR*	-0.30 (-1.47, 0.87)	0.61	0.04 (-1.30, 1.40)	0.94
TC (mmol/L)*	0.01 (-0.29, 0.31)	0.95	-0.05 (-0.42, 0.32)	0.78
LDL-C (mmol/L)*	-0.02 (-0.27, 0.22)	0.85	-0.05 (-0.35, 0.24)	0.70
HDL-C (mmol/L)*	0.02 (-0.14, 0.19)	0.77	-0.01 (-0.21, 0.18)	0.90
TG (mmol/L)*	0.01 (-0.26, 0.28)	0.93	0.03 (-0.29, 0.35)	0.84
CRP (mg/L)*	-0.04 (-0.28, 0.18)**	0.68	0.06 (-0.19, 0.32)**	0.63
TNF-α (pg/mL)*	-0.39 (-1.81, 1.02)	0.57	-0.33 (-2.09, 1.42)	0.70
Leptin (ng/mL)*	-0.81 (-4.52, 2.90)	0.66	1.54 (-1.14, 4.23)	0.25
IL-6 (pg/mL)*	-0.07 (-0.52, 0.37)	0.73	0.07 (-0.44, 0.59)	0.88

Values determined using linear regression models; all results presented as unstandardised beta coefficient (95% confidence interval). Statistically significant p-value <0.05. Abbreviations: B Beta coefficient; CI Confidence interval; BMI Body mass index; WC Waist circumference; SBP Systolic blood pressure; DBP Diastolic blood pressure; HOMA-IR Homeostatic Model of Assessment for Insulin Resistance; TC Total cholesterol; LDL-C Low-density lipoprotein cholesterol; HDL-C High-density lipoprotein cholesterol; TG Triglycerides; CRP C-reactive protein; TNF-α Tumour necrosis factor-alpha; IL Interleukin. Never breastfed was used as a reference category to which ever breastfed was compared. All models adjusted for child sex, birthweight, age at follow-up, preteen physical activity, HP index, maternal age at delivery, maternal ethnicity, early pregnancy BMI, timing of introduction of complementary foods, sexual development, mode of delivery, gestational age, original study group, smoking. *Model additionally adjusted for preteen BMI. **Log10 transformed data was used.

GC3.010

Influence of mother's country of birth on early childhood BMI z-scores in Victoria, Australia

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Introduction: In high income countries globally, high body mass index for-age z-scores (BMIz) in early childhood, including overweight and obesity, are both prevalent and inequitably distributed across populations. The early emergence of inequalities according to socio-demographic factors such as ethnicity, socio-economic position, sex and rurality may help to identify groups at higher risk of nutritional and other health challenges, and highlight groups who may require further support to promote healthy growth and development. This study aimed to investigate the extent to which early childhood weight status varied according to mother's country and region of birth, among children born in Victoria, Australia, and whether these differences differed according to sex and age at measurement.
Methods: Analysis of data on a sample of 70,516 children born at term, measured at birth, 1 and 2 years (71.5% Australian-born mothers), between 2013 and 2015 in the state of Victoria, Australia. Sex-specific BMIz was calculated from measured weight and height/length, according to the WHO Child Growth Standards. Mother's country of birth (except for Australia) was classified into regions using the nine 'Major Groups' in the Standard Australian Classification of Countries(Australian Bureau of Statistics), and Australia was additionally separated from other Oceania. For each sex, age and mother's region of birth we estimated the probability density function of BMIz using kernel density estimation, and BMIz quantiles (10%, 25%, 50%, 75%, 90%) fitting quantile regression models.
Results: The BMIz distribution for children of Australian-born mothers was shifted to the right (higher values than the reference standard), even from birth. Compared to children of Australian-born mothers, median BMIz at birth was significantly lower (p<0.01) for all regions except 'other Oceania' and Europe. For most regions, differences in BMIz distributions became smaller at older ages with BMIz quantiles increasing with age for all regions and both sexes.
Conclusion: Mother's country of birth is not a direct indicator of ethnicity, but rather a proxy for some potential influences on early childhood nutrition and growth. Understanding the determinants of variability in early childhood growth is critical to developing equitable, evidence-based early years supports. In this large sample of children born in Australia, we identified significant variations in early childhood growth, and important opportunities to support optimal early childhood development to enhance life-course health equity.

GC3.011

The effects of ectopic ASIP (agouti signaling protein) on adipocyte development and metabolism *in vitro*

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Introduction: We recently discovered a mutation in the *ASIP* (agouti signalling protein) gene locus resulting in an ectopic expression of *ASIP* in a female patient with severe early-onset obesity[1]. ASIP physiologically acts as an inverse agonist on the melanocortin 1 receptor (MC1R) in the skin, but can also block signaling on all other MCR subtypes in vitro. Apart from clinical signs of a central dysregulation of eating behaviour and changes to pigmentation, we also observed lowered cellular energy expenditure and facilitated preadipocyte differentiation of adipose stromal vascular fraction cells of the index patient.
Methods: To further investigate the effects of ASIP on adipose tissue development and metabolism, we first analyzed the expression pattern of all MCR subtypes and MCR ligands in SGBS (Simpson-Golabi-Behmel Syndrome) and primary human preadipocytes during differentiation and in adipose tissue samples of the Leipzig Adipose Tissue Cohort. Next, we overexpressed *ASIP* in SGBS cells using a plasmid mimicking the patient mutation and analyzed differentiation efficiency, mitochondrial respiration, and adipogenic marker gene expression before and after differentiation. Furthermore, we studied the short-term effects of ASIP and αMSH on lipolysis in mature adipocytes and tried to reverse the observed changes to adipocyte differentiation and function by treating immortalized patient cells with the MCR agonist Setmelanotide.
Results: We detected highest expression of *MC1R* amongst all MCR subtypes in adipocyte cell culture as well as in adipose tissue, followed by *MC5R*, whereas *MC2*,*3*,*4R* as well as the physiological MCR ligands *POMC*, *ASIP* and *AGRP* were not clearly detectable using qRT-PCR. *ASIP*-expressing SGBS cells showed no significant changes in relative number or size of differentiated cells. However, leptin expression was elevated by 50% (p<0.01) in cells carrying the mutation after 6 days of adipocyte differentiation. Furthermore, there seemed to be a small, but significant (p<0.05) effect on lipolysis through ASIP in SGBS cells, while αMSH did not affect lipolysis. Preliminary data also indicated a lowered respiratory capacity

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in *ASIP*-expressing cells and a slight decrease of adipocyte differentiation under Setmelanotide treatment.

Conclusion: Highest expression of the *MC1R* on human adipocytes supports the hypothesis of ASIP directly affecting adipose tissue biology and thereby potentially contributing to the obesity phenotype if it is expressed ectopically. Although *ASIP* overexpression does not seem to enhance adipocyte differentiation directly, we found evidence of ASIP elevating leptin expression and hindering mitochondrial respiration as well as lipolysis. The observed decrease in adipocyte differentiation under Setmelanotide treatment indicates a peripheral effect of the drug, which needs to be studied in further detail.

Reference

1 Kempf, E., Landgraf, K., Stein, R. et al. Aberrant expression of agouti signaling protein (*ASIP*) as a cause of monogenic severe childhood obesity. Nat Metab 4, 1697–1712 (2022). https://doi.org/10.1038/s42255-022-00703-9

GC3.012

Chronoexercise around Meals and Energy Intake in Youth - The Importance of Considering Sex and Activity Levels

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Introduction: Chronobiology suggests that the timing of physical activity (PA), termed "chronoexercise", can influence physiological outcomes. While results about exercise timing over 24 hours remain inconclusive for body weight regulation, timing relative to meals shows promise due to its relatively short-lived anorexigenic effect. Although most studies were mainly done in laboratory settings and focused on the impact of a single exercise session or exercise on a 24-hour basis, preliminary research by our group indicated that youth generally have better nutritional responses when exercising 2-3 hours before meals in real-life settings. The objective of the current work it to investigate the association between moderate-to-vigorous PA (MVPA) at specific times and energy intake across groups differentiated by sex and activity level.

Methods: Data stem from the QUALITY cohort of 630 children 8-10 years of age with a parental history of obesity. MVPA averaged per hour was assessed with an ActiGraph accelerometer for seven consecutive days. Participants completed three 24-hr dietary recalls (two weekdays and one weekend day) with a registered nutritionist to assess total energy, lipid, and protein intakes.

Results: Data of 337 participants were analyzed on weekdays and 170 on weekends. For boys, there were a significant positive correlation between MVPA15:00h-16:00h ($r = 0.214$, $p = 0.040$) and the % proteins at dinner on weekends. For active youth (i.e. respected the 60 minutes of MVPA on most days of the week), there were significant positive correlations between both MVPA10:00h-11:00h ($r = 0.184$, $p = 0.030$) and MVPA11:00h-12:00h ($r = 0.194$, $p = 0.022$) with % proteins at lunch on weekdays and MVPA15:00h-16:00h ($r = 0.576$, $p < 0.001$) with % proteins at dinner on weekends. For inactive children, there were significant positive correlation between MVPA14:00h-15:00h with % proteins ($r = 0.272$, $p = 0.002$) at dinner on weekends. However, for girls, there was a significant positive correlation between MVPA16:00h-17:00h ($r = 0.301$, $p = 0.008$) with EI at dinner on weekends. For active youth, there were significant positive correlations between MVPA9:00h-10:00h ($r = 0.307$, $p = 0.050$) with the % lipids at lunch and MVPA14:00h-15:00h ($r = 0.443$, $p = 0.004$) with EI at dinner on weekends.

Conclusion: Strategic exercise timing (2-3 hours before meals) could support obesity prevention via its association with improved nutrition through increased protein intakes, especially in boys and active youths. In addition, some distinctions emerged from weekdays and weekends.

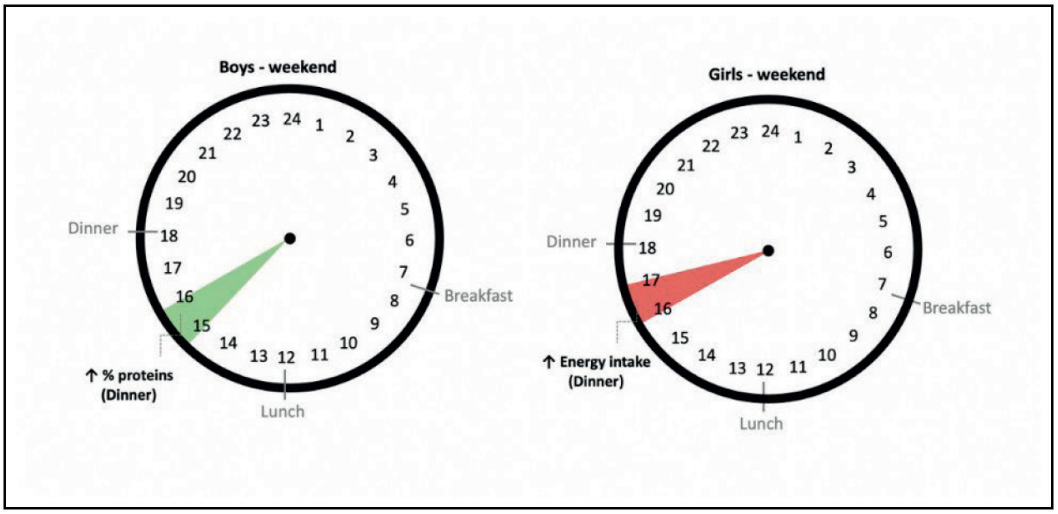


Fig. 1. Associations of moderate-to-vigorous physical activity performed at specific time frames with nutritional outcomes according to sex.

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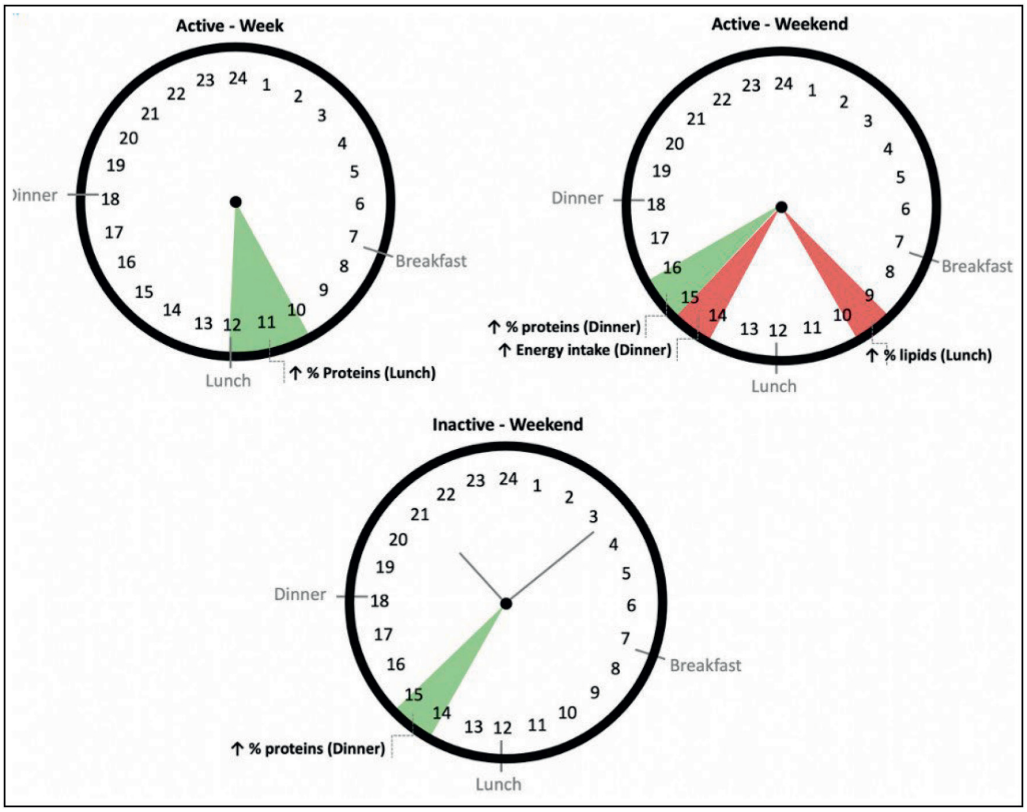


Fig. 2. Associations of moderate-to-vigorous physical activity performed at specific time frame with nutritional outcomes according to their activity level.

GC3.013

Diagnostic value of soluble LEPR levels in the serum of patients with disease-causing biallelic *LEPR* variants

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Introduction: The soluble leptin receptor (sLR) is the main binding protein of leptin in the serum. It reflects the amount of membrane-bound leptin receptors (LEPR) as the sLR is produced by proteolytic cleavage of the extracellular domain of membrane-bound LEPR. Low sLR but high leptin levels were measured in patients with severe obesity. In patients with monogenic obesity caused by biallelic *LEPR* variants, sLR levels were found to be either undetectable or extremely high, leading to high circulating leptin levels. The aim of this analysis was to investigate whether a disease-causing *LEPR* variant results in low or high sLR levels in patients with biallelic *LEPR* variants.
Methods: 13 patients with disease-causing biallelic *LEPR* variants presented to our outpatient clinic were included. SLR levels were measured using the Enzyme-linked Immunosorbent Assay (kit R07, Mediagnost, Reutlingen, Germany), which is a Sandwich-Assay using two specific high-affinity antibodies against the sLR in the serum. Anthropometric and laboratory parameters such as lipids, liver enzymes, parameters of glucose metabolism, thyroid hormones, sex hormones, growth hormones, bioactive and total leptin levels were assessed at the first visit to our outpatient clinic.
Results: Patients with biallelic *LEPR* variants due to frameshift or nonsense variants (n = 7) had significantly lower sLR levels than patients with biallelic *LEPR* variants due to missense variants (n = 6, 0.57 ± 0.33 ng/mL versus 7.05 ± 6.87 ng/mL, p <0.05). Patients with nonsense/frameshift variants had a significantly higher BMI SDS (4.57 ± 0.59 versus 3.38 ± 0.75, p <0.05), and a trend toward lower leptin SDS (-7.02 ± 6.14 versus -0.83 ± 3.91, p = 0.057) than patients with missense variants. There were no significant differences in the laboratory parameters between patients with frameshift/nonsense and missense variants. After adjusting for sex, age and BMI, patients with frameshift/nonsense variants presented significantly higher adjusted means for cholesterol (5.79 ± 0.63 mmol/L versus 2.71 ± 0.32 mmol/L, p <0.05), LDL cholesterol (4.21 ± 0.67 mmol/L versus 2.11 ± 0.34 mmol/L, p = 0.05) and TSH (4.72 ± 0.59 mIU/L versus 2.47 ± 0.3 mIU/L, p <0.05) than patients with missense variants.
Conclusion: In contrast to patients with biallelic *LEPR* variants due to missense variants, patients with frameshift or nonsense variants have extremely low sLR levels and are thus discriminable. Patients with frameshift or nonsense variants are associated with a more severe obesity phenotype than patients with missense variants. Future studies are required to verify these results.

GC3.014

Unraveling the relationship between head circumference and MC4R deficiency in children: a cohort study

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Background: The most common cause of monogenetic obesity is MC4R deficiency. Other forms of genetic obesity, such as 16p11.2 deletion syndrome, are associated with increased head circumference. Well-known symptoms of MC4R deficiency are insatiable hunger, i.e., hyperphagia, and early-onset obesity. However, little is known about head size. This

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study examined the head circumference (HC) of pediatric patients with MC4R deficiency.
Methods: This prospective observational study included pediatric patients (0-19 years) diagnosed with MC4R deficiency, classified as a homozygous or heterozygous class 4 or class 5 mutation according to The American College of Medical Genetics and Genomics (ACMG) guidelines. HC, height, weight and body-mass index (BMI) measurements were collected and SD-scores were calculated. HC SDS of the patients was compared to the reference population (Dutch National Growth charts) using one-sample t-tests, unpaired t-tests and simple and multivariate linear regression analysis.
Results: The 59 patients with MC4R deficiency in this cohort (mean age 10.18 ± 4.53 years, 51% female) had a significantly larger HC compared to the reference population, with a mean HC of 1.73 SDS (SD 1.12, $p < 0.001$). 41% of the patients were classified as macrocephalic (HC ≥2 SDS). The patients also had a significantly larger height (mean 1.02 SDS, $p<0.001$). Patients with a homozygous (n=3) MC4R deficiency tended to have a larger HC compared to heterozygous (n=56) MC4R variants (mean difference -1.17, 95% CI -2.47 to 0.13, p-value 0.077). An association was found between HC and height (R2 0.21, p-value <0.001), but not between HC and BMI (R2 0.04, p-value 0.13). In multivariate linear regression analysis height remained the only significant predictor of HC (R2 0.22, p- value 0.001) and explains 22% of the variability in HC.
Conclusion: Children with MC4R deficiency have an on average larger head circumference compared to the Dutch reference population. Head circumference measurement should be included in the diagnostic work-up of children suspected for genetic obesity, since it can be a clue for MC4R deficiency.

GC3.015

Polygenic risk score improves prediction of childhood obesity in the Norwegian Mother, Father, and Child Cohort Study

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Introduction: Several factors in pregnancy, infancy and childhood have been identified as markers of increased risk of childhood obesity, such as rapid postnatal weight gain and high birthweight. Recent advancements of polygenic risk scores (PRS) have shown great potential for disease prediction. We wanted to improve prediction of childhood obesity in the large Norwegian Mother, Father and Child Birth Cohort Study (MoBa), by combining clinical and life-style risk factors with estimates of genetic susceptibility to obesity.
Methods: Within the MoBa-cohort, we have developed prediction models of childhood obesity utilizing genetic and non-genetic data from both parents and children. Here, we present interim results obtained from models featuring non-genetic risk factors, including birthweight, rapid postnatal growth, sex and the mother's BMI, as well as genetic factors quantified through PRS. The PRS was created with LDpred2-auto, a genome-wide Bayesian approach to genetic risk prediction. The individual SNP-effects were inferred from summary statistics from a genome-wide association study (GWAS) on childhood body size from the UK Biobank. Obesity was defined as BMI ≥ 95th percentile for age and sex at age 8. To be included, we required participants to have data on all measures constituting the prediction models. The prediction models were trained in a random 50% selection and testing was performed in the remaining half.
Results: 14074 children met our inclusion criteria, out of which 736 children lived with obesity at age 8. The prediction model that integrated PRS with non-genetic risk factors performs better than the prediction model consisting only of non-genetic risk factors (area under the receiver operator curve (AUC): 81% and 76.2%). The model with only PRS as the predictor had similar performance to the non-genetic risk factors (AUC = 75.2%). In sex stratified analyses the prediction model performed consistently better in females than in males.
Conclusion: Our analyses show that polygenic risk scores adds substantial value to the prediction of childhood obesity compared to the prediction model based only on non-genetic risk factors.

Conflict of Interests: None disclosed.

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GC3.016

Plasma fatty acid esters of hydroxy fatty acids (FAHFA) and surrogate FAHFA hydrolysis activity in children with obesity

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Introduction: Fatty acid esters of hydroxy fatty acids (FAHFA) is a class of bioactive lipids with anti-inflammatory and anti-diabetic properties. FAHFA hydrolysis into its fatty acid (FA) and hydroxy fatty acid (HFA) constituents can affect the bioavailability of FAHFA and its subsequent biological effects. We aimed to investigate plasma FAHFA levels and FAHFA hydrolysis activity in lean children and children with obesity (with and without diabetes).
Methods: Our study cohort included 20 lean children (body mass index (BMI) for age < 85th percentile) and 40 children with severe obesity (BMI for age ≥ 97th percentile). A subgroup of the children with severe obesity had a clinical diagnosis of type 2 diabetes (n=20). We quantitated plasma levels of four families of FAHFA (palmitic acid hydroxy stearic acid (PAHSA), palmitoleic acid hydroxy stearic acid (POHSA), oleic acid hydroxy stearic acid (OAHSA), stearic acid hydroxy stearic acid (SAHSA)) and their corresponding FA and HFA constituents using liquid chromatography tandem mass spectrometry (LC-MS/MS) analysis. Surrogate FAHFA hydrolysis activity was estimated as FA/FAHFA or HFA/FAHFA ratio.
Results: Children with obesity had significantly lower plasma PAHSA (2.17 [1.98 - 2.45] nM vs. 2.63 [2.41 - 2.95] nM, p = 0.001), OAHSA (0.00266 [0.00184 - 0.00364] nM vs. 0.00446 [0.00237 - 0.00494] nM, p = 0.006) and total FAHFA (3.71 [3.33 - 4.19] nM vs. 4.12 [3.81 - 4.74] nM, p = 0.011) levels, and significantly higher surrogate FAHFA hydrolysis activity, represented by PA/PAHSA (p = 0.040) and HSA/OAHSA (p = 0.025), as compared to lean children. Among the children with obesity, there were no significant differences in plasma FAHFA and surrogate FAHFA hydrolysis activity between the children with or without diabetes.
Conclusion: Altered FAHFA metabolism is associated with obesity and inhibition of FAHFA hydrolysis should be further studied as a possible therapeutic strategy in obesity.

GC3.017

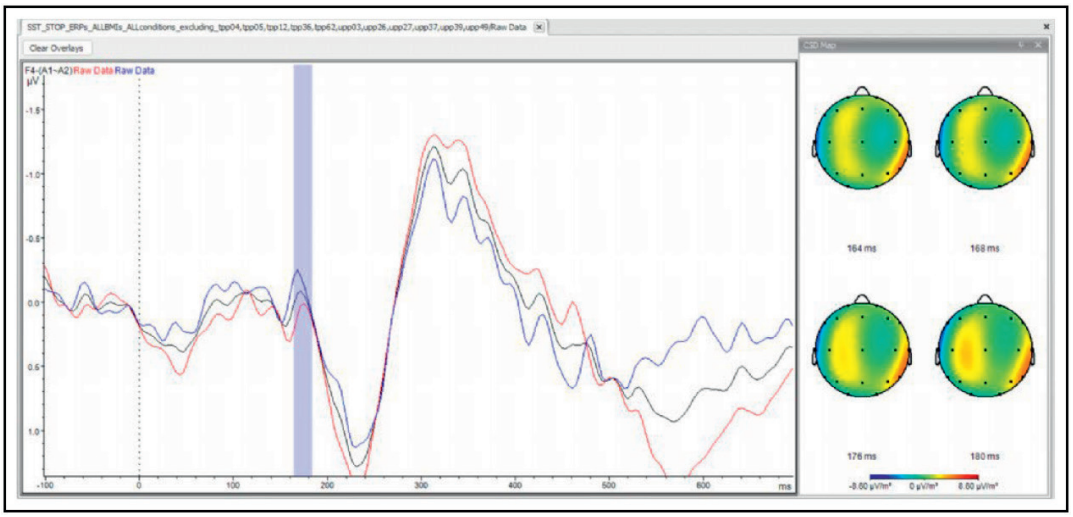
The relationship between body mass index and inhibitory control in neutral and food reward conditions, and the role of self-regulation

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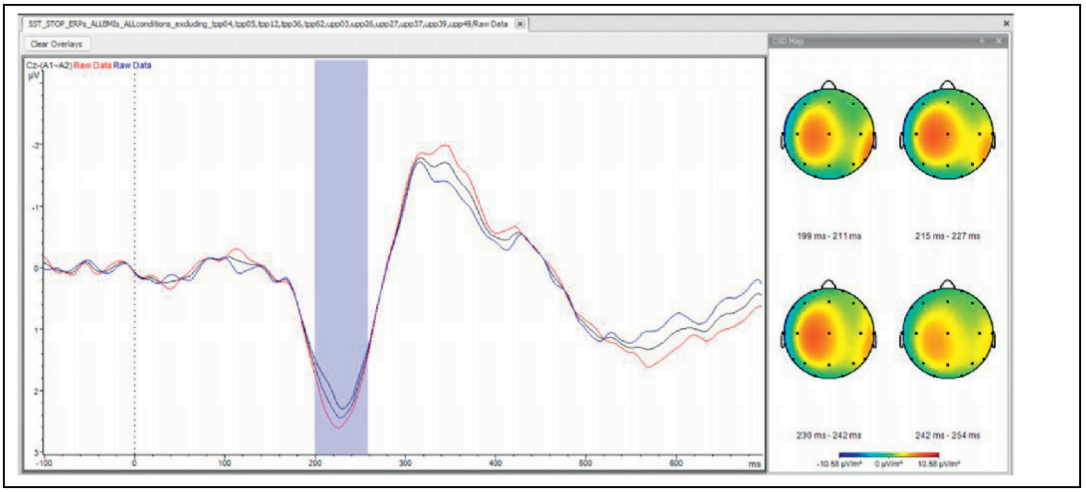
Introduction: Previous studies have shown that individuals with obesity show challenged inhibitory control in reward relative to neutral contexts. The role of self-regulation in this relationship, critical for effective treatment strategies, remains unclear. This study aims to explore this aspect.

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Black=all conditions; Red=neutral; Blue=reward.

Fig. 1. ERP of Stop N2.



Black=all conditions; Red=neutral; Blue=reward.

Fig. 2. ERP of Stop P3.

It was hypothesized that higher BMI would be associated with reduced inhibitory control, most predominantly in the food reward condition, and that poor self-regulation would enhance this effect.

Methods: The final sample consisted of 117 participants (73 women, 44 men) with a mean age of 25.26 (range 40, SD 7.01). The mean BMI was 23.23 (range 35.69, SD 4.78) and median was 22.17. Participants completed the Short form Self-Regulation Questionnaire (SSRQ) and performed the Stop Signal Task (SST), yielding the Stop Signal Response Time (SSRT), an index of inhibitory control.

Results: There was a significant correlation between BMI and SSRT, but only in the reward condition ($p = 0.036$). There was no significant main effect of SSRQ, or interactions with SSRQ with respect to SSRT (for all analyses $p > 0.05$).

Conclusion: Results suggest that higher BMI is associated with challenged inhibitory control, but this was only apparent in the reward condition. There was no evidence for a (moderating) role of self-regulation regarding inhibitory control. Results might suggest that strategies aimed at improving self-regulation may not render improved inhibition. However, we did not contrast effects between standard weight groups, and effects could be sample dependent.

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Tab. 1. Main effect of SSRQ or interactions with SSRQ with respect to SSRT.

Repeated Measures ANOVA

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
conditions	2419.307	1	2419.307	0.652	0.421
conditions ✻ SSRQ_Scores	2947.112	1	2947.112	0.794	0.375
conditions ✻ BMI	1584.728	1	1584.728	0.427	0.515
conditions ✻ SSRQ_Scores ✻ BMI	2035.130	1	2035.130	0.548	0.461
Residuals	419542.910	113	3712.769		

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
SSRQ_Scores	4192.153	1	4192.153	0.435	0.511
BMI	3090.462	1	3090.462	0.321	0.572
SSRQ_Scores ✻ BMI	1528.613	1	1528.613	0.159	0.691
Residuals	$1.089\times10^{+6}$	113	9636.498		

Note. Type III Sum of Squares

Tab. 2. The correlation between BMI and SSRT in the reward condition.

Correlation

Pearson's Correlations

Variable		BMI	SSRT_neutral	SSRT_spec_rew	SSRQ_Scores
1. BMI	Pearson's r	—			
	p-value	—			
2. SSRT_neutral	Pearson's r	0.117	—		
	p-value	0.229	—		
3. SSRT_spec_rew	Pearson's r	0.203	0.434	—	
	p-value	0.036	< .001	—	
4. SSRQ_Scores	Pearson's r	−0.073	0.087	0.032	—
	p-value	0.455	0.371	0.745	—

GC3.018

"An adipocyte-targeted nanocomplex with photothermal-browning synergy for fighting obesity and related metabolic syndromes"

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Background: Obesity is a global epidemic which induces a multitude of metabolic disorders. Browning of white adipose tissue (WAT) has emerged as a promising therapeutic strategy for promoting weight loss. However, current methods of inducing WAT browning have limited applicability.
Methods: We developed an adipocyte-targeted nanocomplex, pTSL@(P+I) (an adipocyte-targeted thermosensitive liposome loaded with Pioglitazone (Piog) and IR780), with synergistic pharmacological and photothermal properties that promote browning for fighting obesity. Group intervention was administered to 3T3-L1 preadipocytes after induction of differentiation: PBS, Piog, pTSL@P, pTSL@I, and pTSL@(P+I). Oil Red O staining and TAG assay kits were utilized to observe the morphology and content of lipid droplets. A HFD-induced DIO mouse model was used for group intervention as described above for 28 days. After treatment, changes in mouse body size and weight were observed and WATs were collected for staining analysis to evaluate the morphology of adipocytes and UCP1 expression in each group.
Results: This novel nanocomplex exhibited a uniform spherical shape, with an average diameter of approximately 200 nm. Additionally, the nanocomplex exhibited remarkable photothermal properties, the NIR light energy absorbed by IR780 can be effectively converted into thermal energy for Piog release from pTSL@(P+I) and plays an important role in photothermal and pharmacological synergistic therapy. After treated with pTSL@(P+I), TAG content in adipocytes decreased remarkably and intracellular mitochondrial activity increased significantly. The TAG content in the pTSL@(P+I) group was significantly lower than those in pTSL@P and pTSL@I groups, accounting for 75% and 66%, respectively. pTSL@(P+I) effectively upregulates UCP1 and COX5B expression by activating the transcription axis of PPARγ/PGC1α and HSF1/PGC1α. It was observed that mice in the pTSL@(P+I) group had the greatest degree of weight loss, with a decrease of 14.4% from initial weight. Their adiposity ratio based on body fat analysis was the lowest at 20.8%, significantly lower than those in the Piog (34.8%), pTSL@P (26.9%), and pTSL@I (32.4%) groups compared to the PBS group. Results from GTT, ITT, and energy metabolism measurements suggested that pTSL@(P+I) improved physiological

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metabolic functions such as glucose tolerance and insulin sensitivity in mice. H&E and immunofluorescence staining of WATs revealed significantly smaller adipocytes in the pTSL@(P+I) group compared to other groups, with higher expression levels of UCP1 and other browning-associated proteins than other intervention groups.
Conclusion: Implementation of the targeted nanocomplex pTSL@(P+I) to enhance energy expenditure by stimulating WAT browning offers a promising therapeutic approach for fighting obesity and related metabolic syndromes.

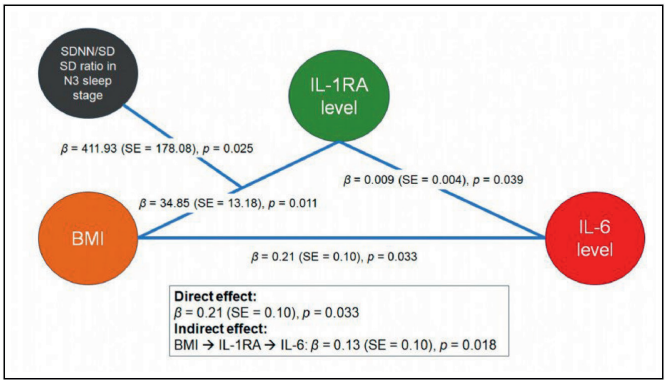
GC3.019

Weight Status, Autonomic Function, and Systemic Inflammation in Children with Obstructive Sleep Apnoea

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Introduction: Obstructive sleep apnoea (OSA), a prevalent sleep disorder in children, is intricately linked with obesity, which contributes to autonomic dysfunction and systemic inflammation. Understanding the interplay between weight status, autonomic function, and inflammation is essential for crafting targeted interventions for paediatric OSA. This study sheds light on these complex relationships, offering novel insights into obesity's multifaceted role in paediatric OSA.
Methods: In a cohort of 55 children with OSA, we examined the associations between body mass index (BMI), sleep heart rate variability (HRV), systemic inflammation markers (interleukin-1 receptor antagonist [IL-1RA] and interleukin-6 [IL-6]), anthropometric data, and polysomnographic findings. Employing advanced statistical methods, including mediation and moderation analyses, we deciphered the intricate dynamics among these clinical indicators.
Results: The study group comprised 43 boys (78%) and 12 girls (22%), with a mean age of 7.4 ± 2.2 years and an apnoea-hypopnoea index (AHI) of 14.1 ± 17.1 events/hour. We found significant correlations between BMI and several key parameters, including age, adenonasopharyngeal ratio, AHI, lowest peripheral oxygen saturation, HRV measures during different sleep stages, and levels of IL-1RA and IL-6. Notably, IL-1RA level mediated the relationship between BMI and IL-6 level, while the ratio of standard deviation of N–N intervals/standard deviation of successive R–R interval differences in N3 sleep stage moderated the link between BMI and IL-1RA level (direct effect: $\beta = 0.21$, standard error = 0.10, $p = 0.033$; indirect effect: $\beta = 0.13$, standard error = 0.10, $p = 0.018$).
Conclusion: This study highlights the intricate interactions among BMI, HRV, IL-6, and IL-1RA in paediatric OSA, emphasizing the critical role of weight management. These findings pave the way for future research into specific therapeutic approaches to mitigate the disease burden in children with OSA.



IL-1RA level mediated the relationship between BMI and IL-6 level, while SDNN/SDSD ratio in N3 sleep stage moderated the link between BMI and IL-1RA level.

Fig. 1.

GC3.020

Changes of Nutritional Status of First Grade Lithuanian Children during 15 Years of the Surveillance

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Introduction: Monitoring of children's growth plays a crucial role in assessing growth patterns and indicating their nutritional status. The World Health Organization (WHO) in 2007 initiated the WHO European Childhood Obesity Surveillance Initiative - COSI. The aim of the Initiative is to routinely measure the main anthropometric indicators of primary school children - height and weight, and to assess the changes of first-graders nutritional status. Lithuania joined the COSI from the very beginning. Our study aims to evaluate and compare changes of Lithuanian first-graders living with underweight, normal, and elevated weight during the period of fifteen years.
Methods: The Growth Surveillance Study of Lithuanian Children was performed following the WHO COSI protocol and data collecting procedures. The target population were first-graders and their parents. A multilevel sampling method (county, school and class) was employed for composing a national representative sample. In each survey round the informed consent of children participation of 5800 parents was asked. During the six rounds in 2008, 2010, 2013, 2016, 2019 and 2023 year of the Survey 23340 children participated in the surveillance. BMI of children was calculated and evaluated using IOTF cut-offs (2012).
Results: During the last round of the surveillance 3160 Lithuanian first grade children participated in the Survey: 1526 (48.3%) boys and 1634 (51.7%) girls from 93 schools of all counties of Lithuania. It was determined that the proportion of children with normal weight was 2238 (70.8%): 1112 (49.7%) boys and 1126 (50.3%) girls. The proportion of children with insufficient body weight was 279 (8.8%): 119 (42.7%) boys and 160 (57.3%) girls. Significant differences between sex of children with normal and insufficient weight was observed (p = 0.033). It was also evaluated that the proportion of children with overweight and obesity was 440 (13.9%) and 203 (6.4%): boys respectively 206 (13.5%) and 89 (5.8%); girls respectively 234 (14.3%) and 114 (7.0%). No significant differences between sexes were observed (p = 0.063). Significant differences were determined in nutritional status of children in the period of 15 years. The prevalence of children with normal weight was significantly higher in 2008 - 3690 (74.7%) than in 2023, the proportion of children living with overweight and obesity was significantly lower in 2008 respectively 559 (11.3%) and 252 (5.1%) compared to results in 2023 (p <0.001). However, no changes between 2008 and 2023 in nutritional status was observed among boys. Significant differences were determined between the prevalence among girls with normal weight 1738 (73.2%) being higher, both with overweight 265 (11.2%), and obesity 118 (5.0%) being lower (p <0.001) in 2008.
Conclusion: Over the period of 15 years, more negative tendency in nutritional status of first-graders was observed.

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GC3.021

Childhood and adolescent obesity – comparison between a population-based cohort and a tertiary treatment clinic cohort

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Background: Children and adolescents with obesity are burdened by multiple complications, and access to appropriate treatment is currently highly inconsistent.
Objectives: We compared children and adolescents with obesity from a population-based cohort with children and adolescents with obesity referred to tertiary obesity treatment.
Methods: We included children, adolescents and young adults, aged 1 to 26 years, from The HOLBAEK Study recruited from The Children's Obesity Clinic, Holbaek Hospital (n=1,851) and from schools around Zealand, Denmark (n=524) as a population-based cohort. Anthropometric measurements and blood pressure were assessed and fasting blood samples were collected. Inclusion criteria were a record of clinical data and a body mass index (BMI) standard deviation score (SDS) ranging from 1.20 to 3.60. The degree of obesity was higher in the cohort included from the clinic compared to the population-based cohort. Thus, in order to compare the two groups, descriptive statistics, histograms, and boxplots were used to illustrate potential differences in anthropometric measures, blood pressure, blood markers of lipid and glucose metabolism, liver metabolism, adipokines, and thyroid stimulating hormone, matched for sex and the degree of obesity and grouped into narrow BMI SDS intervals.
Results: No clear differences were observed when comparing measurements of waist- and hip circumference, blood pressure, lipid and glucose metabolism, ALAT or TSH, between children and adolescents with obesity from a population based cohort with children and adolescents referred to a tertiary treatment clinic, but the results should be treated with caution.
Conclusion: Children and adolescents with obesity show no systematic differences in regards to anthropometric and metabolic measurements, whether they are from a population-based cohort or referred to a tertiary treatment clinic. This indicates a need for broader access to treatment.

GC3.022

Short term dynamics of arterial compliance in adolescents with obesity

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Introduction: Atherosclerosis, the formation of fibrofatty lesions in the artery wall, is a continuously developing pathological process responsible in late stages for much morbidity and mortality worldwide, including most myocardial infarctions and many strokes. To detect early preclinical stage of atherosclerosis, several methods were developed, including arterial stiffness (or its reciprocal value – arterial compliance (AC)) measurement. Decrease of AC with aging is accelerated by factors associated with the progression of atherosclerotic process, including obesity. However, the results of studies focused on the effect of obesity on AC are contradictory. Considering the limitations of previously applied methods and the need to interpret AC values in the context of potential confounders or during various physiological states, the aim of this study was to assess the effect of obesity on AC in adolescents during four different physiological states: supine rest, head-up tilt (HUT), supine recovery and mental arithmetic (MA).
Methods: AC was estimated by the recently developed method based on two-element Windkessel model as the ratio of a time constant characterizing diastolic blood pressure decay and total peripheral resistance (TPR). In total, fifty participants with normal blood pressure (40 females, 10 males, age 17.5 years (SD=1.1 years)) were examined – 25 participants with obesity and 25 age- and sex-matched control participants.
Results: Paradoxically, we observed significantly increased AC values reflecting decreased arterial stiffness during all phases in examined group with obesity. An increase in AC was also preserved after controlling for blood pressure influence. These results were confirmed using another method of AC estimation based on pulse wave velocity measurement. Furthermore, AC decreased similarly during stress phases (HUT, MA) in both groups. Lastly, TPR was decreased throughout the study protocol in participants with obesity.
Conclusion: AC is increased in young participants with obesity consistently during various physiological states. Furthermore, changes of physiological states evoke similar response of AC in both groups indicating preserved autonomic control of elastic arteries. A decreased TPR in participants with obesity points towards the influence of different maturation state of the arterial tree and/or changes in vasomotion possibly counterbalancing acceleration of atherosclerosis process.

GC3.023

Frequency of MC4R Pathway Variants in an Israeli Cohort of Children with Early-Onset Severe Obesity

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Background: Monogenic obesity is a rare form of obesity resulting from pathogenic variants in genes implicated in the leptin–melanocortin signaling pathway (MC4R pathway). The MC4R pathway is crucial for the regulation of satiety, energy balance, and body weight. Abnormalities in the MC4R pathway are characterized by early weight gain, hyperphagia, and severe obesity.

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Objective: To elucidate the genetic causes of early-onset obesity in children younger than 21 years with severe obesity referred to the pediatric endocrinology clinic at Sheba Medical Center, Israel.
Methods: The study group comprised 154 children with early-onset obesity and hyperphagia. A targeted gene panel, comprising 80 obesity-related genes, was used for screening, as part of the genetic testing program of Rhythm Pharmaceuticals, Inc.
Results: 80 (51.9%) had negative genetic results, while 74 (48.1%) had positive genetic test, with 97 abnormal genes identified. 48 children with obesity (CwO) had one abnormal gene; 20 had two abnormal genes; 9 had three abnormal genes. Of these 34% were classified as suspected benign, 35% as pathogenic or suspected pathogenic and 31% as uncertain. Thirty-two distinct genes were identified, with PCSK1 (10%), MC4R (7%), PLAXNA1 (7%) and TBX3 and MRAP2 (5% each) being the most common. Other genes included SH2B1, POMC, PLXNA4, DYRK1B, KIDINS220, MC3R, NRP1, PLAXNA2, PLXNA4, SEMA3D, SEMA3F. No significant BMI Z score difference was observed between those with positive gene variants and those with negative results. Additionally, no differences in parameters of the metabolic syndrome were observed between groups.
Conclusion: Approximately 50% of our cohort exhibited positive genetic results, and one-third had pathogenic or suspected pathogenic variants that appear to account for the phenotype. Clinical and laboratory results could not differentiate between CwO with positive genetic results and those with negative results. Incorporating genetic testing into the clinical care of children with severe obesity, especially with the innovative treatment targeting the MC4R pathway, is important. as degree of obesity is not a reliable indicator.

GC3.024

Acceptability and clinical utility of adiposity measures in preteens: findings from the ROLO longitudinal birth cohort study

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Background: Limited research has investigated young people's opinions on measures of obesity. Youth may experience embarrassment or adverse reactions to being weighed or having their waist circumference measured[1]. Alternatively, circumferences of the neck and mid-upper arm have shown to discriminate body fat and may serve as less invasive tools[2]. This study aimed to describe young people's views on adiposity measures utilised in a longitudinal birth cohort and the utility of neck and mid-upper arm circumference as indicators of body composition in preteens.
Methods: This is a secondary analysis of 408 preteens who were born into the ROLO longitudinal birth cohort study. Body mass index (BMI), skinfold thickness, circumferences of the waist, neck and mid-upper arm, and dual-energy x-ray absorptiometry (DXA) scans were obtained at 9-11-years of age. A subgroup completed a Likert-style acceptability questionnaire post study visit and took part in public and patient involvement (PPI) to gain further insight into opinions of adiposity measures utilised. Spearman's Rho correlations and adjusted linear regression models explored associations between circumferences of the neck and mid-upper arm and adiposity parameters in preteens.
Results: No preteen participants rated the ROLO study measurements as unacceptable research methods. Analysis of the proportion of complete data obtained at the ROLO Preteen follow-up showed that the most complete data was obtained for anthropometric measures. In PPI discussions, researchers prompted participants to share their opinions about anthropometric measurements. Most young people agreed that neck circumference was an easy measure of adiposity, and one participant viewed it as uncomfortable.
"I'd say it's easier" (Older sibling 1, aged 17 years)
"I feel like I'd just be a bit uncomfortable if I had something around my neck" (Study child 1, aged 12 years)
After controlling for potential confounders in linear regression models, neck and mid-upper arm circumference were positively associated with BMI z-score, waist circumference, sum of skinfolds, total fat mass, and body fat % in preteens ($p<0.001$ for all).
Conclusion: Neck and mid-upper arm circumference may serve as simple and less burdensome indicators of adiposity. Our findings may help researchers and clinicians when designing acceptable and feasible adiposity assessments for youth.

Tab. 1. Adjusted associations between neck and mid-upper arm circumference with adiposity parameters at 9-11 years of age.

	Neck circumference (cm)	Mid-upper arm circumference (cm)
	B (95% CI)	B (95% CI)
Body mass index z-score	0.42 (0.34, 0.49)*	0.32 (0.29, 0.35)*
Waist circumference (cm)	2.83 (2.22, 3.45)*	2.10 (1.78, 2.41)*
Sum of skinfolds (mm)	4.84 (3.96, 5.72)*	3.39 (2.94, 3.84)*
Total fat mass (kg)	1.86 (1.52, 2.20)*	1.45 (1.32, 1.58)*
Body fat (%)	2.26 (1.66, 2.87)*	2.05 (1.80, 2.30)*

All models adjusted for sex, age at follow-up, sexual development, preteen physical activity, HP index, maternal ethnicity, breastfeeding. *P<0.001.

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GC3.026

Behavioural Susceptibility Theory: Understanding the directionality of associations between appetite and adiposity from infancy to early adolescence

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Background: Behavioural Susceptibility Theory hypothesises that inherited individual differences in appetite, contribute to variability in weight gain and obesity risk, from early infancy. This study tested this hypothesis by examining directionality of associations between appetite and weight from infancy to early adolescence.
Methods: Parents from the Gemini twin cohort (n = 4804) completed the Baby-/Child-Eating Behaviour Questionnaire when their children were 3-months, 16-months, 5-years, 7-years, and 13-years and reported weights and heights at 3-monthly intervals from birth to 13-years. Trajectories for appetite and weight were generated using available data from infancy (3-months) to early adolescence (13-years). Structural equation models examined bidirectionality in associations between the intercept (i.e. weight/appetite at ~3-months of age) and linear slope for appetite and weight trajectories (i.e. change over time). Analyses were adjusted for clustering of twins within families, sex, gestational age, birth weight, length at birth and height trajectory from 2-13 years.
Results: Higher intercepts for food responsiveness and enjoyment of food and lower intercepts for satiety responsiveness and slowness in eating were significantly associated with greater weight gain from infancy to early adolescence (β = 0.10; 0.08, 0.12; p <0.001; β = 0.08; 0.06, 0.10; p <0.001; β= -0.11; -0.08, -0.13; p<0.001; β = -0.10; -0.08, -0.12; p <0.001, respectively). Higher intercept for weight was associated with less steep increases in food responsiveness (β = -0.07; -0.04, -0.10; p<0.001), steeper reductions in enjoyment of food (β = -0.19; -0.14, -0.24; p <0.001), greater increases in satiety responsiveness (β = 0.16; 0.13, 0.19; p<0.001), and less decline in slowness in eating (β = 0.20; 0.15, 0.25; p = 0.001) from infancy to early adolescence. Additionally, greater increases in food responsiveness, less decline in enjoyment of food and steeper reductions in slowness in eating were associated with greater increases in weight from infancy to early adolescence (β = 0.06; 0.02, 0.11; p = 0.009; β = 0.05; 0.01, 0.09; p = 0.008; β = -0.07; -0.03, -0.11; p = 0.001, respectively). Conversely, steeper increases in satiety responsiveness were associated with lower weight gain over time (β = -0.07; -0.03, -0.11; p <0.001).
Conclusion: These findings support the hypothesis that a more avid appetite predisposes to excessive weight gain, from infancy onwards, but also indicates bidirectionality between appetite and weight from infancy to early adolescence.

GC3.027

Risk factors for childhood obesity in the first 1000 days: systematic review and risk factor quality assessment

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Introduction: Childhood obesity is a major public health challenge. Adverse early life exposures might lead to developmental adaptations in the early stages of programming, predisposing the fetus to an adverse metabolic profile in childhood. We aimed to identify risk factors for childhood obesity in the preconception period, pregnancy, and infancy until two years.
Methods: In this systematic review, we searched PubMed, Medline, Scopus, Web of Science, and Cochrane Central Register of Controlled Trials for English, longitudinal studies published between database inception and August 17th, 2022. We included studies that identified risk factors and non-invasive biomarkers from preconception until infancy for childhood obesity between 2 and 18 years. Records were screened and data were extracted using a standardized extraction form. This study is registered in PROSPERO, CRD42022355152.
Results: We identified 177 publications, comprising 172 observational and 5 intervention studies from 37 countries. The reported prevalence of childhood obesity ranged from 0.9 percent in Peru to 42.5 percent in Portugal. Most studies were performed in high-income countries. The majority of publications identified risk factors during pregnancy, birth and infancy period, with only limited publications studying the preconception period. Birthweight, maternal weight, maternal smoking, and breastfeeding were most prevalently examined. Our findings indicated that higher maternal pre-pregnancy and prenatal body mass index, cesarean section, gestational diabetes, maternal smoking during pregnancy, higher gestational weight gain, higher birthweight, higher infant BMI or weight gain and shorter duration of breastfeeding are associated with childhood obesity. 29 family based risk factors were scored as modifiable on individual level. The level of evidence was generally moderate due to confounding, selection bias, and loss-to-follow up.

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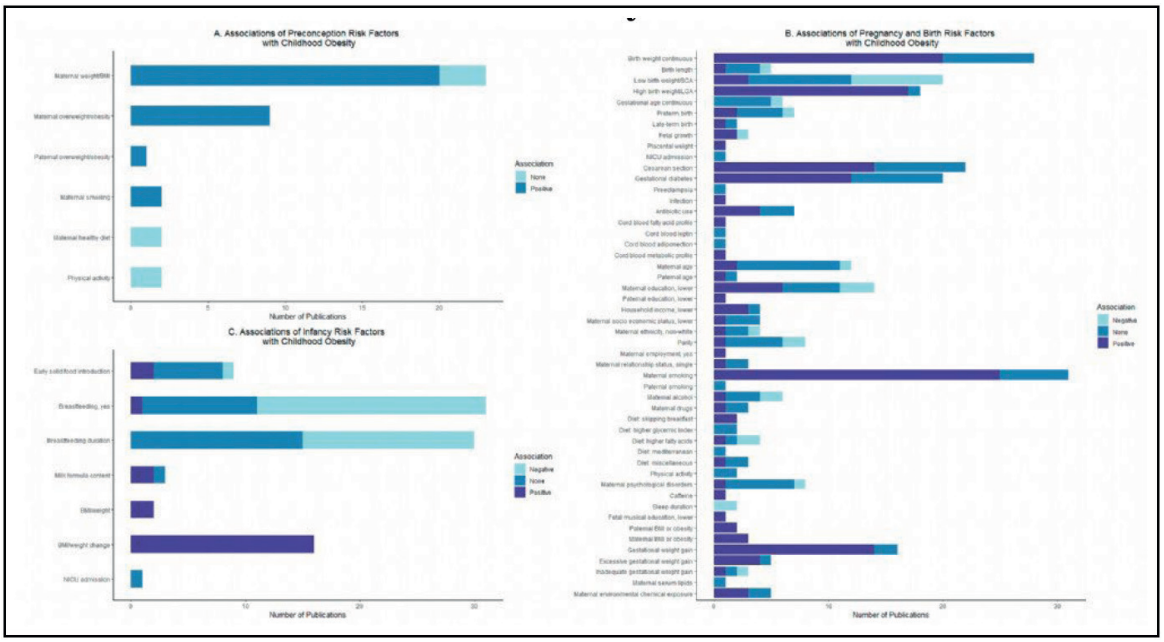
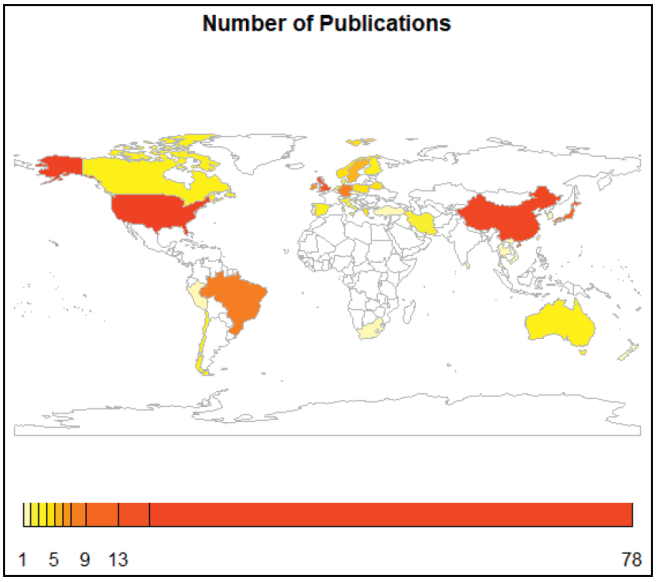


Fig. 1. Associations with childhood obesity.



Number of publications per country included in current systematic review.

Fig. 2. Numbers of publications per country.

Conclusions: Childhood obesity is a global epidemic that may already originate in early life. Our findings are relevant for early life risk prediction and insight into the strongest potential modifiable factors. Further research should focus on preconception factors, lifestyle interventions, and studies among middle- and low-income countries.

Conflict of interest: None

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GC3.028

The association of carotid Intima-Media Thickness (cIMT) with lipid profile in prepubertal children with obesity

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Background: Childhood obesity is a global health problem, related to numerous cardiovascular risk factors. cIMT is a well-known structural marker of subclinical atherosclerosis, but its association to childhood obesity is debatable.
Aim: To evaluate the lipid profile in prepubertal children with obesity (study group, SG) in comparison with normal weight matched controls (control group, CG). Furthermore, to examine the correlation between cIMT, lipid profile and BMI.
Methods: The study included 37 children with obesity [9.06 ± 1.64 years, BMI-z-score 2.40 ±0.368] and 33 controls [8.40±1.94 years, BMI-z-score 0.402 ±1.11]. They were submitted to anthropometric, laboratory measurements after a 12-h fasting, and sonographic assessment of cIMT.
Results: Children with obesity in comparison with controls, showed significantly higher LDL and triglyceride levels, whereas HDL levels were decreased. There was no difference between the two groups regarding cIMT values. However, sex-specific associations were observed, where males with obesity demonstrated a significantly (p =0.018) thicker cIMT (median cIMT, 0.456 mm) compared to males in the control group (median IMT, 0.411 mm). Overall a positive correlation was observed between cIMT and the degree of obesity (BMI-z-score) in all the participants (r=0.248, p=0.039) and in the study group (r=0.369, p=0.025). Finally, a marginally significant correlation of cIMT with LDL levels was found in all the participants (r=0.228, p=0.058).
Conclusions: This study suggested the presence of an unfavorable lipid profile in children with obesity, even in prepubertal stage compared to controls. cIMT values correlated positively with the degree of obesity. An encouraging finding was that no significant alteration in cIMT was found in the study group, underlying the role of early intervention.

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GC3.029

Associations Between Parental Adherence to the Mediterranean Diet and Family Time on Weight Status of School-age Children

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Introduction: Understand how family habits impact children's behaviours could assist in mitigating the risk of childhood overweight. This study explores the association between parents' adherence to the Mediterranean diet, family time, and children's weight status.
Methods: Conducted in socially vulnerable primary schools, the research involved 735 children (380 boys), aged 6 to 10. Parents reported socio-demographic data, Mediterranean diet adherence (using MEDAS questionnaire), and family time (using a selected question from the Health Behaviour in School-Aged Children survey), while anthropometrics and weight status were assessed by researchers during school hours.
Results: Children whose parents comply with the Mediterranean diet have a significantly lower odds of overweight/obesity (OR 0.546, 95% CI 0.339-0.880, p=0.013). Moreover, overall family time is associated with a reduced odds of children experiencing overweight/obesity (OR 0.771, 95% CI 0.640-0.930, p=0.007).
Conclusion: The family environment is significantly associated with children's weight status, emphasizing the need for health professionals to consider family dynamics in promoting health behaviors.

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GC3.030

Low birth weight and overweight at young adult age for the risk of type 2 diabetes in men

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Objective: To determine the relative contribution of low birth weight (BW) and overweight during childhood and young adulthood for the risk of type 2 diabetes.
Methods: We included 34,231 men born 1945–1961 from the population-based BMI Epidemiology Study (BEST) with data on BW and overweight status in childhood (8 years, body mass index, BMI >17.9 kg/m^2) and young adulthood (20 years, BMI >25 kg/m^2). Participants were followed from 30 years of age until the 31st December 2019. Information on type 2 diabetes diagnoses was retrieved from Swedish national registers. Hazard ratios (HR) and 95% confidence intervals (CI) for the risk of early (<59.4 years) and late (>59.4 years) type 2 diabetes were estimated using Cox proportional hazards regression.
Results: During follow up, a total of 2733 cases of type 2 diabetes were diagnosed. BW below the median (<3.6 kg) and overweight at age 20, but not overweight at age 8, were associated with an increased risk of early and late type 2 diabetes. Of note, a BW below the median, followed by overweight at 20 years of age was associated with a substantially increased risk (HR 6.07, 95% CI 5.08–7.27), and low BW (<2.5 kg) combined with later overweight at 20 years a massive risk (HR 9.94, 95% CI 6.57–15.05) of early type 2 diabetes.
Conclusion: Low BW and overweight in young adulthood are the major developmental determinants of the risk of type 2 diabetes in men. They contribute in an additive manner to the risk of type 2 diabetes. To reduce risk of type 2 diabetes young adult overweight should be avoided, especially in boys with a low BW.

GC3.031

Vegetable consumption and exercise are key factors in managing hypercholesterolemia among overweight and normal weight adolescents: A retrospective study of college freshmen

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Introduction: The rising prevalence of overweight adolescents globally is a public health concern. While overweight is commonly associated with hypercholesterolemia, variations in metabolic health among adolescents suggest that factors beyond weight contribute to cholesterol levels. Identifying key lifestyle factors influencing hypercholesterolemia among overweight adolescents could guide effective early interventions.
Methods: We conducted a retrospective analysis of college freshman health examination data (2005-2016) from a Northern Taiwanese university. Participants with overweight (24 ≤ BMI < 27) and normal weight were included. Hypercholesterolemia was defined as low-density lipoprotein (LDL) > 130 mg/dL and high-density lipoprotein (HDL) < 40 (male) or 50 (female) mg/dL, while those with LDL < 130 mg/dL and HDL > 40 (male) or 50 (female) mg/dL served as controls. We analyzed the impact of various lifestyle factors (vegetable intake, fried food consumption, meal skipping, exercise frequency and duration) on cholesterol levels using univariate and multivariate logistic regression.

Tab. 1. Basic demographics and metabolic profiles of the participants with overweight.

	Hypercholesterolemia	Control	p-value
Number (n)	212	2941	
Age	19.24	18.91	0.001
BMI (kg/m^2)	25.27	25.14	0.033
Male	60.38 %	81.94 %	<0.001
Glucose AC (mg/dL)	92.48	89.91	<0.001
HDL (mg/dL)	39.33	51.97	<0.001
LDL (mg/dL)	147.84	93.44	<0.001
TG (mg/dL)	119.43	73.51	<0.001
AST (U/L)	24.83	21.27	<0.001
ALT (U/L)	31.94	22.05	<0.001
Cre (mg/dL)	0.95	0.94	0.423
Uric acid (mg/dL)	7.00	6.60	<0.001
Impaired fasting glucose (IFG)	13.21 %	7.58%	0.003
elevated blood pressure reading	31.60 %	37.23 %	0.101
abnormal ALT	18.40 %	8.23 %	<0.001

The basic demographics and metabolic profiles of the participants with overweight in our study is shown here.

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Tab. 2. Univariate analysis of the lifestyle factors in the group with overweight.

	Hypercholesterolemia group	Control Group	p-value
Skip breakfast	14.15 %	10.40 %	0.088
Skip lunch	2.36 %	1.46 %	0.303
Skip dinner	2.83 %	2.07 %	0.461
Skip numbers of meals	19.34 %	13.94 %	0.035
Intake servings of vegetable / day	2.29	2.57	0.009
Intake servings of fried food / day	0.92	0.99	0.262
exercise frequency (times/week)	2.49	2.90	0.015
average exercise duration (mins)	49.34	56.81	0.007

Univariate analysis of the lifestyle factors in the group with overweight is shown in the table.

Tab. 3. Multiple logistic regression of risk and protecting factors in overweight group.

	coefficient	standard error	odds ratio (OR)	p-value
Male	-1.07	0.15	0.34	<0.001
BMI	0.22	0.09	1.24	0.011
Intake servings of vegetable / day	-0.12	0.06	0.88	0.044
Exercise frequency (times/ week)	-0.11	0.05	0.90	0.031
Skip numbers of meals / day	0.21	0.18	1.23	0.235
const.	-6.75	2.14	-	0.002

BMI, SEX and factors with p-value < 0.05 in univariate analysis were selected and added into the multi-logistic model.

Results: The study included 26,891 students (average age 18.81 years, male: 61.47%). Of these, 11.7% (3,153) were overweight (BMI 24-27). In the overweight group, each additional daily serving of vegetables (OR: 0.88) and each additional weekly exercise session (OR: 0.90) significantly reduced the risk of hypercholesterolemia. Interestingly, fried food intake or skipping meals did not significantly affect hypercholesterolemia risk in overweight adolescents. Similar patterns were observed in the normal-weight group.
Conclusion: Our findings highlight the importance of promoting exercise and vegetable intake over merely avoiding fried foods for managing hypercholesterolemia in adolescents. This suggests a need to refocus lifestyle modification strategies for adolescents.

GC3.032

The associations between body mass index and total sleep duration in infants – preliminary results from BeE-School project

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Introduction: Sleep is a normal and necessary biological process which impacts children's health, growth and development. Insufficient sleep is increasingly common in children and associations between short sleep duration and childhood obesity are consistently found. The aim of this study was to investigate the association between sleep duration during weekdays and weekends and body mass index (BMI) in a sample of Portuguese children.
Methods: A cross-sectional study comprising 735 children (51.7% male, aged 5-11 years) from 10 schools in Braga, Portugal was conducted during 2020. A parents-reported questionnaire was used to collect the information about demographic characteristics as well as sleep duration in weekdays and weekends. Anthropometric measurements (height and weight) were taken by trained researchers using standardised procedures and body mass index was computed as the ratio of body weight/height2 (kg/m^2) and then converted into standard deviation (SD) scores (BMI Z-scores) and adjusted for specific age and sex categories using the World Health Organization growth reference. Associations between sleep duration and BMI Z-score were estimated using logistic regression models adjusted for gender, age, mother´s and father's education.
Results: Children who had higher levels of total sleep duration exhibited lower odds of having overweight or obesity (aOR: 0.661; 95%CI 0.503; 0.870). The same association was not observed for weekends.
Conclusion: Sleep duration is considered an essential determinant of weight status early in childhood. These findings suggests that promotion of healthy bedtime habits and sleep duration can be promising in weight management in Portuguese children.

GC3.033

Is the use of screens during mealtime associated with the waist-to-weight ratio of school-aged children?

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Introduction: Screen time is emerging as a significant driver of children's dietary behaviors. Excessive screen use has been linked to increased body weight and various other health indicators. Furthermore, the screen use during mealtimes is disproportionately higher among families with a low socio-economic status. The objective of this study was to examine the associations between screen use during meals and the waist-to-weight ratio of school-aged children with social vulnerabilities.
Methods: This study is part of a randomized controlled trial, conducted in primary schools with socio-economic vulnerabilities. The research involved 735 children (380 boys), aged 6 to 10 years old. Parents reported sociodemographic data and screen time during meals by children

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(using Screen-Q). Anthropometric measurements were undertaken by researchers while at school, and then was calculated waist-to-weight ratio as waist/weight^0,5. Generalized linear models were used in the statistical analysis and childrens' gender and age, and parents' education were used as covariates.

Results: Children that usually use screens during meals have significantly higher waist-to-weight ratio (B=0.162; 95% CI: 0.035; 0.289), even when adjusted for children's sex and age, and parents' education (B=0.152; 95% CI: 0.035; 0.269).

Conclusion: The use of screens during mealtimes seems to be associated with waist-to-weight ratio in school-aged children. Further studies should underscore the importance of reducing screen time, particularly during meals, especially among families of vulnerable socio-economic contexts.

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GC3.034

BMI z-score trajectories from birth to adolescence and associated risk factors in the PARIS birth cohort study

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Introduction: Childhood overweight/obesity is a global public health concern. In epidemiological studies, body mass index (BMI), used for defining weight status, is often assessed cross-sectionally, without capturing the dynamic changes over life. However, it is crucial to study BMI trajectories for a comprehensive understanding of weight status development. The aims of this study were: 1/to identify BMI trajectories from birth to adolescence, and 2/to examine their associated risks factors in the PARIS (Pollution and Asthma: an Infant Study) cohort.

Methods: All along the longitudinal follow-up, at 15 time points, standardized questionnaires collected data on: birth parameters, parental weight status, physical activity, sedentary behaviour, sleep, diet, body development and stress. Height and weight were extracted from medical records or measured in PARIS health check-ups. Using WHO growth standards, BMI z-scores (BMIz) were calculated. BMIz trajectories were identified by a group-based trajectory modeling (GBTM) approach in adolescents for whom anthropometric data were available at least at six specific time periods: birth, 18 months, 3–4 years, 5–6 years, 8–13 years and 15–16 years. Their associated risk factors were investigated in multivariable multinomial logistic regression models, adjusted for potential confounders.

Results: Five BMIz trajectories were identified in 540 adolescents (50.6% males). The "Early high stable BMI" trajectory grouped 10.0% of participants who reached overweight status in early age. The other four trajectories remained within the normal weight status: "Low stable BMI" (10.0%), "Continuous decrease BMI" (27.2%), "Continuous increase BMI" (23.3%), and "Early increase and slight decrease BMI" (29.5%). Compared with "Low stable BMI", "Early high stable BMI" and/or "Continuous increase BMI" trajectories were associated with higher parental weight status, early rebound age, excessive TV watching, lower FAV score, early-life stressful events and parent-child relationship stress. Children in the "Continuous increase BMI" trajectory had a higher risk of early rebound age and a lower adherence to the Mediterranean diet compared to those in the "Early increase and slight decrease BMI" trajectory.

Conclusion: This study highlights two high BMI trajectories that require enhanced monitoring. They shared several modifiable risk factors emphasizing the need for multifactorial interventions to tackle the childhood obesity epidemic.

GC3.035

Parents-offspring association of obesity types in Korean families: nationwide cross-sectional survey

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Background: Several studies suggested that Parent-Offspring association of obesity and metabolic syndrome is strong. Genetic and environmental factors is shared among family members, thus they are important risk factors in obesity.

Method: A cross-sectional study in the 1,535 offsprings aged 12-18 years had fathers with Obesity or mothers with Obesity according to measured body mass index, waist circumference and total body fat using based on the KNHANES from 2009 to 2010, was a nationwide cross-sectional survey to assess the health and nutritional status of adults and children living in South Korea. For adult, obesity was defined as a body mass index ≥25 kg/m^2 in asian people with Obesity and adolescent people with Obesitywho above body mass index 95th percentile for age and gender using the Korean body mass index reference chart were classifed as group of people with obesity. Abdominal obesity was defined as a waist circumference of ≥90 cm in males and ≥85 cm in females in korean people. The percent of body fat measured by DEXA. Statistical analyses were performed using the survey procedure of SAS to account for the complex sampling design and to provide nationally representative prevalence estimates.

Result: The greater the degree of parental obesity, the higher the degree of relevance of their offspirings of people with Obesity except mothers with Obesity in total body fat, using multiple logistic regression adjusted variables such as age, sex, smoking, drinking alcohol,exercise, income and sleep habit. Also when both parents with Obesity than that of only one parent, their offspring's obesity rate(38.6%±5.59) was five times higher and abdominal obesity rate(13.6%±3.15) was three times higher. In addition to this tendency of obesity, offspring's phenotype of obesity such as central obesity is similar to that of parents.

Conclusion: Parental obesity affects their descendants becoming people with Obesity in all of BMI, WC and TBF. Therefore it is very important that reducing obesity in adults can reduce the incidence of obesity in offspring.

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Tab. 1.

	Normal BMI group	Obesity group	*p*
N	1270	265	
Sex(Male)	70.5(1.5)	61.1(3.2)	0.0056
Age	15.03±0.06	14.9±0.15	0.3617
Smoking experience	16.8(1.2)	14.4(2.7)	0.4509
Urban resident	82.1(3.2)	86.3(3.6)	0.1209
Drinker	27.4(1.4)	27.7(3.9)	0.9265
Exercise	27.6(1.4)	40.8(3.5)	0.0002
Income(Q1)	13.6(1.8)	11.8(3.2)	0.607
Height(cm)	164.67±0.3	166.1±0.66	0.0421
Weight(kg)	53.85±0.34	73.78±0.78	<.0001
BMI (kg/m²)	19.74±0.08	26.64±0.23	<.0001
WC(cm)	67.7±0.28	83.57±0.62	<.0001
BF(%)	25.11±0.38	34.83±0.74	<.0001
Optimal sleep duration	7.82±0.24	7.68±0.45	0.7658
Energe intake	2127±32.8	2096.8±67.3	0.6716

Baseline Characteristics of offsprings.

Tab. 2.

Mather						
	TBF		BMI		WC	
	r	p	r	p	r	p
Weight(kg)	0.09858	0.0004	0.21544	<.0001	0.2197	<.0001
Height(cm)	-0.00214	0.9458	0.04928	0.1499	0.0866	0.0111
BMI (kg/m²)	0.13082	<.0001	0.2474	<.0001	0.22862	<.0001
WC(cm)	0.11858	0.0006	0.22441	<.0001	0.29317	<.0001
BF(%)	0.18566	<.0001	0.1699	<.0001	0.17135	<.0001
Father						
	TBF		BMI		WC	
	r	p	r	p	r	p
Weight(kg)	0.13878	0.0012	0.28398	<.0001	0.29838	<.0001
Height(cm)	0.0531	0.235	0.05031	0.144	0.13432	<.0001
BMI (kg/m²)	0.15167	0.0007	0.33823	<.0001	0.29774	<.0001
WC(cm)	0.14285	0.001	0.29888	<.0001	0.3348	<.0001
BF(%)	0.27344	<.0001	0.20465	<.0001	0.17452	<.0001

The factors of offsprings according to parent obesity.

GC3.036

Sweden's first national guidelines for the assessment and treatment of pediatric obesity

Danielsson, P.

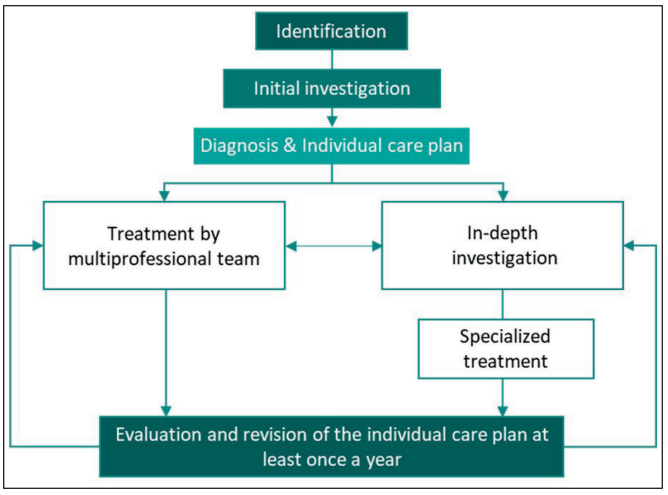
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Introduction: Children with obesity in Sweden are treated unequally, due to low prioritization within healthcare. The first national guidelines were initiated to promote equal healthcare for children with obesity, ensuring consistent access, quality, and content regardless of place of residence. Further, they should contribute to increased knowledge about identification, investigation, assessment, treatment options, and follow-up.

Methods: These national guidelines were developed within The Swedish Association of Local Authorities and Regions. After a nomination process within healthcare regions, a collaborative multidisciplinary expert committee was formed. This national working group, consisting of thirteen professionals and one patient representative, actively contributed to the two-year guideline development process. During this time, the guidelines were circulated for external review on two occasions. The guidelines are based on evidence, experience, and incorporate a clear patient perspective.

Results: The national guidelines emphasize obesity remission as the long-term treatment goal, with a short-term focus on reducing degree of obesity to prevent co-morbidities. Upon identifying a child with obesity, a comprehensive assessment is recommended, covering growth, dietary habits, physical activity, quality of life, mental health, and eating disorders. Additionally, medical history and clinical examination, including blood pressure measurement are warranted for all patients and blood sampling. Early identification of risk factors for comorbidity and mental health issues is crucial to identify. Upon diagnosis, an individualized treatment plan should be collaboratively established with the family, considering factors such as varying care needs, the child's age, disease severity, and the family's needs. Combined lifestyle intervention forms the foundation, with patient-driven habit changes supported by healthcare. The guidelines point out the importance of initiating intensive combined lifestyle interventions at an early age and that the intensity of the treatment is crucial for the outcome. Further, the combined lifestyle intervention should include regular physical visits that can be integrated with group sessions, parental education program, and digital treatment support or other forms of healthcare contacts with the family. For adolescents, pharmacological treatment and bariatric surgery are options when lifestyle interventions are insufficient. In treatment, healthcare professionals should consider inequalities, encompassing physical and mental illnesses, neuropsychiatric or intellectual disabilities, low socioeconomic status, limited health literacy, and language barriers. A significant emphasis is also placed on interaction and education for clinicians who meet families to reduce the risk of stigmatization within healthcare.

Conclusion: All children with obesity have the right to be diagnosed at an early age, assessed, and treated. The national guidelines empower children, adolescents, and their families to demand equitable, modern, and evidence-based care throughout Sweden.



Flow-chart of the structured care from diagnosis to follow-up.

Fig. 1. Structured care from diagnosis to follow-up.

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GC3.037

Lack of age-specific recommendations on diet and nutrition behaviour for young people living with obesity in transition age – an evidence map of recommendations from evidence-based guidelines

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Introduction: Especially for young people appropriate treatment of obesity is crucial, as behavioural changes take place in the transition from adolescence to adulthood, e.g. increasing separation from the parental home, establishment of own (adult) habits (e.g. nutrition behaviour), which can influence the course of therapy. Evidence-based guidelines (EbG) recommend multicomponent lifestyle behaviour interventions as first-line therapy, with diet as one relevant component. Often, EbG for children and adolescents differ from adult ones. Therefore, we assessed available recommendations for young people living with obesity and explored to what extent recommendations from paediatric and adult EbG differ.
Methods: Our pre-registered evidence map is based on two EbG synopses of the German Institute for Quality and Efficiency in Health Care (IQWiG) [1-2]. We updated searches in nine guideline databases and searched for EbG via Medline and Embase 08/2023, systematically. We included paediatric and adult EbG for the management of obesity from OECD member countries, extracted their characteristics (e.g. year, society) and recommendations, summarised data descriptively and assessed methodological quality of the EbG (AGREE II tool; domains II, III and VI).
Results: The IQWiG synopses included 29 EbG, further 19 were finally included within the search update (total: paediatric 8 and adult 35, both 5). Nine EbG (7 with a poor quality) contained 44 recommendations on diet and nutrition behaviour. Based on the content of recommendations, five core topics with 13 subtopics were derived: dietary pattern (e.g. focus on composition of macronutrient), food selection, calorie restriction (e.g. very low), meal replacement, and eating behaviour (e.g. portion size, meal frequency). For 5 subtopics, recommendations were available for both, paediatric and adult age (e.g. food selection). In a few subtopics the recommendations were conform for both age groups, while in others discrepancies exist (e.g. for adults, specific diets like the Nordic diet are recommended, unlike for children/adolescents). Regarding the 8 further subtopics, we found recommendations for only one age group (e.g. focus on composition of macronutrients or meal-replacement).
Conclusion: The majority of identified EbG showed only a poor methodological quality. Although there are specific dietary recommendations for adults, the emphasis for children is on a balanced diet (e.g. consisting of regular meals, ample vegetables, minimal fast food). No recommendation specifically addressed young people in transition age. Developing transition specific recommendations is strongly needed to support decision making in daily practice and to enable a patient-centred care during a crucial phase of life in young patients.

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GC3.038

Parental experiences and perceptions of a parent support program followed by a mHealth intervention as treatment for childhood overweight and obesity

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Introduction: Digital interventions may change the management of childhood overweight and obesity, but little is known about how parents experience these interventions. This study was part of a larger RCT within the EU funded project STOP, which compared a combined digital treatment program with standard treatment. The combined treatment included the 10-week More and Less (ML) parent support program, which was delivered online in weekly sessions, followed by a mobile-based behavior change program, the MINISTOP app, as continued support for 6 months. Each ML session introduced one evidence-based parenting skill such as encouragement, limit setting, monitoring, problem-solving and positive involvement and covered various themes regarding food and play. The MINISTOP app provided parents with recipes and information about healthy nutrition, physical activity, and sedentary behaviors. It also provided personalized guidance for improvement based on parents' reports of what their children ate and drank during the day and how much they had been active. This study explores how parents of children 2 to 6 years old experienced and perceived the combined digital treatment program.
Methods: Semi-structured interviews were conducted with 12 mothers and 2 fathers in Sweden. Of the 14 parents, 8 had a university degree. The children included 9 girls and 5 boys, of whom 11 had obesity and three had overweight. At baseline, the children's mean age was 4.3 years. The interviews were recorded, transcribed and analyzed through thematic analysis, following the COM-B model, which focuses on the capability, opportunity, and motivational factors that enable behavior change.
Results: Two main themes were identified with two subthemes each. The first theme, Supporting each other, consisted of the subthemes Group support and Group learning. The second theme, Support through a digital program, included the subthemes Digital versus in-person engagement and Staying on track. Parents spoke of peer support and connecting with other parents as crucial in treating childhood overweight and obesity. The group sessions provided families with a sense of community and safety. Although most parents preferred in-person meetings, they also valued the digital set-up of the group sessions as it was convenient. The parents' motivation and capability to use the MINISTOP app varied. Some parents used the app for the entire study duration, reporting the app provided them with support that enabled them to follow the recommended treatment. However, other parents said they would have used the app more had it provided feedback more specific to their family's situation and delivered in a more encouraging and motivating manner.
Conclusion: In obesity treatment, parents need a safe and encouraging environment that enables them to share their concerns and challenges. Even when delivered online, peer support profoundly improves parents' perceived ability to manage their children's lifestyle behaviors. Mobile-based programs can empower and equip parents for behavior change, and program designers should involve parents in testing these programs to ensure they meet families' needs.

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GC3.039

Implementing a family-based intervention to promote healthy family routines in deprived neighbourhoods – a feasibility study from Bremen, Germany

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Background: The prevalence of overweight and obesity among children in Europe is high. Particularly ethnically diverse, low-income families are at an increased risk. This highlights the need for effective family-based interventions addressing multiple obesity-related behaviours tailored to families living in socially deprived areas. Addressing this issue, our study aimed to adapt the US/Canadian 'Healthy Habits, Happy Homes' programme to socially deprived neighbourhoods in Bremen, Germany, and to test the feasibility of its implementation by using the RE-AIM model.
Methods: This single-arm intervention study was conducted between 2021-2023, including an adaptation phase, a process evaluation and a pre-post outcome assessment. Families with children aged 3-10 received 4 visits from a health educator over a period of 4-6 months. The fidelity of intervention delivery was assessed via an intervention logbook and the acceptability of intervention via feedback questionnaire filled out by parents. Qualitative data were collected from parents and stakeholders/personnel before and after the intervention. The outcome assessment was conducted to evaluate its acceptability and to estimate the change in measures of healthy weight development and behaviour change (children's weight status, dietary habits, physical activity, sleep duration, screen time and behavioural problems) over the course of the intervention.
Results: In total, 23 caregivers and 33 children participated in the study, and about 85% of the families reported at least one indicator of social deprivation. Recruitment proved to be challenging; active recruitment method, i.e. approaching families personally, were more effective than passive ones. The program implementation demonstrated good fidelity and acceptability. Language barriers were perceived as obstacles in program delivery. 83 % of the families completed the outcome measurement. Descriptive analysis revealed positive trends over time in physical activity, reduced screen time, and behavioral issues, but no changes in BMI, dietary habits, or sleep duration. Stakeholders recommended integrating the intervention into existing structures like kindergartens for long-term implementation.
Conclusion: This study highlights the program's acceptability and potential benefits for families in deprived neighborhoods of Bremen, Germany, while acknowledging recruitment challenges. Further adaptations are needed to address barriers and integrate the intervention into wider community efforts to combat childhood obesity.

GC3.040

Support on the Homefront: Using a Hospital in the Home (HiTH) service to support implementation of specialised interventions for Children and Adolescents with Class 3+ Obesity

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Introduction: Children and adolescents with class 3 obesity and above, who have significant co-morbidities, require a more intensive intervention protocol to address the impact of obesity on their health. This includes full assessment of the co-morbidities and implementation of specialised weight loss strategies (dietary and pharmacological), in addition to established lifestyle interventions, including encouraging family-wide changes. Implementation of such strategies can be challenging in the outpatient setting. A more intensive protocol incorporating utilisation of a Hospital in the Home (HiTH) service was developed with the aim to provide short-term focussed support to assist with adherence to more intensive weight management interventions and avoid potential hospital admission at a tertiary children's hospital network in Sydney, Australia.
Method: The protocol was developed in collaboration with the Weight Management and HiTH services at the Sydney Children's Hospitals Network and includes:

- Day admission for extensive multidisciplinary assessment by appropriate subspecialties
- Discharge home with 6 visits by HiTH staff (nursing, physiotherapy) over a two-week period
- Subsequent follow-up long-term in weight management outpatient clinic

Home visits by the HiTH team address the following: adherence to dietary regime (modified very low energy diet (mVLED)), initiation/adherence to using continuous positive airways pressure (CPAP) support, supervision of administration of anti-obesity medication (such as semaglutide or liraglutide), assessment of home environment and potential barriers to implementation of weight management strategies, review of household (family-wide) changes, anthropometric measurements, and implementation of physical activity sessions. Information gathered in home visits is communicated back to the weight management team supporting the family longer term and plays a key role in formulating their treatment plan.
Results: To date, two patients (aged 12 and 13 years) have progressed through the protocol. Both patients had been unsuccessful losing weight despite attending weight management clinic. Enrolment in the HiTH intensive pathway facilitated adherence to a mVLED and commencement of semaglutide and resulted in a significant reduction in BMI (51.7 to 44.3kg/m^2 and 61.5 to 55.7kg/m^2 respectively) over a 4-month period.
Conclusion: Incorporating HiTH services as part of a weight management strategy to treat children and adolescents with class 3 obesity and above provides short-term intensive support enabling more in-depth multidisciplinary assessment of the patient as well as the implementation of specific weight management strategies for the patient and family. Further evaluation, as more patients are enrolled in the program, will be required to determine optimisation of the protocol.

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GC3.041

Differences in parental feeding practices used in preschoolers with Autism Spectrum Disorders (ASD) of normal weight and those with overweight or obesity: A pilot study

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Introduction: Feeding is harder for children with ASD compared to neurotypical ones (Karhu et al., 2020). Thus, the present study aimed to compare the feeding practices used in preschool children with ASD to those used in neurotypical ones.
Methods: Data on the child's weight, height, and age were collected from parents of 11 children (54% boys) diagnosed with ASD, aged from 2 to 6 years old. Parental feeding practices were collected with a validated tool (Comprehensive Parental Feeding Practices Questionnaire – CPFQ) (Michou et al., 2019), which assesses the following practices: 1) Monitoring (score 0-16), 2) Child control (score 0-20), 3) Food as a reward (score 0-24), 4) Pressure (score 0-12), 5) Restriction (score 0-40), 6) Healthy eating guidance (score 0-56). Then, children were grouped based on their Body Mass Index (BMI) into: a) those of normal weight and b) those with overweight or obesity. BMI classification was based on the cutoff points for overweight and obesity published by Cole et al (2000) for children and adolescents aged between 2 and 18 years (Cole et al., 2000). The normality of variables was tested with the Kolmogorov-Smirnov test. Between-group analysis was made with independent samples t-test, for normality distributed variables and with Mann-Whitney for non-normally distributed ones. Chi-square was used to test for between-group differences for qualitative variables. All analysis was performed with SPSS v.29. All hypotheses were tested at a 5% significance level.
Results: The two groups did not differ in terms of child's sex (p=0.797) and age (p=0.833). Statistically significant differences were found between parents of normal-weight preschoolers with ASD and those of overweight or obesity, on monitoring (15.0 ± 1.7 vs 11.0 ± 2.4, p=0.012) and on pressure to eat (7.0 ± 0.9 vs 4.8 ± 1.2, p=0.05). No other differences in parental feeding practices were revealed.
Conclusion: The parents of children with ASD and normal weight were monitoring and pressing their children to eat more than the parents of children with ASD and overweight or obesity.

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Conflict of interest: None Disclosed

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GC3.042

Comparing the use of food and physical activity parenting practices: Parents of children with overweight and obesity versus parents of children with a healthy weight

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Background: Paediatric overweight and obesity are caused by a complex imbalance between energy intake and expenditure. Parents may influence this imbalance through energy balance-related parenting practices. This study aims to compare the use of energy balance-related parenting practices between parents of children with overweight and obesity and children with a healthy weight.
Methods: This study compares energy balance-related parenting practices among a group of parents with children with overweight and obesity at the start of a lifestyle intervention (N = 107) and children with a healthy weight (N = 137). Specifically, it compares the feeding practices 'overt control' (open control over eating), 'encouragement', 'instrumental feeding', 'emotional feeding', and 'covert control' (hidden control over eating), as well as the physical activity parenting practice 'promoting physical activity'. Multiple regression analyses are used to calculate associations between child weight groups and parenting practices when corrected for children's characteristics.
Results: Parents of children with overweight and obesity reported significantly different scores on control over eating practices than parents of children with a healthy weight, namely a significantly higher score on covert control (B = 0.397, S.E. 0.123, p = 0.001) and a significantly lower score for overt control (B = −0.136, S.E. 0.068, p = 0.046).
Conclusion: Covert control is reported more, while overt control is reported less in parents of children with overweight and obesity compared to parents of children with a healthy weight, even after correction for the child's, family, and maternal characteristics. Future longitudinal research and intervention trials are recommended to determine whether and how the use of control over eating practices changes.

GC3.043

Cost of Obesity: Estimating Health and Academic Premium Loss among the University Student in Arab Gulf Region

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Introduction: Globally, obesity among the adolescent and early adulthood population is a growing concern. It has severe public health and economic consequences across life course and it endures to the next generation. This study aims to examine the effects of obesity among the college going student on their current health and productivities that may affect their future wellbeing.
Methods: Conducted a random survey among the university students and collected information from 424 undergraduate students using a structure questionnaire. The questionnaire consists the demographic characteristics, height, weight, academic performances and current health status. Overweight and obesity was measured based on BMI scores calculate using height and weight of each respondent.
Findings: The study found that in Arab countries, more than one-fourth of the college going students are overweight or obese. We find a significant negative effect of obesity on academic performance—obese students lose 6.6 percent academic premium compared to normal weight students. Our logistic odd ratio reveals that the probability of acquiring a lower academic grade is 2.44 times higher among the obese student than the nonobese category. Further, the study shows obese students experience 11 percent higher burden of obesity related comorbidities, and they are carrying 5.77 times higher risk of acquiring obesity related comorbidities than the normal weight student. Obese students not only compromise their academic grade, but it may affect their future earnings when they join the labour market that has a long term impact on health economic wellbeing throughout their life course.
Conclusion: The study concludes that one-quarter of the college going students aged 18 to 24 years are obese and it has significant impact on their present health status and academic performances. Obese students are most likely to earn lower academic grade compared to the non-obese student and it affect on future health and economic wellbeing.

Conflicts of interest: No conflicts of interest to report.

Funding: No funding to report.

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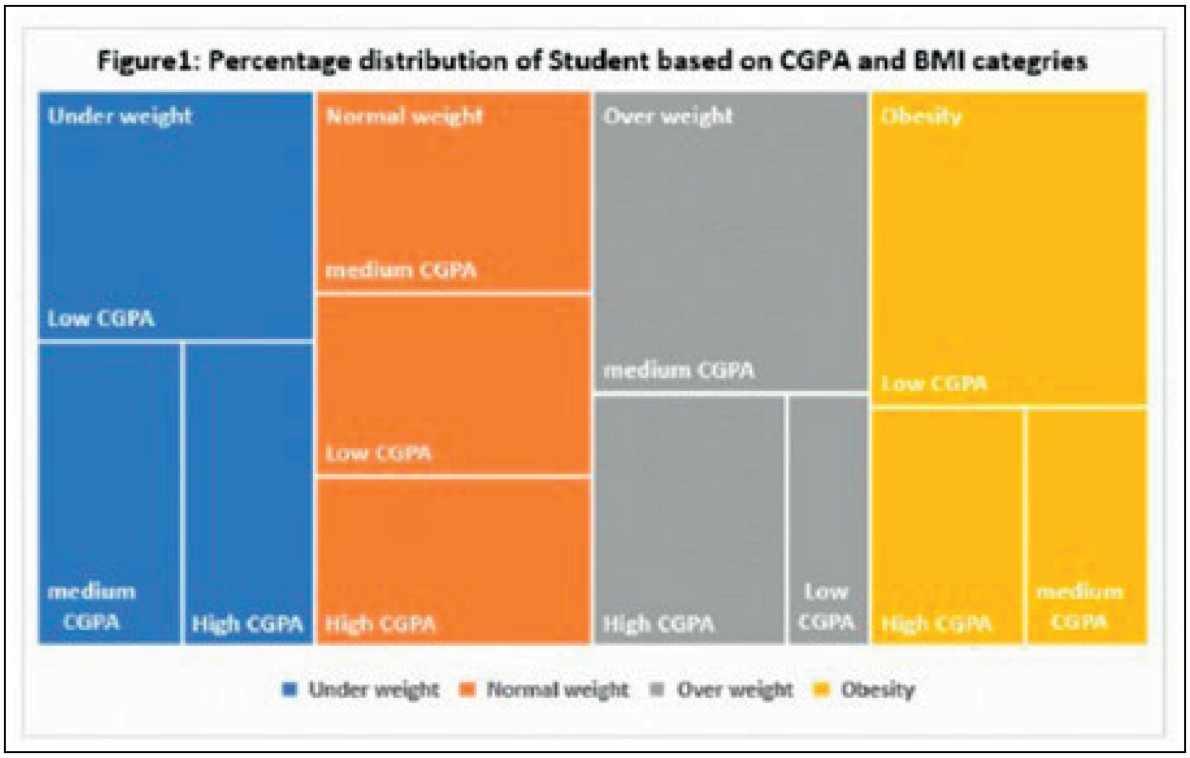


Fig. 1. Percentage Distribution Of Student Based On Cgpa And Bmi Categries.

Tab. 1.

Tables

Table 1: Characteristics and Descriptive Statistics of the variables

Variable	Observations	Mean	SD	Min	Max
CGPA	242	2.49	1.05	0.00	3.94
Weight in KG	282	61.01	39.45	24.00	141
Height in CM	282	159.27	11.28	120	189
Age in completed years	280	22.12	2.75	17.00	38.00
Household size	281	8.32	3.32	1.00	25.00
BMI	281	23.04	5.7	11.25	57.20
Parent average income	280	814.58	558.52	500.00	4500.00

Categorical variables

Variables	Categories	Numbers	Percentage
Location	Rural	125	44.33
	Urban	157	55.67
Gender	Female	249	87.68
	Male	35	12.32
Marital Status	Single	229	80.63
	Married	55	19.37
BMI	Underweight	46	16.37
	Normal weight	159	56.58
	Overweight	46	16.37
	Obesity	30	10.68
CGPA categories	Low CGPA	81	33.47
	Moderate CGPA	90	37.19
	High CGPA	71	29.34
Obesity related disease	Yes	24	8.51
	No	258	91.49

Source: Authors calculations from the survey data

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Tab. 2.

Table 2: Number(Percentage) of student living with Overweight and Obesity across the socioeconomic groups

		Under Weight	Normal Weight	Overweight	Obesity
Location	Rural	19.08	56.65	15.61	8.67
	Urban	16.13	56.13	17.42	10.32
Gender	Female	19.08	56.65	15.61	8.67
	Male	16.37	57.3	17.08	9.25
Marital Status	Single	18.58	55.75	17.26	8.41
	Married	7.27	63.64	16.36	12.73
Family Type	Nuclear	15.28	61.11	13.89	9.72
	Joint	17.72	55.7	18.99	7.59
	Extended	18.87	49.06	24.53	7.55
Income category	0-500 OMR	12.64	55.17	18.39	13.79
	501-800	14.71	63.24	17.65	4.41
	801-1000	17.39	58.7	13.04	10.87
	1001-1500	19.57	52.17	23.91	4.35
	1501-2000	21.05	57.89	10.53	10.53
	2001 +	27.27	72.73	0.00	0.00
Age group	17-20 years	20.51	53.85	12.82	12.82
	21-24 years	17.58	57.58	17.58	7.27
	25-30 years	3.33	70.00	20.00	6.67
	31 + years	0.00	20.00	60.00	20.00
Overall		16.37	57.3	17.08	9.25

Source: Authors calculations from the survey data

Tab. 3.

Table 3 : Average CGPA and BMI status across socioeconomic groups

	location	Underweight	Normal weight	Overweight	Obesity
Location	Urban	2.57	2.87	3.02	2.72
	Rural	2.87	2.87	2.83	2.61
Gender	Female	2.74	2.83	2.93	2.68
	Male	2.57	2.94	2.98	2.69
Marital Status	Single	2.70	2.88	2.87	2.73
	Married	2.61	2.81	3.27	2.57
Family Type	Nuclear	2.62	2.86	2.98	2.70
	Joint	2.78	2.86	3.05	2.63
	Extended	2.74	2.82	2.79	--
Household Income categories	0-500 OMR	2.70	2.85	2.72	2.60
	501-800	2.75	2.69	2.75	2.41
	801-1000	2.74	2.85	3.43	2.60
	1001-1500	2.82	3.18	3.16	3.23
	1501-2000	2.45	3.13	3.32	3.70
	2001 +	2.38	2.83	--	--
Age group	17-20 years	3.07	2.75	2.98	2.32
	21-24 years	2.52	2.88	2.88	2.83
	25-30 years	3.20	2.97	2.82	2.85
	31- and above	3.20	2.97	2.82	2.85
over all		2.69	2.87	2.95	2.68

Source: Authors calculations from the survey data

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Tab. 4.

Table 4 : Percentage changes of CGPA for underweight, overweight and obesity(CGPA for normal weight=100)

	location	Underweight (% change)	Normal weight	Overweight (% change)	Obesity (% change)
Location	Urban	89.55 (-10.45)	100	105.23 (5.23)	94.77 (-5.23)
	Rural	100.00 (0.0)	100	98.61 (-1.39)	90.94 (-9.06)
Gender	Female	96.82 (-3.18)	100	103.53 (3.53)	94.70 (-5.3)
	Male	87.41 (-12.59)	100	101.36 (1.36)	91.50 (-8.5)
Marital Status	Single	93.75 (-6.25)	100	99.65 (-0.35)	94.79 (-5.21)
	Married	92.88 (-7.12)	100	116.37 (16.37)	91.46 (8.54)
Family Type	Nuclear	91.61 (-8.39)	100	104.20 (4.20)	94.41 (-5.54)
	Joint	97.20 (-2.8)	100	106.64 (6.64)	91.96 (-8.04)
	Extended	97.16 (-2.84)	100	98.94 (-1.06)	
Household Income categories	0-500 OMR	94.74 (-5.26)	100	95.44 (-4.56)	91.23 (-8.77)
	501-800	102.23 (2.23)	100	102.23 (2.23)	89.59 (-10.4)
	801-1000	96.14 (-3.86)	100	120.35 (20.35)	91.23 (-8.77)
	1001-1500	88.68 (-11.32)	100	99.37 (-0.63)	101.57 (1.57)
	1501-2000	78.27 (-21.73)	100	106.07 (6.07)	118.21(18.2)
Age group	17-20 years	111.64 (11.64)	100	108.36 (8.36)	84.36 -15.6)
	21-24 years	87.50 (-12.5)	100	100.00 (0.0)	98.26 (-1.7)
	25-30 years	107.74 (7.74)	100	94.95 (-5.05)	95.96 (-4.04)
	31- and above	107.74 (7.74)	100	94.95 (-5.05)	95.96 (-4.04)
over all		93.73 (-6.27)	100	102.79 (2.79)	93.38 (-6.62)

Source: Authors calculations from the survey data

Tab. 5.

Table 5 : Percentage distribution of student fall under different categories of BMI and CGPA categories

	Under weight			Normal weight			Over weight			Obesity		
CGPA	Low	medium	High	Low	medium	High	Low	medium	High	Low	Medium	High
Rural	36.8	26.3	36.8	34.9	34.9	30.2	15.0	60.0	25.0	75.0	0.0	25.0
Urban	54.6	27.3	18.2	31.0	38.0	31.0	13.0	52.2	34.8	46.2	30.8	23.1
Female	48.5	24.2	27.3	34.4	38.7	26.9	14.8	55.6	29.6	57.1	21.4	21.4
Male	33.3	44.4	22.2	29.3	31.7	39.0	11.8	52.9	35.3	57.1	14.3	28.6
Married	33.3	33.3	33.3	26.1	47.8	26.1	0.0	50.0	50.0	60.0	20.0	20.0
Single	46.2	28.2	25.6	34.2	34.2	31.5	16.7	55.6	27.8	56.3	18.8	25.0
Nuclear Family	47.4	31.6	21.1	33.3	34.9	31.8	5.9	64.7	29.4	57.1	14.3	28.6
Joint Family	50.0	14.3	35.7	23.8	52.4	23.8	14.3	35.7	50.0	40.0	40.0	20.0
Extended fam	33.3	44.4	22.2	50.0	16.7	33.3	23.1	61.5	15.4	0.00	100.0	0.0
Low income	50.0	30.0	20.0	41.5	37.8	20.7	23.1	65.4	11.5	64.3	14.3	21.4
Middle	37.5	25.0	37.5	17.1	37.1	45.7	0.00	33.3	66.7	50.0	33.3	16.7
High income	50.0	33.3	16.7	23.5	29.4	47.1	0.00	50.0	50.0	0.00	0.00	100.0
17-20 years	46.7	6.7	46.7	52.8	27.8	19.4	25.0	50.0	25.0	75.0	25.0	0.00
21-24 years	46.2	42.3	11.5	25.9	41.2	32.9	10.7	60.7	28.6	45.5	18.2	36.4
Overall	45.2	28.6	26.2	32.8	36.6	30.6	13.6	54.6	31.8	57.1	19.1	23.8

Source: Authors calculations from the survey data

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Tab. 6.

Table 6: Association between Lower-CGPA (low academic performances) and categories of BMI

Dependent variable: Low-CGPA (student earned low-CGPA=1, 0 otherwise-moderate or high-CGPA)

Predictors	Reference Variable	Odd ratios	z-value
Obesity (obesity=1, 0 otherwise)	Non-obese	2.44**	1.97
Overweight (overweight=1, 0 otherwise)	Not overweight	0.39**	-1.87
Under weight (Underweight=1, 0 otherwise)	Not underweight	1.64	1.26
Gender (Female=1, 0 otherwise)	Male	1.44	0.73
Age (in completed years)		0.79***	-3.01
Household size (numbers of family members)		1.02	0.33
Parent income in OMR		0.75***	-2.59
Location (Rural=1, 0 otherwise)	Urban household	1.02	0.05
Constant		93.82	2.45

Number of observations=282, LR chi2(8) = 32.66, Prob > chi2 = 0.0001

Pseudo R2 = 0.1076, ** indicates significant at 95% level and *** indicates 99 % level

Source: Authors calculations from the survey data

Tab. 7.

Table 7: Logistic regression results—how overweight and obesity increases the risk of obesity related co-morbidities.

Dependent variable: student living with obesity related disease=1, 0 otherwise—no obesity related health issues)

Dependent variable= obesity related disease	Reference categories	Odds Ratio	z-values
obesity(obesity=1, 0 otherwise)	Non-obese	5.34***	2.50
overweight(overweight=1, 0 otherwise)	underweight, normal	5.77***	3.02
underweight (underweight=1, 0 otherwise)	normal, overweight and Obesity	1.66	0.68
Household size		0.70***	-3.73
Age in completed years		0.80***	-2.34
Location(rural=1, 0 otherwise)	Urban	0.58	-1.10
Gender(female=1, 0 otherwise)	Male	1.63	0.60
Constant		71.85	1.69

Number of observations=282, LR chi2(7) = 29.30

Prob > chi2 = 0.0001, Pseudo R2 = 0.1805, *** indicates significant at 99 % level

Source: Authors calculations from the survey data

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GC3.044

Spillover effects of childhood obesity prevention interventions: a systematic review

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Introduction: Interventions designed to prevent childhood obesity are complex, aiming to improve children's obesity-related behaviours and provide health promoting environments. These efforts often impact not only the individuals, communities and outcomes directly addressed by the intervention, but also those beyond the primary targets. To comprehensively evaluate effectiveness and cost-effectiveness, it is important to understand the broader impacts (or spillover effects) of childhood obesity prevention initiatives. This systematic review aims to assess the spillover effects of childhood obesity prevention interventions.
Methods: Two reviewers searched six academic databases and two trial registries (2007 -2023) to identify studies that reported measuring quantifiable obesity-related and other outcomes in individuals or communities not primarily targeted by an obesity prevention intervention. Critical appraisal was performed for studies reporting statistically significant findings, and a narrative synthesis of the data was carried out.
Results: Twenty academic studies and 41 trial records were included. Studies were primarily conducted in the United States of America (35 academic studies or trial records), followed by Europe (12 academic studies or trial records) and Oceania (8 academic studies or trial records). Studies primarily reported on interventions that targeted children aged under five years (33 academic studies or trial records), followed by school-aged children and adolescents (25 academic studies or trial records). The most frequently reported spillovers were diet or nutrition (nine academic studies and 16 trial records) or physical activity/sedentary behaviour-related (eight academic studies and 17 trial records), followed by body mass index (eight academic studies and 14 trial records). Spillovers were most frequently reported in parents/caregivers, followed by other family members. Among the 20 academic studies, nine reported statistically significant spillover effects.
Conclusion: Limited evidence suggests that childhood obesity prevention interventions may have positive spillover effects in parents/caregivers and families of targeted participants. More evidence of the nature and magnitude of spillover effects from childhood obesity prevention interventions would build a stronger case for obesity prevention in the future.

GC3.045

Correlation between weight and time of menarche

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The time of first menarche is an important milestone in female sexual maturation. Dates of some studies have shown that early menarche may be associated with obesity. The present study examines the menarche age among adolescent girls in Yerevan city.
Materials-Methods: Dates regarding gestational age, birth weight and height, chronological age of onset of menarche, anthropometric dates at menarche time were collected from medical records of 450 girls.
Results: We found than high percentage of girls including to this study had menarche at age between 9.6-13.0 (n=352(78.2%)), and lower percentage 98 (21.8%) had menarche at age between (14-15). We found that the mean for age of menarche decrease steadily from (14.3; 13.7 to 11.3) years as the BMI increase from (15-19, 20-25, to >25) respectively. We found that there was no relationship of birth weight or small size for gestational age to age at menarche (p>0.05).
Discussion: The study shown that weight, BMI are negatively correlated with menarche age.

GC3.046

Changes in lifestyle and nutritional status in children at risk of obesity after one-year intervention: MELIPOP Study

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Introduction: Childhood obesity is a public health concern that requires adequate prevention and intervention. Healthy dietary patterns, such as the Mediterranean diet, stands out for their nutritional value and well-known beneficial effects in the prevention of chronic diseases. Physical activity since childhood improves cardiometabolic markers, mental health, social and cognitive development. For these reasons, the present intervention project has focused on modifying both the dietary and physical activity patterns and reducing sedentary behaviours through an integrated approach that should contribute to prevent obesity. The aim was to evaluate the association between changes in the adherence to the Mediterranean diet (MDA) and active lifestyle adherence (ALA) and the nutritional status during first-year follow-up in the control and intervention groups.
Methods: MELIPOP study is a randomised clinical trial conducted in three Spanish cities (NCT04597281). Children aged 3-6 years at baseline, whose parents living with overweight or obesity, were contacted (n=293). After run-in period, baseline measurements were performed in 147 children, who were subsequently randomised. In this study, we only include the first 117 children. Anthropometric and body composition measurements were obtained in 51 children who had been followed up for 12 months in clinical care and 66 in the Mediterranean lifestyle intervention. Weight and height were measured according to the ISAK-protocol and used for body mass index (BMI) derivation. Fat Mass Index (FMI) was calculated from fat mass (kg) by bioelectrical impedance. MDA was assessed using an 18-item questionnaire adapted from the PREDIMED

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study; good adherence was considered for values ≥14 points. ALA was measured by questionnaire based on physical activity recommendations for children, good adherence was considered for values ≥7 points. MDA changes or ALA changes or both, after the first-year of follow-up, were created as exposition variables. Categorical values were obtained by variability in MDA and ALA at baseline (V00) and after 12 months (V12), as well as the combination of these two expositions (MDA plus ALA). These variables were associated with BMI z-score and FMI, after 12 months of intervention, using General Linear Models in Stata software, considering 5% significance level.
Results: The sample was composed by 47% girls. Children of the intervention group showed a significant decrease in BMI z-score (p=0.010), while those of the control group showed a significant increase in FMI (p=0.004) after first-year follow-up. Changes were observed in MDA (11.33±2.57 and 12.09±2.68); and ALA (9.03±1.57 and 9.26±1.74); BMI z-score (16.54±2.0 and17.05±2.72); FMI (3.79±1.0 and 4.04±1.49) in V00 and V12, respectively. No significant changes were observed in BMI z-score and FMI associated to MDA, ALA or both, in the control and intervention group.
Conclusion: A healthy lifestyle, based on the promotion of the Mediterranean dietary pattern and regular physical activity since infancy, decreases obesity in children aged 3 to 6 years.

GC3.047

The recruitment of adolescents with obesity to the Fast Track to Health randomised control trial

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Introduction: Identifying and engaging adolescents in clinical trials and health services is challenging. This study describes the outcomes of recruitment strategies used to recruit adolescents with obesity for the Fast Track to Health study, undertaken at two tertiary paediatric centres in Australia.
Methods: Fast Track to Health (HREC/17/SCHN/164) was an RCT that enrolled 13–17-year-olds with adult equivalent BMI 30-45kg/m^2 and ≥1 metabolic complication. Recruitment ran from December 2017 to March 2022. A range of recruitment strategies were used. Following an initial phone screen, adolescents attended an in-person, onsite screening appointment. Recruitment strategies were grouped and the enrolment yield of each recruitment strategy was calculated.
Results: Of the 308 adolescents who enquired about the study, 171 (55.5%) attended onsite screening and 141 (45.8%) were enrolled in the trial. The most successful recruitment strategy was referrals from specialists at the two tertiary paediatric centres (21.1%). Other recruitment strategies with high enrolment yield were referrals from family/friends (6.5%), family doctor/GP (3.6%), and social media (3.6%). Recruitment via social media was used for 11 months only, equating to an enrolment yield of 8.5% during that time. Recruitment strategies with low recruitment yield were digital or print media (1.3%), the study website (1.0%), and referrals from other clinical trials (0.7%). 137 adolescents were found to be ineligible for the trial at phone screening, the most common reason being disinterest in participation (34.3%). Of the 171 adolescents who underwent onsite screening, 30 did not meet the inclusion criteria; approximately a quarter (23%) had no metabolic complications and 27% did not meet BMI requirements. Other reasons for ineligibility at onsite screening included: taking medications that influence weight in the short term, diagnosis of Type 2 diabetes, requiring referral for psychological concerns and disinterest in participation.
Conclusion: Connecting with specialists at relevant health facilities is a helpful strategy to generate enrolment of treatment-seeking adolescents with obesity in a weight management trial. Further research is needed to investigate the use of social media strategies to engage adolescents in clinical research.

GC3.048

Safety and acceptability of a very-low-energy diet for the treatment of adolescent obesity: a Fast Track to Health sub-study

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Introduction: Very-low-energy diets (VLED) induce rapid weight loss. However, concerns remain surrounding their safety for adolescent use. This study aimed to report on the safety and acceptability of a 4-week VLED for adolescents with obesity.
Methods: Adolescents were participants in the Fast Track to Health 52-week randomised controlled trial which recruited 13–17 year olds, with obesity and ≥ 1 obesity-related complication (HREC/17/SCHN/164). Participants undertook a 4-week micronutrient complete VLED (800 kcal/day), with weekly dietitian support, before commencing their randomised dietary intervention: intermittent or continuous energy restriction. Weight was recorded at baseline and week-4 and side-effects were recorded at day 3-4 and 1-, 2-, 3- and 4- weeks into the VLED intervention. Adolescents completed an acceptability survey at week-4.
Results: Of 141 (70 female) adolescents recruited to Fast Track, 134 (14.9 ± 1.2 years, 50% male) remained in the study at week-4 and lost an average of 5.5 ± 2.9 kg ($p < 0.001$). Nearly all (92%) experienced ≥1 side-effect, most (59%) experienced ≥ 3 side-effects during the VLED. Side-effects peaked at week-1. Hunger, fatigue, headache, irritability, loose stools, constipation, nausea and lack of concentration were most common. More side-effects at day 3-4 was associated with greater weight loss at 4-weeks ($r = -0.188$, $p = 0.03$). Seven participants experienced viral infections; two modified their VLED regimen consequently. On a 100-point Likert scale, adolescents rated the intervention 61 ± 24 for "easy to follow" (easy = 100-points, difficult = 0-points) and 53 ± 24 for "enjoyable to follow" (enjoyable = 100-points, not-enjoyable = 0-points). Losing weight (34%) and the prescriptive structure (28%) were reported as the most positive aspects of the VLED intervention. The restrictive nature (45%) and taste of meal replacement products (20%) were liked least.
Conclusions: A health professional monitored VLED can be implemented safely in the short-term and is acceptable for many adolescents, despite being associated with frequent side-effects. More emphasis on the utility of VLED interventions in clinical practice guidelines for adolescent obesity treatment is required, especially as an intermediate step before pharmacological/surgical intervention.

Conflict of Interest: None to declare.

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GC3.049

Does Lifestyle Intervention Impact on Infant Growth After Exposure to Hypertensive Disorders of Pregnancy? A BP2 Sub-Study

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Introduction: Hypertensive disorders of pregnancy (HDP), including preeclampsia, gestational hypertension, and chronic hypertension, increase the long-term risk of obesity and cardiovascular disease for mothers and their infants. No study has explored how lifestyle interventions impact on infant growth following HDP exposure. This study aimed to compare 6- and 12-month growth outcomes of infants born to HDP mothers participating in one of three lifestyle interventions.
Methods: Infants were children of women enrolled in BP2, a randomised controlled trial across six Sydney hospitals recruiting women with previous HDP. Mothers were randomly assigned to Group 1: usual care; Group 2: one education session with a dietitian and physician; or Group 3: extended lifestyle intervention (one education session with a dietitian and physician plus 6-month phone-based lifestyle coaching). Baseline and post-intervention data were collected at 6-months and 12-months, respectively, including infant weight, length and head circumference. Baseline, post-intervention and change in weight, length and head circumference z-scores and rapid weight gain (≥0.67 increase in weight z-score) were calculated to assess infant growth using WHO (term) and INTERGROWTH-21st (preterm) standards.
Results: Overall, 394 infants (Group 1: n=122; Group 2: n=133; Group 3: n=139) completed anthropometric assessments at baseline and post-intervention. Baseline, post-intervention and change in growth outcomes did not differ between groups (Table 1). A third (n=131) of all infants experienced rapid weight gain.
Conclusion: Maternal participation in lifestyle interventions did not alter infant growth trajectories from 6- to 12-months, compared with usual care. High rates of rapid weight gain may increase infant risk of obesity and cardiovascular disease long-term. Further studies are needed to elucidate if intervening post-HDP can impact infant health.

Tab. 1. Infant growth outcomes by intervention group.

	Group 1 (n=122)	Group 2 (n=133)	Group 3 (n=139)
Birthweight, kg	2.76 ± 0.76	2.79 ± 0.84	2.84 ± 0.85
Birth weight z score	-0.44 ± 1.12	-0.37 ± 1.01	-0.32 ± 1.15
6-month Weight, kg	7.41 ± 1.17	7.48 ± 1.30	7.49 ± 1.17
6-month Length, cm	66.41 ± 3.85	66.69 ± 4.03	66.87 ± 4.24
6-month Head circumference, cm	43.11 ± 1.92	43.37 ± 2.05	43.36 ± 1.67
6-month Weight z-score	-0.26 ± 1.18	-0.22 ± 1.29	-0.17 ± 1.06
6-month Length z-score	-0.06 ± 1.42	0.01 ± 1.50	0.11 ± 1.58
6-month Head circumference z-score	0.31 ± 1.54	0.47 ± 1.49	0.53 ± 1.22
12-month Weight, kg	9.57 ± 1.24	9.74 ± 1.37	9.79 ± 1.26
12-month Length, cm	75.25 ± 3.41	75.79 ± 3.36	75.99 ± 3.39
12-month BMI, kg/m^2	16.86 ± 1.58	16.92 ± 1.69	16 91 ± 1.53
12-month Head circumference, cm	46.22 ± 1.69	46.23 ± 1.81	46.52 ± 1.91
12-month Weight z-score	0.11 ± 1.12	0.29 ± 1.14	0.31 ± 1.01
12-month Length z-score	0.00 ± 1.31	0.27 ± 1.32	0.26 ± 1.24
12-month BMI z-score	0.15 ± 1.09	0.20 ± 1.14	0.23 ± 1.07
12-month Head circumference z-score	0.50 ± 1.24	0.54 ± 1.34	0.73 ± 1.34
Weight z-score change (6- to 12-month)	0.37 ± 0.79	0.51 ± 0.90	0.48 ± 0.67
Length z-score change (6- to 12-month)	0.07 ± 1.26	0.27 ± 1.23	0.15 ± 1.43
Head circumference z-score change (6- to 12-month)	0.17 ± 1.50	0.09 ± 1.22	0.20 ± 1.18
Rapid weight gain, n (%) (6- to 12-month)	37 (30)	45 (34)	49 (35)

GC3.050

Family Meals on Prescription as Treatment for Childhood Obesity - a Randomized Controlled Trial

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Introduction: The corner stone in the treatment of childhood obesity is lifestyle treatment often based on counselling. There are few randomized controlled trials evaluating intensive dietary treatment options using a participatory approach such as prepacked Family Meals involving the whole family in the home setting.
Objective: The aim was to investigate the effects of Family Meals on Prescription, a three-month intensive dietary intervention, on body mass index and metabolic health in children living with obesity.
Methods: This study is a prospective randomized controlled trials with children aged 5-15 years from two Pediatric Obesity Outpatient Clinics in Halland, Sweden. Participants were randomized to either lifestyle treatment with or without Family Meals on Prescription. The intervention consisted of a subsidized prepacked grocery bag including recipes and provisions for five Family Meals per week for three months. The primary endpoint was change in BMI standard deviation score (BMI-SDS) at 3, 12, and 18-24 months. Secondary endpoints were the effects on metabolic biomarkers and the frequency of shared meals.
Results: 89 (51.7 % female) children were included, 54 participants in the intervention group and 35 in the control group. The groups did not differ regarding gender, age or level of obesity at baseline. Family Meals on Prescription combined with lifestyle treatment resulted in a greater reduction in BMI-SDS than lifestyle treatment alone after the 3 months long intervention (-0.17 vs + 0.01, p<0.01), this treatment effect was not maintained through the follow-up period.
Conclusions: Receiving a prepacked grocery bag with recipes, as addition to the lifestyle treatment of childhood obesity, may contribute to a more effective treatment. However, the achieved BMI-SDS reduction did not persist over time after the intervention ended, which emphasizes that obesity is a complex and chronic disease with a need for long term treatment.

Conflict of Interest: None Disclosed

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GC3.051

Effectiveness of a health promotion program in primary schools and children in socially vulnerable conditions - cluster-randomized study (BeE-school)

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Introduction: Obesity is a complex and multifactorial disease whose prevalence has been increasing. Previous studies have shown its negative impact on health, quality of life, and on healthcare systems expenditure. Additionally, there is evidence about the association between overweight and lower socioeconomic status so, obesity prevention programs in vulnerable contexts should be prioritized. This study aims to assess the effectiveness of a health promotion program on body composition in children from primary schools in vulnerable conditions.
Methods: The BeE-school is a cluster randomized controlled trial that involved 735 children [380 boys, 7.7 (SD=1.2) years old] from 10 primary schools of two distinct school groups identified as Educational Territories for Priority Intervention in the Northern region of Portugal. Following the baseline assessment, schools were randomized into a control group (n=382, 6 schools) and an intervention group (n=353, 4 schools). Weight, height, and waist circumference were assessed following internationally accepted procedures. Subsequently, Body Mass Index (BMI) was calculated, and its corresponding z-score (BMIz) was computed with World Health Organization LMS. The waist-to-weight ratio, an indicator of central adiposity was calculated as waist circumference/weight^0.5. The intervention program consisted of three components: i) teachers´ education and training; ii) implementation of the learned contents into the classroom and iii) challenges for families. Data were analyzed using IBM SPSS V.28. The adopted significance level was 5%. The primary outcome was body composition, i.e the difference (post-intervention – baseline) in BMIz and in waist-to-weight ratio. We used Generalized Linear Models and the predictor was group allocation (control and intervention). The adjustment was made for school groups, school level (1st, 2nd, 3rd or 4th), length of time from baseline to post-intervention assessment, sex, age, mothers' and fathers' education in order to maximize precision.
Results: Intervened children had a significantly reduction in BMIz (b= -0.066, CI 95% -0.121 to -0.012), even after adjusting for confounders (b= -0.112, CI 95% -0.193 to -0.032). The intervention group also showed a significant decrease of -0.113 cm/kg^0.5 in waist-to-weight ratio (CI 95% -0.179 to -0.048), this effect persisted in the adjusted model (b= -0.133, CI 95%: -0.235 to -0.031).
Conclusions: The school-based intervention, focusing on teacher training in health promotion and involving families, proved to be effective in improving body composition in socially vulnerable children. Further studies are needed to assess the long-term effects of the intervention. Health policies could consider schools and teachers as significant contributors to obesity prevention.

GC3.052

Attrition rate and predictors of a monitoring mHealth application in adolescents with obesity

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Introduction And Methods: Integrating mobile health (mHealth) into pediatric obesity treatment offers potential for personalized and lifelong treatment, yet faces a significant hurdle in high attrition rates. This study, involving 69 adolescents aged 12 to 16 undergoing multidisciplinary obesity treatment (outpatient or inpatient), aimed to comprehend attrition in a 14-day monitoring mHealth application. To assess the attrition rates, frequency distributions were used. To test the predictors of attrition, zero-inflated negative binomial regression was performed.
Results: The results revealed substantial attrition, with 53.3% of the outpatient participants and 24.1% of inpatient participants utilizing the app for only 0-7 days. Notably, deficits in initiating, a component of executive functions, emerged as the sole negative predictor of attrition, indicating that a lack of initiation skills corresponded to lower attrition rates.
Conclusions: This study sheds light on the prevalence of attrition in mHealth interventions for adolescent obesity treatment and represents the inaugural exploration of psychological predictors of attrition in this context. However, caution is advised in interpreting predictor findings due to the study's limited sample size.

GC3.053

Childhood Obesity – Effect of a 10-week Multicomponent Lifestyle Camp on Body Composition, Metabolic Health, Eating Behavior, Eating-related Problems and Quality of Life

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Introduction: Weight status is associated with eating behavior in children (1), and a substantial proportion of children with overweight and obesity have eating-related problems (2), and a decreased Quality of Life (QoL) (3) compared to peers with normal weight. The aim of this study was to investigate the effect of a 10-week lifestyle camp intervention with 52-weeks follow-up on anthropometry, metabolic health, eating behavior, self-reported overeating (OE), binge eating (BE), and QoL in children.
Methods: Seven to fourteen-year-old children attending camp between October 2020 and March 2022 were recruited. Children were referred to attend the multicomponent lifestyle camps if they had overweight/obesity, were lonely, unhappy or had social or family-related problems. Children had anthropometry measurements collected at baseline, 10 weeks and 52 weeks. Additionally, children answered the Child Eating Behavior Questionnaire, two questions from the Eating Disorder Examination Questionnaire, and the Pediatric Quality of Life Inventory with a parent present. A subsample of the children had a blood sample collected.
Results: Children (n:208) had a mean age of 12.2±1.4 years, and a BMI-SDS of 2.7±0.7 SD (4). After 10 weeks at camp, children had a decrease in body weight (-6.5kg, p=<0.01), BMI-SDS (-0.58 SD, p<0.01), and body fat (-5.92%, p<0.01), and favorable changes in the metabolic health (e.g. reduction in lipids, increased liver-health and a decrease in uric acid). Also, at the 52-weeks follow-up, children had a lower BMI-SDS (-0.45

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SD, p<0.01) and body fat (-5.42%, p<0.01) compared to baseline with sustained improvements in total cholesterol (p<0.01), triglycerides (p<0.01), alanine aminotransferase (p=0.01), HbA1c (p<0.01) and CD163 (p<0.01). Furthermore, children had favorable improvements in eating behavior, eating-related problems (i.e., OE and BE) and QoL after camp with most beneficial changes sustained at the 52-weeks follow-up.

Conclusion: Overall, the 10-week lifestyle camp leads to remarkable improvements in the physical and psychological health in children with overweight and obesity. Additionally, most favorable effects were sustained 52 weeks after camp suggesting that attending these multicomponent camps induce health benefits beyond weight loss.

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GC3.054

Successful community-based interventions to tackle obesity in Portugal: lessons learned to support BETTER4U – an innovative European project

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Introduction: Obesity represents an ongoing public health emergency with multiple implications. Current literature highlights the importance of implementing integrated and comprehensive interventions throughout the life course. Previous, multidisciplinary interventions at national and European level targeting various population groups [namely MUN-SI and EAT Mediterranean (EM) programs and the EU project CO-CREATE (CC)], have set the basis for the identification of obesogenic determinants. These will serve as one of the cornerstones for the new European project BETTER4U, focusing on the effectiveness of a lifestyle intervention methodology for weight management in adults with obesity.

Methods: MUN-SI Portugal (2008-I) offers a proactive and interactive response to the problem of childhood overweight. Acting at municipality level and based on continuous and sustainable actions, it aims at mobilizing children aged 6-12 through promoting healthy eating habits and assessing children's nutritional status. The EM program (2015-2017) aimed to reduce nutritional inequalities in children and adolescents (aged 3-17) through the promotion of the Mediterranean Diet (MD) and via a multisectoral network of partners located in Portugal. The CC project (2018-2023) aimed to co-create policy ideas for obesity prevention, led by the collaboration of adolescents (aged 16-18) from 5 European countries, including Portugal. Similarly, BETTER4U (2023-2027) will implement a lifestyle intervention in 7 European countries, including Portugal, using AI and monitoring tools to derive and implement personalized recommendations for obesity prevention.

Results: MUN-SI program impacted more than 15000 children from 150 schools, improving children´s health literacy and adherence to the MD (+12.1% in 2016-2019 and +20.9% in 2016/2017). MUN-SI also led to a reduction of the overweight (35.5% to 24.3%) and obesity (16.7% to 6.4%) prevalence in 2008-2009 and 2019-2020 (p<0.005). In the EM program, 3965 young people participated. At the end of the program, the adherence to the MD significantly improved by 17.6% (p<0.001), while the intake of high energy density foods significantly decreased (p<0.001). In the CC project, "group model building" workshops with 60 adolescents were held to develop system maps to identify the factors driving obesity. Three novel policies were co-created along with researchers and were further discussed with relevant stakeholders and national and European level. BETTER4U will, thus, integrate all described results to develop and successfully deliver the proposed lifestyle intervention.

Conclusion: Successful community-based approaches from previous and ongoing national and European projects provide valuable insight for obesity prevention. These findings will support the implementation of the BETTER4U project.

GC3.056

Using ADAPT-ITT to adapt programmes from US as family-based interventions for children with obesity and eating disorders in Singapore

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Introduction: Both childhood obesity and eating disorder are on the rise in Singapore, mirroring similar trends worldwide. Family-based treatment strategies are evidence-based interventions to treat both conditions. Fit Together, an integrated clinic community obesity treatment model was developed in the United States (US) and has been shown to help patients to achieve the recommended treatment dose of more than 25 hours using family-based intervention. A group parent-skills training (GPT) programme has also been designed in US to increase caregiver competency in managing their child's eating disorder, address vulnerability factors that may increase eating disorder risk and to increase caregiver self-care and support. Contextual and cultural adaptations are necessary to implement these programmes to an Asian culture in Singapore. ADAPT-ITT, an 8-step framework for the adaptation of evidence-based interventions to different settings were used to guide the adaptation of both the Fit Together and GPT programme to Singapore.

Methods: For these adaptations, the ADAPT-ITT consists of the following phases: (1) Assessment where a core team is formed with the intervention experts from Duke US with local stakeholders to assess the suitability of intervention for Singapore; (2) Decision where an intervention is chosen to be adapted to local context with identification of core component to maintain fidelity and components that needed to be adapted to local context; (3) Administration of a preliminary programme that is tested through trial sessions and/or feedback from stakeholders and participants; (4) Production of the full adapted programme; (5) Consultation or feedback from topical experts; (6) Integration of topical experts input into the final version of the intervention; (7) Training on intervention and (8) Testing of the pilot programme.

Results: Core components of both programmes were identified to ensure fidelity while adapting certain elements of the programme to the local context in Singapore and included 1) Number of intervention hours 2) Key modules of the intervention. Common themes on adapted components identified included 1) Need for culturally relevant food and preparation 2) Incorporation of local languages 3) Incorporation of physical activities that were suitable in the local climate and public housing 4) Relating to academic priorities for the activities such as videos which were used in the GPT to develop caregiver's competency were adapted to manage academic stressors commonly found amongst Singaporean adolescents.

Conclusion: ADAPT-ITT has been shown to be useful in guiding the structured adaptation of evidence-based interventions from the US for Asian societies like Singapore to address childhood obesity and adolescent eating disorders enabling the evidence-based interventions to be scaled to other parts of Asia.

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GC3.057

Proof-of-feasibility study of a participatory research program (YPAR) aiming to prevent obesity in children: Chic@s en Acción. GrowH! Study

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Introduction: Childhood obesity is a global public health concern (1) and unhealthy dietary behaviors and insufficient physical activity were reported as the main drivers worldwide (2). Despite various attempts to develop and implement sustainable interventions to promote healthy behaviors (3), current interventions have limited effects (4). Youth-centered Participatory Action Research (YPAR) is an approach that may reduce the health inequalities (5-8). The aim to explore the outcome evaluation of a proof of feasibility study in children.
Methods: The YPAR intervention approach was adapted from a previous program in Amsterdam (Netherlands) to Zaragoza (Spain) (9,10). The approach involved three phases: 1) preparation and adaptation; 2) participatory needs assessment; and 3) action co-development, implementation, and evaluation. Action Teams were established in the 1st phase, which groups of children participating as co-researchers through (bi)weekly meetings during two school years. Children aged 9-11 years attending primary schools in a socially disadvantaged neighbourhood in Zaragoza were included. A mixed-methods process- of outcome evaluation was conducted. The outcome evaluation included an assessment of children's physical activity, sedentary behaviors, dietary behaviors, and sleep, and determinants of these behaviors. The questionnaire was completed before and after the implementation of the co-created actions by the children. Outcomes were analyzed using Chi-square and Wilcoxon tests (11). All study activities were voluntary, and all participants signed a consent form.
Results: In the first phase, 3 Action Teams, including 20 children, were created. 16 of these 20 children (80%) participated in all YPAR co-creation activities. All children define their participation as a good experience. The directors agreed about the approach, whereas the teachers were more hesitant due to the limited time.
In phase 3, 80 children participated in the implemented actions (32 children in one school and 48 children in the other school; 59% response rate). Children participating in phase 3 reported a higher consumption of soft drinks, energy/sports drinks, snacks, water, and vegetables at T1 compared to T0, and a lower consumption of candy and fruit and higher consumption of fruits and vegetables in their celebrations at T1 compared to T0 (ns). Fewer children reported active transport to school, but an increase in physical activity was reported (ns). More children stay alone at home more times per week at T1 compared to T0 (ns). A higher screen time before bedtime at T1 than at T0 was reported (p=0.017). Fewer children reported sleep routines (ns) and sleep problems due to light (p=0.011) or noise (ns) at T1 compared to T0.
Conclusion: It was feasible to adapt the Dutch YPAR approach to the Spanish context. The approach was acceptable for children aged 9-11 years in Zaragoza and showed to have some potentially beneficial effects on children's health outcomes.

GC3.058

Growing up healthy: Obesity prevention tailored to critical transition periods in the early life-course

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Background: Obesity prevention programs often have had only limited or short-term effects. In particular socially vulnerable groups, who are affected most, have not been reached successfully. If the known modifiable risk factors were effectively changed in a favorable direction and if this was achieved in the early life course and in the most affected population subgroups, the burden of obesity and its related cardio-metabolic disorders could be reduced immensely.
Methods: We have modeled a hypothetical intervention that builds on the most recent longitudinal research results on risk factors while applying novel participatory intervention approaches in youth to develop and test better targeted and more effective primary prevention strategies. To this aim, we conducted a comprehensive analysis of two large children cohorts to assess the proportion of childhood obesity that is preventable by reducing modifiable risk factors and we implemented and tested two participatory community-oriented intervention approaches based on motivational interviewing and on participatory action research. Both approaches were adapted to target vulnerable groups with a systems lens.
Results: The impact of known modifiable risk factors at critical transition periods during the early life-course is age-dependent. The hypothetical interventions showed the strongest decrease in overweight and obesity prevalence for the reduction of screen time and the increase of physical activity. The novel participatory intervention approaches that have shown first promising effects in Canada and the Netherlands were successfully transferred to socially disadvantaged community settings in Spain and Germany with the support of operational stakeholders anchored in these settings. We evaluated the structural and regulatory requirements and conditions needed for the implementation and up-scaling of the developed intervention approaches onto a regional, national or international level from a whole systems perspective.
Conclusions: The lessons learned from the hypothetical intervention as well as from the implementation of the two participatory intervention approaches form the basis for a White Paper explaining the need for a systems perspective in developing future obesity prevention programs. The main messages of the White Paper will enter into a policy guidance document that may support the uptake and wider use of systems thinking for obesity prevention in a European context together with public health societies and the WHO.

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GC3.059

Using the person-centred approach to co-develop the AIM2Change intervention with young people: helping adolescents to increase their intrinsic motivation to change weight

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Introduction: Childhood obesity levels continue to rise, resulting in significant costs to individuals, the NHS and society. The 'Complications of Excess Weight' (CEW) clinics have opened across England and Wales to provide support to young people with complications of their weight. Taking the person-centred approach, we have co-designed a new intervention with young people, called AIM2Change, which aims to help young people to develop their intrinsic motivation to manage weight, using Acceptance and Commitment Therapy (ACT).
Methods: Young people from the Care of Childhood Obesity (CoCO) clinic in Bristol, UK, were invited to co-develop this intervention. The seven-session ACT-based intervention was delivered one-to-one, securely online. Qualitative interviews were conducted with young people immediately after each session to explore acceptability, engagement, and perceived value. Qualitative data were reviewed regularly to make iterative changes. The Table of Changes was then discussed during two consensus meetings. Inductive thematic analysis was conducted followed by framework analysis to map the themes according to each participant and session.
Results: Fourteen participants from diverse backgrounds were recruited, of whom nine completed the co-development process (female=4; median age(IQR)=15(1.5); 4 with parent; IMD range=1-10). Iterative changes during co-development included an earlier focus on eating behaviour, body image, and goal setting, with more practical activities to increase engagement. Four themes emerged from the interviews: theoretical understanding; delivery and receipt of therapy; view of strategies and engagement; real world benefits of co-development process. Participants valued the choice of whether or not to have an accompanying parent, and the online delivery. A strong therapeutic alliance developed, through which many activities were introduced. Participants provided opinions on those activities, which have informed development of a flexible intervention manual, allowing AIM2Change to be tailored to patient's preferences.
Conclusion: Insights from the co-development process have shaped AIM2Change to optimise the intervention's value, relevance and acceptability to young people. Findings from this study suggest that AIM2Change meets an unmet need in the current clinical context, allowing young people to explore their values, to accept the need to change to live to those values, and to commit to managing their weight effectively on their terms. The next step is a feasibility trial over three CEW clinics with preliminary health economic evaluation to inform the clinical trial pathway, with the ultimate goal of incorporating AIM2Change into the UK-wide Complication of Excess Weight Clinics.

GC3.060

Management of Overweight and Obesity in Transgender Youth in New York, United States

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Overweight and obesity pose a growing challenge among transgender youth in New York. Given this backdrop, the current plan proposes an interdisciplinary intervention, incorporating parental involvement. It considers the intricate interplay between hormonal therapy, cultural challenges, and psychological concerns. The goal is to promote healthy habits and strengthen the psycho-emotional well-being of the youth, integrating their families into the process. Despite challenges like self-stigmatization and structural limitations, collaboration with esteemed medical institutions bolsters confidence in its effectiveness. As a largely uncharted territory, this project aims to establish itself as a benchmark, laying the groundwork for future interventions in similar populations.

GC3.061

Risk of cardio-cerebrovascular disease according to changes in obesity and abdominal obesity before and after menopause in peri-menopausal women

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Background: Physiological changes occur in menopausal women owing to hormonal imbalances, resulting in increased obesity and abdominal obesity. This increase in abdominal fat increases the risk of metabolic syndrome and cardiovascular disease. In this study, changes in the obesity and abdominal obesity status of peri-menopausal women were evaluated longitudinally, and the risk of developing cardiovascular and cerebrovascular diseases was determined.
Methods: This study included menopausal women who underwent cancer screening conducted by the Korean National Health Insurance Service between January 1, 2012, and December 31, 2017. Women in peri-menopause were defined as those who had not reached menopause up to 3 years prior to cancer screening. This study analyzed the risk of cardio-cerebrovascular disease according with changes in obesity and abdominal obesity before and after menopause.
Findings: Results indicated that women who were not obese before menopause but were obese after menopause and those who were obese before and after menopause had a high risk of cardiocerebrovascular disease (HR], 95% CI: 1·141, 1·054–1·236 vs. HR, 95% CI: 1·167, 1·113–1·225). In women who were not obese after menopause, there was no significant difference in the risk of cardio-cerebrovascular disease between obese and non-obese women before menopause. The group with pre-menopausal abdominal obesity, but not post-menopausal abdominal obesity, had an increased risk of cardio-cerebrovascular disease (HR, 95% CI: 1·132, 1·039–1·234).
Interpretation: The prevention of cardio-cerebrovascular diseases in peri-menopausal women and management of post-menopausal obesity and pre- and post-menopausal abdominal obesity are crucial.

GC3.062

Revised adolescent PCOS criteria: implications for women's metabolic well-being

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Introduction: Polycystic ovary syndrome (PCOS) is one of the most common endocrinopathies in women. In recent years revised diagnostic criteria for PCOS in adolescent females were disseminated. These new criteria notably encompass the specification of irregular menstrual cycles and hyperandrogenism, with the exclusion of polycystic ovarian morphology. In our study, we aimed to verify whether the clinical presentation of adolescent patients meeting the new criteria is associated with an increased risk of metabolic disorders in adulthood.
Methods: We conducted a retrospective analysis of the medical records of adolescent patients in a singular medical center scrutinizing individuals with PCOS (meeting adolescent or Rotterdam criteria). Subsequently, after 4 to 11 years from the first visit, 35 women were reassessed with 19 meeting the new criteria as adolescents (study group, SG) and 16 serving as controls (CG) – not meeting adolescent criteria. Comprehensive blood

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tests encompassed assessments of alanine aminotransferase (ALT), aspartate aminotransferase (AST), lipids, insulin and glucose. A concurrent clinical assessment complemented the laboratory analyses. Statistical analyses were conducted utilizing Student's T-test and Pearson's correlation.
Results: In SG, 8 out of 19 individuals (42%) are afflicted with obesity as opposed to CG comprising 4 (25%) individuals living with obesity. The disparity in BMI values between the groups in this cohort did not attain statistical significance (SG 30.3±8.9kg/m^2 vs. CG 26.4±6.6kg/m^2; p=0.16). However, analyzed data revealed a significant increase in BMI between the first and second assessment in SG (Δ=2.0±3.7kg/m^2; p=0.03), which was not observed in CG (Δ=1.4±3.9kg/m^2; p=0.17). Other significant differences were identified in AST(SG 23.4±5.9U/L vs. CG 19.3±3.6U/L; p=0.02), ALT (SG 24.0±14.2U/L vs. CG 15.9±6.2U/L; p=0.04), and insulin levels (SG 13.0±8.5uIU/ml vs. CG 7.9±3.8uIU/ml; p=0.03). There was no significant difference in lipids and glucose levels between the groups. The study further unveiled a significant correlation in SG between testosterone levels during adolescence and glucose levels in adulthood (r=0.91, p<0.05).
Conclusion: Our study on patients with PCOS, diagnosed using adolescent criteria, reveals a significant increase in BMI within the SG over time. Despite non-significant BMI differences between SG and CG, notable variations in AST, ALT, and insulin levels were observed in SG. These findings emphasize the importance of addressing and managing of PCOS during adolescence to mitigate potential metabolic risks in adulthood.

GC3.063

The impact of obstructive sleep apnea on endothelial function in a pediatric outpatient weight loss setting

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Introduction: Childhood obesity is associated with several comorbidities such as cardiovascular complications and obstructive sleep apnea (OSA). Endothelial dysfunction is an early predictor of cardiovascular disease and is related to both obesity and OSA. This study aimed to investigate the effect of OSA on endothelial function (EF) throughout a pediatric outpatient weight loss program.
Methods: Children aged 8 to 18 with overweight and obesity were recruited whilst following an outpatient multicomponent weight loss treatment program at a tertiary pediatric obesity center. They attended three follow-up (FU) visits: at baseline, and after 6 and 12 months of treatment. Anthropometry and EF (EndoPAT) were determined at every visit. Polysomnography was performed at baseline.
Results: 163 children with a mean BMI of 31.8 ± 5.0 kg/m² were enrolled, of which 20 % had OSA. OSA patients had a higher BMI and WHR at baseline (BMI 33.4 ± 4.4 kg/m² vs 31.4 ± 5.1 kg/m², p =.04; WHR 0.91 ± 0.1 vs 0.87 ± 0.1, p =.01). Obstructive apnea-hypopnea index (OAHI) correlated with baseline BMI z-score (r =.21; p =.01), but not with the change in BMI SDS across visits, implying that OSA did not influence weight loss. At baseline, OSA patients had a significantly worse EF, implicated by a lower reactive hyperemia index (RHI) (1.38 (0.92 - 3.30) vs 1.6 (0.80 - 3.31), p =.045) and max dilatation (maxd) (1.23 (0.83 - 1.84) vs 1.29 (0.84 - 2.47), p =.03), as well as a higher pulse wave amplitude (PWA) (547.91 (222.82 - 979.46) vs 422.60 (95.92 - 1458.22), p =.01). OAHI inversely correlated with RHI (r = -.20, p =.01) and maxd (r = -.26, p <.001), again indicating that OSA severity is associated with more prominent endothelial dysfunction. This association was independent of baseline BMI SDS.
Seventy-three % of the patients attended the first FU visit and 60 % attended the second FU visit. After six months of treatment BMI SDS improved (2.43 ± 0.36 to 2.19 ± 0.45; p <.001). A similar improvement in EF was seen, evidenced by an increased maxd (1.28 (0.84 - 2.46) to 1.38 (0.98 - 3.34); p =.01) and a decreased PWA (453.31 (453.31 - 1455.75) to 397.36 (69.18 - 1062.85); p =.01). At twelve months BMI SDS and maxd remained stable.
Children with OSA showed significantly greater improvements in maxd within the first six months compared to children without OSA (-0.151 (-2.16 - 0.25) vs -0.025 (-1.96 - 1.31), p =.02). No long term associations between OAHI, change in BMI SDS and change in EF were found.
Conclusion: Improvements in BMI SDS within the first six months resulted in improvements of EF, both for OSA and non OSA patients. However, the improvements in EF did not persist six months later, 12 months from treatment start. Other therapies, such as nutritional supplementation or organized physical activities could be introduced into outpatient weight loss programs to achieve more clinically meaningful endothelial improvement.

GC3.064

Pattern of adult disease diagnoses by childhood body mass index

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Introduction: Associations between body size in childhood and specific diseases in adulthood have been examined frequently. However, limited information is available on the overall pattern of diseases and if it differs by childhood body size. Therefore, we aimed to describe, among women, the pattern of disease diagnoses in adulthood by age and childhood body mass index (BMI) status.
Methods: We included 128,756 girls from the Copenhagen School Health Records Register born 1930-1996. Weight and height were measured at regular school health examinations. BMI (kg/m²) were categorized using the International Obesity Task Force criteria as underweight (9.3%), normal weight (82.6%), overweight (7.0%) and obesity (1.1%) at age 7 years. The girls were followed at ages 15-87 years and disease diagnoses were obtained by individual-level linkage to the National Patient Register between 1977 and 2017. A Danish modified version of the International Classification of Disease (ICD) codes version 8 was used until 1995, when ICD version 10 was introduced. For comparability across versions, the ICD-8 codes were translated to ICD-10. Disease incidences were calculated by age (15-29 years, 30-44 years, 45-59 years, 60-74 years, ≥75 years) and childhood BMI status. The 50 most frequently registered diseases were identified.
Results: In this explorative study we found that the pattern of disease diagnoses changed by age at risk and by childhood BMI status. Using women aged 45-59 years as an example, the diagnoses of "excessive, frequent or irregular menstruation" and "leiomyoma of uterus" were frequently diagnosed among women with normal weight and overweight in childhood, whereas the diagnoses of "type 2 diabetes mellitus", "obesity", "subarachnoid haemorrhage", and "arthrosis of knee" were diagnosed most frequently among women with overweight in childhood. Moreover, diagnoses such as "skin abscess", "diverticular disease", and "inflammation of a vein" were among the 50 most frequent disease diagnoses in women with overweight but not normal weight in childhood.
Conclusion: Body size in childhood likely influences the pattern of diseases experienced among women in adult life. Despite the explorative nature of this study, the most frequent diagnoses included diseases that are not typically examined, as previous studies often focus on common non-communicable diseases. Thus, these findings highlight that future research should examine a broader range of diseases.

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GC3.065

BMI during childhood and puberty and blood pressure in midlife

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Background: A high BMI in adults is strongly associated with increased blood pressure and hypertension. However, the relative contribution of an elevated BMI during childhood and puberty to blood pressure in midlife is not clear.
Aim: We aimed to evaluate the association between BMI during development and systolic and diastolic blood pressure in midlife in men and women.
Method: In the present study, we linked information from two population-based cohorts, the BMI Epidemiology Study Gothenburg (BEST) cohort and the Swedish CArdioPulmonary bioImage Study (SCAPIS). Individuals born 1948-1968 with information on developmental BMI from the BEST Gothenburg cohort, and information on blood pressure in midlife from the SCAPIS study, were eligible. We included men (n=858) and women (n=825) who were not on anti-hypertensive medication at the time of blood pressure measurement. The associations between childhood BMI (at 7 to 8 years) and pubertal BMI change (young adult BMI at 20 years minus childhood BMI) and systolic and diastolic blood pressure in midlife were evaluated using linear regression models with 95% confidence intervals. All analyses were adjusted for birth year.
Results: In men, we found significant linear associations between childhood BMI and systolic and diastolic blood pressure, and between pubertal BMI change and systolic and diastolic blood pressure. Among women, there was a significant linear association between the pubertal BMI change and midlife systolic and diastolic blood pressure. No significant association was seen for childhood BMI and systolic and diastolic blood pressure in women.
The associations were essentially unaltered in analyses where both childhood BMI and the pubertal BMI change were included in the same model. For men, both childhood and pubertal BMI change were significantly associated with blood pressure in midlife, independently of each other (systolic blood pressure: childhood BMI 1.80 mmHg/sd increase (0.74;2.87), the pubertal BMI change 1.47 mmHg/sd increase (0.42; 2.51)). For women the pubertal BMI change was significantly associated with both systolic (1.72 mmHg/sd increase (0.44;3.00)) and diastolic (1.38 mmHg/sd increase (0.61;2.16)) blood pressure in midlife, independent of childhood BMI. In contrast, childhood BMI was not associated with systolic or diastolic blood pressure in midlife, independently of the pubertal BMI change.
Conclusion: We demonstrate that both childhood BMI and the pubertal BMI change were associated with systolic and diastolic blood pressure in men, independently of each other. In women, the pubertal BMI change, but not childhood BMI, was associated with blood pressure in midlife. These findings indicate that high blood pressure may originate in early life. We therefore suggest that targeted prevention during the developmental years could reduce the life-course burden associated with high blood pressure.

GC3.067

Body Composition and Non-invasive Indices of Hepatic Fibrosis in Children and Adolescents with Overweight and Obesity

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Introduction: Data on the role of the balance between muscle and fat in the development of childhood-onset metabolic dysfunction-associated steatotic liver disease (MASLD) are sparse. We explored the interaction between body composition parameters and hepatic indices of fibrosis in children with overweight/obesity.
Methods: 170 children and adolescents with overweight/obesity underwent body composition analysis (fat percentage, truncal-to-total fat ratio and muscle-to-fat ratio [MFR]), Homeostatic Model Assessment for Insulin Resistance (HOMA-IR), triglyceride to high-density lipoprotein-cholesterol (TG:HDL-c) ratio, and hepatic fibrosis assessments (alanine transaminase [ALT], aspartate aminotransferase [AST]/ALT ratio, Fibrosis-4 index, and NAFLD score (NFS). Abdominal ultrasonography was carried out in eighty-seven (51%) individuals.
Results: Enrolled were 65 males and 105 females, with a mean age of 12.7±3.4 years and a mean body mass index z-score of 2.02±0.54. The strongest correlation was between the MFR-z score and the AST/ALT ratio in boys (r=0.530, p<0.001), and between fat percentage and NFS in girls (r =0.503, p<0.001). Sixty-seven percent of the patient cohort had sonographic evidence of hepatic steatosis. Children with hepatic steatosis were older (p=0.002), less physically active (p=0.002), had a higher fat mass (p=0.003) and a lower MFR z-score (p=0.020). They exhibited greater insulin resistance (higher HOMA-IR levels, p=0.018) and a higher dyslipidemic atherogenic index (TG:HDL-c ratios, p=0.037) compared to those without hepatic steatosis. The logistic regression model adjusted for sex, age, and socioeconomic position revealed that the MFR z-score was associated with findings of hepatic steatosis on ultrasonography with a risk 3.8 times higher for every 1 standard deviation decrease in MFR z-score (OR=0.263, 95%CI [0.067 to 1.031], p=0.05).
Conclusions: In this study involving children and adolescents with overweight/obesity, we identified sexual dimorphism in the link between body composition and non-invasive indices of hepatic fibrosis. Our findings highlighted metabolic distinctions between individuals with and without hepatic steatosis on sonography, revealing higher levels of insulin resistance and atherogenic dyslipidemic indices among those with steatosis. The relationship between adverse body composition and heightened risk of hepatic steatosis underscores the importance of its assessment within this at-risk population. Further studies are needed to explore sex-specific differences in body composition and their impact on hepatic steatosis risk in children and adolescents with overweight/obesity.

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GC3.068

Positive changes in quality of life of children with severe obesity after personalized, integrated care advice in secondary or tertiary care, followed by local treatment

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Introduction: Childhood obesity is associated with physical and psychosocial comorbidities, including a decreased health-related quality of life (HRQoL) similar to children with cancer. In the Netherlands, pediatric obesity care is currently hindered by limited funding and fragmented integrated care networks.
This study aims to determine whether the generic- and weight-specific HRQoL of children with severe obesity changes after receiving comprehensive diagnostics and a personalized, integrated care advice, followed by one year of local guidance.
Method: Between 2015 and 2022, we included 464 children with severe obesity (mean age 11yr [±4], BMI-SDS 3.7 [±0.7]) at an EASO's 'Collaborating Centre for Obesity Management' in The Netherlands (Obesity Center CGG, Rotterdam). The following physical and psychosocial measurements were done at first assessment and one year follow-up: weight and length, the Pediatric Quality of Life Inventory (PedsQL), The Impact of Weight on Quality of Life – Kids (IWQOL-Kids), Dutch Eating Behavior Questionnaire and Dutch Exercise Behavior Questionnaire
One year changes were tested with paired t-tests, correlations between ΔHRQoL and ΔBMI-SDS with Pearson correlation and the association between Δ HRQoL and BMI-SDS at intake with linear regression, adjusted for demographic and lifestyle factors.
Results: Generic HRQoL (n=457)
PedsQL scores improved (PedsQL total score +3.1 [±12.0], ($p<0.001$)) and Δ BMI-SDS decreased
(-0.1 [±0.4], $p<0.001$), at follow-up. The correlation between ΔGeneric HRQoL and ΔBMI-SDS was weak ($r=-0.24$, $p=0.02$) and ΔGeneric HRQoL was not associated with BMI-SDS at intake, adjusted for demographic and lifestyle factors.
Weight-specific HRQoL (n=107) IWQOL-Kids scores did not change significantly. The correlation between Δweight-specific HRQoL and ΔBMI-SDS was moderate ($r=-0.43$, $p<0.001$) and Δweight-specific HRQoL was associated with BMI-SDS at intake, when adjusted for demographic and lifestyle factors (β-8.3, 95%CI -15.2, -1.4).
Conclusion: This study suggests that generic HRQoL of children with severe obesity may improve after receiving a personalized integrated care advice and local guidance in the Netherlands. These changes were not associated with BMI-SDS at intake or the change over time, indicating that BMI severity and change may not have been a major factor of influence for the effect on generic HRQoL, in contrast to the effect on weight-specific HRQoL.

GC3.069

Childhood overweight and obesity management: general practitioners, practice nurses and parents perspectives

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Background: Overweight and obesity in children is a major health problem worldwide. Children with overweight and obesity have an increased risk to develop serious health problems during childhood and later in life such as cardiovascular diseases, diabetes and cancer. To reduce this risk, addressing overweight and obesity in children should be done as early as possible. In the Netherlands, the general practitioner (GP) is the first point of care for children. Most children visit their GP at least once each life year. Therefore, general practice might be a promising setting for signalling and for the first steps in the management of overweight and obesity in children.
Aim: The aim of this study was to explore opinions, needs and preferences about the role of general practice in the management of overweight and obesity in children from the perspectives of Dutch GPs, practice nurses and parents of children with and without overweight.
Method: A qualitative study using semi-structured focus group interviews was performed. Dutch GPs and practice nurses were recruited from general practices from the South-Western region. Parents were mainly recruited via social media and primary schools. All interviews were audio recorded, transcribed verbatim and thematically coded using software MAXqda.
Results: In total, five focus group interviews with 25 GPs (group size: 3-7), two with seven practice nurses (group size: 3-4) and four with 18 parents of children with and without overweight (group size: 4-5) were performed. GPs, practice nurses and parents agreed that it is the task of the GP to signal, address and refer children with overweight and obesity. However, GPs find it difficult to start this conversation due to time constraints; fear for the reaction of parents and children; fear to trigger an eating disorder; lack of clarity about treatment and referral options. Parents indicated they are open to a conversation if the GP is non-judgmental, honest and respectful. Practice nurses in the present study saw no role in managing overweight and obesity in children.
Conclusion: Although GPs experience several barriers, GPs, practice nurses and parents all agreed that GPs could play a role in signalling, addressing and referring children with overweight and obesity. In order to support GPs to play this role, development of new supportive tools is needed.

GC3.070

Development of a tool for children with overweight and obesity in general practice: a Delphi study

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Background: In the Netherlands, there has been a noticeable increase in the number of children with overweight and obesity. In line with the Dutch guidelines of general practitioners (GPs), parents expect that GPs address overweight and obesity in children and that GPs have the knowledge about appropriate interventions. Earlier performed focus group interviews showed that GPs agree that they could play an important role in signalling, addressing and referring children with overweight and obesity but that they are in need of a supportive tool since they still experience different barriers.
Objective: The aim of this study was to establish consensus among Dutch GPs about the content of a supportive tool to signal, address and refer children with overweight and obesity in general practice.
Methods: A Delphi study was conducted. A concept of a supportive tool was constructed based on literature research, the Dutch Obesity guideline for GPs and insights from focus group interviews with GPs, practice nurses and parents of children with and without overweight and obesity. GPs working in general practice were identified as experts and invited to participate. Through a two-round consensus process, experts evaluated statements on the components of the tool in terms of content and usability. All statements were rated on a 5-category scale and consensus was set at ≥70% of respondents agreeing with the statements. Components and subcomponents were iteratively refined, added or removed until consensus was reached.
Results: In round one, 31 of 33 experts who consented to participate completed the survey (93.9% response rate), followed by 29 of the 31 experts

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in round two (93.5% response rate). The experts agreed that a supportive tool to signal, address and refer children with overweight and obesity should consist of a child specialized BMI-calculator; examples to initiate and to have weight-related conversations with parents and children; an intervention map including an overview of appropriate interventions and referral options for children with overweight and obesity; background information about health risks of overweight and obesity during childhood and healthy lifestyle advices.
Conclusion: A supportive tool for GPs to signal, discuss and refer children with overweight and obesity was developed through a consensus-driven process with GPs. Further validation and assessment are required through a feasibility and implementation study.

GC3.071

Correlations between appetite-regulating-hormones with body composition after long-term multidisciplinary therapy plus combined training in adolescents with obesity

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Introduction: Weight control is determined by multiple factors, that include appetite and energy balance, which are orchestrate by a complex system of peripheral and central signals. Combined exercise training as adjuvant tool in the multidisciplinary weight loss therapy can positively affect the neuroendocrine regulation of energy balance in adolescents. However, the role of combined training according to genders are unclear. This study aimed to analyse the effect of combined training (aerobic plus resistance), associated to a multidisciplinary weight loss therapy, in the orexigenic and anorexigenic factors, analysed in both genders, and to assess the extent to which this relationship is influenced by body composition changes.
Methods: From 168 post-pubertal adolescents with obesity (BMI>95th percentile; 96 girls and 72 boys) enrolled in this study, 56 (28 girls and 27 boys) did not complete the full protocol. The dropout rate was similar between girls (29%) and boys (39%) (p=0.19). They were submitted to 1 year of multidisciplinary therapy (clinical – one session/month, nutritional, psychological, physiotherapy (60 minutes, one session/week) physical training (60 minutes, 3 times/week). Body composition by pletismography (Body Weight - BW, BMI, Body Fat - BF, Free Fat Mass - FFM and Rest Metabolic Rate - RMR) and plasma levels of AgRP (Agouti-related protein); NPY (Neuropeptide Y); MCH (Melanin-concentrating hormone); Alpha-MSH (Alpha Melanocyte-stimulating hormone) were measured before and after therapy. Significance was set a Pp<0.05.
Results: The results show that, boys present: 1) a higher FFM (G: 51.0 ± 6.3; B: 63.4 ± 9.0 kg; p<0.00), 2); a lower BF (G: 47.6 ± 5.2; 41.7 ± 6.9 %; p< 0.00); and a double of Δ FFM/BF (G: 0.35 ± 0.32; B: 0.69 ± 1.07; p<0.04) than girls, at the beginning of the study. Delta values to variables, ratios of body composition and neuropeptides were similar between gender (BF, FFM, AgRP, NPY, alpha-MSH, MCH, alpha-MSH/NPY ratio), except for the Δ of FFM/BF ratio. Similar correlations were found to boys and girls between Δ Alpha-MSH and Δ FFM/FM (B: 0.509, p<0.00; G: 0.331, p=0.00) and FFM (B: 0.479, p=0.00; G: 0.245, p=0.04).
Conclusion: Our study was not able to show differences between boys and girls after combined training, suggesting that, independently of differences in body composition by gender the neuroendocrine control of energy balance is similarly counter regulated with mechanism conducted by orexigenic/anorexigenic factors.

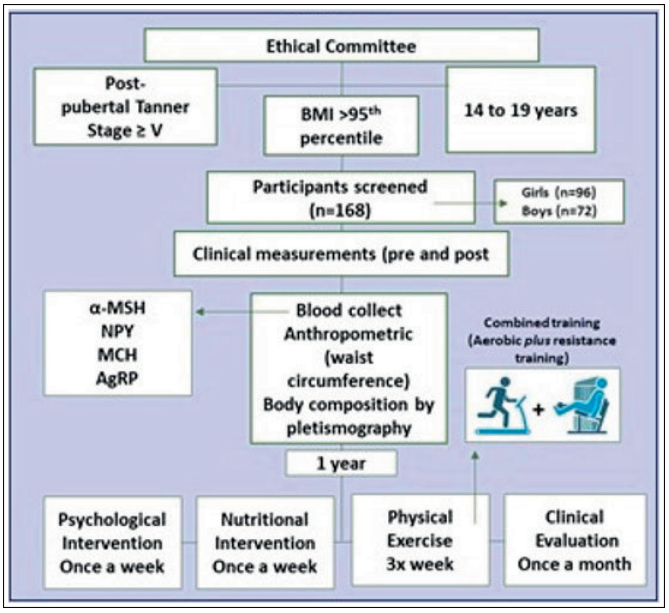


Fig. 1. Effects of combined exercise training on body composition and appetite-related peptides in adolescents with obesity submitted to an interdisciplinary intervention, according to gender.

Conflict of Interest: None Disclosed

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GC3.072

Impact of ultra-processed food intake on visceral fat and neuroendocrine mediators of energy balance in adolescents with obesity undergoing multidisciplinary therapy

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Introduction: The intake of ultra-processed foods, characterized by high levels of sugar, fat and additives, has been linked to various consequences, including obesity. However, the relationship between the consumption of these foods, with body composition, and neuroendocrine regulation of energy balance in adolescents remains unclear. The aim of this study was to verify the relationship between ultra-processed food intake, the body composition, including visceral fat, and neuroendocrine mediators of energy balance in adolescents with obesity undergoing a multidisciplinary therapy for long-term.
Methods: Fifty-eight adolescents with obesity participated in a one-year multidisciplinary therapy, including nutrition, psychology, physical exercise, and clinical approaches. The protocol was approved by the Ethics Committee and registered Clinical Trials. Body composition was estimated by air displacement plethysmography, while visceral and subcutaneous fat were assessed through ultrasonography. Blood samples were analyzed for neuroendocrine mediators of energy balance, including leptin, AGRP, neuropeptide Y, and alpha-MSH. Dietary intake was evaluated using a food frequency questionnaire. Food items were categorized according to the NOVA classification, which differentiates foods based on processing level: in natura or minimally processed foods, culinary ingredients, processed foods and ultra-processed foods. Consumption frequency categories were used to calculate the score for each food item, converting these frequencies into the annual score consumption of each food group. Participants were divided into two groups for statistical analysis based on whether they had reduced (n=45) or increased (n=13) their intake of ultra-processed foods, as determined by their scores post-therapy. All data were collected at baseline and after therapy. Statistical analyses were conducted, with a significance level set at p<0.05.

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Results: After the therapy, improvements in anthropometric profiles, including body mass, body mass index (BMI), body fat, fat-free mass, and subcutaneous fat, were observed in both groups. Significant reductions in visceral fat, leptin, neuropeptide Y, and alpha-MSH were only noted in adolescents who decreased the intake of ultra-processed food. The magnitude of change of score of ultra-processed food intake was positively correlated with changes in visceral fat and neuropeptide Y after therapy. The prevalence of hyperleptinemia was reduced in both groups: from 73.3% to 62,2% in adolescents who reduced their intake of ultra-processed food, and from 84.6% to 53.8% in the group that increased their consumption of ultra-processed food.
Conclusion: Interdisciplinary therapy promoted significant improvements in the anthropometric profiles of adolescents with obesity. Furthermore, alterations in the intake of ultra-processed food were associated with a reduction in visceral fat and the improvements of neuroendocrine mediators of energy balance. Therefore, enhancing the quality of food consumption can be considered a nutritional strategy in the treatment of obesity among adolescents, providing a better control of energy balance in long-term.

GC3.073

Precisioning risk detection for emerging (pre)diabetes in children applying new reference values of insulin response with oGTT

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Background and Aims: The course of obesity related type 2 diabetes is more severe in children than in adults. Therefore, it is critical to identify children at high risk for glycemic deterioration early to guide preventive (and interventional) clinical management. We aimed to determine the prevalence of insulin resistance in children with obesity based on new reference values of insulin response in an oral glucose tolerance test (oGTT) and evaluated the predictive value for development of (pre)diabetes.
Methods: We established age- and puberty-specific reference values for parameters of insulin (Ins) response (ISIMatsuda, AUCIns (area under the curve), ratio AUCIns/AUCglucose, insulinogenic index (IGI), peak Ins, 2h Ins, oral disposition index (oDI)) in an oGTT in 459 healthy participants with normal weight aged 6–30 years. Applying those, we determined the prevalence of insulin resistance in a cohort of 1484 children with obesity. We assessed the predictive value of insulin resistance regarding the onset of (pre)diabetes by survival analyses up to 20 years.
Results: Insulin response to glucose challenge in an oGTT doubled from early childhood to mid-puberty with only partial regression after puberty. Considering these age dynamics we established age and puberty related reference ranges for insulin parameters. Based on these reference values, insulin resistance was already present in half of the young children with obesity at preschool age (6-8 years), peaked during puberty and remained high during early adulthood with two thirds of pathological values among patients with obesity aged 18-30 years. Concordance of "pathological" in an oGTT levels was much more stable for insulin based levels (80-83%) compared to glucose based levels (<40%). Children with insulin resistance were four to five times more likely to develop (pre)diabetes in follow-up than those without (hazard ratio (HR) ISIMatsuda 4.82 (95% CI 2.49 - 9.36); HR for AUCIns 3.57 (95% CI 2.0 - 6.35)). Particularly ISIMatsuda, AUCIns, and peak insulin were discriminative in predicting future dysglycemia risk with approximately half of the children with impaired ISIMatsuda developing (pre)diabetes within 10 years.
Conclusions: The herein provided reference values facilitate the evaluation of insulin resistance both in a clinical and epidemiological context. Children with obesity and insulin resistance should be monitored carefully and treated rigorously, as they are four times more likely to develop (pre)diabetes than those without. We advocate for insulin based cut-offs for a more precise risk prediction for future dysglycemia.
Trial registration number: NCT02550236, NCT04491344

GC3.074

Diverse Obesity Trajectories in a Family, including Identical Twins, with a Pathogenic MC4R Variant

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Introduction: Pathogenic heterozygous melanocortin-4 Receptor (MC4R) variants are the most common cause of monogenic obesity, affecting the central satiety and appetite regulatory areas of the brain. MC4R monogenic obesity is largely under-diagnosed, and the management remains undefined.
Case Presentation: We report 3 adults of first-degree family members with a pathogenic MC4R variant causing increased craving and hunger despite heavy meals. The proband was living with type 2 diabetes diagnosed at a young age of 17 and obesity, with severe insulin resistance requiring up to 1000 units insulin/day at age 60 with a weight of 99.6kg. Various anti-obesity agents were used: liraglutide 1.8 mg (+3 kg), followed by liraglutide 3 mg (-4.7 kg), which was switched to semaglutide 2 mg weekly (-1.9 kg), with greatest loss of another 11.5 kg after addition of naltrexone-bupropion (Contrave PR) 8/90 mg.. His insulin requirement decreased to 80 units/day at a weight of 84.5kg at age 62. Genetic testing revealed a pathogenic heterozygous MC4R variant (c.380C>T, p.Ser-127Leu). His identical twin daughters were born full-term, with one being significantly underweight (Twin 1: 2.5kg, Twin 2: 1.55 kg). They both had childhood-onset obesity, however their weight trajectories were significantly different; Twin 1 had a peak BMI of 29.1 kg/m^2 at age 25 and decreased to 19.7 kg/m^2 at age 35 with intensive daily exercise and diet control, without using weight-lowering medication. In Twin 2, who had a sedentary lifestyle, BMI continued to increase gradually to 28.8 kg/m^2 at the age of 35. Body composition on DXA showed total body fat percentage of 19.1% and 25.5% respectively. Both twins were confirmed to be heterozygous for the familial MC4R variant.
Conclusion: The phenotypic manifestation of obesity is complex and goes beyond genetic predisposition alone. In a patient with severe insulin resistance and MC4R monogenic obesity, the use of combination GLP-1 agonists and naltrexone-buproprion was successful in reducing insulin requirement and body weight. As shown with the case of his identical twin daughters with the same pathogenic MC4R variant, we report that significant lifestyle measures can successfully alter weight trajectory.

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GC3.075

ACTION Teens UK survey: adolescents living with obesity, caregivers and healthcare professionals identify a need for effective weight-related conversations

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Introduction: Despite the rising prevalence of childhood and adolescent obesity in the UK, little is known regarding the experiences of adolescents living with obesity (ALwO), their caregivers and healthcare professionals (HCPs). ACTION Teens aimed to identify their perceptions, attitudes, behaviours and barriers to effective obesity care.

Methods: ACTION Teens (NCT05013359) was a multi-national, cross-sectional, online survey study. Here, we report only UK data from 416 ALwO, 498 caregivers and 250 HCPs (Table).

Results: Only 10% of ALwO and 8% of caregivers reported being informed by a doctor that they/their adolescent has obesity. Respondents' perceptions of who should initiate weight-related discussions varied (Figure). Although 82% of HCPs agreed they have a responsibility to help their ALwO patients lose weight, 46% reported not initiating weight-related discussions due to short appointment times and 20% due to feeling uncomfortable discussing weight. Most HCPs (73%) reported that obesity-related comorbidities are a key driver for initiating weight-related discussions. Among ALwO who had discussed weight with their HCP, only 49% trusted their advice; notably, 29% felt ashamed (and 23% depressed) after the discussion. The most important source of weight-management information for ALwO was social media (selected by 24% vs 6% for information from a doctor); overall, only 13% had used information from a doctor.

Conclusion: The results highlight a need to improve the quality, frequency and format of weight-related discussions between HCPs and ALwO in the UK, potentially by offering additional HCP training, to promote greater trust in HCPs' advice among ALwO.

Tab. 1.

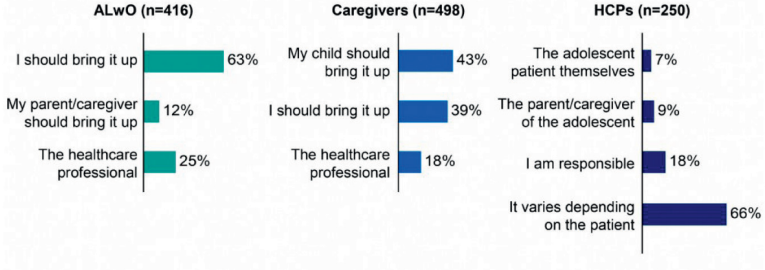
Table. Key inclusion criteria and baseline characteristics of the adolescents living with obesity, caregivers and healthcare professionals

Key inclusion criteria	ALwO (n=416) Aged 12–<18 years BMI ≥95th percentile for age and sex*	Caregivers (n=498) Aged ≥25 years Lived with the ALwO ≥50% of the time	HCPs (n=250) In clinical practice ≥2 years ≥50% of time spent in direct patient care
Mean age (years)	15.3	41.4	44.9
Sex (%)			
Female	59	58	36
Male	41	42	64
ALwO obesity class (%)†			
Obesity Class I	49	55	60
Obesity Class II	21	22	26
Obesity Class III	30	22	13
Primary medical specialty (%)			
Primary care physician	N/A	N/A	60
Paediatrician	N/A	N/A	16
Specialist‡	N/A	N/A	24
Mean length of time in practice (years)	N/A	N/A	15
Mean number of ALwO seen in a typical month	N/A	N/A	22

Percentages may not add up to 100%, due to rounding.
*Body mass index was based on self-reported data; †Obesity class of recruited ALwO, the ALwO of recruited caregivers, and the ALwO treated by recruited HCPs; ‡Specialist includes: paediatric endocrinologist, nutrition specialist, paediatric gastroenterologist, psychiatrist, obstetrician/gynaecologist, internal medicine (specialist) and paediatric cardiologist.

ALwO, adolescents living with obesity; HCP, healthcare professional; N/A, not applicable.

Figure. Perception of who should initiate weight discussions



Data are proportions of participants who selected each prespecified response option when asked who should bring up the topic of weight; only one response option could be selected.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Fig. 1.

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Data first presented at the Royal College of General Practitioners (RCGP) Annual Conference, 19–20 October 2023, Glasgow, UK.

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GC3.076

Somatic Maturation and Indicators of Obesity Among 9-11 Old Children

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Introduction: The degree to which biological maturation, as a source of inter-individual variability, affects estimates of adiposity in children is still not well understood, especially within the international context. Children of the same chronological age may have systematic differences in adiposity which may be related to their level of maturation. The present study investigated the relationship between two estimates of somatic maturation (maturity offset and % predicted adult height), BMI Z-scores, and total body fat among children in the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE).
Methods: The sample includes 5,568 children (54% girls) aged 9-11 years from 12 countries (Australia, Brazil, Canada, China, Colombia, Finland, India, Kenya, Portugal, South Africa, United Kingdom, and United States). Height and weight were measured using standard techniques and BMI Z-scores were computed from WHO reference data; total body fat (kg) was estimated using a Tanita body composition analyzer (SC-240). The maturity offset was computed from sex-specific regression equations, which use age and physical growth characteristics to predict the status of the child relative to their predicted age at peak height velocity (PHV). The % predicted adult height was estimated from the participant's age, height, weight and their mid-parent stature using the Khamis-Roche method. Sex-stratified mixed multilevel models with age as a covariate, adjusting for the nested nature of the data (children within schools within study sites), were used to examine the relationships among maturity offset, % predicted adult height, BMI Z-scores, and total body fat.
Results: The mean (SD) age of the sample was 9.9 (0.6) years; the children were -2.1 (1.0) years from their PHV and had attained 83.8 (4.4) % of their predicted adult stature. Among girls, both maturity offset and % predicted adult height were positively associated with BMI Z-scores [B=1.66 (SE=0.03); p<0.0001 and B=0.29 (SE= 0.005); p<0.0001, respectively). Similar results were obtained for boys [B=2.06 (SE=0.04); p<0.0001 and B=0.45 (SE= 0.01); P<0.0001, respectively). Among girls, both maturity offset and % predicted adult height were also positively associated with total body fat [B=8.27 (SE=0.14); p<0.0001 and B=1.45 (SE= 0.02); p<0.0001, respectively). Similar results were obtained for boys [B=8.50 (SE=0.18); p<0.0001 and B=1.86 (SE= 0.04); p<0.0001, respectively). Further, the associations did not differ among children among countries with low, moderate and high human development index.
Conclusions: In this multi-national sample, children who were more advanced in maturation had higher levels of BMI and total body fat, after adjusting for their chronological age. Incorporating assessments of maturational status into the diagnosis of obesity may serve to better delineate obesity-related health risks and well-being.

Conflict of Interest: None disclosed.

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GC3.077

Is there an elevated risk for developing eating disorder symptoms during family-based behavioral treatment for adolescents with severe obesity?

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Introduction: Concerns have been raised that behavioral obesity treatment, that includes a restrictive dietary component, may increase eating disorder symptoms in adolescents.
Aims: To investigate eating disorder symptoms pre- and post a family-based behavioral treatment for severe obesity.
Methods: Eating disorder symptoms were measured pre- and post treatment in 74 adolescents (age 10-18; 43 girls; Mean BMI SDS 3.11) enrolled in a treatment trail investigating the effectiveness of a 17-session family-based behavioral treatment for severe obesity. Eating disorder symptoms were assessed using the Youth- Eating Disorder Examination Questionnaire (Y-EDE-Q), including a global score and sub-scales for dietary restraint, eating-, weight- and shape concern. Robust linear mixed models and generalized mixed models were applied to measure change over time. All models were random intercept, fixed slope models in which measurement occasions (time) was nested within the subjects.
Results: There was no significant change in global eating disorder score over time (mean (SD) pre 1.82(1.07) and post 1.67(1.08); beta = -0.16, p = 0.69). Before treatment 14.9 % of the adolescents scored above a clinical cut-off for eating disorders (> 2.5) on the Y-EDE-Q, compared to 9.5 % after treatment. However, none received a clinical eating disorder diagnosis at any time point. At baseline 4 adolescents reported a mean above 1 weekly binge eating episode with loss of control during the last month, compared to none at the end of treatment. The fixed effect of time on shape concern was significant (beta = -0.29, p = 0.036), demonstrating a reduction in shape concern during treatment. No significant changes over time were found for dietary restraint, eating- or weight concern.
Conclusion: In general, eating disorder symptoms did not increase during a family-based behavioral treatment for severe obesity, and improvements were seen in some parameters.

GC3.078

BMI-based obesity classification misses children and adolescents with elevated cardiometabolic risk due to increased adiposity

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Introduction: The medical definition of obesity considers it as a state of increased adipose tissue, not body weight, of a magnitude that might have a negative impact on health. Body mass index (BMI) shows a high specificity but low sensitivity to detect excess body fat percentage (BF%) at all ages. Our aim was to assess how the BMI inaccurately diagnoses obesity when compared to the determination of BF% as well as to compare the cardiometabolic risk in children and adolescents with or without obesity according to BMI but with a similar BF%.
Methods: A retrospective cross-sectional investigation was conducted including 553 (378 females/175 males) White children and adolescents aged 6-17 years, 197 with normal weight (NW), 144 with overweight (OW) and 212 with obesity (OB) according to BMI (classified by Cole's

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criteria). In addition to BMI, BF% measured by air displacement plethysmography, as well as markers of cardiometabolic risk were determined.
Results: We found that 7% of people considered as NW and 62% of children and adolescents classified as with OW according to BMI presented a BF% within the obesity range. Children and adolescents without obesity by the BMI criterion but with obesity by BF% exhibited blood pressure and serum C-reactive protein (CRP) concentrations in boys similarly increased to those of the group with obesity both by BMI and BF% as compared to the group with both BMI and BF% in the normality range ($P<0.05$). In girls, higher blood pressure, glucose, uric acid, CRP levels and white blood cell count together with reduced HDL-cholesterol similar to those found in obesity by BMI and BF% were observed ($P<0.05$ as compared to the group with both BMI and BF% in the normality range).
Conclusions: Given the raised cardiometabolic risk factors in children and adolescents without obesity according to BMI but with obesity based on BF%, the inclusion of body composition determination in everyday practice for the diagnosis and treatment of overweight and obesity yields clinically useful information.

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GC3.079

Examining the effectiveness of a new digital care model on weight loss for people living with obesity

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Introduction: Telemedicine and asynchronous virtual appointments for patients living with chronic medical conditions have been increasingly used to overcome distance barriers and improve access to medical care. The patient perspective is largely positive, with many patients appreciating the convenience and accessibility it offers. Through digital platforms, healthcare professionals can monitor patient data, adjust treatment plans, and provide personalized guidance, creating a dynamic and responsive approach to healthcare delivery.
The objective of this real-world retrospective study was to investigate the effectiveness of using a digital platform for weight loss and other related clinical outcomes (up to 6 months) with a group of Swedish patients who are overweight (BMI ≥ 27 kg/m^2 with ≥ 1 weight-related co-morbidity) or living with obesity (body mass index ≥ 30 kg/m^2).
Methods: In a total of 2608 patients (613 men and 1999 women), we investigated the effects of remote treatment (pharmacological treatment used in combination with lifestyle support) via a novel Swedish digital therapeutics platform (Yazen Health) for reducing body weight in adults. Patients received individualised treatment with various GLP-1 receptor agonists (mainly semaglutide and dulaglutide) and lifestyle advice via asynchronous text-based communication within a secure medical app. Weight and blood pressure data were obtained through self-reporting from patients according to specific instructions. To ensure the patients qualified for obesity treatments using medication with GLP-1 analogs, information including medical history, electronic ID, patient photo, and blood tests were gathered. In addition, the model includes authentication at the pharmacy, medication retrieval, and continuous contact between the patient and healthcare providers at Yazen.
Data for the study was retrospectively collected from the electronic health records. The percentage change from baseline body weight was assessed every month for six months, at which point follow-up laboratory testing was done.
Results: Mean base age for men was 47.7 ± 9.9 years and BMI 34.2 ± 4.9 and for females 46.6 ± 10.5 years and BMI 33.7 ± 5.1. Mean weight loss (percentage) after 1, 2, 3, 4, 5 and 6 months was 4.3; 6.6; 8.1; 10.1; 11.4 and 12.6%. Treatment and weight loss also led to significant improvement in weight-related and cardiometabolic measures such as blood pressure, glycated haemoglobin, fasting plasma glucose, liver enzymes, fasting lipid levels and testosterone (men).
Conclusions: Several barriers may contribute to obesity treatment failures including the requirement of long-term patient adherence to lifestyle recommendations or drug treatment.
In the current study the use of a telemedicine platform specifically developed for obesity care combined with pharmacological treatment with different GLP-1 analogues and lifestyle intervention resulted in 12.6 % weight loss after 6 months and improved metabolic profile. By embracing the capabilities of digital technology, healthcare providers can offer a level of care that is effective for managing patients living with obesity.

GC3.080

3-year setmelanotide weight outcomes in patients with Bardet-Biedl syndrome and obesity

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Background: Bardet-Biedl syndrome (BBS) is a rare genetic disease in which impaired melanocortin-4 receptor (MC4R) signaling leads to hyperphagia and obesity. In an index Phase 3 trial, broad clinical benefit was observed in patients with BBS based on improvement or stabilization in ≥1 measure of weight, hunger, or quality of life with 1 year of treatment with the MC4R agonist setmelanotide. Reported here are long-term extension (LTE) weight outcomes after 3 years of setmelanotide.
Methods: Patients with BBS who achieved clinical benefit and tolerability in a prior trial of setmelanotide could enroll in the LTE (NCT03651765) and continue treatment for ≥5 years or transition to commercial product or other clinical trials. This analysis reports age-appropriate weight-related outcomes and adverse events for 3 years of setmelanotide treatment in patients who achieved clinically meaningful response at 1 year of index trial, defined as ≥10% weight reduction (age ≥18 years at baseline) or reduction of ≥5 percentage points in the percent of the BMI 95th percentile (%BMI95; age <18 years at baseline).
Results: Of 32 patients who entered the LTE with clinically meaningful age-appropriate weight responses, 21 patients with 3-year measurements were included in the analysis. Eleven patients were excluded as 1 pediatric patient transitioned to adulthood before this analysis, 5 had <3 years of treatment, 2 transitioned to commercial therapy, and 3 discontinued treatment. Mean (SD) index trial baseline for body weight was 129.8 (21.3) kg in patients aged ≥18 years (n=10) and 148.7 (36.1) percentage points for %BMI95 in patients aged <18 years (n=22); change at Year 3 was −22.0 (18.1) kg (n=8) and −19.4 (19.4) percentage points (n=13), respectively. No new safety signals were observed in the LTE.
Conclusions: Sustained meaningful benefit in weight-related measures at 3 years of treatment with no new safety signals supports continuous treatment with setmelanotide in patients with BBS.

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GC3.081

Early-Onset of Obesity-Model: Impact of early weight reduction on life expectancy and on risks of comorbidities in a patient with severe, early-onset obesity

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Introduction: There is limited research on the impact of early-onset obesity on mortality and co-morbidities. We developed a comprehensive model to qualify and quantify this impact with a specific focus on cardiovascular health and related diseases. Here, we use this model to evaluate the impact of early weight loss in a theoretical patient who has developed severe obesity by age 4.

Methods: The Early-Onset of Obesity-Model is the first model to estimate the impact of early onset obesity on life expectancy, disability-adjusted life years (DALYs) and comorbidities. It adopts a multidisciplinary approach, synthesizing data from published clinical studies and demographic information to estimate the effect of various weight trajectories, including weight gain or weight loss at different ages.

To illustrate the impact of early intervention in pediatric obesity, we provide an example of a patient with severe early-onset obesity with rapid weight gain in infancy, reaching a BMI Z-score of 2.5 by age 2 and BMI Z-score of 4 by age 4. Various levels of weight reduction are then applied at different ages.

Results: Without therapeutic intervention, the model predicts the patient to have a life expectancy of 37 years. The likelihood of type 2 diabetes mellitus (T2DM) by the age of 25 and 35 is 35.4% and 54.9%, respectively, and the likelihood of a cardiovascular event 22.1% and 39.2%, respectively.

- A weight loss of 1 point in BMI Z-score at age 6 increases life expectancy by 5 years and DALYs by 4.8.
  - The likelihood of T2DM or a cardiovascular event by age 35 is now 38.6% and 33.6%, respectively.
- A weight loss of 1.5 points in BMI Z-score at age 6 increases life expectancy by 13 years and DALYs by 12.1
  - The likelihood of T2DM or a cardiovascular event by age 35 is now 36.3% and 28.6%, respectively.
- A weight loss of 2 points in BMI Z-score at age 6 increases life expectancy by 27 years and DALYs by 24.6
  - The likelihood of T2DM or a cardiovascular event by age 35 is now 28.9% and 26%, respectively.

  If weight loss is delayed, benefits of intervention are reduced. A weight loss of 1.5 points in BMI Z-score at ages 12, 18 or 30 increases life expectancy by 12, 10 and 5 years, respectively, compared to an increase of 13 years for the same weight reduction at age 6. In parallel with survival benefits, there are also smaller reductions in the risk of comorbidities.

Conclusion: These results illustrate the benefits of early weight reduction among patients with severe, early-onset obesity, but also that these benefits are slightly reduced with delayed intervention. Furthermore, they show a significant impact on life expectancy of reducing BMI Z-score, even if patients remain with obesity. However, the non-linearity of benefits shows the value of achieving a body weight that is close to, or within, normal range

This illustrative use of the model shows the benefit of early weight reduction in pediatric obesity to reduce the negative impact on long-term outcomes including life expectancy and development of comorbidities.

GC3.082

Early-Onset of Obesity-Model: Impact of early-onset obesity on life expectancy and on risks of comorbidities

Wiedemann, U. C.[1]; *Van Den Akker, E.*[2]; *Barber, T. M.*[3]; *Clément, K.*[4]; *Farooqi, S.*[5]; *Goldstone, A. P.*[6]; *Marcus, C.*[7]; *Moreno Aznar, L. A.*[8]; *Poitou, C.*[4]; *Schorfheide, J.*[1]; *Touchot, N.*[9]; *Wabitsch, M.*[10]; *Kühnen, P.*[11]

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Introduction: There is a substantial impact of early-onset obesity on co-morbidities and mortality. We developed a comprehensive model to qualify and quantify this impact specifically on cardiovascular (CV) health and related diseases. The Early-Onset of Obesity-Model adopts data from published clinical studies and demographic information to estimate the effect of weight trajectories including weight gain/loss at different ages on comorbidity development, disease burden (disability-adjusted life years, DALYs) and mortality.

Methods: Four key variables were included: obesity severity based on BMI/BMI Z-scores; age of obesity onset; obesity duration; irreversible risk accumulation. A comprehensive literature search identified 226 studies on obesity and obesity-related comorbidities. Upon detailed assessment, 59 were used as inputs in the model. Linear interpolation was used to close gaps between available data.

To estimate life expectancy, prevalence of comorbidities is combined with mortality risk to yield an all-comorbidity mortality risk that was further modified with obesity duration factors. To estimate the comorbidity risk, prevalence figures are directly modified with obesity duration. The actual model includes three main bodies: the database including hazard ratios extracted from study results, the engine which selects case-specific information based on provided weight trajectories, calculating comorbidity risk and life expectancy, and an interface used to create a specific weight trajectory to display model outcomes.

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Validation was performed by comparing the impact on life expectancy from the model versus published data of i) T2DM and CV disease, and ii) of strategies reducing these comorbidities. Specific patient trajectories and impact on comorbidities and life expectancy were validated with clinical experts.
Results: The model shows that earlier onset and more severe obesity increase the likelihood of developing comorbidities. For example, an individual with a BMI Z-score of 3.5 by age 4 without subsequent weight reduction has a 27% and 44.7% likelihood of developing T2DM by ages 25 and 35. A higher BMI Z-score at an early age leads to a lower life expectancy: a BMI Z-score of 2 by age 4 decreases the average life expectancy from 80 to 65 years (23.5 DALYs). This expectancy is further reduced to 50 years for a BMI Z-score of 2.5 and 39 years for a BMI Z-score of 3.5 by age 4. By comparison, a BMI Z-score of 3.5 by age 12 without subsequent weight reduction yields an average life expectancy of 42 years (46 DALYs).
Conclusion: This is the first model estimating the impact of early-onset obesity on life expectancy, DALYs and comorbidities. It confirms both magnitude and duration of obesity are critical determinants of outcomes. The age at obesity manifestation, especially at younger ages, has a profound negative effect on life expectancy. This model not only reinforces the importance to consider early-onset obesity as a life-threatening disease but also emphasizes the need and benefits for early diagnosis and appropriate management strategies, without waiting for the development of comorbidities, to limit long-term negative outcomes.

GC3.083

10 years results of Laparoscopic Sleeve Gastrectomy (LSG) in young patients (<25 years old) with severe obesity: a single institution experience

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Introduction: Obesity in adolescents and young is rising at an alarming rate. The aim of our study was to present and discuss our experience with laparoscopic sleeve gastrectomy (LSG) in young patients treated at our Institution.
Methods: 110 patients (93 F, 17 M) mean age 20.7+/- 1.9 years underwent LSG at our Institution from January 2012 to January 2022.
Anthrpometric data as initial Body weight, Body Mass Index (BMI), %Excess Weight Loss (%EWL) after surgery and hospital stay, Hb levels after surgery, complications rate were retrospectively collected.
Results: Initial mean BMI was 47.3 +/- 5.6 kg/m^2 and % EWL was 83, 84, 86, 73 % at 1, 3, 5, 10 years follow up respectively.
Mean hospital stay was 3 days and mean hb levels on 1st and 3rd postoperative day were 13.3+/- 1.4 mg/dl and 13.5 +/- 1.4 mg/dl, respectively.
After a median time of 7.5 years after surgery, 7 patients required reoperation for failure and gastroesophageal reflux. Four cases were converted to One Anastomosis Gastric BY Pass (OAGB) due to weight regain, 3 cases to Roux En Y Gastric By Pass (RYGB) due to weight regain associated with gastroesophageal reflux.
Conclusions: In our experience, LSG is safe and effective to achieve durable weight loss in young patients (<25 yo) with severe obesity. Larger series and longer follow-up are needed to confirm these results.

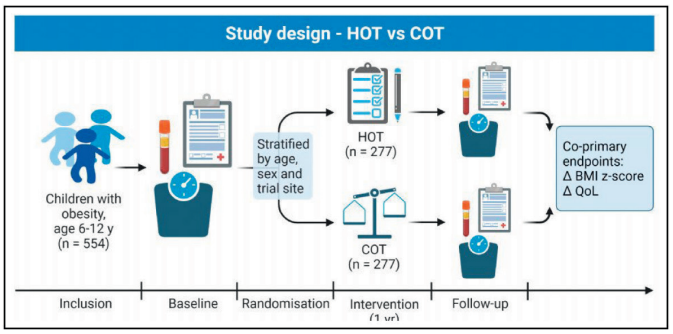
GC3.084

Holbæk Obesity Treatment (HOT) versus Conventional Obesity Treatment (COT) in children with obesity - An investigator-initiated, multi-centre RCT with blinded outcome assessment

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Introduction: In spite of increasing number of children with obesity(1), evidence of effective non-pharmacological treatment is lacking. As childhood obesity and related complications is often carried into adulthood(2,3) it is imperative to identify strategies that are effective towards treatment of obesity in early life.
Materials-Methods: The objective of this randomized, parallel group, clinical superiority trial is to investigate the beneficial and harmful effects of two childhood obesity treatment approaches: The Holbæk Obesity Treatment (HOT) versus Conventional Obesity Treatment (COT).
Based on power calculations, 554 6-12 year-old children with obesity will be included in the study to detect differences in the two co-primary outcomes; body mass index (BMI) z-score and quality of life. Exploratory outcomes are symptoms of anxiety and depression, school absence, body composition, waist circumference, blood pressure, cardiometabolic blood markers, serious adverse events, and incidence of eating disorders.
Healthcare nurses and dietitians in three Danish municipalities will conduct the treatment as face-to-face sessions, totalling six to 12 hours over 12 months. Both interventions aims to reduce the degree of obesity and increase quality of life through lifestyle changes.



Study design of the HOT vs COT study. Δ, change; BMI, body mass index.

Fig. 1. Study design.

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The HOT method is based on the physiological insight into the endocrine regulation of fat mass; especially on how the body adapts when it is challenged by weight loss. All known obesity-related aspects of the participant's life are identified and translated into a treatment plan with 10-25 plan points that should be implemented in the daily life of the participant and family from treatment start.

In COT, obesity is thought to reflect energy imbalances and the treatment plan should be designed to induce a slightly negative energy balance by focusing on diet, physical activity, and inactivity through behaviour change. The healthcare professional and participant will focus on one or a few selected lifestyle changes at a time, where the motivation of the participant is pivotal in this process.

It is ethically justified to randomize participants into the two intervention groups since they are in equipoise, and neither are associated with known risks of harm.

Registration details: The Ethics Committee of Region Zealand approval: SJ-868. The Danish Data Protection Agency approval: REG-102-2021. ClinicalTrials.gov Identifier: NCT05038683

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GC3.085

Hepatic and lipidic assessment in children with overweight and obesity

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Unıversity of Medicine and Pharmacy Grigore T Popa IASI

Introduction: Obesity is a chronic pathology that predisposes to complications such as dyslipidemia, decreased glucose tolerance, type 2 diabetes, hypertension, hepatic steatosis, obstructive sleep apnea, early puberty, cognitive disorders, arthritis. The aim of the study was to highlight the impact of obesity on liver function and lipid metabolism in the pediatric population

Methods: We performed a retrospective observational study, on a number of 221 children aged between 2 and 17 years, hospitalized in a nutrition and endocrinology clinic during a period of 14 months. Patients were evaluated regarding anthropometric parameters, clinical, biological (liver function, glycemic and lipid profile, thyroid function), imaging.

Results: Of the study group, 19% of patients are overweight, and 81% are obese. In the study group, 19% of patients had hypercholesterolemia, and 21% had hypertriglyceridemia. Both hypercholesterolemia (52 %) and hypertriglyceridemia (63 %) prevailed in 7-13-year-old schoolchildren. Hepatocytolysis was found in 25% of the patients, and most were 7-13-year-old schoolchildren. The proportion of obese patients with hepatocytolysis was 3-4 times higher in male patients compared to female patients. 38% of the patients investigated by abdominal ultrasound showed hepatomegaly. 48% of patients showed steatotic-type liver reflectance increases; the increase was moderate in 53% of cases, and mild in 47% of cases. Of the patients with increases in liver reflectivity, 60% are male, and 71% are 7-13-year-old schoolchildren. Hypothyroidism was present in 9% of the children in the investigated group. Of these, 47% are schoolchildren aged 14-17. 6% of the patients included in the study received therapy with Metformin, and 4% with Liraglutide

Conclusions: Liver damage and dyslipidemia is common in children with obesity. The increased rate of this modifications in the age group 6-13 years underlies the increased risk of developing comorbidities from younger ages in obese patients.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC3.086

Fast Track to Health. Change in psychosocial outcomes during a randomised controlled trial of intermittent energy restriction in adolescents with obesity

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Introduction: Adolescent obesity requires effective and accessible treatment. Intensive dietary interventions have potential to be used as adjunctive therapy to behavioural weight management. While behavioural weight management tends to improve psychosocial health for most adolescents, the effects of prescriptive dietary interventions is poorly understood.

Methods: Fast Track to Health (ACTRN12617001630303), an Australian multi-site 52-week RCT, recruited adolescents (13-17years) with obesity and ≥1 associated complication, was conducted 2018–2023. The intensive behavioural intervention, delivered by a multidisciplinary team, compared a very low energy diet followed by intermittent (IER) or continuous energy restriction (CER). Anthropometry, eating behaviours (Dutch Eating Behaviour Questionnaire [DEBQ]), mental health (Depression Anxiety and Stress Scale [DASS]) self-esteem (Rosenberg Self-Esteem Scale [RSE]) and internalised weight bias (Weight Bias Internalization Scale [WBIS]) were assessed at baseline, weeks-4, -16, and -52. BMI-for-sex/age z score (BMIz) and BMI expressed as a percentage of the 95th percentile (BMI%95) were calculated. Analysis was intention to treat and linear mixed models were used to investigate changes over time between intervention groups.

Results: 141 adolescents (70 female) were enrolled and 97 (48 female) completed the intervention. There were no significant differences for anthropometry between groups ($p>0.05$). At 52 weeks both groups reduced BMIz ($F=70.850$, $p<0.001$, change in estimated marginal mean [95%CI]; IER -0.28 [-0.37, -0.20]; CER -0.28 [-0.36, -0.20]) and BMI%95 ($F=86.544$, $p<0.001$, IER -9.56 [-12.36, -6.83]; CER -9.23 [-11.82, -6.64]). There were no significant group by time interactions for dietary restraint (DEBQ: $F=1.18$, $p=0.317$), emotional eating (DEBQ: $F=2.579$, $p=0.54$), self-esteem (RSE: $F=1.445$, $p=0.229$), anxiety (DASS: $F=1.869$, $p=0.136$), stress (DASS: $F=0.308$, $p=0.082$), or weight bias internalisation (WBIS: $F=10.143$, $p<0.001$). External eating (DEBQ: $F=5.681$, $p<0.001$) and depression (DASS: $F=2.945$, $p=0.034$) were significantly different between groups over time. However, there were no differences between groups in change in external eating from baseline to week-52 ($p=0.591$) or change in depression scores between baseline to week-52 ($p=0.516$).

After 52 weeks, both groups had significant reductions in anxiety (DASS: $F=12.027$, $p<0.001$) and stress (DASS: $F=19.518$, $p<0.001$), weight bias internalisation (WBIS: $F=10.143$, $p<0.001$) and significant increases in self-esteem (RSE: $F=11.014$, $p<0.001$).

Conclusion: IER and CER, delivered as part of an intensive behavioural weight management program, were equally effective for improving obesity and psychosocial health for adolescents with obesity associated complications.

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GC3.088

A longitudinal study of psychological distress and changes in body mass index in adolescents with overweight/obesity in Singapore

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Introduction: Childhood obesity is rising globally, including in Singapore, with many physical and psychosocial consequences. The association between psychological distress and response to obesity treatment amongst adolescents in Singapore has yet to be examined. The primary aim of the study is to investigate the change in body mass index (BMI) over 3-15 months amongst adolescents with overweight/obesity seeking obesity treatment at KK Women's and Children's Hospital (KKH) presenting with or without psychological distress. The secondary aim is to determine predictors of change in BMI over 3 to 15 months in this population.
Methods: Adolescents aged 11-17 were recruited from KKH Weight Management Clinic (June 2022 - November 2023). Upon recruitment, participants completed the Young Person's Clinical Outcomes in Routine Evaluation (YP-CORE) to assess psychological distress. Significant psychological distress was indicated by scores above age- and gender-based cut-offs. Demographic and anthropometric data were collected at recruitment and 3-15 months later. BMI was analysed as a percentage of the 95th percentile BMI (%95th BMI), calculated using age- and gender-specific Centers for Disease Control and Prevention (CDC) growth charts. Change in BMI was expressed as average change in %95th BMI per month, calculated by taking the latest %95th BMI divided by number of months from recruitment. Data was analysed using SPSS version 29.0. Univariate and multivariable linear regression were used to determine predictors of change in BMI.
Results: 90 participants were analysed. 40%(n=58) of males and 63%(n=32) of females had psychological distress. A significantly greater proportion of adolescents with psychological distress experienced bullying and have parents with obesity. There was no significant difference in change in BMI between adolescents presenting with or without psychological distress. After excluding participants previously diagnosed with a psychiatric disorder and sought psychiatric help (n=7), there was significant difference in change in BMI between those without or with psychological distress (-0.517 vs -0.118, p=0.032). Further subgroup analysis by gender showed a significant difference in change in BMI between those without or with psychological distress for females (-0.342 vs 0.404, p=0.030) but not for males (-0.578 vs -0.436, p=0.497). Univariate linear regression showed gender, pre-existing physical health conditions and dyslipidaemia were significantly associated with change in BMI. Multivariable linear regression showed that psychological distress (β=0.344, 95% confidence interval (CI):(0.019,0.668), p=0.038), pre-existing health conditions (β= -0.466, 95%CI:(-0.888,-0.043), p=0.031) and dyslipidaemia (β= 0.449, 95%CI:(-0.821,-0.076), p=0.018) remained significant determinants of change in BMI.
Conclusion: Psychological distress, pre-existing health conditions and dyslipidaemia are significantly associated with change in BMI for adolescents with overweight/obesity. These results highlight the potential role of systematic screening for psychological distress and early psychological interventions as part of obesity intervention.

GC3.089

Characteristics of additional clinical support provided for adolescents with obesity participating in a dietary intervention: Fast Track to Health

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Introduction: Treatment-seeking adolescents with obesity may have dietetic, psychosocial or medical needs that require further support. This secondary analysis reports on characteristics of additional reviews provided to participants in the Fast Track trial.
Methods: Fast Track to Health was a 52-week multi-site RCT conducted between 2018 and 2023 in Australia, comparing intermittent energy restricted and continuous energy restricted diet following a very low energy diet in adolescents with obesity and ≥ 1 obesity related comorbidity. The intensive behavioural weight management intervention was delivered by a multidisciplinary team. Alongside routine medical and dietetic consults, symptoms of depression and eating disorder risk were assessed via questionnaires and monitored during regular dietetic consults. Additional reviews were provided by the study dietitian, paediatrician or clinical psychologist if needed or if requested by participants. De-identified clinical notes for each review visit were independently coded by two reviewers to identify the content of each review.
Results: Of 141 adolescents enrolled in the study, 51 (36.2%) attended at least one additional review with the study dietitian, paediatrician, and/or psychologist. The number of additional reviews per adolescent ranged from 1 to 13, with most (n=31) having one only. Adolescents often accessed additional reviews for mental health, dietetic, and/or medical reasons. Thirty-one adolescents had additional reviews for mental health or psychosocial reasons (e.g., anxiety, depression, disordered eating, body image concerns, ADHD, and/or self-esteem). Twenty-seven adolescents had additional reviews for dietetic reasons (e.g., modifying meal plans, managing hunger and fullness cues) and five adolescents required additional reviews for medical reasons (e.g., menstrual problems). Data on the duration of each additional review was available for roughly half (45%) the sessions, with each additional support session averaging 47 minutes (SD = 25) in duration.
Conclusion: Some Fast Track participants accessed further support, particularly for psychosocial reasons. Understanding additional needs of adolescents with obesity in weight management settings is important in ensuring appropriate care, allocation of resources and provision of referrals.

GC3.090

A UK-Based Specialist Children Weight Management Approach: Initial Outcomes from the Family Therapy Pathway

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MoreLife UK

Introduction: Today, nearly a third of children aged 2 to 15 are living with overweight or obesity1, which has an impact on both physical and mental health2.
MoreLife delivers tailored, evidence-based and psychologically-informed specialist child weight management services (SCWMS) in the UK. Children living with obesity need support in gaining self-esteem and self-acceptance3 and the higher risk of depression in children living with obesity or those who are overweight can be partially accounted for by their weight concerns, their perceived isolation from their peers and shame. Despite this, the majority of commissioned Specialist Child Management Services are highly medicalised, neglecting psychological support.

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Methods: MoreLife provides 6-9 sessions of 1-2-1 family therapy for families with complex medical, social and psychological needs to help them with healthy lifestyle changes to facilitate weight loss/maintenance. Weight, physical activity, diet and other lifestyle factors are monitored during the intervention, which lasts a year.
Results: Three families with children living with obesity and complex needs are presented in this evaluation. All three cases improved their physical activity levels.
Case A, female, 10 years old. Has blood conditions. Total weight loss at the end of the programme is 6.8 kg, 10.54% of total body weight. Case A also improved her relationship with food and reduced emotional eating. Her family also mentioned Case A is now involved with cooking and meal planning.
Case B, male, age 15, has Autism Spectrum Disorder (ASD), learning difficulties, epilepsy and sensory issues. Case B lost 9 kg, 6.87% of his total body weight at the end of the programme.
Case C, female, 11 years old., struggles with joint hypermobility. Case C lost 10 kg. 12.7 of her body weight. Her family shared some healthy lifestyle changes, such as smaller portions, improved sleep, more family time, meal planning and batch cooking, and family exercise. All those changes reflect on children's health and eating behaviours.
Conclusion: This evaluation indicates that family therapy is a clinically- and cost-effective way of supporting families of children with complex obesity. Feedback from families shows that families with complex needs benefit from therapy support and achieve behavioural changes whilst improving their parental skills, wellbeing and communication with their children. Future research is needed to assess the long-term impacts of family therapy and weight loss.

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GC3.091

Time Limited Psychology Provision in a Tier 3 Multidisciplinary Service for Children living with Severe Obesity and Associated Health Complications

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Complications from Excess Weight Service, NUH NHS Nottingham UK

Introduction: The Complications of Excessive Weight (CEW) service is a National Health Service England (NHSE) funded pilot for under 18s with severe obesity and related complications. Over a 10-month period the Nottingham CEW service worked with approximately 95 young people in relation to their severe obesity. This abstract covers the role of 1-1 psychology provision (0.3 full time equivalent) in this service. Included, is the number and nature of referrals, challenges in managing demand and capacity, and the need to manage time and solutions creatively to optimise the application of psychology within the service.
Methods: Over a 10-month (January-October 2023) period referral requests for 1-1 psychology were recorded along with the referring issues. Capacity for 1-1 psychology was limited to 8-10 patients at any one time, depending on clinical need and frequency of contact (typically fortnightly). The Psychologist worked closely with the MDT to screen referrals and consider if other potentially helpful courses of actions could be taken.
Results: Twenty-five requests (13 male, 11 female, 1 non-binary) for 1-1 psychology input were made. Almost all requests were for children aged 13-18 with an average BMI of 42.62 (SDS 3.81). Ethnicity of the 25 young people was 16 Caucasian, 2 black British Caribbean,1 British Indian, 1 British Pakistani, 1 mixed British and Asian, 2 'other ethnic group' and 2 declined to specify. Six of the 25 children had been diagnosed with autism. Sixteen of the 25 young people were offered full psychological assessment and of those assessed, 10 received ongoing therapy.
The main referring issues were as follows, with some referrals citing multiple issues. Challenges with engagement with weight management professionals (n=8); Mental health concerns such as anxiety and depression (n=10); Behavioural issues (n=3) acting as a barrier to lifestyle change (n=10); Disordered eating concerns (n=7); Confidence and self-esteem issues linked with the experience of living with severe obesity (n=2).
Of the 25 requests for 1-1 psychology input, alternative courses of action were found in 9 cases, including joint home visits with referring clinician (n=2); Consultation and redirection to other aspects of support available within the MDT (n=2); Joint sessions with the Dietician to explore disordered eating (n=2); Supporting colleagues to refer to mental health services (n=2); Liaising with existing mental health professionals (n=1).
Conclusion: Where demand exceeds capacity, the psychologist has worked closely with referring MDT colleagues. For this reason, it is essential that psychology is embedded within such a service, rather than peripheral and less physically present, as can be common practice. Working closely with colleagues also allows for organic opportunity to promote psychological ways of understanding the challenges that this cohort of patients face. The next steps for psychology in this service should be in enhancing indirect ways of working, such as psychological consultation, psychological supervision, and psychologically informed training.

GC3.092

Obesity management of Polycystic ovary syndrome

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Polycystic ovary syndrome is becoming very common among girls from ages 14 to 21 years old alongside women in their childbearing period. A combination of menstrual irregularities, overweight or obesity, insulin resistance (type2 diabetes) and symptoms of virilization are characteristics of these cases.
A multidisciplinary team should be involved in managing these cases and may consist of a Gynecologist, endocrinologist, nutritionist and a psychologist.
The role of nutritionists is crucial in these cases in weight reduction and nutritional management.
It is mandatory to present some questions that may help in expanding further our understanding of the nutritional management of this syndrome, such as;

1) it is not an easy process to reduce weight of PCO patients
2) Need yo know the most suitable nutritional plan for these case
3) it is not successful to use one diet plan for all patients or a specific plan tailored for each patient

Based on these questions, we will summarize the medical nutritional therapy and weight management in PCO patients and highlight the best eating plan and dietary composition in the treatment of these women. We will also discuss the role of dieticians in treating PCOs and overcoming the Challenges these women face.
Dr. Mohamed Radwan is a physician with a bachelor degree in Medicine from The Faculty of Medicine, Cairo University. He presented his Assay on "The health hazards among Children due to the use of food additives" for the fulfillment of The Master Degree in Pediatrics. Dr. Radwan specialized in Weight management and, acquired The MS Degree in Nutritional Sciences. With his 7 year experience as the head of the nutritional and obesity unit in The 6th of October University Hospital, he was able to meet many cases from the university's students who suffer from PCOs and Overweight, therefore, enabling him -with the assistance of the Gynecology department- to study more and focus on this common syndrome.
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GC3.093

Innovations in Pediatric Obesity Care: Examining the Impact of Low-Threshold stepped care and the Energy Density Concept in STARKIDS - A large cluster-randomized controlled study

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Introduction: Against the backdrop of high prevalences of overweight and obesity, as well as insufficient guideline-compliant care structures in the child and adolescent sector, low-threshold pediatric programs in combination with e-health approaches represent an opportunity to partially close this care gap. The multidisciplinary project "Stepped Care for the Treatment of Children/Adolescents with Obesity" (STARKIDS) is examining the effectiveness of a low-threshold outpatient program for children and adolescents with overweight/obesity and their parents (Ziser et al., 2022, Trials, DOI: 10.1186/s13063-022-06525-0).

Methods: The intervention is evaluated within the framework of a cluster-randomized study design with a control group and 611 children/adolescents and their families. The primary outcomes are the body mass index z-score and quality of life. Within the first 12 months (step 1), families receive five training sessions in their pediatric practice with parallel access to an e-health portal. Key topics include nutrition, physical activity, media consumption, stress management, and family dynamics. In case of insufficient success, step 2 is initiated, which involves the local health authorities. The focus in step 2 lies on barriers and solutions as well as local resources for further support.

Results: In the nutrition module, for the first time, the application and effectiveness of the energy density principle in children and adolescents are evaluated as part of a large health care study. Reducing the energy density of food allows individuals to eat a satisfying amount while simultaneously reducing energy intake. This is demonstrated by a variety of randomized controlled cross-over studies in both the child and adolescent sector and the adult sector, using different study designs (Klos et al., 2023, Eur J Nutr, DOI: 10.1007/s00394-022-03054-z). At the same time, strategies for reducing energy density are flexible and diverse, adaptable to different dietary patterns, food preferences, and cultural peculiarities (Mack, 2022, Adipositas, DOI: 10.1055/a-1912-0498). Two randomized controlled studies have shown that even elementary school children can understand and apply the energy density principle (Mack et al., 2020, JMIR, DOI: 10.2196/15725; Weiland et al., 2022, Life, DOI: 10.3390/life12060779). In STARKIDS, the e-health portal, through educational films, reflection tools, and serious games, intensively reinforces the knowledge learned in face-to-face training sessions about energy density and its application possibilities. STARKIDS recruitment was completed in June 2024. The recruiting centers were distributed equally across the federal state. The mean age of children was 10.7 (3.2) years, with 55% being boys and 45% being girls. The study is ongoing, and first preliminary data will be analyzed and presented.

Conclusion: STARKIDS is the world's first large pediatric obesity health care study with a focus on the energy density concept in the field of nutrition.

GC3.094

Acupuncture combined with a very low carbohydrate diet as multi-targeted therapy for the multifactorial disease obesity: a complex neuro-endocrine immune interplay

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Introduction: The prevalence of obesity has reached pandemic dimensions worldwide. This complex multifactorial disease is associated with multiple comorbidities and is becoming a clinical and public health threat. Obesity has a complex pathophysiology and interplay of various systems. A strong multi-directional interplay exists between the neuro-endocrine system, the immune system with systemic chronic low-grade inflammation, and microbiome dysbiosis that can lead to the development of obesity, which in turn can exacerbate each of these factors, hence creating a vicious cycle. The conventional treatment of obesity with lifestyle modifications such as diet, physical exercise, pharmacotherapy, and bariatric surgery could have side effects and does not always result in sufficient weight control thus paving the way for other strategies. As one such strategy, acupuncture is increasingly used worldwide to treat obesity and has been a subject of research over the last few decades and has emerged as a safe and effective complementary therapy. I will first present the evidence for the complex neuro-endocrine-immune interplay in the pathophysiology of obesity. Furthermore, I will explain the existing experimental and clinical evidence of acupuncture as a multi-targeted therapy for obesity. Moreover, I will show the results of our retrospective chart review.

Methods: The combined effect of a very low carbohydrate diet with weekly acupuncture sessions on weight reduction has been assessed and historical data were collected in existing medical records between 2002-2021 in seven acupuncture clinics in Switzerland.

Results: 11.233 patients with overweight or obesity were included. Maximum weight loss of patients with BMI of 35 kg/m^2 or above was 29.8 ± 12 kg, while it was 18.8 ± 8 kg for patients with BMI 30–34.9 kg/m^2 and 12 ± 7 kg for patients with BMI 25–29.9 kg/m^2.

Conclusion: The results suggest that the combination of acupuncture with a very low carbohydrate diet can induce weight reduction and could be considered as an effective and noninvasive treatment option for obesity. However, due to methodological limitations there is a strong urge for more careful analysis and further rigorous prospective comparative research and therefore such RCT will be performed and the design will be presented.

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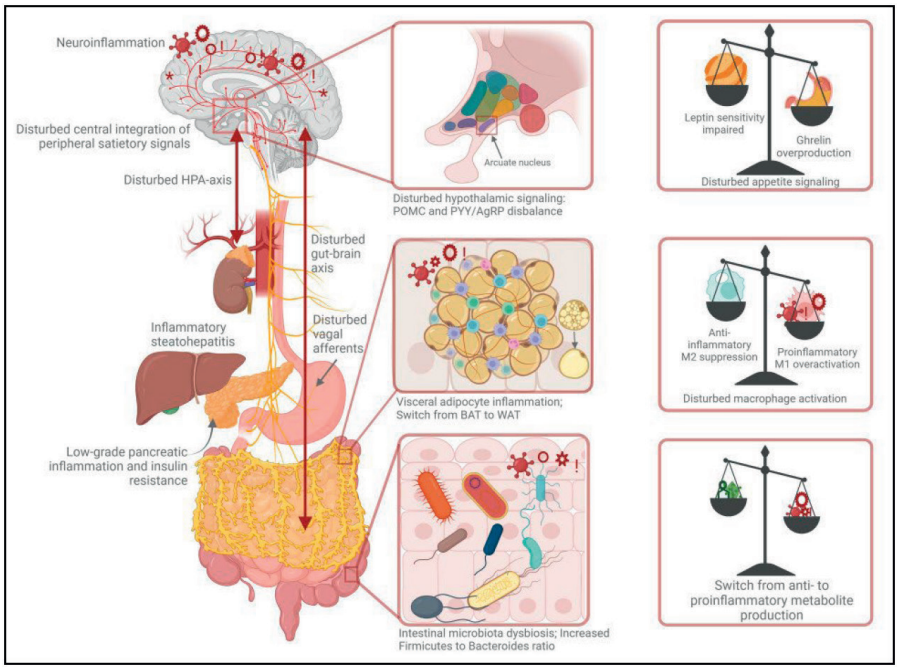


Fig. 1. Pathophysiology of obesity: A complex orchestra of neuroendocrine cross-talk, chronic low-grade inflammation and microbiota dysbiosis.

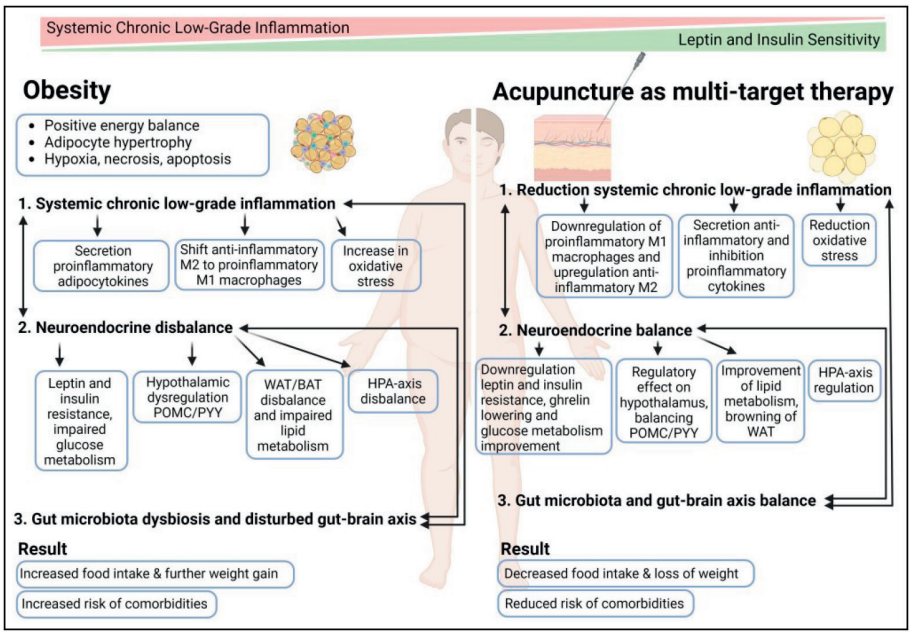


Fig. 2. Acupuncture as a multi target therapy: Mode of action of acupuncture as a multi-target treatment for obesity management.

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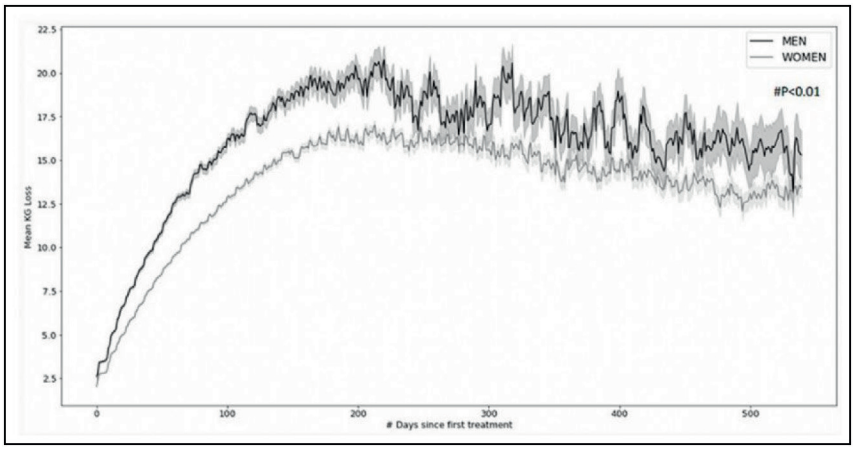


Fig. 3. Mean weight-loss curves with standard error of mean (in gray) observed over 540 days for male and female patients with overweight or obesity treated between 2002 and 2021, having attended at least 10 acupuncture visits ($p < 0.01$).

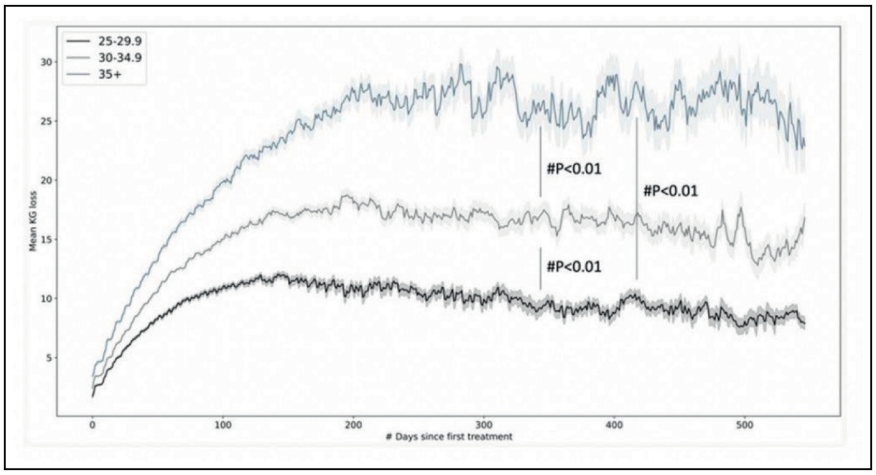


Fig. 4. Mean weight-loss curves with standard error of mean (in gray) over 540 days for three categories of patients (with body mass index (BMI) 25.0–29.9, 30–34.9 and >35, respectively), treated between 2017 and 2021, having attended at least 10 visits.

GC3.095

Probiotic supplementation and body weight

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Obesity and overweight are major public health problems. Which leads to increased mortality from non-communicable diseases including type 2 diabetes (T2DM), hypertension, cardiovascular diseases, atherosclerosis, and certain cancers (1). Today, the prevalence of obesity has tripled compared to 50 years ago, and its rate is increasing (2). The obesity crisis, in addition to the effects it has on the individual's health and economy, causes a great social and economic burden on health care resources (3). Although lifestyle changes that include improving nutrition, increasing physical activity and regular exercise are the most important factors in reducing obesity and maintaining normal weight, Studies have shown that taking nutritional supplements plays an important role in achieving fitness and health (4).

In the human digestive system, large and complex communities of microbes live, which are called gut microbiota (GM) (5). GM is effective in extracting energy from food, hormonal levels and appetite. GM produce short chain fatty acids (SCFA) by fermenting food components, these compounds play an important role in cholesterol metabolism, lipogenesis and appetite regulation (6). Studies have shown that there is a close relationship between GM and body composition such as fat percentage (7, 8). Studies have shown that by changing the composition of the GM through the intake of microorganisms in the form of probiotic supplements (living microorganisms with the ability to improve human health) and synbiotic, a combination of probiotics and prebiotics (indigestible fibers that help the growth of bacteria), body composition also changes (9, 10). Recently, a meta-analysis study was conducted with the aim of investigating the effect of probiotic and synbiotic supplementation on anthropometric characteristics and body composition. This meta-analysis including two hundred clinical trial studies (12603 participants) shows that supplementing with probiotics and synbiotics compared to the control group can lead to a significant reduction in body weight, body mass index, waist circumference, waist to hip ratio, body fat mass and body fat percentage. Interestingly, the subgroup analysis in this meta-analysis shows that synbiotic supplementation does not have a significant effect on reducing body fat percentage and body fat mass, and only probiotic supplementation can significantly reduce them (11). Since supplements with probiotics and synbiotic have significant effects on body composition, they can be used in weight loss processes.

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GC3.096

Water intake and adiposity development among pre-school children susceptible to obesity

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Objective: Childhood obesity remains a public health concern. Although there is a growing body of evidence for adequate hydration as a tool for weight management, evidence for associations between hydration, water intake and risk of adiposity is still scarce, especially among children. The purposes of this study were to examine if total water intake, total drinks/total water ratio, and plain water/total water ratio were associated with subsequent adiposity development.
Methods: Data derived from the Healthy Start intervention project, conducted among Danish pre-school children susceptible to develop overweight. The final study population consisted of n=351 children with complete information on exposure, primary outcome (BMI z-score), and relevant confounders. The average follow-up period was 1.3 years. Multiple linear regression analyses were performed while adjusting for relevant confounders.
Results: No associations were observed between total water intake, total drinks/total water intake, or plain water/total water intake and subsequent development of adiposity (all p-values ≥0.08) in the general sample of all children. However, we found evidence of sex interaction (all p-values ≤0.015), where total water intake and total drinks/total water intake was directly associated with BMI z-score changes in boys, but not in girls.
Conclusion: In our data, the observed null-results in the general sample of all children were explained by an interaction with sex. Future studies are encouraged to record information on all dietary water sources, and to target or include preschool children in the sample.

GC3.097

Maternal Dietary Inflammation and Placental Outcomes: Evidence of Sexual Dimorphism in Mothers with Overweight and Obesity

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Introduction: Emerging evidence suggests that maternal diet may influence placental development and efficiency, determined by placental weight (PW) and birth weight:placental weight (BW:PW), respectively. Additionally, the effects of maternal obesity on placental function and development may be sex-specific. Adverse outcomes such as higher PW and lower placental efficiency have also been reported among mothers with overweight and obesity, but there is limited investigation of maternal diet and placental outcomes in this cohort of women. Therefore, our objective was to examine associations between a range of maternal dietary scores in mothers with overweight or obesity with placental outcomes, and to investigate whether there was evidence of sexual dimorphism.
Methods: This secondary data analysis of the Pregnancy Exercise And nutrition Research Study (PEARS) RCT Cohort includes 357 mother-child pairs (46.8% male). A 3-day food diary given at the first antenatal visit (10-18 weeks) assessed habitual maternal diet. Dietary scores reflecting dietary quality (Healthy Eating Index); inflammatory and antioxidant potential (Dietary Inflammatory Index (DII) and Dietary Antioxidant Quality (DAQ)); and glycemic load and index were calculated. Pre-pregnancy BMI was calculated from self-reported heights and pre-pregnancy weights. Untrimmed PW and BW were collected from medical charts. Regarding potential confounders, maternal age, gestational age, and parity were also collected from medical charts; education level, smoking status and alcohol intake from the self-reported lifestyle questionnaire. These factors along with energy intake and intervention group were included in the final model. Study participants were pooled together as there were no differences in the outcomes of interest between intervention and control groups. Linear regression analyses assessed maternal dietary score associations with placental outcomes overall and stratified by sex, with adjustment for the potential confounders. Sensitivity analyses (n=244) excluding pre-eclampsia, GDM and pre-term cases (due to their association with placental dysfunction) were conducted.
Results: Mothers had a mean age of 32.40 ± 4.4 years and mean BMI of 29.14 ± 3.3kg/m^2. No associations were found between any of the dietary scores with placental and birth outcomes in fully adjusted models even when stratifying by sex. However, sensitivity analyses based on uncomplicated pregnancies revealed sex-specific associations whereby higher maternal DII scores (reflecting a more pro-inflammatory diet) were associated with greater PW (B: 29.75g, CI: 5.17, 54.32, p=0.02) and lower BW:PW ratio (B: -0.22, CI: -0.39, -0.04, p=0.01) in male offspring. No significant maternal diet associations with placental outcomes were observed in female offspring.
Conclusion: The results of this novel investigation in mothers with overweight or obesity suggest that the association between maternal inflammatory potential with placental outcomes in uncomplicated pregnancies may vary by offspring sex, thus adding to the literature that male offspring are more sensitive than females to the maternal inflammatory milieu.

GC3.098

The longitudinal associations of health behaviors with rapid increase in adiposity during early adolescence

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Background: Rapid gains in adiposity might have more adverse health implications in later life compared with having stable adiposity throughout childhood and adolescence. A gap of knowledge concerns concomitant health behaviors contributing to rapid adiposity gain among adolescents.
Objectives: We investigated associations of several health behaviors with an increase of body mass index z-score (BMIz) and waist–height ratio (WHtR) during adolescence.
Methods: We included 4785 adolescents (girls 53%) 11.1 (SD 0.8) years old at baseline and followed them for three years. We clustered them into decreased, stable and increased BMIz and WHtR categories using K-means clustering method. Using Cox regression, we computed hazard ratios (HR) with 95% confidence intervals (CI) for the associations of self-reported health behaviors (dietary habits, physical activity, sleep, and sedentary digital media use) with belonging to an increased BMIz or WHtR group.
Results: Later sleep midpoint and irregular meal pattern predicted increased BMIz (HR 1.26 [95% CI 1.13–1.41]; and 1.23 [1.08–1.39], respectively) and WHtR (1.23 [1.09–1.39]; and 1.18 [1.02–1.36]) over the follow-up period, after adjusting for other health behaviors.
Conclusions: Early bedtime with adequate sleep duration and regular meal pattern should be encouraged to prevent adiposity gain during early adolescence.

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GC3.099

Satiety responsiveness predicts weight development from childhood to adolescence

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Introduction: Satiety responsiveness (SR) is an appetitive trait referring to the ability to regulate eating in response to internal fullness cues. Children with low SR develop an avid appetite and are prone to overeat. Low SR is cross-sectionally linked with overweight in children, but only a few studies have investigated the association of SR with subsequent weight trajectories. We therefore studied if SR predicts weight development until the age of 16 years in Finnish children and if physical activity modifies the association.
Methods: This study included 4,555 children from the Finnish Health in Teens (Fin-HIT) cohort. At baseline, the parents answered a question on child's overeating – a proxy for low SR. Overeating was categorised as: overeating; possible overeating; no overeating. Height and weight measures from two data collections were merged with growth data from the national Register of Primary Health Care visits, and age- and sex-standardised BMIz were calculated (IOTF reference). The children reported their lifestyle factors with multiple choice questions. We tested the association of overeating with BMIz with linear mixed model (random slope and intercept). The model was adjusted for age, sex, sweet treat, plant and fast-food consumption, leisure-time physical activity, screen time and sleep duration. Further, we tested if the association of overeating with BMIz differs by age or amount of physical activity, by adding the respective interaction term.
Results: The mean age at baseline was 11.2 years (SD 0.8). In the total sample, the proportion of girls was 51% but in the overeating group 45%. The average BMIz for the whole age span differed between the three overeating groups (p<0.001). The overeating group had 1.18 (95% CI 1.09–1.26) units higher BMIz than those without overeating. The BMIz differences between the three groups flattened with increasing age: in the overeating group BMIz decreased 0.010 units per year of age (p=0.136), while among those without overeating BMIz increased 0.043 units per year (p<0.001). Physical activity modified the association of overeating with BMIz (p for interaction = 0.037). In the lowest physical activity third (≤5 h/week), the association of overeating with BMIz was 1.27 (95% CI 1.14–1.41) while in the highest third (≥9 h/week) 1.07 (95% CI 0.92–1.23).
Conclusion: SR predicts weight development from childhood to adolescence, but with age the differences in BMIz attenuated, implying that the biggest impact is seen in younger children. Physical activity modified the association, suggesting that a higher amount of physical activity mitigates the effect of low SR on BMIz.

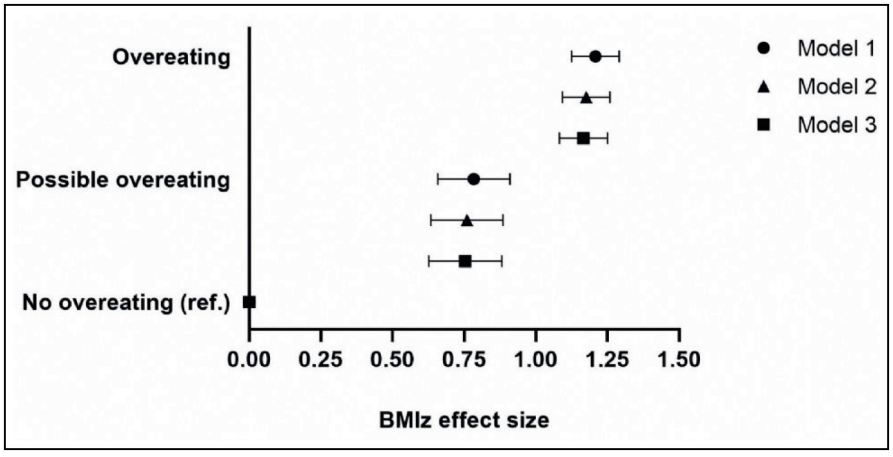
GC3.100

Assessing Childhood Obesity and Dietary Patterns in Romania: A Comprehensive Study Utilizing the KIDMED Test

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Introduction: Obesity was identified as a major problem and a poor dietary pattern is strongly associated with a higher prevalence of childhood obesity, which has been shown among Romanian children. The Mediterranean diet (MD) has been widely recognised as associated with significant health benefits including the prevention of chronic diseases.
Method: To assess the adherence of Romanian children and adolescents to the MD, we used an online questionnaire called the KIDMED Test, based on a 16-question test, which was to evaluate the compliance of the kid's daily nutrition status with MD. A total number of 6115 Romanian children and adolescents, aged 2-18 years with gender distribution, participated in the study. The questionnaire was implemented online (endocrinologiepediatrica.ro) and it was completed by the participants at home under parental supervision.
Results: Table 1 analyzed children's responses to the KIDMED test and identified areas where improvement in nutritional education is needed. A notable percentage of participants consume fruits and vegetables daily(~80%) although a limited percentage declares consumption of a second portion. Regular fish consumption falls below 20% indicating a potential area for nutritional enhancement. Additionally, pulses consumption is reported by 32.15% of participants. Nut consumption was 38.9% while a substantial proportion consumed cereal or cereal products for breakfast(47.83%) with a concerning percentage of participants



Adjustments: Model 1 age and sex; Model 2 additionally sweet treat, plant consumption and fast-food index, physical activity, screen time and sleep duration; Model 3 additionally parental education and emotional feeding.

Fig. 1. Differences in BMIz between the overeating categories; parameter estimates and 95% confidence intervals.

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Tab. 1. KIDMED index in children and adolescents by gender and age.

	2-6 years			7-13 years			14-18 years		
	Boys(%)	Girls(%)	Total(%)	Boys(%)	Girls(%)	Total(%)	Boys(%)	Girls(%)	Total(%)
Poor(<=3)	25.47	29.27	27.37	42.98	41.67	42.32	38.89	35.29	37.09
Average(4-7)	55.56	54.88	55.27	48.25	50	49.12	50	58.82	54.41
Good(>=8)	18.87	15.85	17.36	8.77	8.33	8.55	11.11	5.88	8.49

Table 2 reflects the adherence to MD among children and adolescents across different age groups and genders. Most of the participating children had an average KIDMED index with a noticeable decrease in adherence as age increased, with the 'Good' category showing a decline from the youngest to the oldest age group. In the first age group, we noticed that a substantial proportion demonstrated 'Good adherence' (17.36%), while in the second and third age groups, the percentage adhering to the 'Good' category decreased (8.55%/8%) There was no significant difference between genders but in general, boys tend to have higher percentages in the 'Good' adherence category compared to girls across all age groups (girls, in the 14-18 age group showed the lowest adherence to MD, only 5.88% falling into the good adherence).

Tab. 2. KIDMED TEST.

KIDMED questionnaire	YES/percent	NO/percent
Fruit or juice daily	4777-80.42%	1163-19.58%
Second serving of fruit daily	2680-45.12%	3260-54.88%
Fresh or cooked vegetables daily	4837-81.43%	1130-18.57%
Fresh or cooked vegetables>1/day	2717-45.74%	3223-54.26%
Regular fish consumption (at least 2-3/week)	1179-19.85%	4761-80.15%
> 1-week fast food restaurant	396-6.67%	5544-93.33%
Pulses>1/week	1910-32.15%	4030-67.85%
Pasta or rice almost daily(>=5/week)	997-16-78%	4943-83.22%
Regular nut consumption (at least 2-3/week)	2312-38.92%	3628-61.08%
Cereal or cereal product for breakfast	2841-47.83%	3099-52.17%
Use of olive oil at home	4745-79.88%	1195-20.12%
Skip breakfast	777-13.08%	5163-86.92%
Dairy products for breakfast	4906-82.59%	1034-17.41%
Two yogurts and/or 40 g cheese daily	2232-37.58%	3708-62.42%
Commercially baked goods or pastries for breakfast	629-10.59%	5311-89.41%
Sweets and candies several times a day	2344-39.46%	3596-60.54%

Table 1 analyzed children's responses to the KIDMED test and identified areas where improvement in nutritional education is needed. So, we noticed a notable percentage of participants who consume fruits and vegetables daily, but there is room for improvement in achieving a second serving of fruit daily and having vegetables more than once a day. Regular fish consumption falls below 20% indicating a potential area for nutritional enhancement. Additionally, pulses consumption is reported by 32.15% of participants, suggesting room for improvement in incorporating legumes into their diet. While a substantial proportion consumes cereal or cereal products for breakfast (47.83%), there is an opportunity to increase regular nut consumption, promoting a healthier snacking habit. A noteworthy concern is the percentage of participants skipping breakfast (13%). In the end, a considerable percentage includes commercially baked goods or pastries in their breakfast (10.59%) and a concerning number consume sweets several times a day (39.46%), signaling areas for potential lifestyle adjustments.

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skipping breakfast (13%). In the end, a considerable percentage includes commercially baked goods or pastries in their breakfast(10.59%) and a concerning number consume sweets several times a day (39.46%), signalling areas for potential lifestyle adjustments.
Table 2 reflects the adherence to MD among children and adolescents across different age groups and genders. Most of the participants had an average KIDMED index with a noticeable decrease in adherence as age increased. In the first age group, we noticed that a substantial proportion demonstrated 'Good adherence'(17.36%), while in the second and third age groups, the percentage adhering to the 'Good' category decreased(~8%)
Boys tend to have higher percentages in the ' Good' adherence category compared to girls across all age groups (girls, in the 14-18 age group showed the lowest adherence to MD, only 5.88% falling into the good adherence).
Conclusion: Our study sheds light on the pressing issue of childhood obesity in Romania, emphasizing the association with poor dietary habits. The KIDMED questionnaire analysis revealed both positive dietary behaviours and areas needing improvement. The findings from the KIDMED Test underscore the need for targeted nutrition education interventions, especially concerning the low adherence to MD among children. The identified areas for improvement, such as increased fruit and vegetable consumption and reduced intake of sweets, present actionable insights for healthcare professionals. As we observed a decline in healthy dietary habits during adolescence, particularly among female adolescents, intervention strategies promoting adherence to the MD should be targeted in early childhood.

GC3.101

Daily erythritol intake over five weeks led to a reduction in sugar intake in healthy adolescents

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Introduction: Based on the World Health Organization's (WHO) report, 18% of children and adolescents have overweight or obesity. They have a five times higher likelihood to carry their obesity into adulthood. The rise in obesity is related to an increase in sugar consumption and consequent rise in associated comorbidities such as type 2 diabetes mellitus. To counter this trend the WHO recommends reduction of sugar intake which can be reached through partial substitution with alternative sweeteners such as erythritol. This naturally occurring non-caloric bulk-sweetener triggers the release of gastrointestinal satiation hormones while not affecting plasma glucose and insulin concentrations. The objective of the study is the assessment of the effects of daily erythritol versus sucrose intake over a 5-week period on food intake and glucose tolerance.
Methods: In this randomized, double-blind parallel trial, 30 healthy, lean adolescents (15 per group: mean ± SD; age: 16.9 ± 1.5 years; BMI: 20.9 ± 1.8 kg/m^2) took either 18 g erythritol or 12.5 g sucrose dissolved in 150 mL tap water twice daily for 5 weeks, resulting in 36 g total daily erythritol (ERY) vs. 25 g total daily sucrose (SUC). Food intake was assessed through a food record, filled out by the participants the week before and during the last week of intervention. Before and after the intervention period blood samples were collected at fixed time points during an oral glucose tolerance test for measurement of plasma glucose and insulin concentrations and consequent calculation of HOMA (Homeostasis Model Assessment) index. Values are given as mean ± SD.
Results: All study participants completed the study. In the erythritol-group, total sugar intake (PRE-ERY: 90.3 ± 34.0 g vs. POST-ERY: 71.0 ± 36.0 g; p = 0.034) and total carbohydrate intake (PRE-ERY: 256.8 ± 54.8 g vs. POST-ERY: 211.1 ± 71.0 g; p = 0.038) were significantly reduced after the treatment period while total caloric intake (PRE-ERY: 2113.7 ± 495.4 kcal vs. POST-ERY: 1855.1 ± 495.7 kcal; p = 0.068) showed a trend of reduction. In the sucrose-group, total sugar intake (PRE-SUC: 75.4 ± 31.2 g vs. POST-SUC: 92.4 ± 24.7 g; p = 0.073) showed a trend of increase after the treatment period while total carbohydrate and total caloric intakes were not significantly different. In the erythritol-group Cmax for blood glucose and insulin and HOMA index were not significantly different after the treatment period. In the sucrose-group Cmax for blood glucose was not significantly different but Cmax for insulin (PRE-SUC: 91.67 ± 33.71 g vs. POST-SUC: 127.38 ± 68.24 g; p = 0.025) and HOMA index (PRE-SUC: 1.79 ± 0.74 g vs. POST-SUC: 2.51 ± 0.74 g; p = 0.0004) were significantly increased after the treatment period.
Conclusion: In lean, healthy adolescents, daily erythritol intake over five weeks led to a significant reduction in total sugar and carbohydrate intake while not affecting glucose tolerance. In contrast, sucrose intake resulted in a significant increase in maximum blood insulin concentrations and HOMA index. Based on the observed effects, erythritol emerges as promising sugar alternative in prevention and treatment of obesity.

GC3.102

Diet among European children and its association with weight-related outcomes

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Introduction: Dietary patterns have been changing in the past decades, with traditional whole food diets being replaced towards highly processed foods. Yet, little is known about their association with factors related to future obesity among European children. To our knowledge, no study to date has investigated data- and hypothesis-driven patterns across European countries, using a longitudinal design, and explored its association with a different weight-related outcomes. We therefore aimed to estimate data- and hypothesis-driven dietary patterns in childhood and explore their associations with childhood and adolescence weight-related outcomes in a Europe-wide population sample.
Methods: This study is based on the Human Early-Life Exposome (HELIX) subcohort which included children across six European countries (Spain, France, UK, Greece, Lithuania and Norway) from two examination visits at primary school-age (median age 8.3 years; n=1597) and at adolescence (median age 14.9 years; n=803). Using validated food frequency questionnaires at primary school age, we generated data-driven dietary patterns through exploratory factor analyses, and also assessed diet quality with the KIDMED dietary profile. We assessed weight-related outcomes (body mass index z-scores (zBMI), fat mass proportion and waist-to-height ratio) with standardized protocols both in childhood and adolescence. Associations between dietary patterns and weight-related outcomes were estimated using generalized linear regressions, adjusting cohort, sex, age, sedentary behavior, SES, maternal BMI and education.
Results: Five data-driven dietary patterns were derived: "Meat pattern", "Dairy pattern", "Western pattern", "Heathy pattern" and "Sweets and fats pattern". A low "Dairy pattern" adherence, compared to those with a high adherence was associated with lower child fat mass proportion (β(95%CI) -1.09(-2.08; -0.11)). High "Western pattern" adherence, vs. those with a low adherence, showed a lower zBMI in childhood and a lower waist-to-height ratio in adolescence. Children with an average or low adherence to the "Healthy pattern" had a higher fat mass proportion in childhood (1.35(0.41; 2.29) and 1.07(0.07; 2.07), respectively). Low adherence to the "Healthy pattern", vs. those with high adherence, was also associated with a higher child and adolescent waist-to-height ratio. No significant

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associations were seen between the adherence to KIDMED dietary profile and weight-outcomes.

Conclusion: Diet among European school-aged children are related to both current and future weight-related outcomes. Assessment of children's dietary patterns can help tailor dietary advice and provide support for families aiming to prevent future excess weight gain.

GC3.103

The increasing prevalence of breakfast skipping is associated with increased risk of obesity and cardiometabolic risk in children and adolescents

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Introduction: The potential detrimental health consequences of breakfast skipping in children and adolescents, encompassing decreased academic performance, obesity, and adverse mental health outcomes, have drawn increasing attention. However, previous research exploring the association between breakfast skipping and cardiometabolic risk and nutritional intake among this population has shown inconsistent findings. This study aims to delineate temporal trends in breakfast skipping prevalence and elucidate the association between breakfast skipping and obesity, cardiometabolic risk factors, and nutrient intake in children and adolescents.

Methods: This study included 7,491 children and adolescents (3,911 boys, 3,580 girls, aged 7-18 years) who participated in the Korea National Health and Nutrition Examination Survey 2013 ~2020. Dietary assessment was conducted by a trained nutritionist using a food frequency questionnaire and 24-h-recall from a nutritional survey. Participants were stratified into three groups by breakfast frequency (5-7 days/ week, 2-4 days/week, and 0-1 days/ week). Breakfast skipper was defined as eating breakfast less than times per week. Survey means and multivariate linear regression analysis was used to identify the association between breakfast frequency and obesity and cardiometabolic risk factors, and nutrient intakes.

Results: The breakfast skipping rate increased from 17.0% in 2013 to 28.7% in 2020. The breakfast-skipping group had a higher prevalence of obesity than the breakfast-eating group more than 5 times a week (13.9% vs. 9.8%). The breakfast skipper showed higher SBP (109.5±0.4 mmHg vs. 107.4±0.2 mmHg, p<0.001), DBP (68.3±0.3 mmHg vs. 65.3±0.2 mmHg, p<0.001), HOMA-IR (3.7±0.2 vs. 3.3±0.1, p<0.001), and LDL-C (100.8±2.4 mg/dL vs. 96.0±1.4 mg/dL, p<0.05) when compared to the group that ate breakfast more than 5 times a week.

Total daily calorie intake was lower in the breakfast skipper compared to those who ate breakfast 5 or more days per week (1918.9±35.7 vs. 2081.6±15.3, p<0.05). But, the percentage of fat (25.5±0.3 % vs. 24.1±0.1%, p<0.001) intake in the breakfast skipper was significantly higher. Sodium intake (g per 100 kcal calorie intake) was also higher in the breakfast skipper (156.8±2.4 vs. 147.9±1.1, p<0.05).

Conclusion: Skipping breakfast was found to be closely related to obesity, high blood pressure, insulin resistance, and lipid abnormalities in children and adolescents. Despite their relatively low-calorie intake, their eating habits of consuming salty and greasy foods seem to contribute, so intervention is needed for them.

Conflict of Interest: The authors declared no conflict of interest.

Funding: There are no funding sources.

GC3.104

The effect of omega-3 fatty acids on reducing adiposity in children and adolescents. A systematic review and meta-analysis of randomised clinical trials

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Introduction: The prevalence of childhood obesity continues to increase in middle- and high-income countries owing to various and complex causes. The potential health benefits of omega-3 fatty acid supplementation continue to be of interest with some indication of benefits to reduce levels of adiposity. This review systematically investigates the effectiveness of omega 3 fatty acid supplementation in reducing levels of adiposity in children and adolescents aged 2-18yrs.

Methods: Electronic databases Medline, Embase and CENTRAL were used to search for randomised clinical trials with no restriction on publication date. Risk of bias was conducted using Cochrane RoB 2. A meta-analysis was performed using Revman software with mean difference values between treatment and placebo groups used to develop forest plots for each measure of adiposity (weight, BMI, fat stores, waist circumference, hip circumference, waist: hip ratio).

Results: Ten trials met the inclusion criteria. Participants (n = 1142) had an age range of 7–18 years and an age-specific BMI range of 26.2 ±3.8 – 34.2 ± 4.4 kg/m^2. The omega-3 fatty acid supplement dose was between 600 and 3000 mg/day and was taken over a period ranging from 4 to 24 weeks. Level of compliance was reported in three studies and each study used a different method, including pill count and change in omega-3 plasma concentrations. Three studies received a low-risk bias overall score, four received a medium-risk and two studies received a high-risk score.

The pooled effect for the seven trials including weight change was -1.47 (P = 0.25) and demonstrated low heterogeneity (I2 = 23%). When sensitivity analysis was performed, removing the one trial with poor quality assessment, the pooled weight change was -2.33 (P = 0.46) and there was no heterogeneity. The BMI measure pooled effect was -0.22 (P = 0.08) with moderate heterogeneity (I2 = 46%).

Subgroup analysis was performed for the BMI based on the risk of bias assessment. The pooled effect of the two studies with low-risk quality assessment scores was -0.94, favouring the omega-3 treatment (P = 0.61), without heterogeneity (I2 = 0%). The pooled effect size for the waist circumference was -0.41 (p = 0.31), with low heterogeneity (I = 15%). The pooled effect for the two trials, including waist-to-hip ratio change, was 0.01 (P = 0.60). The pooled effect determining changes in fat stores, from the reporting two studies, was 1.53 (P = 0.38). Both measures of waist-hip ratio and fat stores illustrated no heterogeneity (I2 = 0%).

Conclusion: The individual role of omega-3 fatty acid supplementation in doses between 600-3000 mg/day taken over a period between 4-24 weeks indicates weight loss when sensitivity analysis was performed and in BMI measures, especially in low-risk bias studies in children and adolescents in children and adolescents. There were no changes detected in the other adiposity measures.

Conflict of interest: The authors claim no conflict of interest.

Funding: No funding was required.

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GC3.105

The Role of Eating Patterns and Biological Factors in Inducing Metabolic Improvement Following Bariatric Surgery or Dietary Intervention

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Introduction: Obesity and type 2 diabetes are major public health concerns with significant implications for patients and healthcare systems worldwide. Bariatric surgery, lifestyle modifications and dietary interventions have been considered effective strategies for weight loss and metabolic improvement in individuals with obesity and type 2 diabetes. There are different types of surgical and dietary interventions that should be compared and discussed further. Low-calorie diets and fasting are effective in controlling and curing obesity and type 2 diabetes, which are used prior to bariatric surgery. A comparison of the low-calorie diet and bariatric surgery had not been investigated thoroughly.
This research, which consisted of a systematic review and a clinical trial, will compare the short-term effects of these two procedures on metabolomics in patients with obesity.
Methods: The clinical trial studied the alterations of metabolomics in three groups of patients a week after the interventions. One group underwent a low-calorie diet and two groups underwent two procedures of bariatric surgery, RYGB and LSG. Various metabolites had studied, including circulating amino acids and glycemics. The energy-restricted diet consisted of a daily intake of kcal/day on average, with 4 meals per day. The approximate amount of protein was 44 g/day and the patients could drink plenty of water between meals.
Besides, a comprehensive systematic review was conducted by searching electronic databases, with a particular emphasis on the most up-to-date articles. We considered human short-term or acute clinical trials that involved patients with obesity undergoing low-calorie diets or fasting and the effects of these interventions on blood metabolites, especially amino acids were examined.
Results: After analyzig the concentrations of metabolites we discovered that there were decreasing patterns in both fasting glucose and insulin concentrations in all patient groups. Among all of the measured metabolites, there were some of them that had the most significant changes after the interventions to compare with pre-intervention concentrations.
Considering the measured amino acids, there were seven amino acids with significant changes, which was more than 20% change after the dietary intervention: Cystathionine, Glycine, Isoleucine, Leucine, Proline, Sarcosine, Serine.
The alterations in the levels of amino acids in the studies in the systematic review varied and mostly the same as our clinical research.
Conclusion: The short-term metabolic improvement following the low-calorie diet and bariatric surgery are almost the same and the surgery could be replaceable by the diet in some subjects. The outcomes contribute to a better understanding of these interventions' success and provide important implications for clinical practice and the development of personalized treatment strategies for obesity management.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC3.106

An examination of association of parental feeding practices with childhood obesity among school children aged 6-12 years in Ghana

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Introduction: Children with obesity has become a major public health problem worldwide as a significant proportion of children are with obesity or overweight. There is evidence that 3% of Ghanaian children under five years of age are overweight, however there is limited data on prevalence of obesity. Available data on childhood obesity in Ghana shows an increase of 7.5% in 2017, 15.0% in 2018 and 19% in 2020, confirming the need for health authorities to take corrective and effective measures to counter this threat. Conducting a study to combat children with obesity in Ghana would be of utmost importance. Furthermore, understanding the multiple factors associated with childhood obesity and paying critical attention to beliefs about dietary practices that influence the eating habits of school children in Ghana would help identify effective nutritional interventions, which are culturally considered to reduce children with obesity in the Ghanaian context.
Methods: A sequential explanatory mixed method design was employed in conducting the study. Quantitatively, 434 school children between 6-12 years were sampled randomly. Qualitatively, 15 school children and 15 parents were purposively selected for the study. Data collection was through structured questionnaire, In-depth interview guide and focus group discussion. Descriptive and inferential statistics were conducted for quantitative data and thematic analysis for qualitative data.
Results: The proportion of school children (6-12) years found to be living with obesity was 24.9%. However, no significant differences in obesity among boys compared to girls was established. No significant differences in meaning existed between high consumption of sweet foods and obesity. Commonly consumed staple foods influenced household dynamics and cultural factors. Parents' approaches to limiting their children's food intake differed across weight categories. The qualitative data revealed a strong preference for traditional foods among parents who considered them essential for maintaining cultural identity and connecting children to their ancestry. Again, parents cited worries about addiction and health risks associated with sweetened products.
They implemented disciplinary measures to limit their children's sweet consumption, including restrictions and, in some cases, negative reinforcement for consumption of excessive sweet products. Parents identified several challenges in promoting physical activity among children.
Conclusion: The overarching conclusion stemming from the synthesis of the quantitative and qualitative findings is that children with obesity in Accra is influenced by an intricate interplay of factors. Parental feeding practices, cultural norms, socio-economic conditions, and individual behaviours collectively shape children's weight status. This study's insights advocate for a comprehensive approach that considers a multitude of factors, from household dynamics to cultural beliefs.

Conflict of interest: There was no conflict of interest in conducting this study.

Funding: This study was funded by the Ghana Scholarship Secretariat

GC3.107

Children with Overweight and Obesity: Frequency of first visits and overweight management by general practitioners in the Netherlands

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Introduction: General practitioners (GPs) serve as the first point of contact for healthcare in numerous European countries. Therefore, they play a crucial role in addressing and managing overweight/obesity in children. In Dutch guidelines, GPs are encouraged to proactively address weight-related issues during patient consultations, regardless of the initial reason of the visit. This study explored the frequency of children's' GP first visits for weight-related concerns and the frequency of the identification of overweight/obesity by GPs in children presenting with other complaints.
Methods: A retrospective cohort study was conducted using the Rijnmond Primary Care Database, in children aged 2-18 with overweight/obesity who visited the GP during the period 2012-2021. Children were categorized into two groups: those visiting for weight-related issues (Group 1) and those visiting for other complaints but identified as overweight or

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obese by GPs (Group 2). Patient demographics, reasons for encounter, and management strategies were extracted.
Results: 3035 children were identified with documented overweight or obesity (51% in Group 1 and 42% in Group 2) Over the years, the frequency of first visits remained stable at around 0.5% each year. While the frequency of first visits for children with overweight or obesity was comparable in both groups, group 1 received more referrals (74% vs.17%) and follow-up consultations (45.5% vs.19.7%).
Conclusion: This study highlights a concerning difference in the management between children in group 1 and 2. Strategies for effective management of overweight in children, as well as the role of GPs in addressing this issue, warrant further investigation. Especially, when overweight was not the reason for encounter.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC3.108

Weight loss efforts in Korean adolescents from 2005 to 2021 by weight status and self-perceived body shape

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Introduction: This study aimed to evaluate trends in the proportion of weight loss efforts from 2005 to 2021 among Korean adolescents aged 10-18 years by weight status and combination of weight status and self-perceived body shape.
Methods: Complex sample design analyses were conducted on 12291 adolescents using data from the Korea National Health and Nutrition Examination Survey. The participants were categorized into non-overweight and overweight groups based on a BMI percentile of 85.
Results: The weighted proportion of weight loss efforts were 22-29% in the non-overweight group and 54-77% in the overweight group (P for trend > 0.05). Adolescents who were overweight or subjectively perceived as fat were 4.3-9.7 times (8.3-15.3 times in boys and 2.0-5.8 times in girls) more likely to try to lose weight than those who were not overweight but subjectively perceived as non-fat. Among adolescents with a subjectively perceived body shape as fat, when actual weight status was taken into account, these weight loss efforts were 23-57% for non-overweight and 49-78% for overweight in males, and 41-78% for non-overweight and 63-84% for overweight in females over the past 16 years. Among adolescents who subjectively perceive themselves as fat, the proportion was decreasing among overweight and non-overweight boys and increasing among non-overweight girls.
Conclusion: In Korean adolescents, the proportion of weight loss efforts according to weight status did not show an increasing or decreasing trend over the past 16 years, but differed by sex when subjectively perceived body shape was taken into account.

GC3.109

Title: The Impact of High-Dosage Vitamin D Supplementation on Insulin Resistance: A Case Report

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Introduction: This case report investigates the therapeutic impact of high-dosage vitamin D supplementation on insulin resistance and weight reduction in a 16-year-old female patient presenting with acanthosis nigricans, obesity, insulin resistance related menstrual dysfunction, recurrent hidradenitis and depression.
Clinical trials exploring the impact of vitamin D supplementation on insulin resistance have shown promising but conflicting results. While some trials reported improvements in glycemic control and insulin sensitivity following vitamin D supplementation, others demonstrated limited or inconclusive outcomes.
Case: The patient, diagnosed with overweight - BMI 26.7, SDS +1,34 exhibited acanthosis nigricans, menstrual dysfunction, recurrent hidradenitis and depressive symptoms. The patient's medical history revealed insulin resistance. She was prescribed metformin with no improvement of body weight and acanthosis nigricans during 12 months. Laboratory findings revealed increased fasting insulin level and Vit D deficiency. Given the concurrent diagnosis of vitamin D insufficiency (serum levels below 15 ng/mL), a high-dosage –weekly 100 000 IU vitamin D3 supplementation regimen was initiated. Throughout the intervention, the patient's fasting insulin level, glucose level, HOMA, IR) and serum vitamin D concentrations were monitored during six months of treatment.
The outcomes showed notable improvements in multiple domains. The patient exhibited gradual weight reduction -5 kg, BMI- 24.7, alongside improvements in insulin sensitivity, evidenced by reduced fasting insulin levels and HOMA-IR scores. Simultaneously, the resolution of acanthosis nigricans was observed, coinciding with the elevation of serum vitamin D levels into the optimal range. During 6 month of treatment patient had regular menstrual cycle, she did not have recurrence of hidradenitis. Nevertheless, the patient's depressive symptoms showed considerable

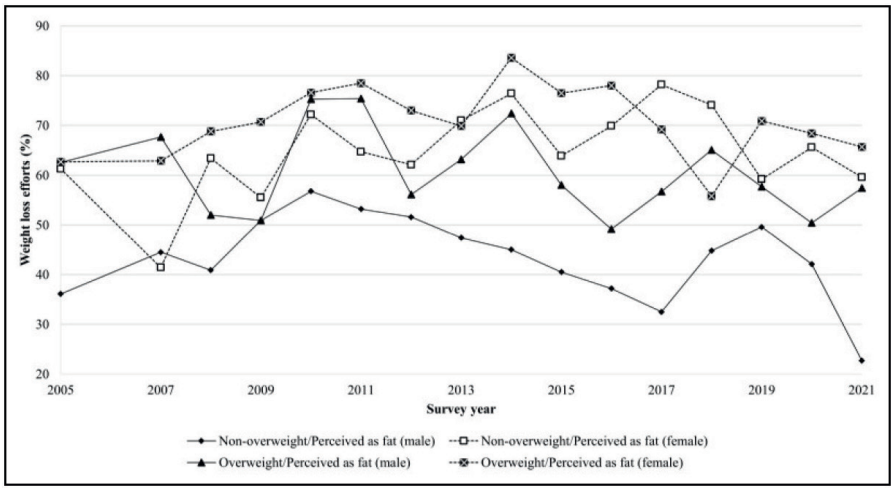


Fig. 1. Weight status specific-weighted proportion of weight loss efforts among Korean adolescents who perceived as fat according to survey year.

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amelioration during the intervention. The patient reported no adverse effects or complications associated with the high-dosage vitamin D supplementation during the course of follow-up.
Conclusion: This case report underscores the potential multifaceted benefits of high-dosage vitamin D supplementation in attenuating insulin resistance, aiding weight reduction, and potentially influencing dermatological manifestations, such as acanthosis nigricans, in adolescent individuals with obesity-related complications. However, larger-scale studies and investigations are warranted to elucidate the precise mechanisms and confirm the efficacy and safety of high-dosage vitamin D supplementation in such clinical contexts.

GC3.110

Child and Adolescent Obesity Management Services in Ireland: Preliminary Perspectives from Service-Users

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Introduction: Accessing timely management for obesity can arrest progression of obesity and associated health complications and improve quality of life (1). With an estimated 9% of children in Ireland living with obesity (2), Ireland's Model of Care for the Management of Obesity outlines plans for obesity treatment services. Family-centred support is a key factor for successful management of obesity in children and adolescents (CAO) (3-4). The LANDSCAPE project explored stakeholder views regarding the management of CAO in Ireland and included perspectives from parents, carers and youth on accessing weight and obesity management services in Ireland.
Methods: An online parent/carer survey was co-created by a multidisciplinary project team including researchers, policy makers, health professionals, and public and patient involvement representatives including parents. The survey was developed using the ""*Checklist for Reporting Results of Internet E-Surveys*"" ""*(CHERRIES)*"" and was guided by relevant literature and a pilot-testing phase (5). The survey was launched in February 2023 using 'Survey Monkey' and was distributed on social media platforms, mainstream media, and by contacting organisations that work with families via phone, email and post.
Results: 159 respondents started the survey and 30% (N=47) completed it. Most respondents were mothers (89%) and all had completed three years of secondary school education. Participants reported that family doctors/General Practitioners, hospital doctors and public health nurses were the main initiators of conversations regarding child growth or weight. Participants shared their dissatisfaction with health professional encounters regarding CAO, particularly a perceived sub-optimal provision of written and online resources, information relating to onward referral to other health services, and long waiting times following referral.
Conclusion: Parents and carers of children living with overweight or obesity in Ireland are faced with systemic challenges that impede access to healthcare. Following analysis of the full survey, findings will guide improvement of obesity services in Ireland.

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GC3.111

Influence of the home and school food environment on childhood overweight and obesity in Madrid

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Introduction: The retail food environment (RFE) is characterized as the availability, accessibility, and promotion of foods and beverages in a defined setting. The home and school food environments might influence children's health, particularly childhood overweight and obesity. However, no studies have quantitatively assessed them in a Southern European setting like Spain. Our aim is to evaluate the association between the access to unhealthy food outlets around children's homes and schools and their weight status in Madrid.
Methods: We carried out a multilevel study. Individual data came from a survey, conducted in 2017 by Madrid Salud (Madrid City Council), on 5,961 children aged 3-12 years. We gathered data on unhealthy food outlets (N = 6,641) from a validated secondary data source. We calculated 400m and 800m street network buffers around children's homes and schools using Geographic Information Systems (GIS) to assess the count of unhealthy food outlets around the home-, school-, and both food environments combined. We operationalized this variable into quartiles (Q4 the highest count). Our outcome variables were overweight and obesity and were measured using objective anthropometric data on body mass index. We estimated Prevalence Ratios (PR) using Poisson mixed-effects models - adjusted for age, family socioeconomic status, and population density. We stratified models by sex and family affluence.
Results: After adjusting for covariates, a higher count of unhealthy food outlets for an 800 m buffer in the school and combined environments was associated with a higher prevalence of overweight for those in Q4 of access to unhealthy foods, (PR = 1.24 95% CI 1.02 – 1.50) and (PR = 1.20 95% CI 1.01 – 1.41), respectively. For obesity, in the combined food an association was observed for those in Q2-Q4 ([Q2, PR=1.50 95% CI 1.08-2.07]; [Q3, PR=1.41 95% CI 1.01-1.97]; [Q4, PR=1.58 95% CI 1.11-2.24] with a 400 m buffer, and in Q2 and Q4 [Q2, PR=1.47 95% CI 1.07 - 2.03; Q4, PR=1.65 95% CI 1.19 - 2.29] with an 800 m buffer. Associations were strongest in females for the combined food environments in Q2 and Q4 with a 400 m buffer [Q2, PR =2.43 95% CI 1.43 - 4.15; Q4, 2.26 95% CI 1.27 - 4.02] and in Q4 for the school (PR = 1.79 95% CI 1.01 - 3.19) and combined (PR = 1.72 95% CI 1.02 - 2.89) environments with an 800 m buffer.
Conclusion: The count of unhealthy food outlets around home and school, both together and individually, may be playing an important role in childhood overweight and obesity in the city of Madrid.

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GC3.112

Genetics of Childhood Obesity: Data from a tier 3 paediatric weight management service in Bristol, UK

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Introduction: Monogenic inheritance causes a proportion of obesity, often characterised by severe and early onset obesity and hyperphagia. Access to genetic testing is limited and so the prevalence may be underestimated. The most common genes affected are in the leptin-melanocortin pathway, which is involved in the hypothalamic control of food intake. We report our data obtained via the Rare Obesity Advanced DiagnosisTM genetic testing program. Among the 79 genes on the panel, genes in the MC4R pathway included *POMC*, *PSCK1*, *LEPR*, *NCOA1*, *SH2B1*, *MC4R*, *MC3R*, *CPE*, *LEP*, *KSR2*, *SIM1*.
Methods: 90 patients with severe obesity (BMI >99.6th centile for age) under the care of a tier-3 paediatric weight management service were screened for monogenic obesity variants using a targeted gene panel, consisting of 79 obesity-related genes. Blood, saliva or buccal samples were taken. The panel included genes encoding proteins in the leptin-melanocortin pathway and assessment for rearrangement of the 16p11.2 chromosomal region. Variants were classified as pathogenic or potentially relevant variants, which was further subdivided into suspected pathogenic (SP), variant of unknown significance (VUS) and suspected benign (SB) based on current knowledge.
Results: 50 patients were female and 40 were male. Patients ages at testing ranged from 1.48-17.54 years. The median age of onset of obesity was 3 years (range 1-11 years). The median BMI at testing was 32.5 kg/m^2 (range 22.4-55.0) and the median BMI SDS was 3.8 (2.1-6.0).
Pathogenic variants were found in 8.8% samples (7/80), suspected pathogenic in 6.3% (5/80), variants of unknown significance in 13.8% (11/80) and suspected benign in 12.5% (10/80), one had a deletion in the 16p11.2 region. *SIM1* heterozygous was the most frequently identified pathogenic variant, representing 5% (4/80) of the samples. *PCSK1* p.(Asn221Asp), a variant conferring polygenic risk for obesity, was found in 12.5% (10/80) of patients.
Conclusions: In our cohort, a pathogenic variant was identified in 8.8% patients and a suspected pathogenic variant in a further 6.3% patients. Most variants identified involved genes in the MC4R-pathway, with pathogenic variants identified in 7.5% (6/80) and potentially relevant variants identified in 11.3% (9/80). For patients with MC4R variants, the emergence of targeted therapies e.g. setmelanotide is important. Increasing access to genetic testing may allow a better understanding of the aetiology of obesity and the development of novel, personalised treatments.

GC3.113

Appetitive traits and body weight in preschoolers – an analysis of baseline data and changes 9 months after an obesity intervention: a study within the STOP project

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Introduction: Previous research has shown that appetitive traits are associated with body weight in childhood. Studies using the Child Eating Behaviour Questionnaire (CEBQ) found that higher scores on food approach traits and lower scores on food avoidant traits are associated with excess weight gain and increased risk of overweight during childhood. In earlier cross-sectional studies, three appetitive traits have shown consistent positive associations with child adiposity: Food responsiveness, Emotional overeating and Enjoyment of food. Two traits have shown negative associations: Slowness in eating and Satiety responsiveness. This study investigates how appetitive traits, measured by the CEBQ, correlate with BMI z-score in preschool-aged children with overweight or obesity. It also examines whether appetitive traits at baseline can be associated with changes in BMI z-score, 9 months following treatment for overweight/obesity.
Methods: This study is based on demographic, anthropometric, and CEBQ data collected through the More and Less study (ML) Europe, a randomized controlled trial (RCT) aiming to evaluate two obesity treatments for preschool-aged children with overweight or obesity in three countries: Sweden, Spain and Romania. To examine the relationship between appetitive traits and weight status, multiple linear regression was used to test associations between the mean values of the different subscales of the CEBQ and baseline BMI z-score. To examine if appetitive traits were associated with changes in BMI z-score from baseline to the follow-up at 9 months, Pearson correlation coefficient was tested. The final regression model was adjusted for child gender, maternal and paternal educational level and BMI.
Results: CEBQ data were available for 254 children (164 girls, 89 boys) at baseline. Mean age was 5.0 years (SD 1.0) and mean BMI z-score at baseline was 3.0 (SD 1.0). At the 9-months follow-up, data were available for 196 children (139 girls, 59 boys). The parents had diverse education levels, with 29.5% of fathers and 40.5% of mothers educated to degree level. Mean paternal BMI was 29,2 (SD 4,6) and mean maternal BMI was 27,9

Tab. 1. Frequency of Variants Identified.

Pathogenic Variants (frequency)	Suspected Pathogenic (frequency)	Variant of Unknown Significance (frequency)	Suspected Benign (frequency)	Gene with polymorphic risk variant (frequency)	Chromosomal rearrangement (frequency)
MC4R heterozygous (2)	KIDINS220 (1)	CREBBP (1)	EP300 (1)	PCSK1 heterozygous (10)	16p11.2 deletion (1)
RAI1 heterozygous (1)	KSR2 (1)	GNAS (1)	HTR2C (1)		
SIM1 heterozygous (4)	SEMA3A (2)	KIDINS220 (2)	KSR2 (1)		
	TUB (1)	KSR2 (1)	NCOA1 (2)		
		MAGEL 2 (1)	NRP1 (1)		
		PCSK1 (2)	PCSK1 (1)		
		PLXNA3 (1)	POMC (1)		
		RPS6KA3 (1)	RAI1 (2)		
		SEMA3A (1)			

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(SD 6,1). After controlling for covariates, subscales Enjoyment of food and Desire to drink were positively associated with child BMI z-score (β = 0.271, p<0.01, (β = 0.184, p<0.01), while Emotional overeating and Food responsiveness were not. The covariates included in the final model were child gender, paternal BMI and education level, maternal BMI and education level. Desire to drink decreased significantly from baseline to 9 months (p<0.05). No associations between baseline appetitive traits and change in BMI z-score were found.
Conclusion: This study shows that the appetitive traits Enjoyment of food and Desire to drink were positively associated with a higher BMI z-score (p<0.01) in preschool-aged children with overweight or obesity. No associations between baseline appetitive traits and change in BMI from baseline to 9 months were found.

GC3.114

ROHHAD syndrome - immunomodulatory response to rituximab and learning points from case series

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Background: Rapid-onset obesity with hypoventilation, hypothalamic dysfunction, autonomic dysregulation (ROHHAD) is a rare syndrome presenting in early childhood associated with a high risk of mortality of 50 to 60%. An immune-inflammatory aetiology has been postulated. We describe 3 cases of ROHHAD syndrome with heterogeneous presentations but some consistent clinical features. In one of these patients, we also describe the immune profile before and after treatment with rituximab associated with significant weight loss.
Case Report: Case 1 (6-year-old girl) presented with sweatiness, tiredness and weight gain. She had hyperprolactinaemia, central diabetes insipidus (CDI), growth hormone deficiency (GHD) and central hypothyroidism. MRI pituitary was normal. She later developed central hypoventilation requiring nocturnal BiPAP and MRI abdomen showed a benign ganglioneuroma (neuroendocrine tumour, NET) which was surgically removed. Case 2 (4-year-old female) presented with rapid weight gain. She had hyperprolactinaemia, central hypothyroidism, and intermittent hypernatremia. MRI pituitary was normal. She later developed central hypoventilation requiring nocturnal BiPAP.
Case 3 (five-year-old female) presented in respiratory arrest with rapid weight gain, central hypoventilation, CDI, GHD and hyperprolactinaemia. To target immune dysregulation, two courses of the monoclonal antibody rituximab (750mg/m^2) were given four weeks apart. A cytokine profile was analysed before and after treatment.
Results: In case 3, a cytokine profile pre-rituximab demonstrated significantly raised TNF, IL-6 and IL-1b levels and low IL-10 levels in response to stimulation by both lipopolysaccharide (LPS) and anti-cluster of differentiation 3 (anti-CD3) with interleukin-2 (IL-2). TNF, IL-6 and IL-1b are pro-inflammatory molecules which have been implicated in the development of obesity-related metabolic dysfunction, with IL-10 being metabolically protective. A reduction in TNF of nearly a third, near halving of IL-6, two third's reduction in IL-1b and a three-fold increase in IL-10 on LPS stimulation was found six months after rituximab therapy. Significant weight loss was observed (2.13 BMI-SDS reduction) in the 12-months following rituximab therapy.
Discussion: High prolactin was a consistent feature of hypothalamic-pituitary (HP) dysfunction. Central hypoventilation and NET may not be present initially but may develop over time. Therefore, regular sleep studies and screening for NETs are required. A high degree of clinical suspicion of ROHHAD is needed in patients with early-onset obesity and HP dysfunction/hyperprolactinaemia and no structural pituitary abnormality. Case 3 had a highly inflammatory immune profile with elevated TNF, IL-6 and IL-1b, and low IL-10, indicating both myeloid and T-cell lineage involvement. This suggests an immune-inflammatory pathology driving metabolic dysfunction and potentially other aspects of the condition. We demonstrate significant improvements in the inflammatory phenotype following rituximab therapy with potential clinical benefit. Further studies on the immune profile and immunomodulation in ROHHAD would be beneficial.

GC3.115

Physical Activity Promotion for Young People with Type 1 Diabetes: A Pilot Community Based Initiative

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Background: Young people with diabetes are at increased risk of sedentary behaviour and the complications associated with leading a physically inactive life (e.g. developing overweight or obesity, cardiovascular disease). Physical activity may provide a mechanism for supporting physical psychosocial factors that contribute to quality of life for young people with type 1 diabetes (T1D), however young people with T1D experience disease-specific barriers to a physically active life.
Aims: This study piloted an initiative to support young people with T1D and their siblings, to participate in a community-based fun run event.
Methods: Information about the perceived barriers and facilitators to participation in community based PA interventions were gathered in advance of the event. A hypoglycaemia treatment table was set up to support the children with T1D at the community event. Medical student chaperones volunteered to run with the young people.
Results: 70% of participants reported fear of hypoglycemia as a barrier to participation. 55% reported co-participants or organisers not being aware of hypoglycemia signs as a barrier to taking part. 45% reported ability to appropriately manage nutrition prior to the event, 30% reported fear of being left behind as a deterrent to participation. 75% of Parents reported lack of facilities to support diabetes management, 55% reported challenges to supervision with large numbers of attendees at the event as barriers to participation. 45% reported young person motivation and confidence were factors that would increase likelihood to participate in the event.
Conclusion: 17 young people participated in this event, all reported that diabetes-specific support was an important factor in their decision to take part.

GC3.116

Effect and safety of a physical exercise-based intervention on body composition and cardiometabolic health of adolescents with severe obesity

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Introduction: Severe obesity (SOb) management in adolescents has been focused on surgy and pharmaceutical treatment, however the potential long-term consequences and high healthcare costs associated with those strategies, prompt new effective and sustainable treatment options targeting this sub-group of adolescents who are at high risk of metabolic and cardiovascular disease development.
Methods: The main aim of this study was to investigate the effect and safety of a 6-month high-intensity physical exercise-based intervention on body composition and cardiometabolic health in adolescents with SOb (BMI z-score ≥ 3), compared to those without SOb.
Methods: Data from 46 adolescents (50% girls; median BMI z-score of 2.96), 20 of them with SOb (43.5%), exposed to two exercise sessions/week for 6 months were analyzed.

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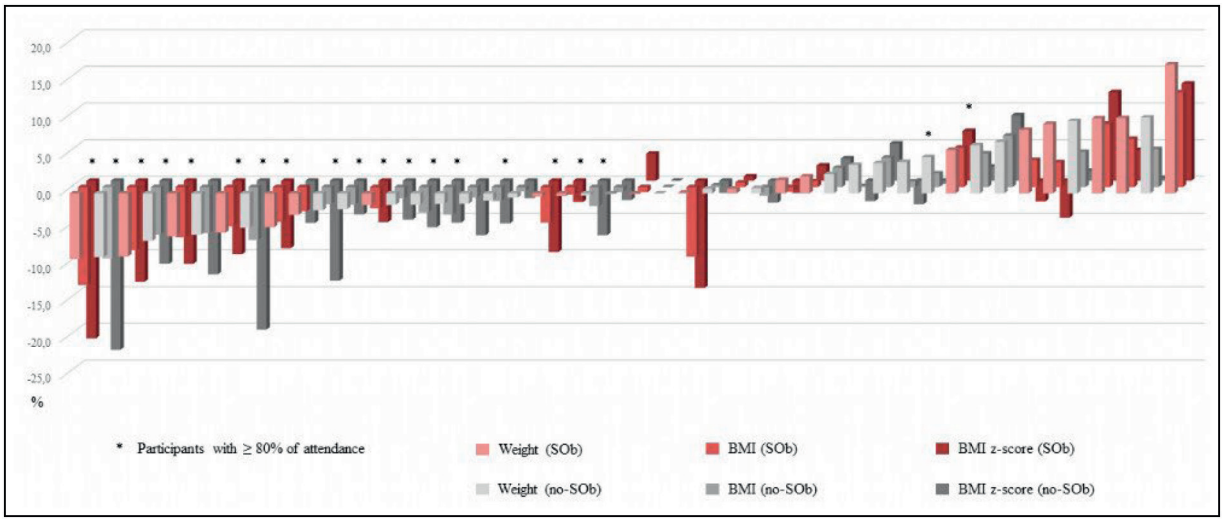


Fig. 1. Relative changes (% of baseline values) in weight, BMI and BMI z-score in participants with and without severe obesity.

Results: Adolescents with SOb showed a mean decrease in BMI z-score and BMI of -0.16 (95%CI: -0.25, -0.07) and -0.51 (95%CI: -1,20 0.17), respectively, with higher improvements in central FM (b=-2.3, 95%CI: 4.8, 0.1, p<.001) and FBFM (b=1.70, 95%CI: 3.25, 0.15, p<.001), as well as a higher rate of insulin resistance reversion, compared to those without SOb (58.3 vs. 12.5%, p=006). No differences were found in adverse effects between groups.
Conclusion: High-intensity physical exercise-based interventions should be considered as a viable obesity-treatment option in adolescents with SOb. More intensive exercise-based interventions, with higher volume and frequency, may further improve health-related outcomes in this population, and should become a first-line strategy together with lifestyle changes.

GC3.117

Sleep and Childhood-onset Obesity: Associations with Appetite and Physical Activity – the RESETTLE trial

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Background: Insufficient sleep in children has become more frequent in modern society, and studies have linked poor sleep and obesity. Insufficient sleep may also be associated with increased appe-tite and physical inactivity, making it an important target in obesity treatment. We hypothesize that self-reported poor sleep is associated with increased appetite and physical inactivity in young adults with childhood-onset obesity.
Methods: 87 young adults (mean age: 22.7±2.6, BMI: 39.7±5.8, 44 women) with childhood-onset obe-sity were recruited from The Children's Obesity Clinic, Holbaek Hospital. Sleep efficiency (time asleep/time in bed*100) and physical activity from 7-day accelerometry from wrist-worn trackers and self-reported sleep quality (Pittsburgh Sleep Quality Index, PSQI) were measured. PSQI score >5 defined poor sleep quality, and PSQI ≤5 good sleep quality. Appetite ratings (visual analog scales during a 3-hour liquid meal test), self-reported physical activity (International Physical Activity Ques-tionnaire), and anthropometrics were assessed.

Tab. 1: Anthropometrics, physical activity, sleep ratings (PSQI) for good (PSQI≤5, n=66) and poor sleepers (PSQI >5, n=21) at baseline (V1). Results presented as mean values (SD), for sleep efficiency: median (IQR).

	Good sleepers PSQI >5	Poor sleepers PSQI ≤5	P-value
BMI (kg/m^2)	37.84 (5.45)	40.35 (5.85)	0.040
Waist circumference (cm)	110.4 (14.0)	119.1 (13.4)	0.017
Age (years)	22.2 (2.9)	22.8 (2.6)	0.391
Sleep duration (hours/night)	7.77 (0.82)	8.17 (1.12)	0.181
Sedentary time (hours/day)	10.30 (1.62)	10.91 (1.36)	0.224
Sleep efficiency (%)	93 (89-100)	82 (73-91)	<0.001
Daily steps (n)	8737 (2987)	6267 (3117)	0.013

Results: Poor sleepers (n=66, 76%) had a lower sleep efficiency (82 vs. 93%, p<0.001), higher BMI (40.4±5.9 vs. 37.8±5.5 kg/m^2, p=0.040), larger waist (119.1±13.4 vs. 110.4±14.0 cm, p=0.017), took 28% fewer daily steps (6267 vs. 8737, p=0.013), and scored lower in overall satiety and higher want-ing of high-fat foods than good sleepers (n=21, 24%).
Summary: Poor sleep is highly prevalent and associated with the degree of obesity, increased appe-tite with cravings for fatty foods, and lower physical activity among young adults with childhood-onset obesity. Addressing sleep is crucial in the treatment of childhood-onset obesity.

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GC3.118

Resources used and trusted for child health information by culturally and linguistically diverse communities in Australia, with Implications for Childhood Obesity

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Background: Parents play a pivotal role in actively seeking health information to promote the optimal growth of their children, a key factor in mitigating the impact of health conditions like childhood obesity. With a notable increase in immigrant parents in Australia, a lack of culturally tailored resources poses potential risks to child health outcomes.
Objective: This study investigates information resources used by Culturally and Linguistically Diverse (CALD) parents related to child health behaviours and examines how they navigate and overcome challenges.
Methods: Combining quantitative and qualitative approaches, we conducted an online cross-sectional survey involving 122 CALD and 399 non-CALD parents. Descriptive statistics and chi-squared tests were employed to compare differences, and logistic regression models were used to identify factors associated with the use of health resources. For qualitative analysis, a semi-structured 60-minute telephone interview was conducted in language with Arabic and Mongolian speaking migrant parents living in Australia. Thematic analysis, using the framework method, was applied to the data.
Results: CALD parents demonstrated a significantly higher trust in social media for child health information (OR 1.92, P = 0.01) and frequent use of general search engines (39.3% vs. 24.1%, p = 0.013). Non-CALD parents placed greater trust in booklets/pamphlets and advice from friends (OR 0.54, P = 0.02). Qualitatively, both groups heavily relied on digital platforms, particularly Google. Barriers to accessing health services included language, financial constraints, and limited awareness of available resources. Unfavourable interactions with healthcare professionals led mothers to perceive them as unhelpful. Acculturation was observed among Mongolian-speaking mothers, who adapted their cultural practices to align with their host country.
Conclusion: The study's findings underscore the imperative of addressing the specific needs of immigrant mothers in accessing child health information. Parents with young children, commonly rely on general search engines and social media. Dependence on unreliable sources for child health information risks misguided practices, potentially contributing to adverse outcomes like childhood obesity. Health professionals, government agencies, and researchers can enhance immigrant family well-being by adopting a culturally responsive and inclusive approach for equitable access to services and resources.

GC3.119

Protocol: Developing and evaluating an interactive web-based Healthy Beginnings program while integrating health literacy and cultural considerations aiming to prevent the onset of overweight and obesity in children

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Introduction: Culturally and Linguistically Diverse (CALD) parents worldwide frequently encounter disparities in health outcomes compared to the general population. These disparities are often attributed to various barriers that impede their access to healthcare services and resources, compelling them to seek information from unreliable sources resulting in adverse outcomes such as childhood obesity.
Objective: This study aims to collaboratively develop and design an interactive web-based platform "Healthy Beginnings" with Arabic and Mongolian-speaking migrant families. The platform places a strong emphasis on enhancing health literacy and ensuring cultural responsiveness to promote child health behaviours.
Methods and Analysis: The research employs a comprehensive mixed-method approach that encompasses several key elements. These include a systematic evaluation of existing web-based platforms related to infant health, qualitative telephone interviews, consumer surveys, and co-design workshops. To address low literacy levels and enhance cultural responsiveness, validated tools such as the Sydney Health Literacy Lab SHeLL Editor and the U.S. Department of Health and Human Services guide to creating user-friendly health websites are incorporated. Additionally, interactive features are integrated into the platform, which are thoroughly tested with parents for optimal usability.
To assess the feasibility of the program, a subsample of 300 pregnant women in their third trimester will be enrolled and followed up until 12 months postnatal. The primary outcomes of this study encompass various aspects of infant health and parenting practices, including infant feeding, screen time, active play, sleep patterns at 6 and 12 months of age, child length and weight, and an assessment of the barriers and facilitators these families encounter when navigating the website. Descriptive statistics and chi-square tests will be used to investigate differences between participants, and logistic regression models will be constructed to explore the behavioural outcomes of both mothers and infants at various time points. Additionally, engagement with the program will be closely monitored through data analytics captured by the website software.
Descriptive statistics and chi-square tests will be used to investigate the differences. Logistic regression models will be built to investigate behavioural outcomes of the mother and infant at different time points. engagement with the program will be measured through the data analytics captured through the web-based program software. The development and implementation of this program will be guided by the Behaviour Change Wheel (BCW) framework.
Ethics: This project was approved by the Ethics Review Committee (RPAH Zone) of the Sydney Local Health District (X21-0351). Parents will provide an informed signed consent form prior to participating.

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GC3.120

Early childhood obesity prevention in primary healthcare: practices, self-efficacy, knowledge, and attitudes of Australian primary healthcare professionals

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Introduction: Primary healthcare professionals (PHPs), often the first point of contact parents of infants have with the healthcare system, can play an important role in early childhood obesity prevention. This study aimed to understand the practices, self-efficacy, knowledge, and attitudes of PHPs towards obesity prevention in early childhood.
Methods: PHPs' experiences embedding obesity prevention in primary care were examined with a 20-item online REDCap survey. Australian PHPs providing care to infants and young children, aged 0-5 years, were recruited from August 2022 to July 2023, via professional organisations and social media. Descriptive analysis was conducted.
Results: 227 PHPs participated in the survey (95% female, 46% Maternal, Child and Family Health Nurses).
87% of PHPs frequently measured and plotted infant growth during routine visits, while 49% plotted young children's body mass index. More PHPs (33-77%) reported frequent discussions of nutritional topics with families, compared to discussions of physical activity and sedentary behaviour (29-36% discussed more than half the time).
Most PHPs reported high confidence in measuring (93% high confidence) and plotting infants' (96%) and young children's (71%) growth. Compared to those reporting high confidence in measuring and plotting growth, a smaller proportion of PHPs reported high confidence in identifying infants (53%) and young children (52%) at risk of overweight/obesity and providing advice regarding rapid infant weight gain (49%). Less than 70% of PHPs reported high confidence in discussing children's portion sizes (58%), managing fussy eating (63%), and limiting screen time (64%).
Of the different types of PHPs surveyed, GPs were least likely to report having sufficient time for discussions of healthy family lifestyles in their routine consultations (14% agreed/strongly agreed they had time) and feeling comfortable raising the issue of infants and young children's weight with parents (49% agreed/strongly agreed they felt comfortable).
Conclusion: Study findings suggest that professional education should support PHPs to identify and have conversations with parents of young children at risk of overweight and obesity and should focus on extending obesity prevention practices to include discussions of sedentary behaviour and physical activity.

GC3.121

Bioelectrical impedance parameters add incremental value to waist-to-hip ratio for prediction of non-alcoholic fatty liver disease in youth with overweight and obesity

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Backgrounds: Non-alcoholic fatty liver disease (NAFLD) is a chronic liver condition characterized by the accumulation of excess fat in the liver that encompasses a spectrum from simple steatosis to non-alcoholic steatohepatitis and hepatic fibrosis. NAFLD is linked to cardiovascular and metabolic risk factors as well as the development of hepatic cirrhosis and hepatic cancer, even in children and adolescents. In this study, we aimed to investigate the utility of BIA in identifying different metabolic profiles among individuals with overweight and obesity, providing valuable insights into more effective and less burdensome screening methods for NAFLD in the pediatric population.

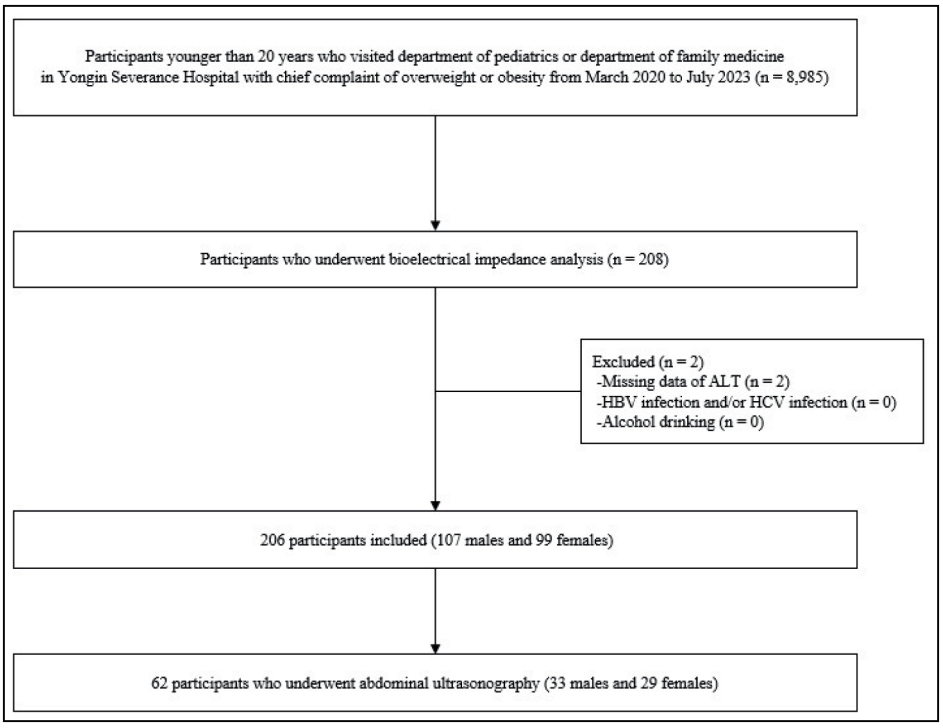


Fig. 1. Study flow.

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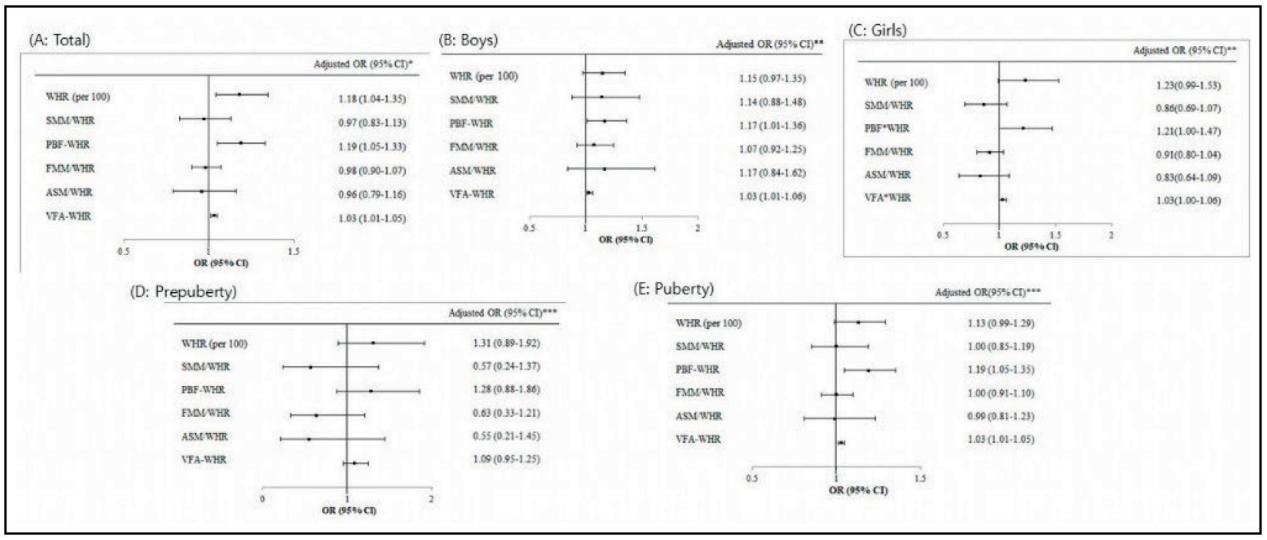


Fig. 2. Logistic regression of WHR and BIA parameters for NAFLD; (A) Logistic regression of WHR and BIA parameters for NAFLD in the total cohort, after adjusting for age, sex, and puberty (B) Logistic regression of WHR and BIA parameters for NAFLD in boys, after adjusting for age and puberty (C) Logistic regression of WHR and BIA parameters for NAFLD in girls, after adjusting for age and puberty (D) Logistic regression of WHR and BIA parameters for NAFLD in the prepubertal group, after for adjusting age and sex (E) Logistic regression of WHR and BIA parameters for NAFLD in the pubertal group, after adjusting for age and sex *Adjusted for age, sex, and puberty **Adjusted for age and puberty ***Adjusted for age and sex

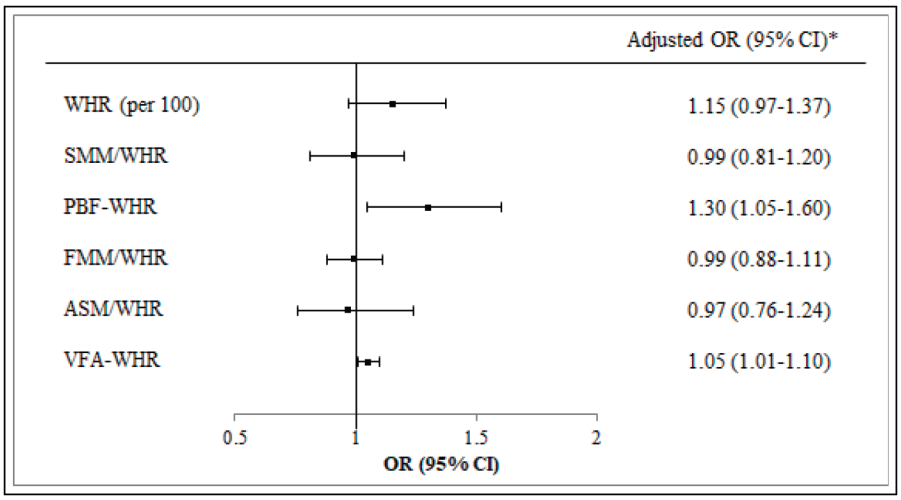


Fig. 3. Logistic regression of WHR and BIA parameters for NAFLD in participants with normal ALT; online *Adjusted for age, sex, and puberty.

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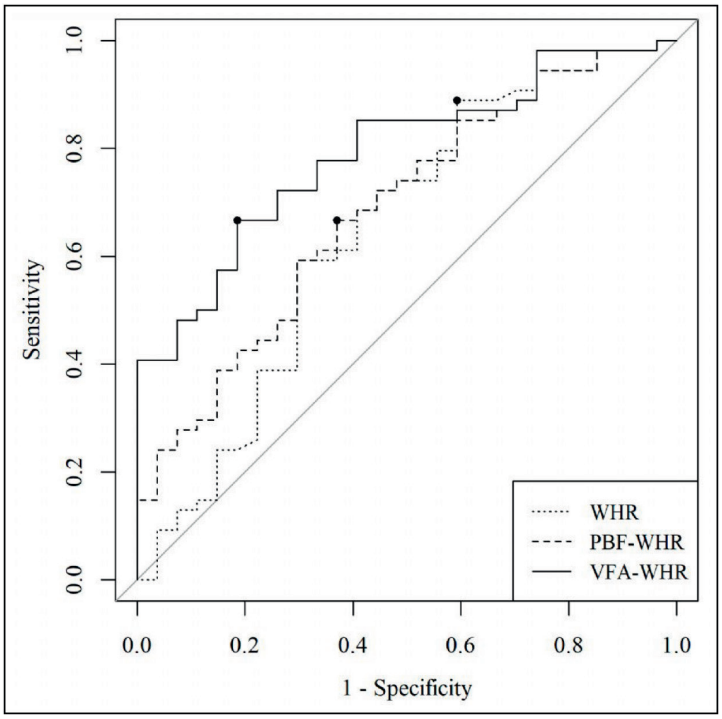


Fig. 4. Comparison of AUC and the corresponding cut-off points for WHR, PBF-WHR, and VFA-WHR The dots on the curves represent cut-off points for WHR, PBF-WHR, and VFA-WHR. AUC, area under the receiver operating characteristic curve; WHR, waist-to-hip ratio; SMM, skeletal muscle mass; PBF, percentage of body fat; VFA, visceral fat area.

Methods: This retrospective, cross-sectional study included 206 children and adolescents aged under 20 years with overweight and obesity. The correlation between anthropometric measurements and BIA parameters and alanine aminotransferase (ALT) was assessed using Pearson's correlation analysis. Logistic regression analysis was performed to examine the associations between these parameters with ALT elevation and NAFLD. Receiver operating characteristic (ROC) curves were generated to assess the predictability of the parameters for NAFLD.
Results: WHR was the only anthropometric factor correlated with ALT in the total population (r = 0.25, p = 0.001), boys (p=0.030), prepubertal group (p=0.041), and pubertal group (p=0.024) Of the BIA parameters, ALT was significantly correlated with SMM/WC, PBF, PBF-WHtR, PBF-WHR, and FFM/WC in boys and PBF and PBF-WHR in girls. No significant correlation was observed between these parameters and ALT in the prepubertal group. In the pubertal group, ALT exhibited significant correlations with PBF, PBF-WC, PBF-WHtR, and PBF-WHR. In the total population, WHR (per100) [OR (95% CI] = 1.09 (1.02–1.17), p = 0.017], SMM/WHR, PBF-WHR, FMM/WHR, and ASM/WHR were significantly associated with ALT elevation, after adjusting for age, sex, and puberty. In the overall population, WHR [per 100; OR (95% CI) = 1.18 (1.04–1.35)], PBF-WHR [OR (95% CI) = 1.19 (1.05–1.33)], and VFA-WHR [OR (95% CI) = 1.03 (1.01–1.05)] showed significant associations with NAFLD defined by ultrasonography, after adjusting for age, sex, and puberty. Logistic regression analysis performed to investigate the association between WHR and combined WHR and BIA parameters with NAFLD in individuals with normal ALT revealed that PBF-WHR [OR (95% CI) = 1.30 (1.05–1.60)] and VFA-WHR [OR (95% CI) = 1.05 (1.011.10)] were significantly associated with NAFLD. The cut-off points and area under the ROC curves were 34.6 and 0.69 for PBF-WHR and 86.6 and 0.79 for VFA-WHR, respectively.
Conclusions: Our study demonstrated that BIA parameters when combined with WHR exhibited significant correlations with ALT, ALT elevation, and NAFLD, and that these relationships were more pronounced in pubertal individuals. Moreover, these relationships were sustained even in youth with normal ALT levels, suggesting the potential of BIA parameters for NAFLD screening in such cases.

GC3.122

Childhood obesity prevention and healthy eating promotion: The potential role of motivational-related factors

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Introduction: Childhood obesity stands as a critical public health challenge in the 21st century. The etiology of childhood obesity is multifactorial, largely rooted in modifiable factors related to children's eating behavior. Despite concerted efforts in implementing interventions and policy actions, the gap between children's eating behaviors and the World Health Organization recommendations persists, contributing to the continued high rates of childhood obesity. This gap may arise from a potential misalignment between interventions and actions' content and the challenges and needs perceived by children, and from a prevalent focus on promoting knowledge without considering the motivational background of children. This communication presents findings from four studies, each aimed at enriching the understanding of the potential role played by motivational-related factors in childhood obesity prevention and the promotion of healthy eating.
Methods: Study one explored the causal attributions children make about obesity through a qualitative design (i.e., content analysis). Studies two and three elucidated the role of motivational-related factors, particularly self-regulation, in preventing childhood obesity and fostering healthy eating behaviors, through quantitative designs (e.g., path analysis). Lastly, Study four, also quantitative, underscores the importance of considering variables from children's proximal contexts (e.g., parental feeding practices, peer pressure) in enhancing their self-regulation and, consequently, healthy eating.
Results: Study one deepened the understanding of the multiplicity of causal attributions that children give to obesity, from the most (e.g., self-regulation and emotionality) to the least (e.g., genetics) important from their point of view. Study two revealed that children's knowledge about healthy eating and self-regulation regarding healthy eating, together, moderates the negative relationship between family's income and children's weight. Moreover, the results of study three showed that self-regulation towards healthy eating mediates the relationship between

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self-efficacy towards healthy eating, attitudes and perceptions on healthy eating, and children's eating behavior. Finally, study four showed that adding variables from children's proximal contexts improved the previous model, by explaining an additional variance of the children's self-regulation and healthy eating behavior.
Conclusion: Overall, the findings of the four studies indicated that considering the motivational background of children may be key to address a healthier eating and, consequently, healthier weight. Implications for practice will be discussed, providing valuable insights for refining current interventions, such as considering children's perspectives on the causes of obesity as a way of overcoming barriers to their engagement and openness to change, and including social support as a tool to sustain behavioral change.

GC3.123

Does declining participation in a community-based lifestyle intervention for children with obesity, predict long-term weight gain?

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Objectives: To investigate the long-term weight development in children with obesity after declining a lifestyle intervention compared to children not invited to participate. Additionally, assess potential interactions by socioeconomic and immigration status.
Methods: This observational study included 713 children, 5-7 years of age, with obesity from the city of Aarhus, Denmark, of which 157 declined participations in a community-based lifestyle intervention between 2010-2020. A median follow-up of 3.6 years (Interquartile Range: 0.4;5.1) was observed for the decline group. Anthropometry was combined with socioeconomic information from national registers. An adjusted mixed effect model with splines was used to model changes in Body Mass Index (BMI) z-score and stratification to investigate potential effect modifications.
Results: Of the 713 children with obesity, 157 declined participations (decline group), and 556 were never invited to participate in the intervention (no-intervention group).
At inclusion children in the decline group were younger compared to the no-intervention group (p<0.001).
No difference was observed in annual change in BMI z-score between the decline and no-intervention group (0.00 per year, 95% Confidence Interval (-0.03;0.03), p=0.90).
No effect modifications were observed between the decline and no-intervention group concerning highest completed household education (p=0.59), equalized household income (p=0.72), or immigration status (p=0.17).
Conclusions: No subsequently increase in weight was observed after declining a lifestyle intervention for childhood obesity, indicating that treatment could be postponed until the families are motivated.
In addition, no effect modifications on the annual change in BMI z-score were observed concerning parental education, household income, or immigration status.

GC3.124

Key elements across systems frameworks for childhood obesity prevention: a scoping review and consultation of international advisors

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Introduction: Childhood obesity is a complex problem. A systems approach takes into account this complexity by considering nonlinear relationships, accumulations, feedback loops, effects of time and delays in systems and unintended consequences that emerge. To date, it is unclear how a systems approach can best be implemented. Therefore, this scoping review aimed to summarize existing systems frameworks focused on childhood obesity prevention, and with that provide insight into the key elements of systems approaches.
Methods: Studies were identified from searches in Medline, PsycINFO, Web of Science, CINAHL, and Sociological Abstracts, until October 2022, and from hand-searches for grey literature in five languages (i.e. English, French, Spanish, German, and Dutch). Systems frameworks were included if they focused on childhood obesity prevention and were informed by systems science or complexity theory. Data extracted from the frameworks were information regarding the goal, key elements, definition(s) of systems/complexity theory, development process, and the (boundaries of the) system wherein the framework was developed. To extract the key elements across included frameworks, a thematic content analysis was performed. To validate the review results, the Systems Science Advisory Board members (N=4) of the Growing up Healthy! (GrowH!) Project were consulted.
Results: We identified 23 systems frameworks for childhood obesity prevention. Twelve key elements were derived from these frameworks: (1) Understanding the local system; (2) Underpin with theory and evidence; (3) Adaptive and dynamic action development; (4) Continuous, adaptive and sustainable implementation of actions; (5) Continuous and adaptive monitoring and evaluation; (6) Upscaling of program actions; (7) Social marketing and communication; (8) Systematic program planning and organization; (9) Supporting leadership for whole system coordination; (10) Community partnership development; (11) Supporting political environment; and (12) Program outcomes of a systems approach, e.g. specific behavioural- and environmental factors on different system levels. Elements 1 and 10 were mentioned most often across frameworks.
Conclusions: A systems approach for childhood obesity prevention requires long-term multi-sectoral collaboration to understand the local context and to adaptively develop, implement and evaluate coordinated actions together with actors aimed at changing the complex system. These key elements from systems frameworks provide guidance for research, policy and practice on how to effectively implement a systems approach for preventing childhood obesity.

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Germany: Federal Ministry of Education and Research (BMBF); Spain: Spanish State Research Agency (AEI); The Netherlands: The Netherlands Organisation for Health Research and Development (ZonMw).

GC3.125

Nutripiatto: a tool for nutritional education. A comparative survey of eating habits in Italian school-age children

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Background: In 2019, Italy reported alarming rates of childhood obesity and overweight, affecting 1 out of 3 children as indicated by "OKkio alla Salute" survey. Excessive weight is associated with a variety of metabolic complications. Children with overweight face challenges such as weight-related stigma, teasing and bullying. These factors can lead to consequences such as binge eating, social isolation, avoidance of health services and decreased physical activity. This study aims to assess and compare eating habits of children (aged 6-7 and 9-10 years) in Piedmont, Sicily, and Lazio after the introduction of Nutripiatto, an easy-to-use food educational tool.

Methods: The study involved 781 primary school children from Asti (Piedmont), Messina (Sicily) and Rome (Lazio). Children received nutrition education with the aid of Nutripiatto kit and a Food Frequency Questionnaire (FFQ) to evaluate dietary habits before and after the interventions. Nutripiatto Kit includes a plate demonstrating food group proportions (half for vegetables, and a quarter each for cereals and proteins) and a recipe guide.

Results: Out of 781 children enrolled in the study, 525 completed it. Participants were divided into 2 age groups: Group A (6-7 years) and Group B (9-10 years). The study showed statistically significant dietary differences between children from the three regions.

In Group A at both times, children in Lazio consumed more milk, milk analog, rusks and nuts compared to Piedmont. In Sicily, bread consumption was higher than in Piedmont at T0, while Piedmont had a higher intake of vegetables than Sicily at both times. At both T0 and T1 Lazio showed a higher consumption of pizza, soups, boiled and fried potatoes, fish, salami, eggs, meat, fresh and aged cheese, legumes, and crackers compared to Piedmont and Sicily. Fruit consumption increased more significantly in Piedmont than in Lazio at T1.

In Group B children in Lazio consumed more sliced pizza than in Piedmont and Sicily at both times. At T0, consumption of non-wheat grains was more frequent in Piedmont and Lazio than in Sicily. Lazio had consistently higher consumption of soups at T0 and fish, eggs, fresh cheese, boiled potatoes, meat, and legumes at both T0 and T1 compared to the other two regions. Fried potato consumption was higher in Lazio than in Sicily at T1.

Overall, Piedmont showed the highest vegetables consumption at both times as well as a significant increase in daily fruit consumption between T0 and T1. Sicilian children increased their daily water from T0 to T1, compared to the other two regions in both groups.

Conclusion: Nutripiatto can be considered an efficient pedagogical instrument. It is useful as a visual guide for dietary modifications and to help families make healthier food choices for their children. It can also be considered a valuable educational aid for nutritionists and healthcare practitioners to improve dietary behaviors in pediatric populations.

Conflict of Interest: Authors have no conflict of interest to declare

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GC3.126

Promoting nutrition knowledge, healthy eating and Mediterranean Diet in childhood: preliminary results from the "LOVVATI" project in Italian schools

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Introduction: Childhood obesity stands as a global public health concern in Western countries. Children with overweight or obesity face elevated risks of physical illnesses, anxiety, and mental disorders. Their vulnerability to an obesogenic environment is exacerbated by a limited understanding of healthy behaviours, compounded by their reliance on parental guidance and surroundings. Although school-based interventions show promise in preventing obesity, there persists uncertainty regarding their efficacy and the specific demographic groups they most effectively benefit.

Methods: The "LOVVATI" project is focused on education and awareness of students on what can be identified as the fundamental steps for one's (and other) well-being: self-acceptance, positive relationships, maintenance of a healthy weight and proper nutrition, and engaging in daily physical activities. This initiative targets primary schools (4th and 5th grades) and lower secondary schools (first classes) in Italy. The activity consists in comprehensive school frontal sessions, featuring expert psychologists, digital specialists, nutritionists, and physical education teachers. The expertise brought by these professionals is complemented by the active involvement of local school teachers who will receive kits to reinforce classroom activities. The adherence to the Mediterranean diet (MD) pattern was assessed with the KidMed [1] questionnaire before and at least six months after the frontal educational activity.

Results: A total of 2000 students filled the questionnaire before and 700 after the educational activity at school. The cohort was composed by 53% girls and 47% boys with a mean age of 10.7 ± 0.9 yr. A 57% of the responders were from school located in Northern regions of the Italian country and 43% in the Center and/or South. From the questionnaire emerged the difficulty in consuming fresh fruits and vegetables daily, the absence of oily seeds in the diet (such as nuts), 73% skipped the breakfast, 72% does not assume yogurt nor cheese. The global KidMed score was 5.11±2.5 (5.13 ± 2.53 in girls and 5.09 ± 2.60 in boys) for a moderate adhesion to MD. After the intervention the score improved to 5.25±2.6 with a significant improvement in girls (5.42 ± 2.71, p-value<0.05). Children with score >7 at baseline increase of 2% (from 18% to 20%) after six months together with a decrease in moderate adhesion scores.

Conclusion: This educational project led to an improvement in nutrition knowledge, eating habits and MD adherence in school children, especially in young girls. School environment constitutes a crucial component of a broader system where interventions can extend beyond targeting individual responsibility.

Reference

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GC3.127

Seasonal variance of (25OH) Vit D among obese women in North Macedonia

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Introduction: Vitamin D is a steroid hormone synthesized and metabolized in humans through several pathways, involving the skin, intestine, kidney, and liver. Vitamin D status may be determined by measuring serum concentration of 25-hydroxyvitamin D [25(OH) D]. 1,25-dihydroxycholecalciferol [1,25-(OH)2D] is the active form of vitamin D. Vitamin D is involved in the mineralization of bones and thereby reduces the risk of rickets and osteoporosis; however it may also be involved in preventing cancers and cardiovascular disease. Vitamin D status has also been associated with the time of hospitalization and mortality rate of critically ill patients. There is a high prevalence of vitamin D deficiency and/or insufficiency globally.
Vitamin D deficiency is associated with impaired glucose metabolism in adipocytes, which appears to be due to an impairment in either insulin synthesis or secretion. The influence of vitamin D on glucose metabolism is therefore related to several mechanisms, such as its effect on the interaction between 1,25-(OH)2D and vitamin D receptors on pancreatic b-cells and expression of a-1-hydroxylase in b-cells. Vitamin D deficiency is also directly associated with abdominal obesity (high waist circumference [WC]), general obesity (high body mass index [BMI]), insulin resistance, and metabolic syndrome (MetS). A systematic review demonstrated the inverse association of 25(OH) D level and impaired insulin release.
Vitamin D has two forms, D2 and D 3. Vitamin D3 is synthesized in the skin on exposure to ultraviolet B (UVB) radiation of sun light. The prevalence of vitamin D deficiency and insufficiency are often high in sunny countries. The dietary sources of vitamin D include vegetables and orange juice as the sources of vitamin D2 and egg, fish oil, dairy products, and sea foods as the sources of vitamin D3. Some previous studies have evaluated the relationships between dietary habits and the concentration of 25(OH) D according to the dietary sources of vitamin D.Previous studies have shown that a dietary foods that are rich in dairy products, sea foods, egg, and vegetables was associated with higher serum 25(OH) D levels and dietary foods which are rich in sweets, alcoholic beverages, fats, and soft drinks were inversely associated with serum 25(OH)D concentrations
The aim of the current study was to investigate vitamin D status and its seasonal dynamics in a random selection of people with obesity (PwO) in North Macedonia.
Methods: The study was conducted at University Clinic of Endocrinology and metabolic disorder In North Macedonia in a sample of 100 obese women aged 24-50 years old (WC > 90cm) weight change, in a period between January 2021 and October 2021.
Laboratory measurements
Blood samples were obtained individually (sampling time from January to october) and in the end of summer (September). Serum was separated and the samples stored at -20°C until analysed. The serum 25(OH)D level was measured in the machine Cobas e 411 with rate(25 Hydroxivit D 25-110nmol/L)
Results: During the analysis of vit.D (nmol/l) we inserted that the value of the group is 33.3±14.5 nmol/l and is within the limit of reference values-25-110 nmol/l. 26.0% of respondents have useful vitD values. The average values of vit.D (nmol/l) during the examined period of 10 months vary. The lowest values (below the reference values) were registered in January 22.5±6.2 nmol/l, February 25.1±5.7 and March 20.8±7.1 nmol/l. The average values during the month of April start to grow and amount to 27.2±3.8 nmol/l, to reach an average value of 31.5±9.1 nmol/l in May. The highest values within the reference values are registered in the summer period, June-50.1 ±23.7 nmol/l, July -45.1±239.8.7 nmol/l and 44.4±13.6 nmol/l. According to the post hoc test - Tukey HSD test, the difference is statistically significant for $p<0.05$ between June versus January, February, March, April, May and October (p=.000174, p=.000297, p=.000163, p=.000883, p=.014397, p=.023339,) (Table 2b).
The difference is statistically significant for $p<0.05$ between July versus January, February, March and April (p=.001067, p=.005921, p=.000402, p=.022005) (Table 2b).
The difference is statistically significant for $p<0.05$ between August versus January, February, March and April (p=.001695, p=.009293, p=.000581, p=.033013)
Conclusion: This cross-sectional study confirmed people with obesity (PwO) obese women with a High BMI > 30 have higher Vit D values in the summer months than in the winter period. Fortification and supplementation of dairy products with vitamin D could affect the provision of daily vitamin D needs, especially for people with an increased BMI.
Abbreviation
25-hydroxyvitamin D: 25(OH) D
Waist circumference: WC
body mass index: BMI
metabolic syndrome: MetS
Waist to hip ratio: WHR
People with obesity (PwO)

GC3.128

Virtual Coaching Interventions for Secondary 2 Students with Obesity in Singapore: A Comparative Study

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Youth Preventive Service Health Promotion Board

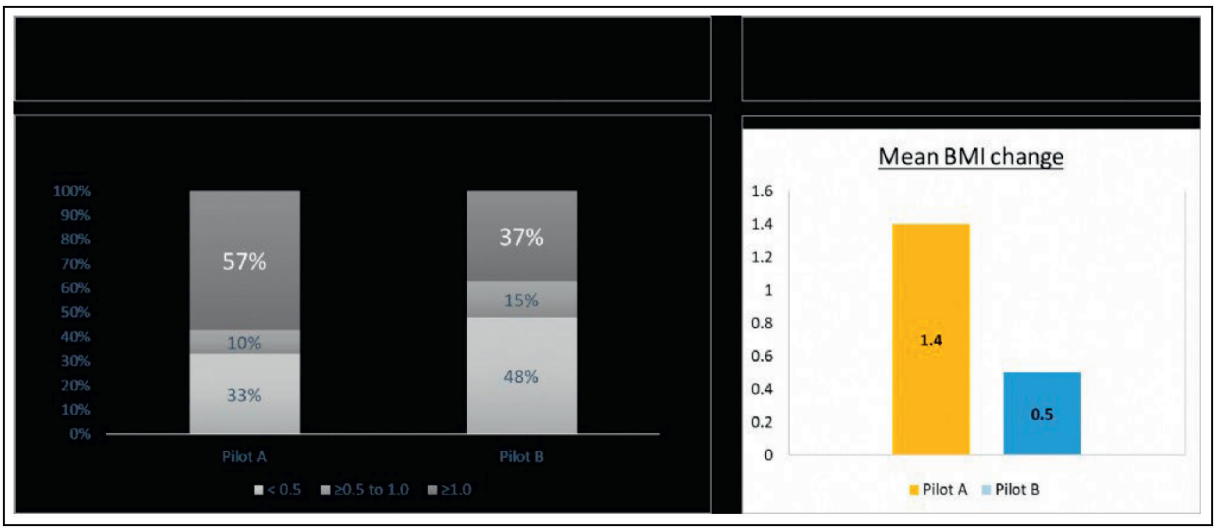
Introduction: This study assesses the effectiveness of two virtual coaching (VC) interventions methods targeting Secondary 2 students with obesity across eight schools in Singapore. Pilot A utilized a fully VC approach, while Pilot B employed a hybrid model with one face-to-face session and three VC sessions. The aim was to evaluate behavioral changes and Body Mass Index (BMI) reduction in comparison to both the original full face-to-face program and each other. after 6 months of intervention
Methods: 200 Participants included students with obesity were recruited for each arm and recruited from four co-ed secondary schools in each pilot. Pilot A delivered a comprehensive VC program, while Pilot B adopted a hybrid structure. Data on 3 key behavioral changes (sugar-sweetened beverage (SSB) intake per week, increased physical activity, enhanced sleep quality) and BMI were collected and compared with the outcomes of the original face-to-face program. Coaches' feedback on the scheduling process was also analyzed.
Results: Both pilots were effective at achieving improvements in behavioral changes, with pilot A outperforming B in reducing SSB intake and improving sleep. Mean SSB reduced by 5.6 servings in pilot A vs 0.5 in pilot B. Mean moderate-to-vigorous physical activity (MVPA) increased by 47 mins in pilot A vs 82 min in pilot B.
Mean daily sleep increased by 0.4hr in pilot A vs 0.3hr in pilot B. Regarding weight loss, Pilot A appeared more effective, with 57% achieving BMI reduction of >1.0 compared to 37% in Pilot B (mean 1.3 vs. 0.4). Remarkably, both VC pilots surpassed the outcomes of the original face-to-face program, particularly in terms of lower attrition rates (pilot A 32%, B 22%, original program 84%, completion of all 4 sessions). Coaches consistently reported that VC offered a more accessible and convenient scheduling process compared to traditional face-to-face sessions.
Conclusion: This study highlights the efficacy of VC interventions for Secondary 2 students with obesity. Pilot A, utilizing full VC, demonstrated superior outcomes compared to the hybrid model (Pilot B) and the original face-to-face program. The practical advantage of easier scheduling further positions VC as a promising and efficient approach to address the unique health challenges faced by this demographic, providing valuable insights for the development of targeted interventions in school-based health programs
With the results, the team will be implementing a nation wide virtual coaching program with sec 2 students in 2024 as it is more scalable and convenient for the student.

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Behavioural Changes for Sugar Sweetened Beverages, Physical Activities and Sleep.

Fig. 1. Behavioural Changes.



Weight and BMI changes in Pilots.

Fig. 2. Weight and BMI Changes.

GC3.129

Increased body mass index is associated with specific causes of hospitalization: A single-centre, cross-sectional study from Greece

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Introduction: An increasing trend in overweight and obesity rates is observed in the general population worldwide. However, data on the prevalence of overweight / obesity among hospitalized patients in Greece are currently lacking. The aim of this cross-sectional study was to capture the rates of overweight and obesity among people admitted to an academic internal medicine department of a tertiary hospital in northern Greece, as well as to explore potential associations between body mass index (BMI) and causes of hospitalization.

Methods: Demographic and anthropometric parameters and cause of hospitalization were recorded in all patients admitted to our department during a 30-day period. Causes of hospitalization were grouped into 4 categories: respiratory system diseases, kidney and urinary system diseases, gastrointestinal tract diseases (other than hepatobilliary disorders) and hepatobilliary disease. The mean BMI was compared between the groups.

Results: Among the 118 patients admitted to the department, we included 92 in the analysis for whom full data were available. The mean age of the study participants was 71.84 years, the mean BMI was 26.85 kg/m^2, while the sex distribution was 60.86% men and 39.13% women. 43.47% of the participants had a BMI within the normal range, 27.17% lived with overweight, and 26.08% lived with obesity. Patients admitted for hepatobilliary disease were found to have a significantly higher BMI compared to those admitted for other diseases of the gastrointestinal tract (29.26 ± 4.37 vs 23.88 ± 3.92 kg/m^2, P<0.001).

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Conclusion: More than half of patients admitted to an internal medicine department in Greece live with overweight or obesity. Specific reasons for admission to the hospital seem to be associated with a higher BMI. Although the present study is unable to establish causal associations due to its cross-sectional character, the results highlight the need for increased vigilance of the medical community regarding the burden of the obesity pandemic on healthcare systems.

GC3.130

EDU-FIT: inclusive social education fit for healthy lifestyle, preventing obesity in young adults

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The student life poses a challenge, marked by the pressure and stress of the university environment. The commencement of studies often entails a transformative shift in lifestyle, encompassing separation from family and the shouldering of diverse responsibilities, along with greater independence. Unfortunately, this transitional period can give rise to unhealthy habits such as insufficient sleep, improper nutrition (in the form of fast food, skipped meals, and poor dietary choices), physical inactivity (often stemming from a sedentary lifestyle), and the daily stressors that can contribute to weight gain.

Recognizing these challenges is crucial, and students are encouraged to strive for a balance between academic responsibilities and prioritizing their health. In pursuit of fostering healthier lifestyles among students, the EDU-FIT project has been initiated. This collaborative effort involves university partners from five countries (Slovenia, Croatia, Portugal, Slovakia), along with a partner from Norway.

The EDU-FIT project aims to enhance the health of students by leveraging accessible and sustainable online resources. These resources aim to provide students with easy access to information and support for promoting positive lifestyle changes. The initial phase of the project involves the creation of a questionnaire, to be translated into the languages of all partners. Google Forms, a tool for designing online surveys, will be utilized for this purpose. Demographic information, study-related details, and lifestyle impact on body weight will be collected through this questionnaire. The data analysis will inform the targeted development of content crucial for students. This includes creating health manuals featuring interactive content such as videos with simple recipes and exercises. Additionally, guidelines for canteen staff, a curriculum for an elective health course in social studies, and online tools to facilitate communication about health and



Fig. 1. EDU-FIT.

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body weight will be developed. All project resources, including the aforementioned materials, will be accessible to everyone through the EDU-FIT webpage.
Recognizing the significance of healthy habits, proper nutrition, regular exercise, and social connections is paramount to preserving well-being during the student years. The EDU-FIT project aims to encourage awareness and promote healthy lifestyles, fostering a positive impact on young generations. This impact extends to shaping them as future leaders of a healthier society, as parents who nurture their offspring's health, and as role models for a wholesome way of life. The message conveyed by EDU-FIT is clear: both knowledge and health are fundamental keys to a successful future.

Conflict of Interest: None Disclosed.

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GC3.131

Obesogenic environment: a narrative review of the literature

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Obesogenic environment. It's not a new term; it's been 'in vogue' for more than 23 years, ever since public health specialist Boyd Swinburn noted the harmful impact, including high diabetes rates, on the American lifestyle of aboriginal Americans living on an Arizona reservation. The phrase "obesogenic environment" refers to "an environment that promotes weight gain but does not lead to weight loss" in the home or workplace. The environmental and behavioral influences on illness development have been understood since ancient times. Obesity: is it genetic or environmental? Population-based cohort research in the south of England revealed environmental features such as greenspace, walkability, supermarket density, unhealthy food outlet relative density, venues for social contact, and air quality being associated with overweight and obesity in school-aged children. Another study reported the setting up of a pediatric obesogenic environment index (COEI) at the county level in the United States, demonstrating that COEI can be used to benchmark obesogenic environments, uncover regional disparities, and target intervention locations. A comprehensive review was undertaken to investigate the relationships between various degrees of obesogenic environmental parameters (objective or perceived) and childhood obesity, including 101 papers from 18 countries worldwide. Among studies with non-null associations, seven found negative relationships between alimentary stores in suburban areas and childhood obesity; eight found positive associations between unhealthy food stores and childhood obesity; and three found negative associations. Measures of recreational or physical activity facilities near participants' homes are likewise negatively connected with childhood obesity in nine of the 15 studies. It is suggested to establish healthy sociocultural, physical, economic, and political frameworks that influence the primary drivers of physical activity and food intake. Urban design, particularly improving public transportation infrastructure and access to green as well as blue spaces, can have a positive impact on health by promoting physical activity and decreasing the prevalence of obesity.

GC3.132

LIVELY: MuLtidimensional school-based and family Involved interVentions, to promote a hEalthy and sustainable LifestYle for the childhood obesity primary prevention, a Study Protocol

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Introduction: Childhood obesity has become a significant public health concern over the past two decades, posing multifactorial challenges including modifiable factors like dietary habits and physical activity1. Prevention efforts require a comprehensive approach, including educational interventions, collaboration among multidisciplinary teams, and community engagement2. Given that schools play a central role in children's lives, they are an ideal setting for promoting healthy habits3. The LIVELY study focuses on assessing the prevalence of overweight and obesity in primary school children and identifying contributing factors within families. Additionally, it aims to implement and evaluate a multidimensional, multidisciplinary intervention to foster a sustainable and healthy lifestyle, ultimately working towards preventing obesity in school-aged children.
Methods: The study has been conducted at Istituto Comprensivo "Luigi Cadorna", a public primary school in Milan, Italy, and it will last one full school year, from October 2023 until October 2024. At baseline (T0), data regarding children's (clinical history, lifestyle habits) and their families (socio-economic status, environmental influences, and behavioral determinants) have been collected throughout a set of structured questionnaires. Also, children's anthropometric measures have been evaluated.

Tab. 1. Weight status prevalence according to BMI z-score and their relation to Waist-to-Height Ratio (WHtR) in males and females.

Males	Total n=109	WHtR <0.5 n=71	WHtR ≥0.5 n=38
BMI z-score (WHO)			
Underweight	3 (2.8)	3 (4.2)	0 (0)
Normal weight	80 (73.4)	68 (95.7)	12 (31.6)
Overweight	16 (14.7)	0 (0)	16 (42.1)
Obesity	10 (9.1)10 (9.1)	0 (0)	10 (26.3)
Females	Total (n=114)	WHtR <0.5 (n=73)	WHtR ≥0.5 (n=41)
BMI z-score (WHO			
Underweight	1 (0.9)	1 (1.4)	0 (0)
Normal weight	87 (76.3)	70 (95.9)	17 (41.5)
Overweight	24 (21.1)	2 (2.7)	22 (53.7)
Obesity	2 (1.7)	0 (0)	2 (4.9)

Table shows the weight status prevalence according to BMI z-score and their relation to Waist-to-Height Ratio (WHtR) in both sexes. Data are expressed as counts (percentages). Body Mass Index (BMI); Waist-to-Height Ratio (WHtR); World Health Organization (WHO).

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Children's lifestyle habits and anthropometric measures will be assessed again at 6 (T1) and at 12 months (T2) from the beginning of the study to evaluate possible changes in relation to the intervention. During the school year, each class will be individually involved in a multidimensional educational intervention that will cover the topics of healthy and sustainable nutrition and lifestyle. The lectures will act on several fronts using frontal teaching, games and drawing activities to stimulate and maximize children's learning and involvement.

Results: Data collection began in October 2023 and will last until October 2024. A sample of 223 children from 14 classes was included in the study. The mean age was 9.1±0.96 years (min 7; max 12 yo); 48.9% were males. Overall prevalence of overweight and obesity was 24% among males and 23% in females. The prevalence of central obesity was 34.9% and 36.0% in males and females respectively. Data analysis and presentation of the complete results will be available after end of 2024.

Conclusions: The authors believe that the study could lead to the structuring of an educational intervention model in school settings aimed at preventing childhood obesity. Moreover, it could help raise awareness of the issue of childhood obesity and it could help prevent such an evident public health problem.

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GC3.133

Body Composition Progression in Pediatric Patients Enrolled in a Two-Year Obesity Management Programme: A Two-Year Follow-Up

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Introduction: The study aimed to evaluate the progression in body composition parameters, assessed through bioelectrical impedance analysis, in children and adolescents with body mass index (BMI) exceeding the 98th percentile (98P) who participated in our two-year obesity management programme.

Methods: A retrospective study was conducted to analyze body composition parameters in pediatric patients enrolled in the obesity managements programme at Children's Hospital Šentvid pri Stični in Slovenia for two years from 2021 to 2023. Data were extracted from an electronic database within patient medical records. Body composition parameters, including BMI (standardized as the ratio of BMI/BMI 98th percentile for age and gender), body fat mass (BFM), skeletal muscle mass (SMM), and fat-free mass (FFM), were analyzed using the InBody 770 Bioimpedance device. Measurements were taken at the beginning, 3-months, 6-months, 12-months, 18-months, and 24-months after the initial visit.

Results: 311 children (149 girls, 162 boys) with diagnosed obesity, mean age 12.8 years, range 6 to 19 years) participated in the programme. The age of participants was (in years) mean 12.8, SD 2.9; range 6-19. Significant changes in body composition parameters observed between the initial visit and the 24-month follow-up (BMI/BMI 98P, BFM; FFM; SSM; $p < 0.05$ for all parameters) indicate good programme adherence. No significant increase in BFM was noted throughout the observation. Both SMM and FFM continued to increase significantly over the two-year period. There was a general reduction in the BMI/BMI 98P ratio, more detailed analysis is still in progress and will be presented at the conference.

Conclusions: Follow-up with bioelectrical impedance analysis revealed favorable data in monitoring our patients. Over the 24-months, enrolled children achieved a reduction in BMI close to the obesity limit (98P), accompanied by a sustained positive shift in body composition, marked by increased fat-free and skeletal muscle mass. Potential unfavorable shifts in some of the parameters may be a result of reintroduction of unhealthy habits, offering essential insights for further programme refinements.

GC3.134

Supporting children and young people living with excess weight with a background of neurodiversity in deprived areas: an experience from a Complications of Excess Weight (CEW) service in the UK

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Introduction: Excess weight and obesity affects 1 in 4 children and young people (CYP) in the UK. In 2021, the Complications of Excess Weight (CEW) services were launched as a nationally funded pilot aiming to set-up services across the UK with multidisciplinary teams (MDT) to holistically support CYP suffering from excess-weight related complications and their families to improve their health, quality of life and well-being. Our West Midlands CEW service covers a wide geographical area with higher levels of obesity and deprivation compared to the national average. There is a clear link between neighbourhood deprivation, independent of individual socioeconomic status, and excess weight. It is also recognised that there is a higher prevalence of excess weight in CYP with learning disabilities (LD) or neurodiversity, i.e. autism and Attention-deficit-hyperactivity disorder (ADHD). We aim to analyse the co-existence of neurodiversity in our CYPs, the degree of social deprivation, and discuss specific challenges faced based on two patient journeys.

Methods: Retrospective analysis of electronic medical record data. Indices deprivation (MID) are calculated based on the 2019 census data for England.

Results: Out of 120 patients seen in our service so far, 60.8% CYP live in the most deprived areas, with deprivation centiles 1 and 2, and another

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20.8% in an area with deprivation centiles 3 and 4. Over half of our patients (55%) have a diagnosis of neurodiversity.
Case vignette 1: A teenager referred with a BMI +4SD and weight-related health complications impacting on their mental health and school attendance. Our MDT effectively and sensitively recognised and addressed socioeconomic factors. They qualified for pharmacological intervention (GLP-1 agonist treatment), alongside person-centred support such as dietary strategies and psychosocial support. Even when the medication had to be discontinued due to supply shortages, their BMI remained stable, most likely due to sustained lifestyle changes and the psychosocial interventions. Their confidence improved, they progressed academically with improvement in biochemical markers.
Case vignette 2: A teenager referred with a BMI of +3.8SD who has learning difficulties and neurodiversity. Their weight remained static during initial follow-ups. A family-based approach, involving multiple team members and taking the experiences and opinions of the young person, was successful in supporting the patient to regulate their own food intake, to gain more independence and be involved in food preparation and in using other tools to manage their emotions, which in turn led to a reduction in their BMI with improvement in emotional wellbeing and academic progression.
Conclusion: A large proportion of patients referred to our CEW service live in the most deprived areas in the country and have co-existing LD or neurodiversity. Recognising, understanding and addressing associated barriers to conducting a healthy lifestyle is crucial in delivering person-centred, family-based, individualised holistic support. More research is needed to develop and test weight loss interventions in CYP with a background of neurodiversity.

GC3.135

Associations between family socioeconomic factors, overweight and unhealthy eating habits after COVID-19 pandemic, in school-age children in Portugal

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Introduction: Childhood overweight (including obesity), unhealthy eating habits and socioeconomic inequalities represent a contemporary Public Health challenge at global and national level. The main purpose of this study is to characterize the association between family socioeconomic factors with energy-dense food consumption and its influence on the prevalence of overweight of Portuguese school-age children, after the COVID-19 pandemic period (2021/2022).
Methods: This study follows an observational cross-sectional design based on data from the 6th round (2021/2022) of the World Health Organization (WHO) European Childhood Obesity Surveillance Initiative (COSI) in Portugal (n=6205). COSI Portugal follows a two-stage cluster sampling design, where the target population is primary school-age children (6-8 years old). The data on anthropometric measurements was collected according to the WHO data collection procedures and methodological protocol, where the body mass index-for-age Z-scores were calculated following WHO reference growth charts recommended for school-age children and adolescents (5-19 years). The information on family socioeconomic indicators and children's eating habits was obtained through a family form. The maternal and paternal education were classified as "lower" and "higher", and the maternal and paternal employment status were categorized as "employed", "unemployed" and "inactive". The information on children's consumption of soft drinks containing sugar, sweet and savoury snacks was defined as "healthy" behaviour - consuming 3 days a week or less, and "less healthy" behaviour - consuming more than 3 days a week. A logistic regression analysis was carried out to estimate the adjusted odds ratio (OR) and their 95% confidence intervals (CI) ($p<0.05$).
Results: Having a mother with lower education level (OR=1.76, CI 95%: 1.34-2.29) and a father with lower education level (OR=1.79, CI 95%:1.30-2.47) and unemployed (OR=2.25, CI 95%: 1.36-3.75) were positively correlated with children's less healthy behaviour, regarding consumption of soft drinks containing sugar. Having a mother with lower education level (OR=2.24, CI 95%: 1.29-3.90) and a father (OR=2.73, CI 95%: 1.23-6.06) and a mother unemployed (OR=2.14, CI 95%: 1.17-3.91) were also associated with higher odds of children have less healthy behaviour regarding the consumption of savoury snacks. Children that belong to a family whose mother (OR=1.38, CI 95%: 1.15-1.66) and father (OR=1.47, CI 95%: 1.19-1.80) had lower education level were more likely to have overweight compared to those who had parents with higher education level.
Conclusion: This study was an important step for a better understanding of socioeconomic disparities in childhood overweight (including obesity) prevalence and in specific behaviours that contribute to this epidemic, namely children's unhealthy eating habits, particularly in a post-pandemic momentum, with unprecedented changes in children's and family's lifestyles. These results enable to identify the most vulnerable population's groups and support equitable policy and practice to respond to this health challenge.

GC3.136

Food Insecurity and childhood obesity: exploring potential dietary and psychological mechanisms

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Background: Rates of food insecurity have increased dramatically in the UK in recent years with 21.6% of households with children experiencing food insecurity in 2023, compared to 12% in 2022. Food insecurity is linked to poorer health outcomes, especially among children, including increased risk of developing obesity in later life. However, the mechanisms underlying these relationships remain unclear. This study examined potential psychological and dietary mechanisms underlying the relationship between food insecurity and childhood obesity risk. We hypothesised that household food insecurity would be associated with higher child BMI-SDS via poorer emotional wellbeing and greater consumption of energy-dense foods.
Methods: Participants were from the Born in Bradford-1000 longitudinal study (BiB1000), a sub-sample of the larger Born in Bradford (BiB) cohort who were recruited between 2008 and 2009. Primary caregivers (n=1309) completed the USDA Household Food Security Survey Module when their child was 12-months and reported on their child's emotional wellbeing using the Strengths and Difficulties Questionnaire and consumption of energy-dense foods via Food Frequency Questionnaire at 3-years. Heights and weights were measured by a trained professional at 4-years. Structural equation modelling was used to examine the hypothesised relationships. Analyses were adjusted for child sex and ethnicity. To account for missing data and non-normality of the data, a maximum likelihood estimator with Satorra-Bentler correction was used for model fitting.
Results: Overall, 11.6% of BiB1000 families were classified as living with food insecurity. Analyses revealed household food insecurity at 12-months was directly associated with higher child BMI-SDS at 4-years (β=0.068; 95% CI=0.004-0.097; p=0.033). Household food insecurity was associated with poorer child emotional wellbeing (β=0.075; 95% CI=0.012-0.157; p=0.021), and in turn poorer child emotional wellbeing was associated with greater consumption of energy-dense snack foods (β=0.122; 95% CI=0.078-0.426; p=0.004) but neither emotional wellbeing or consumption of energy-dense snacks were associated with child BMI-SDS at 4-years.
Conclusion: Our findings revealed that children experiencing greater household food insecurity at 12-months had poorer emotional wellbeing at 3-years and higher BMI-SDS at 4-years. However, the relationship between food insecurity and child BMI-SDS in the pre-school years was not mediated by child emotional wellbeing or dietary intake. As data were

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collected over a decade ago, rates of food insecurity were lower than current rates in the UK and therefore may not reflect the current financial climate. Future research should be conducted in more contemporary samples experiencing the current cost of living crisis, should capture more detailed dietary intake data, and further examine potentially maladaptive coping strategies in families experiencing food insecurity such as using food to soothe. Additionally, future research should investigate the proposed mechanisms underpinning relationships between food insecurity and weight over a longer period and into later in childhood.

GC3.137

Homozygous mutations in SREK1 linked to a new condition of syndromic obesity

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Introduction: The exploration of Mendelian forms of obesity has revealed brain circuits that play a crucial role in regulating appetite, body weight and energy homeostasis. Genetic investigation within the SOPP (Severe Obesity in Pakistani Population) cohort, which is composed of children with severe obesity from consanguineous families from Pakistan, have broadened our understanding. This research has led to the discovery of genes like Adenylate Cyclase 3 (ADCY3) and Prolyl 4-Hydroxylase, Transmembrane (P4HTM), linked to severe obesity and related abnormalities.
Methods: Utilizing the MiST method for gene-centric analysis, we analysed exome data of 492 individuals with severe obesity from the SOPP cohort, all of whom tested negative for mutations in established obesity-associated genes. This analysis also included comparison with data from >1000 individuals from population of the same geographical region with the aim to identify genes harbouring a significant burden of rare, homozygous and potentially deleterious variants among the cases from the SOPP. We further investigated these findings through protein modelling and functional assays using hypothalamic neurons derived from induced pluripotent stem cells (iPSCs), complemented by RNA sequencing. Subsequently, targeted clinical re-examinations were performed.
Results: Using MiST analysis, three unrelated families were identified, each with members who experience hyperphagic obesity and neurodevelopmental delays. These individuals were found to carry three different homozygous missense mutations in the SREK1 gene. This gene encodes a glutamic acid and lysine-rich protein that plays a role in RNA splicing. These mutations comprise two variants located in the N-terminus RNA recognition domains (P95L, T194M) and one within the C-terminus (E601K). SREK1 is expressed throughout the hypothalamus and structural predictions suggested these mutations adversely affect RNA-binding capabilities. Functional assays on iPSC-derived hypothalamic neurons revealed that these SREK1 variants precipitate the downregulation of SNORD115 and SNORD116, with the latter being implicated in causing hyperphagia and weight gain in Prader-Willi Syndrome (PWS). Clinical reassessment of the patients identified several phenotypic characteristics consistent with PWS, further supporting our genetic and functional findings.
Interpretation: We identified a novel form of syndromic obesity due to recessive mutations in SREK1 associated with clinical and molecular disturbances paralleling those seen in PWS.

Conflict of Interest: None Disclosed

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GC3.138

Are associations of adulthood overweight/obesity with mortality and incident cardiovascular disease and obesity-related cancer modified by comparative body weight at 10 years in the UK Biobank study?

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Introduction: Adulthood obesity is a major public health concern. Risk stratification for related diseases might be possible by asking adults simple questions (e.g., where you are thinner or plumper than average child) but evidence is lacking to support such a clinical recommendation because most studies do not explicitly test for effect modification of the association of adulthood obesity with outcome(s) by child weight status. The aim of our study was to evaluate whether the associations of adulthood overweight and obesity with mortality and incident disease differ according to self-reported child body weight.
Methods: The sample comprised 191,181 men and 242,806 women aged 40-69 years at baseline in the UK Biobank prospective cohort study. The outcomes were all-cause mortality and incident cardiovascular disease (CVD), obesity-related cancer, and breast cancer. The exposure was measured BMI at baseline (categorised as normal weight, overweight, or obese) and the effect modifier was self-reported perceived body weight at age 10 years (about average, thinner, plumper). Sex-specific Cox proportional hazards regression models were developed, with adjustment for age, ethnicity, relative age voice break (males) or age at menarche (females), and comparative height at age 10 years.
Results: In both sexes, adulthood obesity (versus normal weight) was associated with higher hazards of all outcomes. However, the associations of obesity with all-cause mortality and incident CVD were stronger in adults who reported being thinner at 10 years. For example, obesity was associated with a 1.28 (1.21, 1.35) times higher hazard of all-cause mortality in men who reported being an average weight child, but among men who reported being a thinner child this estimate was 1.63 (1.53, 1.75). On the HR scale, the difference between these two estimates was 1.28 (1.17, 1.40). Except for incident CVD in females, there was also evidence that the associations of obesity with all-cause mortality and incident CVD were stronger in adults who reported being plumper at 10 years. In women, adulthood overweight was associated with higher hazards of obesity-related cancer in the average and thinner childhood groups, but in the plumper group it was associated with a 0.92 (0.76, 1.12) times lower hazard. For incident breast cancer, there was no evidence that associations differed between the three comparative weight at 10 years groups.
Conclusions: Adulthood overweight and obesity may confer greater risks for all-cause mortality and incident CVD among individuals who perceive themselves to have been a thinner or plumper than average child. Asking adult patients whether they were about average, thinner, or plumper as a child may help with risk stratification for some, but not all, diseases.

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GC3.139

Childhood weight trends in Bergen, Norway (2010-2022): Analysis of overweight, obesity, and severe obesity using data from routine child healthcare

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Aims: To estimate the prevalence of childhood overweight, obesity and severe obesity and analyse pre-pandemic trends (2010-2019). Additionally, to evaluate if prevalence during the COVID-19 pandemic (2020-2022) diverged from pre-pandemic predictions.
Methods: Height and weight measurements were extracted retrospectively from routine health care records from Bergen municipality in Norway of children aged 2, 4,6, 8 and 13 years. Overweight (including obesity), obesity (including severe obesity) and severe obesity were classified according to the International Obesity Task Force (IOTF) cut-offs. Pre-pandemic trends were estimated using linear regression. Prevalence during the pandemic years (2020-2022) was compared against the prevalence and 95% prediction interval predicted from the pre-pandemic linear regression model.
Results: A total of 181,527 scheduled visits from 78,024 children were included. In boys there was an overall decrease in the prevalence of overweight across all age groups between 2010-2019, statistically significant only in 4- and 13-year-old boys. In girls, we found no significant trends. During the pandemic, the prevalence of overweight exceeded the prediction interval in boys at ages 4, 6 and 8, and at age 6 in girls.
Conclusion: Boys, but not girls, showed a decreasing prevalence in overweight from 2010 to 2019. Trends were less prominent for obesity and severe obesity. During the pandemic, overweight and obesity increased, especially among boys compared to girls in some age groups.

GC3.140

The circadian distribution of energy intake and physical activity and its associations with weight status in Portuguese children and adolescents from the National Food, Nutrition and Physical Activity Survey 2015–2016

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Introduction: The circadian distribution of energy intake (EI) and physical activity (PA) has been implied in obesity risk. However, knowledge in paediatric age is scarce.
Methods: We aimed to derive EI and PA patterns and to assess their association with weight status in 714 participants aged 6-14 years from the Portuguese National Food, Nutrition and Physical Activity Survey 2015-2016. Using objective anthropometric measurements and the World Health Organization's z-scores for body mass Index (zBMI) cut-offs, weight status was defined as Underweight or normal weight (<+1SD) and Overweight or obesity (≥+1SD). Using 2-day food diaries/24-hour recalls and 4-day PA diaries, we obtained the reported clock times and EI (kcal) of eating occasions and the PA intensity (metabolic equivalents of task (METs)-hours) of activities. Based on the daily average proportion of total daily EI (%TEI)/PA intensity within 2-hour increments from 00h00 until 23h59, EI and PA patterns were derived by hierarchical and K-means cluster analysis, respectively. The association between EI and PA patterns and Overweight or obesity, was assessed separately using logistic regressions, adjusted for sex, age, parental education, diet quality and sports practice. Results are expressed as Odds-ratio (OR) and 95% Confidence Intervals (CI).
Results: Three EI patterns emerged with %TEI peaks at different 2-hour intervals: 1) "Early afternoon (12:00-14:00) & Early Evening (18:00–20:00); 2) "Early afternoon & Late evening (20:00-22:00)" and 3) "Late morning (10:00-12:00), Early and Mid-afternoon & Late evening". Peaks of %TEI were around 24-27% for Patterns 1 and 2 and around 15% for Pattern 3. Pattern 3 also achieved 50% and 75% of TEI earlier in the day. Pattern 3 (10% of the sample), compared to Pattern 1 (20%) was negatively associated with Overweight or obesity [OR=0.49; 95%CI:0.26, 0.92)]. Two PA patterns were identified: 1) "Late Morning, Late afternoon & Early evening"(36% of the sample) and 2) "Late afternoon". The PA Pattern 2 vs. 1 was not associated with weight status [OR=0.94; 95%CI:0.65, 1.34)]
Conclusion: Concentrating EI towards earlier in the day compared to having a later distribution, may be negatively associated with overweight or obesity in this population. The circadian EI distribution should be further investigated as a paediatric obesity-related behaviour.

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GC4 – Adult Management and Intervention

GC4.002

The Study of How Adiposity in Pregnancy has an Effect on outcomeS (SHAPES) Cohort: a comparison of BMI and anthropometric assessment of adiposity in early pregnancy

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Introduction: Maternal obesity increases the risk of pregnancy complications. Clinical guidelines use BMI to triage antenatal obesity care. Approximately 50% of women with an BMI≥30kg/m^2 and 42% with BMI 25.0-29.9kg/m^2 develop pregnancy complications usually associated with obesity. We hypothesise that measurements assessing amount and

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distribution of adipose tissue may be better at predicting obesity-related pregnancy risk than BMI and could be used to triage high-risk care. The SHAPES cohort explores if ultrasound and anthropometric measures are better at predicting risk of obesity-related pregnancy complication than BMI (ISRCTN82185177). This interim analysis compares the distribution of these measures across maternal BMI categories.

Methods: This on-going study has recruited 1139 participants to date (April 2022-January 2024). Pregnant women have ultrasound measurements of abdominal and preperitoneal visceral and subcutaneous adipose tissue (VAT/SAT) and anthropometric measurements following ISAK protocols (height, weight, circumferences [waist, hip, neck, mid-upper arm], and skinfolds [subscapular, triceps, biceps, iliac crest, supraspinale]) in their first trimester. Data will be linked to electronic patient records to explore prognostic performance of these measurements compared with BMI for pregnancy outcomes usually associated with obesity. This interim analysis explored patterns in all measurements across BMI categories using one way ANOVA. Alternative exploratory risk category distributions analyses were conducted for BMI and anthropometric measures with agreed risk cut-offs: waist circumference (WC<80cm), waist-height ratio (WHtR<0.5), and waist-hip ratio (WHR<0.8).

Results: There was an increase in all ultrasound and anthropometric measurements as BMI categories increased from underweight to class 3 obesity ($p<0.01$). For example, mean WC increased from 66.3cm (SD 6.2) for underweight BMI to 115.8cm (SD 10.7) for class 3 obesity; preperitoneal VAT from 6.2mm (SD 2.3) to 18.4mm (SD 5.2). Most measures demonstrated a linear association with increasing adiposity and increasing BMI category. There were women with a recommended BMI who had "increased risk" measurements for WC (17.5%), WHtR (12.9%), and WHR (23.1%), Table 1. These patterns were observed for overweight BMI to a higher degree (WC 84.9%, WHtR 74.6%, WHR 46.8% respectively). No women with a BMI≥30kg/m^2 had a "low risk" WC or WHtR, but 34.1% did for WHR (obesity classes 1-3 combined).

Conclusion: Despite an overall trend towards increasing adiposity with increasing BMI category, there are women in this cohort who would be classified as having different levels of obesity-related risk using different anthropometric measures. This is most marked for women with an overweight BMI who have high levels of abdominal adiposity and currently do not receive any additional antenatal care, as guidelines are based on BMI. Final analysis of the SHAPES cohort will compare all ultrasound and anthropometry measurements with BMI to assess their risk prediction performance, and whether measures that outperform BMI are more cost-effectiveness compared with routine antenatal care.

GC4.003

Obesity-associated gut microbiota and its impact on the metabolome

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Introduction: Dysregulation in the composition and function of the intestinal microbiota (dysbiosis) significantly affects human metabolic health and influences the appearance of certain diseases, including obesity. However, it is still unclear which species represent a greater or lesser risk of developing obesity, as well as the impact of these species on our metabolic health. Therefore, our objective was to perform an integrative study combining physiological and -omics (metagenomics and metabolomics) data from a Spanish population to understand the mechanisms by which these microorganisms are involved in the development of obesity.

Methods: The 361 Spanish volunteers from the Obekit study (65 participants with normal weight, 110 with excess of weight and 186 with obesity) were classified according to an obesity (OB) index, in LOW or HIGH level of obesity, according to three variables: body mass index (BMI), fat mass, and waist circumference. Sequencing of the V3-V4 region of the 16S rRNA gene from fecal samples was performed, and differential abundance for families, genera and species was analysed using ALDEx2 R package. Untargeted metabolomics analysis in plasma samples of individuals from the HIGH and LOW obesity index was performed, and principal component analysis (PCA), partial least squares-discriminant analysis (PLS-DA) and volcano plot were carried out for the pattern recognition and characteristic metabolites identification.

Results: Individuals with HIGH OB index were characterized by a reduction in the abundance of Christensenella minuta and the enrichment in the levels of Parabacteroides helcogenes and Campylobacter canadensis species. These two later significantly associated with higher BMI, fat mass and waist circumference in men. Interestingly, the species Prevotella micans, Prevotella brevis and Prevotella sacharolitica were significantly associated with higher BMI, fat mass and waist circumference in women, but not in men. Untargeted metabolomics analyses of serum samples demonstrated differential abundance of certain metabolites, especially bioactive phospholipids and sphingolipids, between individuals with LOW and HIGH OB index.

Conclusions: Our study reveals the involvement of gut microbiota dysbiosis in the onset and development of obesity, with differences between sexes, which might affect the metabolism of different bioactive molecules

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Tab. 1. Patterns in "low risk" and "increased risk" category distribution for BMI, WC, WHtR and WHR.

		Underweight BMI (<18.5kg/m^2, n=19)*	Recommended BMI (18.5-24.9kg/m^2, n=451)*	Overweight BMI (25.0-29.9kg/m^2, n=346)**	Class 1 Obesity BMI (30.0-34.9kg/m^2, n=195)**	Class 2 Obesity BMI (35.0-39.9kg/m^2, n=75)**	Class 3 Obesity BMI (≥40.0kg/m^2, n=53)**
WC	<80.0cm*	19 (100%)	372 (82.5%)	52 (15.0%)	0	0	0
	80.0-88.0cm**	0	73 (16.2%)	196 (56.6%)	20 (10.3%)	0	0
	>88.0cm**	0	6 (1.3%)	98 (28.3%)	175 (89.7%)	75 (100%)	53 (100%)
WHtR	<0.5*	19 (100%)	393 (87.1%)	88 (25.4%)	0	0	0
	>=0.5**	0	58 (12.9%)	258 (74.6%)	195 (100%)	75 (100%)	53 (100%)
WHR	<0.80*	16 (84.2%)	347 (76.9%)	184 (53.2%)	71 (36.4%)	19 (25.3%)	20 (37.7%)
	0.81-0.85**	3 (15.8%)	77 (17.1%)	100 (28.9%)	69 (35.4%)	16 (21.3%)	8 (15.1%)
	0.86 +**	0	27 (6.0%)	62 (17.9%)	55 (28.2%)	40 (50.3%)	25 (47.2%)

Abbreviations: WC - waist circumference; WHtR - waist to height ratio; WHR - waist to hip ratio. Notes: * Categories deemed to be "low risk" from adiposity; ** Categories deemed to be at "increased risk" from adiposity.

present in the metabolome. This study reveals the importance of integration of metagenomics and metabolomics for the study of the mechanisms involved in the development of metabolic diseases such as obesity, which might represent valuable information for the development of nutritional precision strategies for weight loss.

GC4.004

Effects of a VLCKD on body composition and gut microbiota in people with overweight with or without IBS

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Introduction: Obesity, a risk factor for many non-communicable diseases, can also arise from factors like gut microbiota imbalance (dysbiosis) [1]. The gut microbiota mainly comprises Firmicutes, Bacteroidetes, Proteobacteria, Actinobacteria, and Verrucomicrobia [2]. Dysbiosis is linked to both obesity and irritable bowel syndrome (IBS), a chronic gut-brain axis disorder [3]. The very low-calorie ketogenic diet (VLCKD) has been proposed to treat obesity [4]. This study evaluates VLCKD's effects on the gut microbiota and gastrointestinal symptoms in people with obesity (PWO), with or without IBS.
Methods: At T0, 31 PWO were enrolled in the study following consultations with nutritionists, endocrinologists and gastroenterologists. They followed their regular diet for 7 days (T1) and then a VLCKD for 28 days (T2), consisting of less than 800 kcal/day, with 30 g carbohydrate, 20 g lipids, and 1.2-1.5 g protein/kg ideal body weight per day. The diet included meal replacements, mineral supplementation, and at least 2 liters of water per day. At T1 and T2 anthropometric and body composition parameters were measured and participants received food diaries to assess food intake, FAST questionnaires for IBS symptoms assessment and a Wellmicro® Gut Test Plus kit to analyze fecal samples. Statistical significance was set at $p<0.05$.
Results: Out of the 31 participants enrolled, 25 completed the study (13 with IBS). At T2, there was a significant decrease in body weight, body mass index (BMI - kg/m^2), and fat mass, and an increase in body water and fat-free mass ($p<0.05$) in all participants compared to T1. Fiber and protein intake increased ($p<0.05$) while lipid consumption decreased ($p<0.0001$). No food intake differences were noted between the whole group and IBS subgroup at T1. In the IBS subgroup, abdominal pain and bloating improved ($p<0.05$). Gut microbiota showed increased species diversity, decreased Firmicutes and Actinobacteria, and increased Bacteroidetes and Verrucomicrobia ($p<0.05$). Bacteroides, Parabacteroides, and Akkermansia increased, while Streptococcus, Dorea, Bifidobacterium, Roseburia, and Ruminococcus decreased ($p<0.05$). Prevotella decreased only in the IBS subgroup ($p<0.05$). Functional and metabolic parameters like Butyrate, Lactate, Indole propionic Acid, and the Gut-Brain Axis decreased ($p<0.05$), while Propionate, GABA, Vitamin K, and the Proteolytic Index increased ($p<0.05$). Glucose homeostasis declined only in the IBS subgroup ($p<0.05$).
Conclusions: The study confirms VLCKD's effectiveness in reducing body weight, BMI, and altering body composition in PWO. It also shows VLCKD's positive impact on modulating gut microbiota and relieving IBS symptoms like abdominal pain and bloating, suggesting its promise in nutritional management of obesity with/without IBS.

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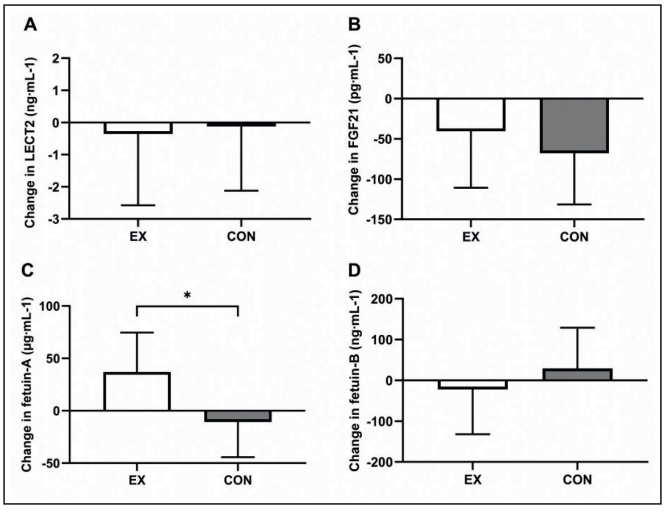
GC4.006

The impact of six weeks of moderate-intensity exercise training on circulating hepatokine concentrations in men with MASLD and impaired glycaemic regulation

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Introduction: Leukocyte cell-derived chemotaxin 2 (LECT2), fibroblast growth factor 21 (FGF21), fetuin-A, and fetuin-B are liver-secreted proteins (hepatokines) which are upregulated in metabolic dysfunction-associated steatotic liver disease (MASLD) and function as mediators of multi-organ metabolic homeostasis. Exercise training may be able to modulate hepatokine production, however, the impact in populations with MASLD and glycaemic dysregulation (including prediabetes and type 2 diabetes) requires further investigation. This study examined the effects of



Data are presented as adjusted mean changes and 95% confidence intervals. All analyses were adjusted for ethnicity and baseline value of the outcome. *Indicates P = 0.037.

Fig. 1. Change in plasma leukocyte cell-derived chemotaxin 2 (LECT2; A), fibroblast growth factor 21 (FGF21; B), fetuin-A (C) and fetuin-B (D) after the six-week exercise training (EX; n = 11) and control (CON; n = 13) interventions.

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Tab. 1. Pre- to post-intervention changes and the intervention effects (exercise training minus control) after the six-week intervention period.

	Pre- to post-intervention change (95% CI)	Pre- to post-intervention change (95% CI)	Intervention effect		
	EX (n = 11)	CON (n = 13)	EX minus CON	P-value	Effect size (d)
Body weight (kg)	-1.1 (-2.1, 0.0)	-0.4 (-1.3, 0.6)	-0.7 (-2.0, 0.6)	0.273	0.40
Liver PDFF (%)	-2.0 (-5.0, 1.0)	0.2 (-2.5, 3.0)	-2.2 (-6.2, 1.6)	0.257	0.45
HbA1c (mmol/mol)	-0.3 (-2.1, 1.5)	0.3 (-1.2, 1.9)	-0.6 (-2.8, 1.5)	0.538	0.23
HbA1c (%)	-0.02 (-0.19, 0.15)	0.03 (-0.11, 0.17)	-0.05 (-0.25, 0.14)	0.601	0.20
Glucose (mmol/L)	-0.8 (-1.4, -0.3)	0.2 (-0.3, 0.6)	-1.0 (-1.7, -0.3)	0.006	1.11
Insulin (pmol/L)	-23 (-65, 18)	15 (-23, 52)	-38 (-88, 12)	0.140	0.55
NEFA (mmol/L)	0.00 (-0.13, 0.14)	-0.03 (-0.15, 0.10)	0.03 (-0.13, 0.20)	0.712	0.13

Data were analysed using generalised linear models with a normal distribution and identity link function, and are presented as mean change from baseline adjusted for pre-intervention values and ethnicity with 95% CI. CON, control; EX, exercise training; HbA1c, glycated haemoglobin; NEFA, non-esterified fatty acids; PDFF, proton density fat fraction.

six weeks of moderate-intensity exercise training on circulating hepatokine concentrations in men with MASLD and impaired glycaemic regulation.
Methods: Twenty-six men with MASLD and impaired glycaemic regulation (mean±SD: age, 60.1±9.0 years; BMI, 34.0±4.1 kg·m^{-2}; liver proton density fat fraction [PDFF], 17.6±7.2%; glycated haemoglobin [HbA1c], 54±10 mmol·mol^{-1}) were randomly assigned to a six-week moderate-intensity aerobic exercise training intervention (EX; four weekly sessions of brisk walking and cycling exercise at 70-75% estimated max heart rate; n=13) or non-exercise control (CON; usual lifestyle habits; n=13). Fasting plasma concentrations of LECT2, FGF21, fetuin-A and fetuin-B were measured before and after the interventions. Changes in body weight, liver PDFF (via proton magnetic resonance spectroscopy), and other circulating biomarkers (HbA1c, glucose, insulin and non-esterified fatty acids [NEFA]) were also assessed. Differences in responses to the two interventions were assessed using generalised linear models, while associations between changes in circulating hepatokine concentrations and changes in other outcomes were explored using Pearson's correlation coefficient.
Results: Twenty-four participants completed the study (n=11 for EX, n=13 for CON) with 96% adherence to the exercise training sessions. Compared to CON, plasma fetuin-A concentrations were increased after EX (P=0.037; ES=0.76; Figure 1C), whereas plasma concentrations of LECT2, FGF21 and fetuin-B were unchanged (Figure 1A,B,D). Fasting plasma glucose concentrations were reduced after EX vs. CON (P=0.006; ES=1.11; Table 1), while changes in body weight, liver PDFF, and the other circulating biomarkers were not different between the two interventions (Table 1). ΔFGF21 and Δfetuin-A were inversely associated with Δglucose (r≥-0.404; P≤0.050), while ΔFetuin-A was also positively associated with ΔNEFA (r=0.575; P=0.003).
Conclusion: In the absence of significant body weight and liver PDFF reductions, short-term exercise training increases circulating fetuin-A concentrations but does not alter circulating concentrations of LECT2, FGF21 and fetuin-B. While the increase in fetuin-A may be related to NEFA metabolism, greater changes in liver PDFF and/or body weight may be required to modulate the other hepatokines.

Conflict of Interest: None

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GC4.007

Exercise Reduces Chronic Low-grade Inflammation in Adults with Obesity After Weight Loss: A Randomized Clinical Trial

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Background: Excessive fat accumulation in adipose tissue leads to chronic low-grade inflammation, illustrated by chronically elevated levels of proinflammatory cytokines, which contribute to the pathogenesis of metabolic disorders such as diabetes and atheroschlerosis. Exercise can reduce the risk of obesity-related complications. GLP-1 receptor agonists (GLP-1 RA) effectively reduce obesity and related disorders. We hypothesize that exercise and GLP-1 RA reduce chronic low-grade inflammation in individuals with obesity.
Methods: One hundred ninety-five adults with obesity without diabetes (body mass index 32-43 kg/m^2) were enrolled in a randomized, double-blinded, placebo-controlled trial. Participants completed an 8-week low-calorie diet, which led to a weight loss of 13.1 kg and were subsequently randomized 1:1:1:1 to a 52-week intervention period with either placebo, exercise (of moderate-to-vigorous intensity assessed by heart rate), liraglutide (3 mg/day) or a combination of both exercise and liraglutide treatment to maintain the weight loss. Blood samples were collected before (week -8) and after (week 0) the low-calorie diet and after the 52-week intervention period (week 52). Changes in the inflammatory cytokines IL-2, IL-6, IL-8, IL-10, IFN-γ, and TNF-α were measured in plasma by Meso Scale Discovery multiplex. The primary endpoint was change in inflammatory markers from after the low-calorie diet (week 0) to after one year of intervention (end-of-trial, week 52).

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Results: The placebo group regained body weight, the exercise and liraglutide groups maintained the weight loss, and the combination group further reduced body weight during the one year intervention. During the low-calorie diet intervention, TNF-α levels increased by 8.4% (95% CI: -55.2% to -7.6%; P<0.001) and IL-10 levels increased by 11.7% (95% CI: 2.2% to 22.0%; P=0.01). The other cytokines showed no significant changes after the dietary intervention. In the 52-week intervention period, the exercise group reduced IL-6 by 31.9% (95% CI, -42.6% to -19.2%; P=<0.001) and 18.9% (95% CI, -33.2% to -7.6%; P=0.03) compared to week 0 and placebo, respectively. The liraglutide and combination groups decreased IL-6 by 17.3% (95% CI, -30.4% to -1.8%; P=0.03) and 19.9% (95% CI, -31.5% to -6.3%; P=0.006), respectively, compared to week 0 but did not differ significantly compared to placebo. The exercise group also reduced IFN-γ by 36.6% (95% 95 & CI -51.8% to -16.6%; P<0.001) and 37.2% (95% CI, -57.4% to -7.6%; p=0.02) compared to week 0 and placebo, respectively. There were no changes in IFN-γ in the placebo, liraglutide, or combination groups. No significant differences were observed between the groups in the plasma concentrations of IL-2, IL-8, IL-10, and TNF-α.
Conclusion: Exercise was the most effective strategy to reduce chronic low-grade inflammation. Liraglutide treatment did not reduce inflammation more than placebo, and adding liraglutide to exercise did not reduce inflammation further. These findings emphasize the benefits of moderate-to-vigorous intensity physical activity in reducing the low-grade inflammation of obesity.
Clinicaltrials.gov registration NCT04122716

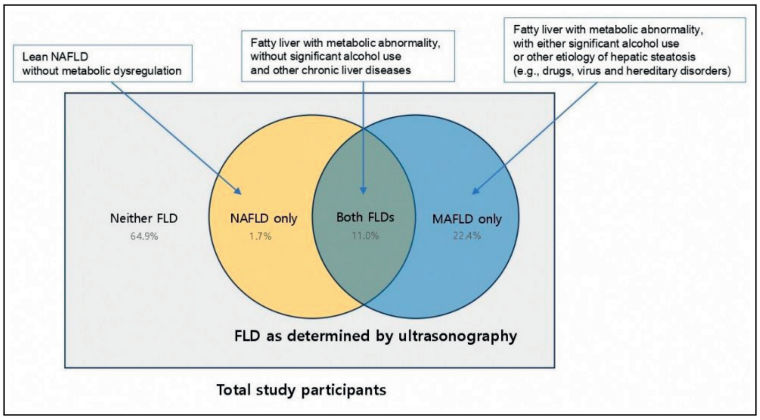
GC4.008

MAFLD Outperforms NAFLD in Distinguishing People with Sarcopenia and Compromised Muscle Quality

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Introduction: In 2020, a concept of metabolic dysfunction–associated fatty liver disease (MAFLD) was introduced as an alternative to nonalcoholic fatty liver disease (NAFLD). We aimed to assess the quantity and quality of skeletal muscle using each of these diagnostic classifications.
Methods: This cross-sectional study included 19,095 participants. The participants were classified into four categories: neither FLD, NAFLD only, MAFLD only, or both FLDs. An appendicular skeletal muscle mass adjusted for body mass index <0.789 for men and <0.512 for women was defined as sarcopenia. The total abdominal muscle area (TAMA) at the L3 vertebral level was segmented into normal-attenuation muscle area (NAMA), low-attenuation muscle area (LAMA), and inter/intra-muscular adipose tissue (IMAT). Myosteatosis was defined by a T-score < -1.0 of



NAFLD, non-alcoholic fatty liver disease; MAFLD, metabolic dysfunction-associated fatty liver disease; FLD, fatty liver disease.

Fig. 1. Grouping of study participants according to the presence of FLD and the diagnostic criteria for NAFLD and MAFLD.

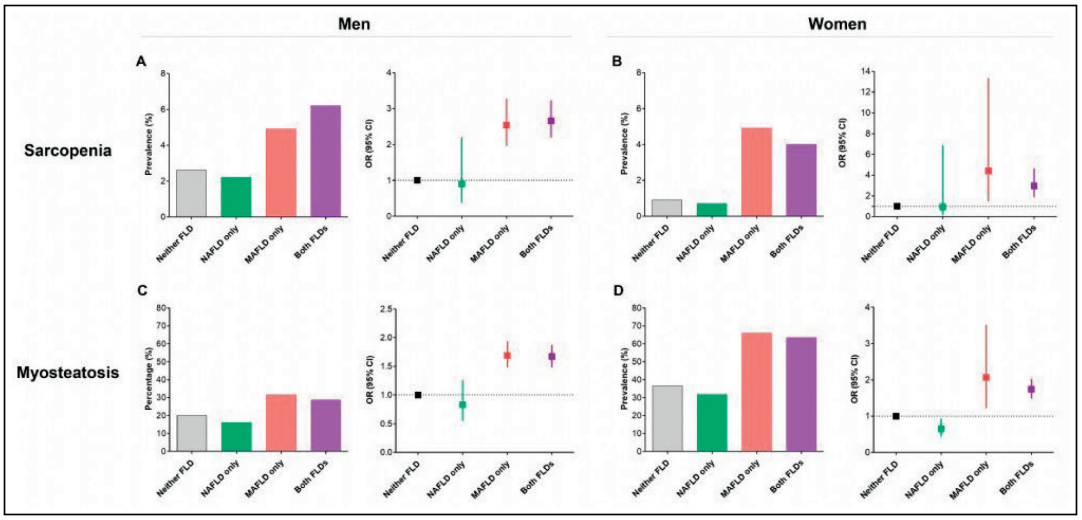


Fig. 2. Summarized figure for the association between FLD and muscle mass and quality. (A) Prevalence and (B) ORs for having sarcopenia according to the presence of FLD. (C) Prevalence and (D) ORs for having myosteatosis according to the presence o.

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the NAMA/TAMA index, which was calculated by dividing the NAMA by the TAMA and multiplying by 100.
Results: Using people with neither FLD as a reference, the multivariable-adjusted odds ratios (ORs) (95% confidence intervals [CI]) for sarcopenia were 2.54 (1.96–3.28) in those with MAFLD only, 2.66 (2.19–3.23) in those with both FLDs, and 0.90 (0.37–2.21) in those with NAFLD only. The ORs for myosteatosis was also elevated in the MAFLD groups, with an OR (95% CI) of 1.95 (1.72–2.21) in people with MAFLD only and 1.66 (1.52–1.82) in those with both FLDs, while the risk was not significant in people with NAFLD only (0.62 [0.45–0.84]).
Conclusion: Employing the MAFLD concept rather than NAFLD proved to be more effective in distinguishing individuals with reduced muscle mass and compromised muscle quality.

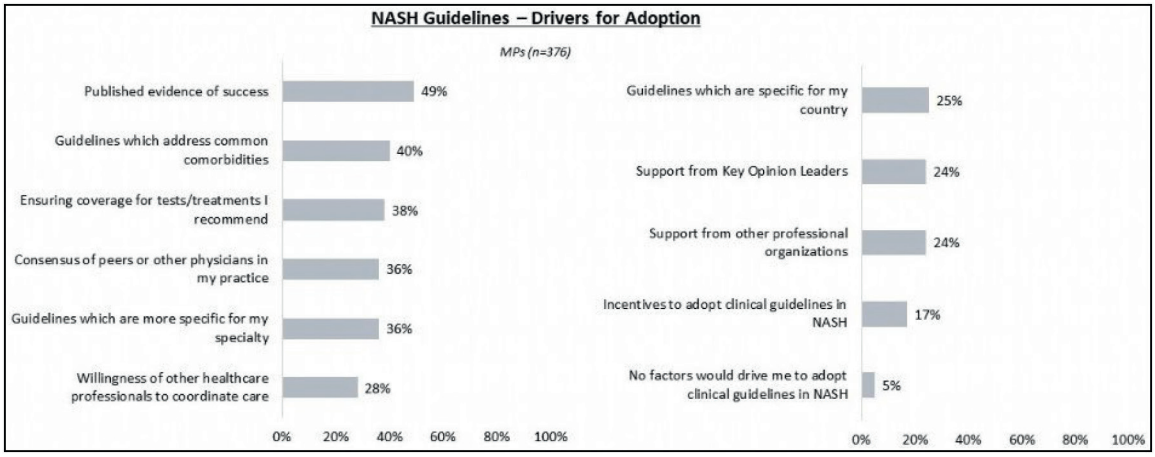
GC4.009

BARRIERS-MASLD: Using a Multi-country Survey to Understand Diagnosis and Treatment Patterns for Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD) among Metabolically Focused Physicians in Europe

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Introduction: Metabolic dysfunction-associated steatotic liver disease (MASLD) and its more severe form, metabolic dysfunction-associated steatohepatitis (MASH), are increasingly prevalent; MASH is estimated to affect 38% of people living with obesity. Guidelines recommend that high-risk groups, such as those with type 2 diabetes (T2D) and obesity, are screened for MASLD and MASH using non-invasive tests, are referred to hepatologists when appropriate, and receive optimal treatment and care. This study aimed to understand the patterns of screening, diagnosis, and treatment for patients with MASLD and MASH, including implementation of clinical guidelines.
Methods: From March to September 2023, a real-world, cross-sectional study was conducted in France, Germany, Italy, Spain, and the United Kingdom among endocrinologists, general practitioners, family physicians, and internal medicine physicians. Each participant was actively managing at least 30 patients with T2D and/or obesity per month; this group is collectively termed "metabolically focused physicians (MPs)." MPs completed an anonymous online survey or participated in qualitative interviews as part of the broader study. Descriptive statistics were used to analyse the data.
Results: Among 376 MPs in the quantitative phase, respondents cared for an average of 118 patients per month with or suspected to have MASLD/MASH, 54% of whom had obesity, 46% had dyslipidaemia, and 43% had T2D. The presence of patient comorbidities was considered the most influential factor in MPs' approach to both diagnosing (60%) and treating (69%) MASH. Most MPs (67%) considered the presence of MASH to be highly impactful in how they manage patients with obesity. Most MPs reported using ultrasound (79%), lipid levels (73%), or liver function tests (64%) to profile patients suspected of MASH and liver stiffness measurement by vibration-controlled transient elastography (52%), ultrasound (49%), and liver biopsy (47%) to confirm a MASH diagnosis. When asked about approaches to treating obesity when MASH is present, 62% of MPs agreed that they are more likely to recommend lifestyle changes that focus on exercise, while 61% of MPs agreed that they are more likely to use a GLP-1 RA. Almost half (47%) of MPs would recommend a prescription weight-loss medication for patients with MASH and obesity. MPs were aware of guidelines from American Diabetes Association (ADA) (34%) and/or ADA/European Association for the Study of Diabetes (EASD) Consensus 2022 (28%). However, 16% of MPs were not aware of any clinical guidelines for MASH. Factors that would most drive MPs to adopt clinical guidelines are shown in Figure 1. Of 25 MPs who participated in the qualitative interviews, 8 had heard about the new MASLD/MASH nomenclature, 13 said the new nomenclature did not change how they practice, and 8 said they will start using the new terms once they become adopted by peers.
Conclusion: This study indicates a need to increase awareness of clinical guidelines to assist metabolically focused physicians with diagnosing and treating patients with MASH, particularly in high-risk groups with cardiometabolic comorbidities.



Factors that would drive most metabolically focused physicians to adopt clinical guidelines for MASLD/MASH.

Fig. 1. Caussy_BARRIERS-MASLD_Factors that contribute to clinical guideline adoption.

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GC4.010

The Impact of Gastric Sleeve Surgery on the Relationship Between Adiponectin and Regional Fat Mass

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Introduction: Adipose tissue is primarily composed of adipocytes and secretes various factors, including adiponectin. It is well-known that adiponectin is found in low concentrations in individuals with obesity, and weight loss leads to an increase in its levels. However, the relationship between adiponectin and parameters of body composition before and after bariatric surgery remaind insufficiently elucidated. This study aimed to evaluate the relationship between adiponectin and regional fat mass before and after sleeve gastrectomy.
Methods: This study enrolled a total of 84 patients who underwent gastric sleeve surgery, consisting of 43 women and 41 men, with a mean BMI of 42.23±5.12 kg/m^2 and a mean age of 40.76±10.25 years. Dual-energy X-ray absorptiometry (DXA) whole-body scans were conducted both before and 12 months after the gastric sleeve procedure. Measurements included total fat mass (TFM), android fat mass (AFM), gynoid fat mass (GFM), as well as total lean mass, android lean mass, and gynoid lean mass. The percentage change in body composition from baseline was calculated using the formula: ((baseline measure - current measure)/baseline measure) x 100. Plasma adiponectin levels were assessed using an ELISA kit (DRG Instruments, Germany).
Results: At baseline evaluation, women had higher adiponectin levels compared to men (22.95(15) mg/dl vs. 14.24 (10.05) mg/dl, p<0.001). Preoperatively, we observed a positive correlation between adiponectin levels and GFM (r=0.217, p<0.05), while a negative correlation existed with AFM (r=-0.290, p<0.05). At 12 months postoperatively, adiponectin increased at a value of 36.92(24.20) mg/dL, with the difference between women and men remaining statistically significant (40.30 (25.90) mg/dL vs. 32.44 (23.63) mg/dL, p<0.01). The negative correlation with AFM was maintained (r=-0.440, p<0.001). To determine whether fat mass or lean mass are independent predictors of adiponectin variation after gastric sleeve, we performed a multiple linear regression, introducing the following variables into the model: age, gender, initial weight, %GFM preoperative-12 months, %AFM preoperative-12 months, %TLM preoperative- 12 months, total weight loss (TWL%). We applied a stepwise method, demonstrating that %AFM preoperative-12 months is an independent predictor of adiponectin variation, a parameter that could explain 26% of the changes.
Conclusion: Weight loss following gastric sleeve surgery is associated with increased levels of adiponectin, and a more pronounced reduction in android fat mass leads to a greater increase in adiponectin.

GC4.011

Dietary intake of nutrients 5 years after gastric bypass vs. sleeve gastrectomy - an RCT

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Introduction: Bariatric surgery induces significant weight loss; however, a healthy nutrient intake is important to prevent weight regain and nutrient deficiencies after surgery. Few studies have compared long-term changes in nutrient intake after Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). We aimed to compare intake of macro- and micronutrients at 5 years, and changes in intake of nutrients from baseline to 5 years, after RYGB vs. SG.
Methods: The Oseberg study is a clinical RCT primarily aimed at comparing the effects of RYBG and SG on remission of type 2 diabetes in patients with severe obesity. Nutrient intake assessed with an interview based food frequency questionnaire was a predefined secondary outcome. Five-year estimates- and between-group changes in intake of nutrients from baseline to 5 years were assessed with linear mixed models.
Results: The study included 109 patients (95% White, 66% women), mean (SD) age 47.7 (9.6) years and BMI 42.3 (5.3) kg/m^2, allocated to RYGB (n=54) or SG (n=55). The RYGB-group had a significantly greater 5-year percentage total body weight loss compared with the SG-group (estimated mean [95% CI]: 22.2 [20.3, 24.1]% vs. 17.2 [15.3, 19.1]%). Self-reported daily total energy intake at 5 years, and change in total energy intake during follow-up, were similar in the RYGB- vs. SG group (1818 [1564, 2071] kcal vs. 1704 [1442, 1967] kcal) and (-782 [-1057, -508] kcal vs. -1098 [-1381, -815] kcal). The percentage of energy intake from carbohydrates (~40%), protein (~18%) and fat (~37%) were similar in the two groups at 5 years, and the percentage of patients consuming ≥60 g protein daily did not differ between the RYGB vs. SG group (82% vs. 71%). Fiber intake was 4.6 [1.2, 8.0] g higher in the RYGB-group compared with the SG-group at 5 years. Fiber intake decreased during follow-up in both groups, and the percentage of patients with a fiber intake of ≥25 g/d at 5 years was significantly higher in the RYGB group than in the SG-group (59% vs. 29%, p=0.008). Alcohol intake was similar in the RYGB- vs. SG-group at 5 years (5.1 [3.3, 6.9] g/d vs. 2.8 [1.0, 4.7] g/d). There was a significant increase in alcohol intake during follow-up in the RYGB-group, but not in the SG-group (between-group difference in change: 2.7 [0.02, 5.3] g/d). Intake of micronutrients (diet and supplements) did not differ between the RYGB vs. SG-group at 5 years (iron: 36.5 [26.0, 47.0] mg vs. 21.7 [10.8, 32.7] mg, vitamin D: 27.3 [22.5, 32.0] mg vs. 27.0 [22.0, 32.0] mg and calcium: 1620 [1398, 1842] mg vs.1493 [1262, 1724] mg). The percentage of patients taking the recommended supplementation was higher in the RYGB vs. SG-group for iron (40% vs. 11%, p=0.002), and calcium (85% vs. 65%, p=0.03), but did not differ for vitamin D (87% vs. 72%).
Conclusions: Considering the current dietary guidelines, intakes of protein and fiber, were inadequate after both surgical procedures, but particularly after SG. Our findings suggest that health care providers and patients should focus on sufficient intake of fiber, protein and vitamin and mineral supplementation after RYGB and SG and pay attention to alcohol intake after RYGB.

GC4.012

Pragmatic vitamin and micronutrient supplementation strategy after bariatric surgery

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Introduction: Bariatric surgery (BS) induces nutritional deficiencies, not all of which are corrected by multivitamin tablets. Most expert guidelines recommend systematic and early addition of other minerals and vitamins after malabsorptive surgery, including vitamin B12, iron, calcium and vitamin D, but supporting data are few and compliance with a large number of tablets is low. Conversely, some experts suggest stopping vitamin supplementation 1 year after restrictive surgery but the long-term needs remain uncertain. Our aim was to study whether pragmatic supplementation based on biological assays is sufficient to avoid nutritional deficiencies after the 2 most commonly performed procedures, Roux-en-Y gastric bypass (RYGB) and vertical sleeve gastrectomy (VSG).
Methods: 313 consecutive patients (179 RYGB / 134 VSG; 86% women, mean age 52 years, IMC 43 kg/m²) who underwent a nutritional assessment, before and at 6, 12, 36 months after BS, recorded in our prospective database, were studied. Multivitamin tablets were systematically

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prescribed after BS and additional supplements were introduced following a standardized protocol in case of deficiency (value lower than laboratory standard).

Results: Weight loss at 3 years was significantly higher after RYGB (33 vs 28% after VSG, p< 0.001). Most of the patients (95%) were taking multivitamin tablets at 6 months, with no difference between procedures, whereas at 3 years only 41% were taking them after VSG compared to 93% after RYGB (p < 0.001). Less than 10% of patients were taking additional supplements in both groups at 6 months, but the need increased over time and at 3 years patients were taking more supplements after RYGB than after VSG (calcium, iron, vitamin B12 and others, 60 vs 39 %, p< 0.01). This was particularly significant for vitamin B12 supplements (23 vs 5 %, p< 0.001), while vitamin D supplementation increased in both group (44 vs 37%, Ns). The mean number of deficits was slightly higher after RYGB at 6 months (4 vs 2.7, p < 0.001) but not at 3 years (3.7 vs 3.4, Ns). The most frequent deficiencies at 3 years were in vitamin D (72%), zinc (50%), iron (35%), vitamin A (28%) and PP (21%), but most were moderate with little difference between procedures. Severe anemia was rare (3.5%), but secondary hyperparathyroidism was more frequent after RYGB (21 vs 8 %, p < 0.01). No significant differences in nutritional symptoms were observed between procedures. The most common nutritional symptom was hair loss, decreasing from 63% at 6 months to 35% at 3 years (p< 0.01), while paresthesia (12%) and cramps (10%) did not increased significantly over time, without severe neurological consequences.

Conclusion: The low frequency of severe nutritional deficits when patients are followed regularly up to 3 years after BS does not justify the systematic postoperative introduction of additional supplements according to the procedure, except maybe for the bone, but rather a personalized strategy "neither too little nor too much", adapted to biological parameters. These results need to be confirmed by long-term randomized studies to determine the best supplementation protocol for each BS procedure.

GC4.013

Rs11110415 in the Farnesoid X-Receptor, a potential predictor of breast cancer risk in women after bariatric surgery?

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Introduction: Women with obesity have an increased risk for breast cancer and studies suggest that bariatric surgery reduces this risk. The farnesoid X receptor (FXR) is a bile acid activated nuclear receptor that has been suggested as an important mediator of the effects of bariatric surgery regarding both weight loss and improvements in glucose metabolism. Furthermore, FXR expression in breast cancer tissue has been associated with tumor size and survival. Here we investigated the association between bariatric surgery and breast cancer risk in relation to FXR genotype in a prospective intervention study.

Methods: This report includes women from the Swedish Obese Subjects (SOS) study; 1420 that underwent bariatric surgery and 1447 matched controls receiving usual obesity care. Inclusion criteria were age 37-60 years and BMI >38. The Swedish Cancer Registry was used for information on breast cancer diagnosis with data up to December 31, 2020. For the initial analysis the Farnesoid X receptor was genotyped in patient DNA using seven tagging single-nucleotide polymorphisms. Genotyping of FXR was done using the TaqMan OpenArray platform.

Results: Of the seven tagging SNPs explored, the minor T allele of rs11110415 was significantly associated with breast cancer risk with 106 and 17 breast cancer events in non-carriers and carriers respectively, p-value <0.0001, withstanding Bonferroni correction with an alpha of 0.007. Rs11110415 was available for genotyping in 2515 women of which 130 were hetero- or homozygous carriers of the minor T-allele.

Further analysis showed that minor T allele carriers of rs11110415 had increased risk of breast cancer compared to non-carriers (adjusted HR=3.82 [95% CI 2.15–6.79]). When stratified into genotype, in the non-carrier strata bariatric surgery was associated with a reduced risk of breast cancer compared to usual obesity care in unadjusted analysis HR=0.64 [95% CI 0.44–0.94]), but after adjustment for BMI, age, alcohol, smoking and baseline insulin the association was no longer significant (HR=0.63 [95% CI 0.39–1.04]). In the carrier strata, there was no reduction of breast cancer risk in the surgery group compared to usual care.

Conclusion: This is the first study to explore the association between FXR and breast cancer risk in women undergoing bariatric surgery. Non-carriers of the rs11110415 T-allele experienced a reduced risk of developing breast cancer after bariatric surgery whilst carriers did not.

GC4.014

Weight Loss Outcomes in Patients with Genetic Mutations linked to Obesity: a Comparative Analysis of Surgical and Non-Surgical Approaches

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Introduction: Bariatric surgery stands out as the most efficacious intervention for obesity in adults, resulting in durable weight loss in the majority of patients. However, approximately 20% of individuals may experience insufficient weight loss, defined as less than 15-20% of the initial weight within the first year post-intervention. This phenomenon could be attributed to a genetic predisposition for obesity. Despite the wealth of literature on bariatric surgery outcomes, there is a scarcity of data in carriers of mutations linked to genetic obesity. No data are available for VLCKD effects on these patients.

Methods: The study examined 37 adult patients eligible for bariatric surgery and who met the following inclusion criteria for genetic screening: grade III obesity (BMI≥ 40 Kg/m^2), early onset obesity, multiple failed diet therapies, hyperphagia. The screening panel included genes of melanocortin system, of central neurotrofic factors/neuronal plasticity, adipose tissue development and genes linked to known syndromic human obesity (such as Prader Willi, Bardet-Biedl, Almstron, Cohen and Borjeson-Forssman-Lehmann syndrome). Sleeve Gastrectomy was performed in 13 patients, bioenteric intragastric balloon positioned in 4 patients and bariclip in one, and another single patient was submitted to an overstich on a previous gastric by pass. The remaining mutated patients followed VLCKD with medical foods and/or obesity drug treatments. Weight loss was evaluated every 3 months during multidisciplinary ambulatory checks, until one year after surgery. Data of Mutated patients (MUT) were compared to wild type patients (WT).

Results: Genetic mutations have been found in 9 patients. A single mutation in the SH2B1, LEPR, MAGEL2, and ADIPOQ gene was identified in 7

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patients, while 2 exhibited two concomitant mutations, LEPR-NTRK2 and LEPR-PCSK1 genes, respectively. The genetic analysis reveals several variants of uncertain significance (VUS). The weight loss did not show a significant difference between WT and MUT patients, ranging from a mean BMI of 43.5 Kg/m² at baseline (before intervention) to 29.9 Kg/m² at 12 months after surgery. One patient with LepRmut, who underwent a Very Low-Calorie Ketogenic Diet (VLCKD), lost 16.5 Kg (BMI: 45.2 Kg/m², starting from a BMI of 51.4 Kg/m²). The other patient with SH2B1 mutation achieved a weight loss of 38.8 Kg (BMI: 36.7 Kg/m², starting from a BMI of 50.7 Kg/m²).
Conclusion: Weight loss after bariatric surgery was comparable in the two groups of patients, irrespective of the presence or absence of genetic obesity. Bariatric surgery emerges as an effective intervention, even among patients with a genetic predisposition to obesity. Very Low-Calorie Ketogenic Diet (VLCKD) could serve as an additional therapeutic approach for patients carrying mutations linked to obesity, especially in not eligible patients. However, wider cohort studies and extended follow-up periods are required to validate and reinforce these observations. Additionally, functional assays to determine the pathological outcome of VUS are needed to provide clinical guidance regarding obesity risk and treatment options.

GC4.015

Guidance for the phased introduction of new medical therapies for weight management: A joint position statement by the Society for Endocrinology and Obesity Management Collaborative UK

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Background: Demand for medical therapies for obesity has increased. Three medications are licenced in the UK and approved by The National Institute for Health and Care Excellence (NICE) for weight loss: Orlistat, Saxenda® (Liraglutide) and Wegovy® (Semaglutide). Saxenda® and Wegovy® belong to a class of drugs called GLP-1 analogues, also used in type 2 diabetes (T2DM). Currently Saxenda® and Wegovy® can only be prescribed in secondary care Tier 3/4 services, which deliver bariatric surgery. Equitable access to these proven treatments for weight loss has been difficult to establish in the NHS because; few trusts provide Tier 3 services, referral rates are high/waiting times long, global demand for GLP-1 analogues exceeds manufacturing capacity and a National Patient Safety Alert discourages new prescriptions until at least mid-2024. Many cannot obtain stock and have resorted to purchasing privately or from abroad.
Aims: Clinicians expressed a need for guidance during phasing in of Wegovy® and future medical therapies to help prioritisation based on clinical need, prompting development of this guidance. It is aimed at healthcare professionals/organisations delivering medical therapies for people living with obesity and commissioners of weight management services. Its objectives are to ease the impact of rolling out GLP-1 analogues and future drugs for obesity on NHS resources, and offer some suggestions on the prioritisation of patients most in need of weight loss for specific medical reasons. TABLE 1 prese**n**ts a method of introducing new therapies, endorsed by All About Obesity (AAO), Association for the Study of Obesity (ASO) and British Obesity & Metabolic Surgery Society (BOMSS). Suggestions are based on similar approaches taken by bariatric surgery providers during the COVID-19 pandemic (1) and are not implementation instructions; it remains the prerogative of local providers to make decisions based on the needs of their population and available resources. It is intended that this guidance will be revised according to emerging evidence and deprecated when NHS services are able to deliver these therapies to people identified in current/future revisions to applicable NICE guidance.

Tab. 1. Clinical criteria in four phased rollout groups.

Patient cohort	Eligibility
Phase 1	Precancerous or cancerous conditions in which weight loss would improve outcomes or aid access to therapies Patients requiring urgent weight loss for organ transplant Idiopathic intracranial hypertension (IIH) requiring frequent lumbar punctures and/or with visual compromise Patients undergoing planned time-sensitive surgery (including bariatric surgery) for life-limiting conditions, where high BMI is the primary barrier to surgery and weight loss would be beneficial Weight loss required for assisted conception in women under the care of a fertility service, in cases where weight loss would be beneficial* Severe obstructive sleep apnoea (OSA), obesity hypoventilation syndrome (OHS) and/or severe asthma Proven genetic cause of obesity and not eligible for Setmelanotide (Imcivree®)
Phase 2	Living with obesity and 3 or more weight-related co-morbidities, including: • Chronic kidney disease (stages 3 or 4) • Hypertension • IIH • Metabolic dysfunction-associated steatohepatitis (MASH) • Moderate OSA • PCOS • Pre-diabetes or T2DM • Pre-existing cardiovascular disease • Restricted mobility affecting quality of life
Phase 3	Living with obesity and 2 weight-related co-morbidities, including: • Chronic kidney disease (stages 3 or 4) • Dyslipidaemia • Hidradenitis suppurativa or psoriasis • Hypertension • IIH • Metabolic dysfunction-associated steatotic liver disease (MASLD) • Mild OSA • Osteoarthritis • PCOS • Pre-diabetes or T2DM • Pre-existing cardiovascular disease • Restricted mobility affecting quality of life
Phase 4	All other eligible patients as defined in NICE Technology Appraisal 875

*Contraception is required while taking Wegovy® ahead of planned assisted conception.

General Principles:

- For many, bariatric surgery will remain the 'gold standard' weight loss intervention.
- Our suggestions may not be comprehensive; it is expected that the bariatric multidisciplinary team (MDT) will use discretion when providing advice to individuals.
- People with T2DM may be eligible for alternative GLP-1 and GLP-1/GIP analogue-based therapy, which can be considered prior to Wegovy®.
- In the UK all patients covered by the rollout phases defined below must meet the NICE criteria for use of Wegovy® as an option for weight management in adults.

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GC4.016

Serious adverse events and safety profile of semaglutide vs placebo in the SELECT study

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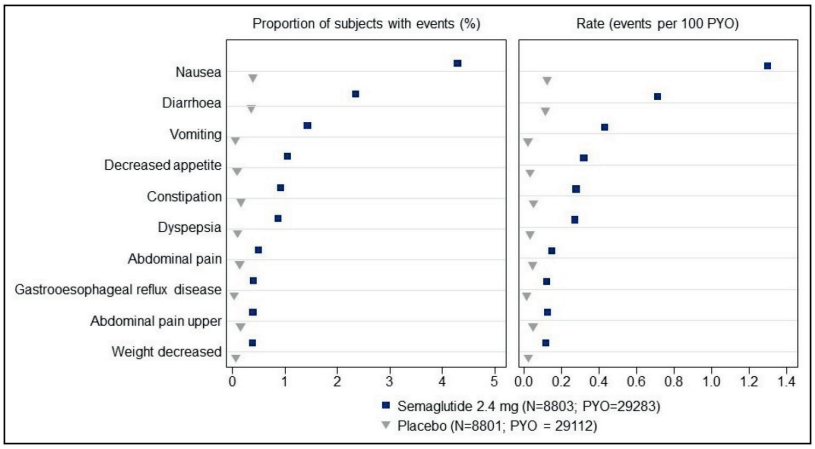
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Introduction: Once-weekly subcutaneous semaglutide 2.4 mg is approved for treatment of overweight and obesity. The SELECT trial is the largest and longest randomised clinical trial of a GLP-1RA and showed a 20% reduction in risk of major adverse cardiac events with semaglutide 2.4 mg compared with placebo in patients with overweight or obesity and established cardiovascular (CV) disease without type 2 diabetes. We report the serious adverse events (SAE) and selected safety data.

Methods: SELECT enrolled 17,604 patients aged ≥45 years from 41 countries who were randomly assigned to semaglutide (dose titrated up to 2.4 mg) or placebo, in addition to standard of care recommendations for lifestyle counselling that did not target weight loss. Safety data collection focused on SAEs, all adverse events (AE) leading to permanent discontinuation of trial product irrespective of seriousness, and prespecified AEs of special interest irrespective of seriousness. Tests of treatment differences were determined by two-sided p values.

Results: The proportion of patients with SAEs was lower in the semaglutide group versus the placebo group (33.4% vs 36.4%, p<0.001), primarily driven by differences in cardiac disorders (11.5% vs 13.5%). These were infrequently related to trial product, deemed (by investigators) probably (0.5% vs 0.4%) and possibly (2.4% vs 2.1%) related for semaglutide and placebo, respectively. The proportion of patients with AEs leading to permanent trial product discontinuation was higher with semaglutide versus placebo (16.6% vs 8.2%, p<0.001); however, the proportion of patients with SAEs was similar (3.6% vs 4.1%). Permanent trial discontinuation was largely driven by gastrointestinal (GI) disorders (Figure 1), primarily occurring during the first 20-week dose escalation phase (Figure 2). Acute pancreatitis occurred similarly between the semaglutide (0.2%) and placebo (0.3%) groups. None of the 69 patients with a history of acute pancreatitis at screening had an acute pancreatitis event confirmed by the Event Adjudication Committee during the in-trial period. Gallbladder-related disorders were more common with semaglutide versus placebo (2.8% vs 2.3%). The imbalance was mainly driven by cholelithiasis (1.4% vs 1.1%), whereas cholecystitis events were balanced between groups (0.56% vs 0.59%). Among the 13.6% of patients who had a history of gallbladder disease at screening, the proportions of patients with cholelithiasis (9.2% vs 9.2%) and cholecystitis (4.0% vs 4.3%) were similar between the semaglutide and placebo groups, respectively.

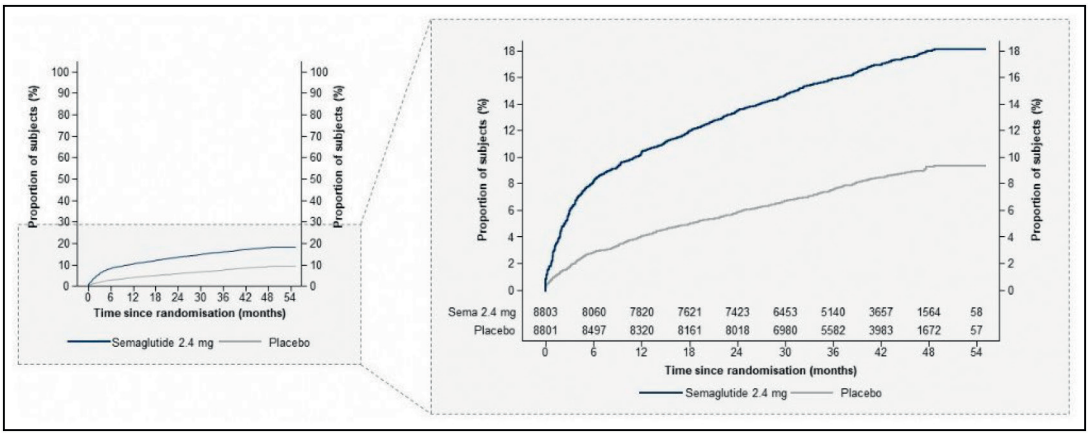
Conclusion: SELECT demonstrates that weight loss and CV benefit can be achieved with semaglutide 2.4 mg with a lower rate of SAEs compared with placebo. More patients receiving semaglutide discontinued trial product due to GI symptoms than those receiving placebo, primarily during the dose escalation period. There was no difference in the occurrence of pancreatitis, but higher rates of cholelithiasis were reported in the semaglutide group. These findings support the overall positive risk–benefit ratio of semaglutide treatment and demonstrate a safety profile consistent with previous semaglutide trials.



Percentages are presented in descending order by frequency in the semaglutide 2.4 mg arm. Up to three AEs could be reported as leading to trial product discontinuation. '%' represents percentage of participants in the full analysis set. Most frequent is defined as the 10 most frequent terms by absolute count, where absolute count is >1 in the total population (up to 15 in case of a tie). PYO, patient-years of observation.

Fig. 1. Adverse events leading to permanent trial product discontinuation by preferred term.

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Data from the in-trial period. Cumulative incidence estimates are based on time from randomisation to first AE leading to permanent trial product discontinuation, with all-cause death modelled as competing risk. Participants without events of interest were censored at the end of their in-trial period.

Fig. 2. Adverse events leading to permanent trial product discontinuation irrespective of seriousness.

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GC4.017

Safety of SGLT2 inhibitors in kidney transplant recipients with diabetes mellitus

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Background: Kidney transplant recipients (KTR) with diabetes mellitus are at risk for developing cardiovascular and renal complications. Sodium-glucose cotransporter-2 inhibitors (SGLT2i) may delay or prevent these outcomes in KTR, however, robust data on their efficacy and safety in KTR is lacking. One of the main reasons for the underuse of SGLT2i in KTR might be the fear of serious adverse events in this special population, including acute kidney injury (AKI), euglycemic diabetic ketoacidosis (DKA) and urinary tract infection (UTI).
Methods: A retrospective cohort study comparing KTR with diabetes mellitus treated with SGLT2i (SGLT2i group) and KTR with diabetes mellitus who were treated with other anti-hyperglycemic agents (control group). Data were collected from electronic medical records of patients who were being followed at Rabin Medical Center, Israel. Primary safety outcomes were: (1) a renal-related composite outcome of dialysis, re-transplantation, acute kidney injury (AKI) or acute rejection and (2) hospital admission due to urinary tract infections (UTIs). Secondary safety outcomes were: each component of the primary outcome separately, the occurrence of DKA, and a composite of dialysis, re-transplantation, AKI, acute rejection or all-cause mortality.
Results: Two hundred and forty patients were included in each group, (20% women, median age 63 and 64 years in the control and SGLT2i group, respectively; maximum follow-up 3 years). The composite outcome of dialysis, re-transplantation, AKI or acute rejection occurred less in SGLT2i users (8.9 vs. 13.3 events/100 patient-years, HR 0.66, 95% CI 0.45-0.98, p=0.037); however, after adjustment for independent predictors the risk was similar between the groups (HR 0.99, 95% CI 0.65-1.52, p=0.970). Similar results were seen in a composite outcome of dialysis, re-transplantation, AKI, acute rejection and mortality. The incidence of hospital admissions due to UTIs was 5.7 versus 10.5 events/100 patient-years in SGLT2i users compared to the control group (HR 0.53, 95% CI 0.33-0.85, p=0.007). DKA occurrence was negligible and similar between the groups. Mortality rates were 3.9/100 person-years in SGLT2i users compared to 9.3/100 person-years in non-users (unadjusted HR 0.43, 95% CI 0.26-0.72; adjusted HR 0.66, 95% CI 0.38-1.14, p=0.135).
Conclusion: No increased adverse renal-specific outcomes were seen in KTR with diabetes mellitus treated with SGLT2i, nor were adverse outcomes such as UTIs or DKA. SGLT2i therapy seems safe to use in KTR with diabetes mellitus. RCTs are needed in this population to solidify our retrospective results.

GC4.018

Managing the new wave of weight loss medication in general practice: A qualitative study

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Introduction: In late 2022, a new type of weight loss medication based on semaglutide became available in Denmark, and both media coverage and public demand was massive. Health care professionals in general practice were centrally placed as gatekeepers authorized to prescribe and manage the use of semaglutide for weight loss.
Health care professionals in general practice already hold a central position in dealing with the prevention and treatment of overweight and obesity. However, there is very little knowledge about how they actually deal with the great demand for and attention surrounding semaglutide for weight loss. The aim of this study was therefore to explore how the new medication is managed in general practice, especially in terms of prescribing and following up.
Methods: This is an exploratory, qualitative study, based on ethnographic fieldwork. Data includes field notes from direct observation of consultations (total of observed consultations was 273. Of this observed consultations focusing on the new weight loss medication was 28) and semi-structured interviews with seven doctors and four nurses from three general practices in Denmark. The interviews included general questions relating to the management of obesity and weight loss as well as specific questions concerning observed consultations. Discourse analysis was used

to identify central themes in the transcribed interviews and field notes. The project is registered at Aarhus University (case no. 2016-051-000001) and follows international anthropological standards for research ethics.
Results: Four central discourses were identified. They revolved around 1) a fundamental trust in the science of medicine which was entangled with pragmatic concerns, such as patient demand and previous clinical experiences, 2) a focus on individual responsibility for health where the way in which the health care professionals perceived and presented the medication had a moral tone, both questioning and evaluating the individual patient's reasons for wanting the drug and highlighting individual responsibility for changing their lifestyle, 3) the price of weight loss medication, both literally in terms of the patients' economy and figuratively, eg. in terms of the effect and side-effects of the medication, and 4) the importance of shared decision making where the data indicates that while the doctor holds the power to prescribe medication and make moral judgments, the patient's wishes and arguments seem decisive, often even overruling the doctor's reservations.
Conclusion: This qualitative study offers direct insight into how a new, highly sought-after weight loss medication is managed in the general practices examined. The study provides an understanding of the different considerations, opportunities and challenges that influence the management of weight loss medication in general practice other than purely medical concerns, including economical, organisational, interpersonal, and moral issues. As such, the study contributes to our knowledge about the complexity and challenges of decision-making in connection with prescribing and handling weight loss medication.

GC4.019

Pharmacological treatment of adult patients with genetic obesity: a real-world study

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Introduction: Rare genetic obesity commonly features early-onset obesity, hyperphagia, and therapy-resistance to lifestyle interventions. Pharmacotherapy is often required to treat hyperphagia and induce weight loss. We describe clinical outcomes of glucagon-like peptide-1 analogue liraglutide or naltrexone-bupropion (NB) treatment in adults with molecularly confirmed genetic obesity (MCGO) or highly suspected for genetic obesity without definite diagnosis (HSGO).
Methods: Liraglutide 3 mg and NB were administered according to the manufacturer's dosing regimen. Treatment evaluation occurred after 12 weeks on maximum or highest tolerated dose, preceded by a dose escalation phase of around one month, so a total of 16 weeks. Differences in anthropometrics, body composition, metabolic markers, appetite, eating behaviour, and quality of life (QoL) were evaluated.
Results: Ninety-eight adult patients were included in the analysis: 23 with MCGO and 75 with HSGO, with median BMI of 42.0 kg/m² (38.7-48.2) and 43.7 kg/m² (38.0-48.7), median age 23.0 years (20.0-31.0) and 34.0 years (24.0-44.0), and 60.9% and 77.3% females, respectively. After liraglutide treatment, median weight at treatment evaluation significantly decreased compared to baseline in both groups: -4.7% in patients with MCGO and -5.2% in patients with HSGO. Additionally, improvements were observed in appetite, fat mass, fasting glucose, and HbA1c in both patients with MCGO or HSGO. Patients with HSGO also reported significant improvements in several domains of QoL and eating behaviour. In patients with MCGO or HSGO with NB treatment, mean weight at treatment evaluation also significantly decreased after 12 weeks of treatment with highest tolerated dose: -5.2% in patients with MCGO and -4.4% in patients with HSGO. Appetite, fat mass and waist circumference significantly decreased in both groups. Obesity-related comorbidities improved in a significant proportion of patients treated with liraglutide or NB.
Conclusion: Our findings show potential of liraglutide and naltrexone-bupropion as treatment options for adults with (a clinical phenotype of) genetic obesity.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.020

High prevalence of positive genetic obesity variants in postoperative bariatric surgery patients with weight regain presenting for medical obesity intervention

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Introduction: Genetic obesity susceptibility in postoperative bariatric surgery weight regain (PBSWR) remains largely unexplored.
Methods: A retrospective case series of adult (N= 27) PBSWR patients who had undergone genetic obesity testing was conducted between Sept 2020-March 2022. Primary outcome: frequency of genetic variants in patients experiencing weight regain following bariatric surgery. Secondary outcomes: prevalence of obesity-related comorbidities, nadir BMI achieved post-bariatric surgery, percent total body weight loss (%TBWL) achieved with obesity pharmacotherapies.
Results: Heterozygous mutations were identified in 22 (81%) patients, with the most prevalent mutations occurring in CEP290, RPGR1P1L, and LEPR genes (3 patients each). Median age was 56 years (Interquartile Range (IQR) 46.8 – 65.5), 88% female. Types of surgery were: 67% RYGB, 19% SG, 4% gastric band, and 13% revisions. Median nadir BMI post-operatively was 34.0 kg/m² (IQR 29.0 – 38.5). A high prevalence of metabolic derangements was noted; patients presented median 80 months (IQR 39 – 168.5) postoperative for medical weight management with

Tab. 1. Cohort Demographics.

Table 1: Cohort Demographics

	N = 27 (%)
Age (median (IQR))	56 (46.8 - 65.5)
Female	24 (88)
Race/Ethnicity	
Non-Hispanic White	19 (70)
Hispanic	1 (4)
African American	6 (22)
Comorbidities	
Type 2 Diabetes	9 (33)
Hypertension	14 (52)
Major Depressive Disorder	8 (30)
PCOS	5 (19)
Obstructive Sleep Apnea	12 (44)
Osteoarthritis	5 (19)
NAFLD	5 (19)
Cardiovascular Disease	2 (7)
Decreased Mobility	3 (11)
Surgery Type	
Vertical Sleeve Gastrectomy	5 (19)
Roux-en-Y Gastric Bypass	18 (67)
Adjustable Gastric Banding	1 (4)
Bariatric Revision	3 (11)

IQR – Interquartile range, PCOS – Polycystic Ovarian Syndrome, NAFLD – Non-alcoholic fatty liver disease.

Table 1 shows the cohort demographics. Majority of the patients presented with metabolic de-arrangements.

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Tabs. 2. and 3.

Table 2: Anti-Obesity Medication Cohort Utilization

Generic Drug Name	Patients (N= 27 (%))
semaglutide	21 (78)
topiramate	14 (52)
metformin	12 (44)
phentermine	10 (37)
liraglutide	5 (19)
dulaglutide	2 (7)
zonisamide	2 (7)
naltrexone	1 (4)
buproprion/naltrexone	1 (4)
empagliflozin	1 (4)
dapagliflozin	1 (4)
tirzepatide	1 (4)
buproprion	1 (4)
sitagliptin	1 (4)
	Median (IQR)
Number of AOMS	3 (2 - 3.5)

AOM – Anti-obesity medication

Table 3: Baseline and post-operative anthropometric measures

	Median (IQR)
Pre-op BMI (kg/m^2)	51.9 (43.0 - 58.3)
Post-op Weight Nadir (kg)	95.3
Nadir Percent TWL (%)	31.3 (25.0 - 36.1)
Post-op Nadir BMI (kg/m^2)	34 (29.0 - 38.9)
Months since Surgery	80 (39 - 168.5)
Pre-AOM Weight (kg)	108.9 (98.0 - 129.3)
Pre-AOM BMI (kg/m^2)	41.7 (36.8 – 44.4)
Percent weight regain (%)	40.0 (20.2 - 68.3)

IQR – Interquartile Range, BMI – body mass index, AOM – anti-obesity, medication.

Table 2. Anti-obesity medication cohort utilization. The table displays the frequency of anti-obesity utilization (combination and monotherapy) in postoperative bariatric surgery weight regain patients. Patients required at least 3 or more anti-obesity medications to achieve a clinically meaningful benefit. Table 3. Baseline and postoperative measurements including surgical characteristics of the cohort. Patients experienced 40% weight regain by the time they presented for medical intervention.

40% weight regain. BMI at initiation of anti-obesity medication (AOMs) was 41.7 Kg/m^2 (36.8 – 44.4). All received AOM and required at least 3 AOMs for weight regain. Semaglutide (N=21), Topiramate (N=14), and Metformin (N=12) were most prescribed. Median %TBWL for the cohort at the first, second, third visit was 1.7, 5.0, and 6.5 respectively. Fourteen (52%) achieved 5 %TBWL, 10 (37%) achieved 10% TBWL and 4 (15%) achieved 15% TBWL with combination AOMs and supervised medical intervention.

Conclusion: An unusually high prevalence of genetic obesity variants in PBSWR was found, warranting further research.

Tab. 4. Cohort of Genetic Mutations.

Table 4: Cohort Genetic Mutations.

	Mutations				
Patient	1st	2nd	3rd	4th	5th
1	CEP290	RPGRIP1L			
2	LepR				
3	PLXNA1	PLXNA2	PLXNA4	SEMA3F	TTC8
4	IFT172	SH2B1			
5	NRP1				
6	PLXNA1	ALMS1			
7	Negative				
8	RPGRIP1L	GNAS	PLXNA3	PLXNA4	
9	LepR				
10	RAI1				
11	VPS13B	RPGRIP1L			
12	CREBBP	SEMA3C			
13	CEP290	IFT27	KIDINS220		
14	BBS2				
15	BBS9				
16	Negative				
17	MKS1				
18	VPS13B				
19	LEPR	PLXNA2			
20	SH2B1	SIM1			
21	Negative				
22	Test cancelled				
23	PCSK1	CPE	WDPCP		
24	IFT172				
25	CEP290				
26	Test cancelled				
27	POMC	GNAS			

The figure displays the cohort of genetic mutations found in post-operative bariatric surgery patients presenting with weight regain for medical obesity intervention. 81% of patients had a positive genetic obesity variant.

GC4.022

Can a mobile app for post bariatric surgery patients help to address concerns and reduce calls to nurses?

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Introduction: Patients undergoing bariatric surgery experience significant changes in their lifestyle and health status. Many individuals feel anxious about aspects such as self-care, diet adjustments, and the use of vitamin and mineral supplements after bariatric surgery. Despite efforts to improve recovery through patient education, issues persist, evident in nursing phone calls, emergency department visits, and readmissions among this patient population. The purpose of this study is to determine the impact of a patient education mobile app on healthcare utilization and outcomes for individuals undergoing bariatric surgery.

Methods: Patients undergoing bariatric surgery were recruited prospectively to use a mobile app that provides evidence-based surgical and dietary education, allowing patients to text bariatric clinicians to ask questions, tracking of postoperative symptoms for 30 days, and alerting patients at risk of ED visits when necessary. The cohort using the app was compared to the group of patients who had surgery at the same period of time but did not use the app. Data on 30-day ED visits, readmissions, and postoperative patient initiated phone calls were collected to compare the healthcare utilization between the two groups

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Results: There was no difference in ED visits (7/104, 6.7% vs. 14/234, 6.0%) or readmissions (6/104, 5.8% vs. 7/234, 3.0%) between patients with and without the app, respectively. Having the app did not make a significant difference regarding the total number of patient initiated calls or types of concerns discussed. Interestingly, data showed that patients with the app were significantly more likely to have concerns when routinely called by the nurse. Although the data revealed no difference in ED visits, the survey from the mobile app showed that 12.6% of patients perceived that they had avoided at least one ED visit.
Conclusion: Overall, patient satisfaction and use of the mobile app were high, although a reduction in ED visits, readmissions and patient initiated call was not found despite a significant percentage of patients that reported avoided ED visits because of the mobile app. Further investigation is warranted to evaluate reduction of other healthcare resources such as nurse educators, as well as to increase the proportion of patients that enroll in the mobile app and allow for transition to a paperless patient information pamphlet.

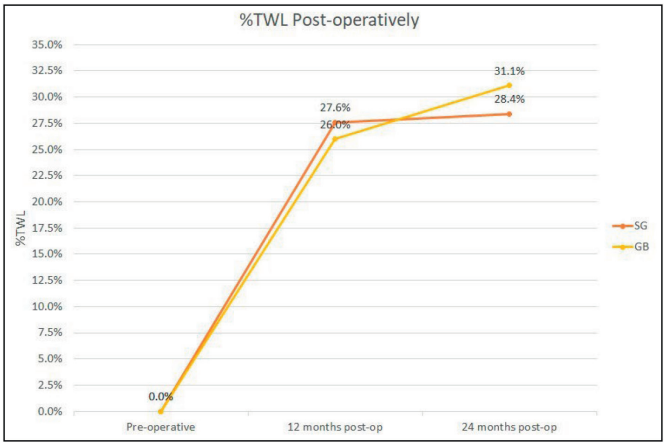
GC4.023

Bariatric surgery outcomes in patients with severe obesity (BMI ≥ 50 kg/m²)

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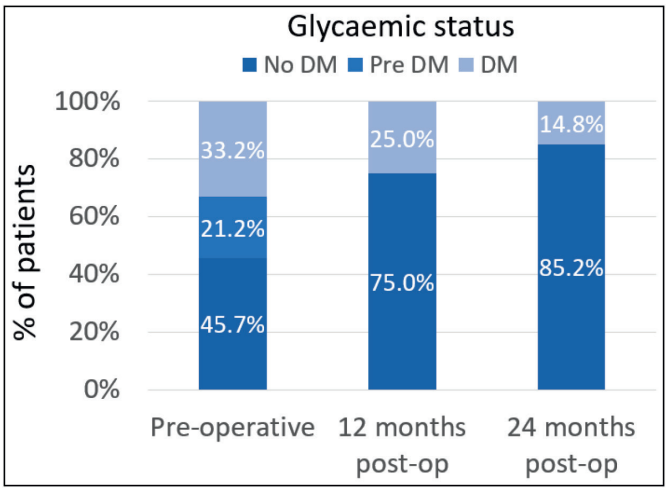
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Background: In patients undergoing metabolic bariatric surgery (MBS) for treatment of obesity, a body mass index (BMI) ≥50 kg/m² has been traditionally associated with increased surgical risk(1,2) and poorer weight loss outcomes (3). We aimed to evaluate the outcomes in these patients post-MBS.
Methods: This was a retrospective study of patients with BMI ≥50 kg/m² who underwent MBS [laparoscopic sleeve gastrectomy (SG) and gastric bypass (GB)] from 2008-2022 at a tertiary centre in Singapore. Demographics, anthropometric measures, medication data and biochemical parameters including weight loss and glycaemic outcomes were analysed at baseline, 12 months and 24 months post-operatively. Diabetes remission was defined as HbA1c <6.5% without diabetes medications for 3 months. Surgical outcomes and complications were also analysed.
Results: The study included 184 patients with BMI ≥50 kg/m² (57.6% female, mean age 38.6±10.5 years, mean weight 150.7±20.8kg, mean BMI 56.3±5.6 kg/m²). Pre-operatively, 21.2% had prediabetes, 33.2% had diabetes and 45.7% were normoglycemic. Other obesity-related complications included hypertension (44%), hyperlipidaemia (23.9%) and obstructive sleep apnoea(59.2%). Majority (89.1%) underwent SG. Mean operative time was 112.5±43.4 minutes for SG and 249.4±76.3 minutes for GB (p<0.001). Early complications developed in 4.9% [3.7% SG and 15% GB, (p=0.061)]. Readmission rate was 2.2% [1.8% SG and 5% GB, (p=0.371)]. Average length of stay was 3.3±2.5days. At 12 months post-operatively, mean BMI was 39.9±7.0kg/m² with a percentage total weight loss (%TWL) 27.3±9.0%. At 24 months, mean BMI was 40.2±8.0 kg/m² with %TWL 28.7±11.5%. Those who underwent SG achieved mean BMI 40.1±7.1kg/m² with %TWL 27.6±8.9% at 12 months and mean BMI 40.2±8.0kg/m² with %TWL 28.4±12.0% at 24 months, whilst those who underwent GB achieved mean BMI 39.2±6.9kg/m² with %TWL 26.0±9.4% at 12 months and mean BMI 39.7.2±7.6kg/m² with



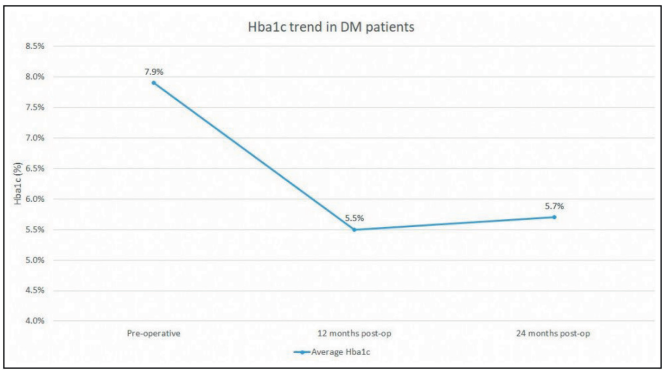
%TWL post-operatively at 12 and 24 months.

Fig. 1.



% of patients with DM, pre-DM and no DM preoperatively, 12 months and 24 months post-operatively.

Fig. 2.



Mean Hba1c in patients with DM pre-operatively, 12 months and 24 months post-operatively.

Fig. 3.

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%TWL 31.1±6.1% at 24 months with no statistically significant difference between the two groups. Patients with diabetes pre-operatively had improvement in glycaemic control, with a reduction of mean HbA1c from 8.0±1.7% at baseline to 5.5±0.5% at 12 months ($p<0.001$) and 5.7±0.8% at 24 months ($p<0.001$). Overall, 75% were in diabetes remission at 12 months and 85.2% at 24 months, with no significant difference in remission rates between SG and GB groups ($p=0.78$ at 12 months and $p=0.71$ at 24 months). In patients who were normoglycemic at baseline, none developed pre-diabetes or diabetes at 12 and 24 months. All patients with prediabetes reverted to normoglycemia. Preoperatively, 13% were on medications for obesity. Postoperatively, 27.2% were on medications for obesity of which 46.9% received ≥ 2 agents. Revisional surgery (SG to GB) was performed in 2.7% of patients.

Conclusion: MBS in patients with BMI≥ 50 kg/m^2 remains a safe and effective treatment option, with good weight loss and glycaemic outcomes. Overall, complication rate was low, although there was a trend towards higher complication rate amongst patients who underwent GB compared to SG. Longer-term data is required to study the difference in outcomes for SG and GB.

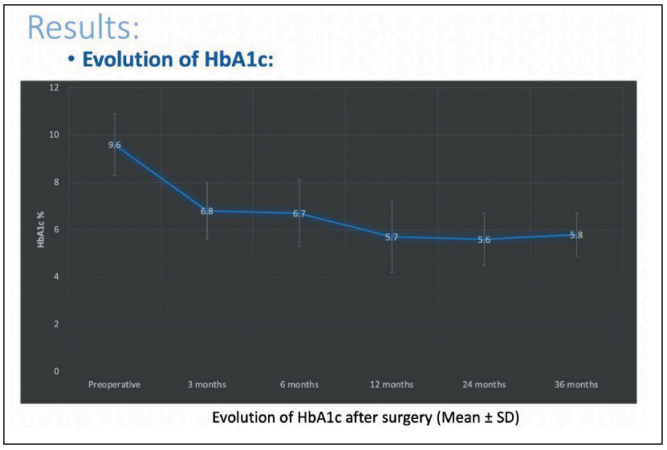


Fig. 1.

GC4.024

Outcomes of One Anastomosis Gastric Bypass in 472 Patients with Diabetes Mellitus

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Background: The positive impact of Roux-en-Y gastric bypass (RYGB) on metabolic syndrome and glycemic control has been proven in patients with obesity. One anastomosis gastric bypass (OAGB) is a simple, effective and easy to learn procedure. OAGB provides encouraging results for the treatment of patients with diabetes mellitus and obesity, but does it have the ability to be an alternative procedure to RYGB in the treatment of these patients? The aim of this study is to evaluate the outcomes of OAGB on patients with diabetes mellitus and obesity at the bariatric centre of our university hospital. By extension, we evaluated the possibility of BMI and the preoperative hypo-glycemic medication usage to be predictive factors for postoperative diabetes resolution.

Methods: This is a retrospective single-centre study of 472 patients with diabetes mellitus who underwent OAGB from November 2009 to December 2015. All patients were followed-up for at least 1 year, and up to 3 years, where available. Weight, HbA1c, and hypo-glycemic medications were recorded at base- line, 3, 6, 12, 24 and 36 months.

Results: A total of 472 patients have been followed-up for 1 year and 361 for 3 years. The mean BMI decreased from 46.8 ± 7.2 to 29.5 ± 2.8 kg/m^2 and HbA1c from 9.6 ± 1.3 to 5.7 ± 1.5% at the 12-month follow-up. At the 3-year follow- up, the mean BMI was 32.1 ± 3.3 and HbA1c mean was 5.8 ± 0.9%. Diabetes remission was achieved by 84.1% of patients.

Conclusions: OAGB can be an excellent alternative to RYGB for the treatment of diabetes and obesity. Pre-operative medications may be used to predict postoperative diabetes remission, but not BMI.

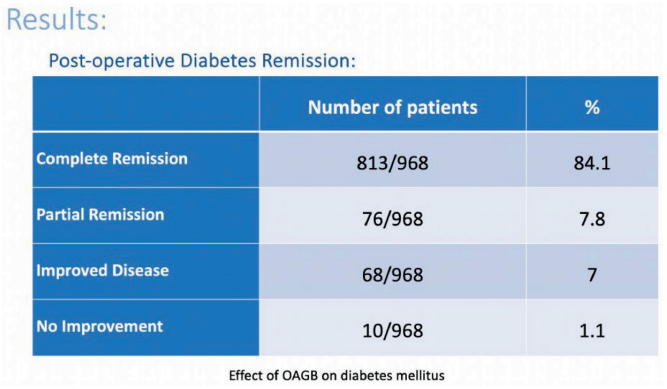


Fig. 2.

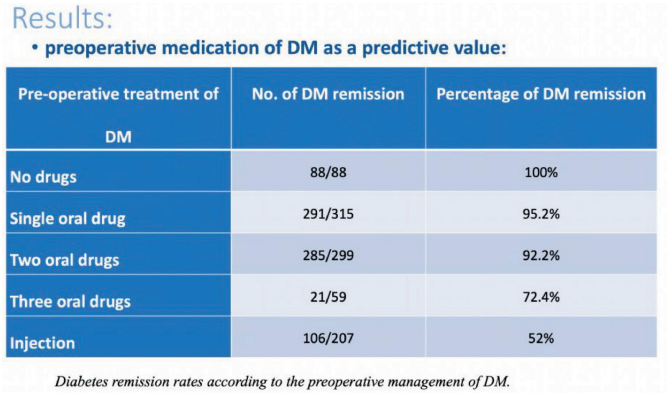


Fig. 3.

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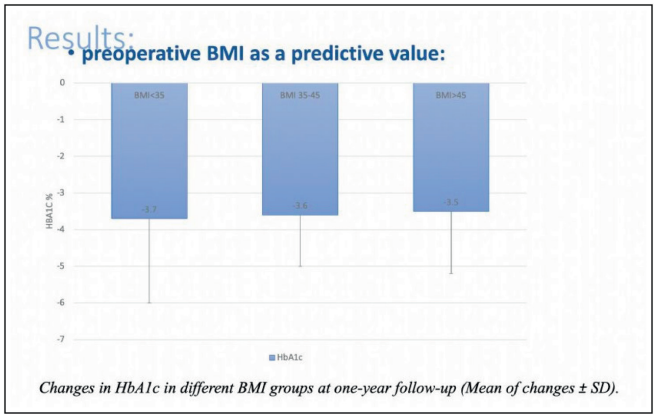


Fig. 4.

GC4.025

Long-term trajectories of weight and health outcomes following multidisciplinary publicly funded bariatric surgery in patients with clinically severe obesity and ≥ 3 comorbidities: A 9-year prospective cohort study in Australia

Tan, M. M.[1]; *Taylor, C.*[2]; *Le Page, P.*[2]; *Jin, X.*[3]; *Low, A. K.*[4]; *Li, A.*[5]; *Martin, D.*[6]; *Joseph, D.*[6]; *Kormas, N.*[7]

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Introduction: Real-world data on long-term (> 5 years) weight loss and obesity-related complications after newer bariatric surgical procedures are currently limited. The aim of this longitudinal study was to examine the effectiveness and sustainability of bariatric surgery in a cohort with clinically severe obesity in a multidisciplinary publicly funded service in two teaching hospitals in New South Wales, Australia.
Methods: Patients were adults with complex clinically severe obesity with a BMI ≥ 35 kg/m^2 and at least three significant obesity-related comorbidities, who underwent bariatric surgeries between 2009 and 2017. Detailed obesity-related health outcomes were reported from annual clinical data and assessments for up to 9 years of follow-up. Data were also linked with the national joint replacement registry.
Results: A total of 65 eligible patients were included (mean = 7 and range = 3–12 significant obesity-related comorbidities); 53.8% female; age 54.2±11.2 years, with baseline BMI 52.2±12.5 kg/m^2 and weight 149.2±45.5 kg. Most underwent laparoscopic sleeve gastrectomy (80.0%), followed by laparoscopic adjustable gastric banding (10.8%) and one anastomosis gastric bypass (9.2%). Substantial weight loss was maintained over 9 years of follow-up ($p < 0.001$ versus baseline) – Significant total weight loss (%TWL±SE) was observed (13.2 ± 2.3%) following an initial 1-year preoperative intensive lifestyle intervention, and ranged from 26.5±2.3% to 33.0±2.0% between 1 and 8 years following surgery. Type 2 diabetes mellitus (T2DM), osteoarthritis-related joint pain and depression/severe anxiety were the most common metabolic, mechanical and mental health comorbidities, with a baseline prevalence of 81.5%, 75.4% and 55.4%, respectively. Clinically significant composite cumulative rates of remission and improvement occurred in T2DM (50.0–82.0%) and hypertension (73.7–82.9%) across 6 years. Dependence on continuous positive airway pressure treatment in patients with sleep-disordered breathing fell significantly from 63.1% to 41.2% in 6 years.
Conclusion: Bariatric surgery using an intensive multidisciplinary approach led to significant long-term weight loss and improvement in obesity-related comorbidities among the population with clinically complex obesity. These findings have important implications in clinical care for the management of the highest severity of obesity and its medical consequences. Major challenges associated with successful outcomes of bariatric surgery in highly complex patients include improving mental health in the long run and reducing postoperative opioid use. Long-term follow-up with a higher volume of patients is needed in publicly funded bariatric surgery services to better monitor patient outcomes, enhance clinical data comparison between services, and improve multidisciplinary care delivery.

GC4.026

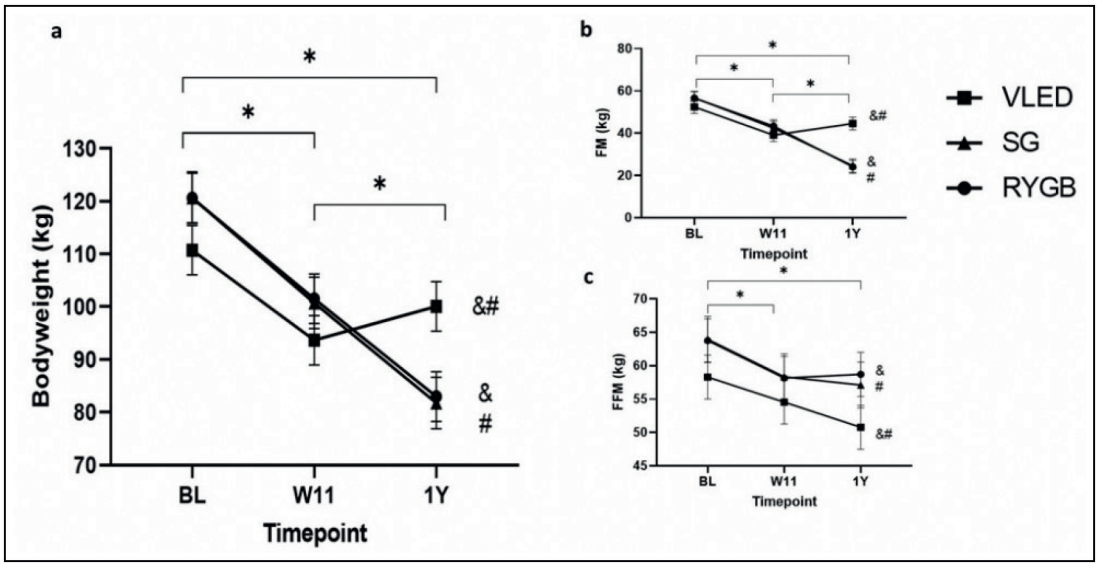
Changes in homeostatic and hedonic appetite 1-year after weight loss induced by diet or bariatric surgery

Aukan, M. I.[1]; *Rehfeld, J. F.*[2]; *Holst, J. J.*[3]; *Finlayson, G.*[4]; *Martins, C.*[5]

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[2]Department of Clinical Biochemistry, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark
[3]The NovoNordisk Foundation Center for Basic Metabolic Research and Department of Biomedical Sciences, University of Copenhagen, The Panum Institute, Copenhagen, Denmark
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[5]University of Alabama at Birmingham (UAB), Birmingham, AL, USA

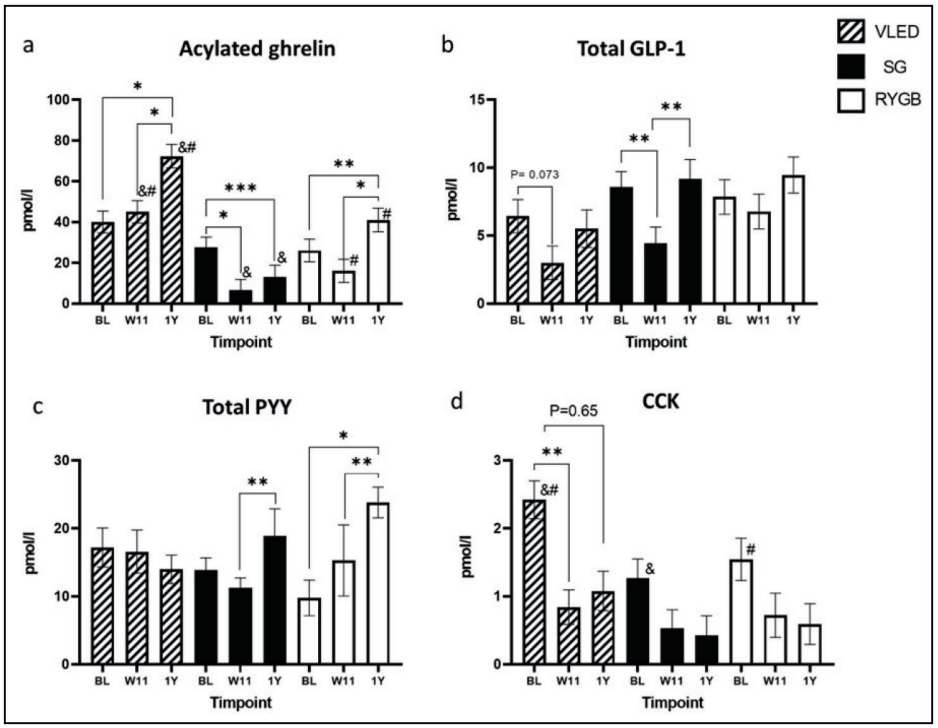
Introduction: Bariatric surgery is the most effective treatment for severe obesity and its success is, at least partially, attributed to beneficial changes in appetite, opposite to what is seen after dietary restriction alone. But no studies had previously directly compared the weight loss (WL) modalities. Therefore, the aim of this study was to investigate the effects of WL with a very-low energy diet (VLED) alone (controls) or in combination with bariatric surgery on gastrointestinal (GI) hormones, appetite ratings, hedonic hunger, eating behavior and food reward. The study was approved by the central regional ethics committee in Norway and registered in Clinicaltrials.gov (NCT04051190).
Methods: Patients scheduled for Sleeve Gastrectomy (SG) or Roux-en-Y gastric Bypass (RYGB), and controls were recruited. At baseline (BL), week 11 (W11) and 1 year (1Y): body weight/composition, basal and postprandial plasma concentrations of ghrelin, glucagon-like peptide 1 (GLP-1), peptide YY (PYY), cholecystokinin (CCK) as well as fasting and postprandial subjective appetite ratings. The Power of Food Scale, Dutch Eating Behavior Questionnaire, Three Factor Eating Questionnaire, and food reward (computerized behavioral task) was completed in the postprandial state.

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Data presented as estimated marginal means ± SEM. Posthoc pairwise comparisons corrected with Bonferroni adjustment. 1Y; 1-year. BL; baseline. FFM; fat-free mass. FM; fat-mass. RYGB: Roux-en Y Gastric Bypass; SG: Sleeve Gastrectomy; tAUC: total area under the curve. VLED; very-low energy-diet. W11; week 11. Significant change over time (*P <0.001). Averages sharing the same superscript symbol denotes significant differences between groups (&#, P<0.001)**.**

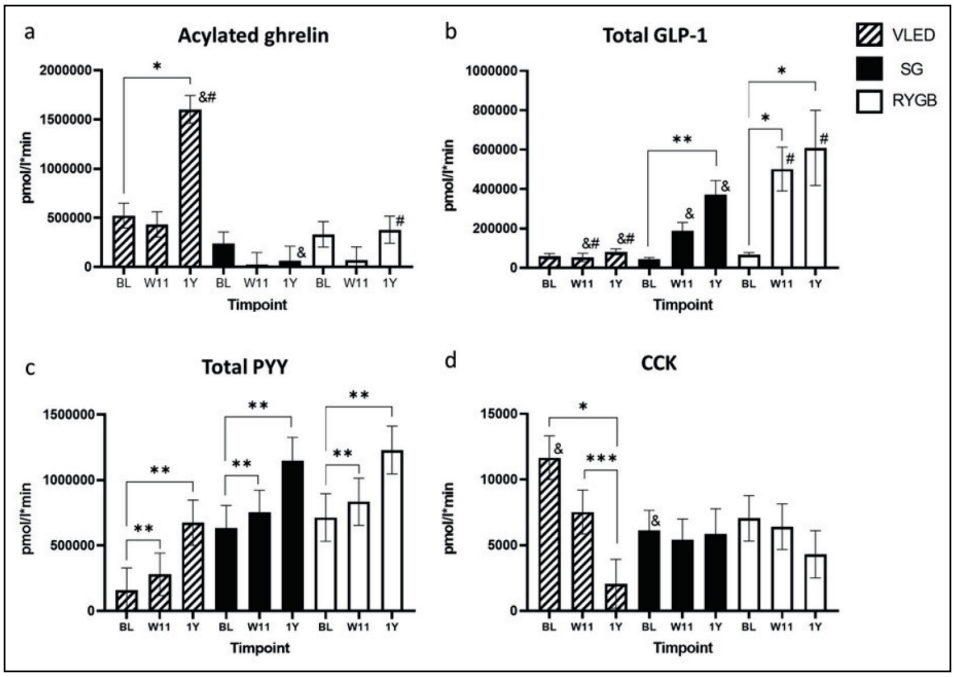
Fig. 1. a-c. Body weight and -composition over time.



Data presented as estimated marginal means ± SEM. Conversion from metric to SI units has been applied as follow: ghrelin pg/ml × 0.3 = pmol/l, PYY pg/ml × 0.25 = pmol/l. Posthoc pairwise comparisons corrected with Bonferroni adjustment. 1Y; 1-year. BL; baseline. CCK; cholecystokinin. GLP-1; glucagon-like peptide 1. PYY; peptide YY. RYGB: Roux-en Y Gastric Bypass; SG: Sleeve Gastrectomy. VLED; very-low energy-diet. W11; week 11. Averages sharing the same superscript letter denote a significant change over time (*P <0.001, ** P<0.01, *** P<0.05). Averages sharing the same superscript symbol denotes significant differences between groups (&#, P<0.05).

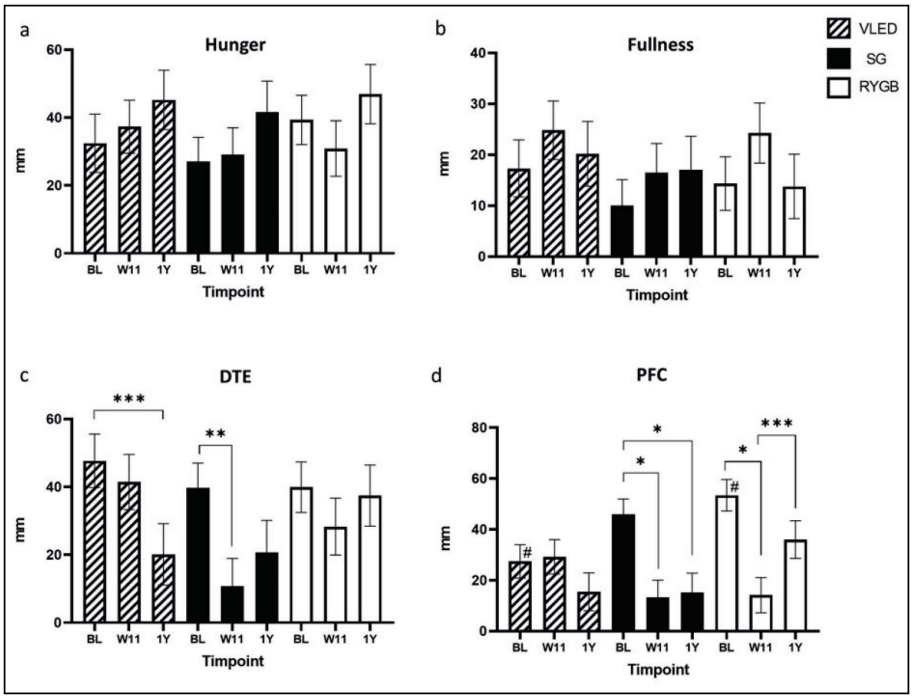
Fig. 2. a-d. Basal concentrations of gastrointestinal hormones over time.

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Data presented as estimated marginal means ± SEM. Conversion from metric to SI units has been applied as follow: ghrelin pg/ml × 0.3 = pmol/l, PYY pg/ml × 0.25 = pmol/l. Posthoc pairwise comparisons corrected with Bonferroni adjustment. 1Y; 1-year. BL; baseline. CCK; cholecystokinin. GLP-1; glucagon-like peptide 1. PYY; peptide YY. RYGB: Roux-en Y Gastric Bypass; SG: Sleeve Gastrectomy; tAUC: total area under the curve. VLED; very-low energy-diet. W11; week 11. Averages sharing the same superscript letter denote a significant change over time (*P <0.001, ** P<0.01, *** P<0.05). Averages sharing the same superscript symbol denotes significant differences between groups (&#, P<0.05).

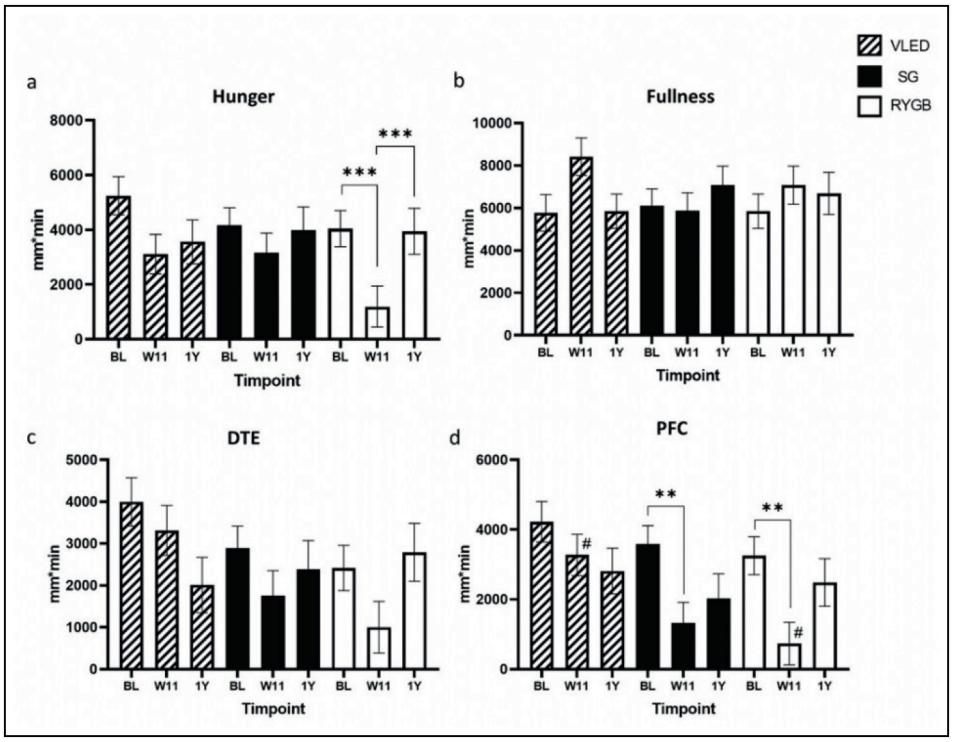
Fig. 3. a-d. Postprandial concentrations of gastrointestinal hormones over time.



Data presented as estimated marginal means ± SEM. Posthoc pairwise comparisons corrected with Bonferroni adjustment. 1Y; 1-year. BL; baseline. DET; desire to eat. PFC; prospective food consumption. RYGB: Roux-en Y Gastric Bypass; SG: Sleeve Gastrectomy; VLED; very-low energy-diet. W11; week 11. Averages sharing the same superscript letter denote a significant change over time (*P <0.001, ** P<0.01, *** P<0.05). Averages sharing the same superscript symbol denotes significant differences between groups (&#, P<0.05).

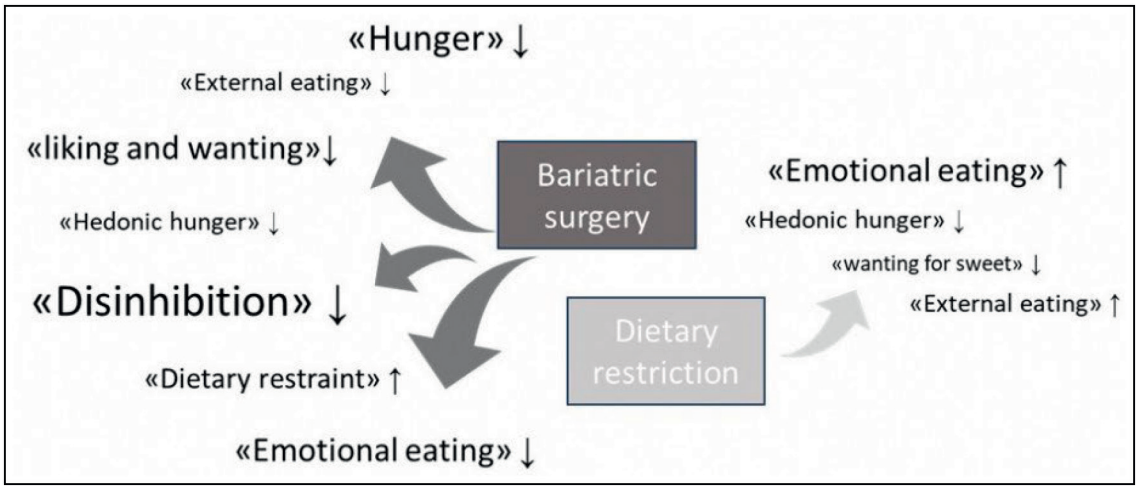
Fig. 4. a-d. Appetite ratings in the fasting state over time.

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Data presented as estimated marginal means ± SEM. Posthoc pairwise comparisons corrected with Bonferroni adjustment. 1Y; 1-year. BL; baseline. DET; desire to eat. PFC; prospective food consumption. RYGB: Roux-en Y Gastric Bypass; SG: Sleeve Gastrectomy; tAUC: total area under the curve. VLED; very-low energy-diet. W11; week 11. Averages sharing the same superscript letter denote a significant change over time (*P <0.001, ** P<0.01, *** P<0.05). Averages sharing the same superscript symbol denotes significant differences between groups (&#, P<0.05).

Fig. 5. a-d. Appetite ratings in the postprandial state over time.



Dietary restraint increased, and disinhibition, and hunger (TFEQ) decreased in general post bariatric surgery. Hedonic hunger (PFS) decreased over time in all groups. Liking and wanting for all food categories generally decreased post bariatric surgery, but only wanting for high/low-fat sweet decreased in controls. Emotional- and external eating (DEBQ) decreased post bariatric surgery, but increased over time for controls.

Fig. 6. Overall changes 1 year post intervention in measures of hedonic appetite and eating behavior.

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Tab. 1. Mean characteristics of the participants over time.

		Control			Sleeve Gastrectomy			Rpux-en Y Gastric Bypass			Main effects	
	Baseline	Week 11	1 year	Baseline	Week 11	1 year	Baseline	Week 11	1 year	Time	Group	Time* group
n	12			11			12					
Age	44 ± 12			39 ± 9			48 ± 12					
Females %	83			63			58					
Body weight (kg)	110.7 ± 4.7	93.6 ± 4.7	100.1 ± 4.7#*	120.7 ± 4.9	100.8 ± 4.9	81.7 ± 4.9#	120.6 ± 4.7	101.5 ± 4.7	82.9 ± 4.7*	<0.001 abc for all	NS	<0.001
BMI (kg/m^2)	39.3 ± 1.2	33.0 ± 1-2	35.2 ± 1.2#*	40.3 ± 1.2	33.6 ± 1.3	27.2 ± 1.2#	41.6 ± 1.2	33.6 ± 1.2	28.3 ± 1.2*	<0.001 abc for all	NS	<0.001
FM (kg)	52.4 ± 2.9	39.1 ± 2.9	44.6 ± 2.9#*	56.7 ± 3.1	42.4 ± 3.1	24.6 ± 3.1#	56.6 ± 2.9	43.4 ± 2.9	24.1 ± 3.0*	<0.001 abc for all	NS	<0.001
FFM (kg)	58.3 ± 3.3	54.6 ± 3.3	50.8 ± 3.3c	63.9 ± 3.4	58.3 ± 3.4a	57.1 ± 3.4b	63.7 ± 3.2	58.1 ± 3.3 a	58.7 ± 3.3bc	<0.001	NS	NS
FM (%)	47.3 ± 2.1	41.5 ± 2.1 a	50.3 ± 2.1b#*	47.0 ± 2.2	42.1 ± 2.2a	29.7 ± 2.2bc #	46.9 ± 2.1	42.3 ± 2.1 a	28.5 ± 2.2bc*	<0.001	0.017	<0.001
FFM (%)	52.1 ± 2.1	58.5 ± 2.1 a	54.3 ± 2.0 bc#*	52.9 ± 2.2	57.9 ± 2.2 a	70.3 ± 2.2 bc #	53.0 ± 2.1	57.6 ± 2.1 a	71.5 ± 2.1bc*	<0.001	0.061	<0.001
βHB (mMol)	0.2 ± 0.2	0.8 ± 0.2 a	0.3 ± 0.2 b	0.2 ± 0.2	1.2 ± 0.2 a	0.3 ± 0.2 b	0.2 ± 0.2	0.6 ± 0.2 a	0.3 ±0.2 b	<0.001	NS	NS

Data presented as estimated marginal means ± SEM. ßHB: beta-hydroxybutyrate. BMI; body mass index. FFM; fat free mass. FM; fat mass. NS: not significant. Superscript letters denote significant differences from BL to W11 (a), from W11 to 1Y (b) and from BL to 1Y(c) within groups (P<0.05). Averages sharing the same superscript symbols denote significant differences between groups: control versus SG(#) or RYGB(*) at the respective timepoint (P<0.01). No differences between SG and RYGB were observed.

Results: Participants had an average age of 42.9 ± 2.5 years, BMI of 40.5 ± 0.5 kg/m^2 at BL, and consisted mainly of females (70%), with no differences across groups. Fifty-four participants completed BL assessments, forty-four participants completed W11, and thirty-five participants completed 1Y follow up. BL anthropometrics, and changes over time at W11, were comparable across groups. At 1Y, SG and RYGB continued to lose weight and fat mass (FM), but controls regained body weight and FM. Ghrelin decreased over time post SG, a small increase was seen for RYGB at 1Y, while controls showed a marked increase obtaining the greatest concentrations at 1Y. Postprandial GLP-1 increased over time post bariatric surgery, and remained unchanged, and lower, in controls. Postprandial PYY increased in all groups, but to a greater extent post RYGB. A reduction in basal and postprandial CCK was seen for controls at 1Y, and no changes observed post-bariatric surgery. Only small changes in subjective appetite ratings were seen over time, and hedonic hunger decreased overall. However, decreases in emotional eating, hunger, disinhibition, and food reward, and increases in dietary restraint were seen at 1Y in the bariatric surgery groups only, while controls showed little or no changes in these appetite constructs.

Conclusion: Bariatric surgery results in a GI hormones' profile favoring a lower drive to eat and increased satiety, and favorable changes in eating behavior and food reward, which persist at 1Y follow up. Diet-induced WL, on the other hand, is associated with increased drive to eat, and no changes in eating behavior, and weight regain at 1Y follow up. In the present obesogenic environment, these striking differences in appetite between WL modalities are likely to be markedly important in the long-term WL management of individuals with severe obesity.

GC4.027

The Outcomes of Revisional One Anastomosis Gastric Bypass Versus Revisional Roux-en-Y Gastric Bypass After Primary Restrictive Procedures

Taha, O.[1]*; Abdelaal, M.*[2]

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[2]Assiut University Hospital, Assiut, Egypt

Background: Failed restrictive procedures are usually managed with conversion to another bariatric procedure. Our aim was to evaluate one -anastomosis gastric bypass (OAGB) as a revisional option for failed restrictive procedures. In addition, we compare the outcomes of OAGB versus Roux-en-Y gastric bypass as a revisional bariatric procedures.

Material-Methods: The current series is a prospective study, from May 2009 to December 2016. A total of 348 patients with failed restrictive bariatric operations underwent laparoscopic revisional gastric bypass. Revisional OAGB was performed in 243 patients and revisional Roux-en-Y gastric bypass in 105 patients. The demographic data and outcomes were studied by our multidisciplinary team.

Result: By the end of the study, the mean age was 39.3 – 10.3 years with body mass index of 37.5 – 9.2 kg/m^2. At 2-year follow-up, the overall intractable reflux (Symptom-Severity score questionnaire >4) was significantly higher after revisional OAGB (21.4%). The reflux with scoring ‡4 was significantly higher in the vertical band gastroplasty than laparoscopic adjustable gastric band and laparoscopic gastric sleeve (25.2%, 16.9%, and 14.3%, respectively).

Conclusion: Although laparoscopic revisional OAGB is a feasible and safe option after failed restrictive procedures, it has a higher chance of reflux in long-term follow-up.

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Tab. 1. Result 2.

The GERD questionnaire uses a grading of symptoms of heartburn and regurgitation. A severity score ≥4 is considered positive for GERD. (Carlsson et al,1998)

Questionnaire Score	SAGB Redo after LVBG Number (%)	SAGB Redo after LAGB Number (%)	SAGB Redo after LVSG Number (%)
Score <4 (1,2 and 3)	105 (73.4) *	54(83.1)	32 (91.4)
Score= 4	9 (6.3)	2 (3.1)	1 (2.9)
Score= 5	9 (6.3)	3 (4.6)	2 (5.7)
Score =6	12 (8.4)	4 (6.1)	0 (0)
Score= 7	8(5.6)	2 (3.1)	0 (0)
Total score > 4	38 (26.6)	11 (16.9)	3 (8.6)
Total	143 (100)	65 (100)	35 (100)

Tab. 2. Results.

	R-SAGB (n= 243)	R-RYGB (n=105)	P- Value
Operative time (min)	57.7±55.8	85.3±44.5	0.023*
Intra-op. blood loss	108.7±48.9	81.2±96.7	0.604
Mean of EWL%	71.8±5.9	58.3±6.6	0.032*
Minor Complications	15 (6.2%)	12 (11.4%)	0.279
Major Complications	27 (11.1%)	9 (8.6%)	0.946
Leakage	5 (2.1%)	1 (0.9%)	0.032*
Bowel Obstruction	2	1	0.462
Major Bleeding	1	0	0.481
Intractable Reflux	52 (21.4%)	3 (2.9%)	0.001*
Hb One Year Post-OP. (g/dl)	12.8 ± 0.5	8.2 ± 3.2	0.030*
Mortality	1	0	0.481

Operative parameters and complications between R-SAGB and R-RYGB

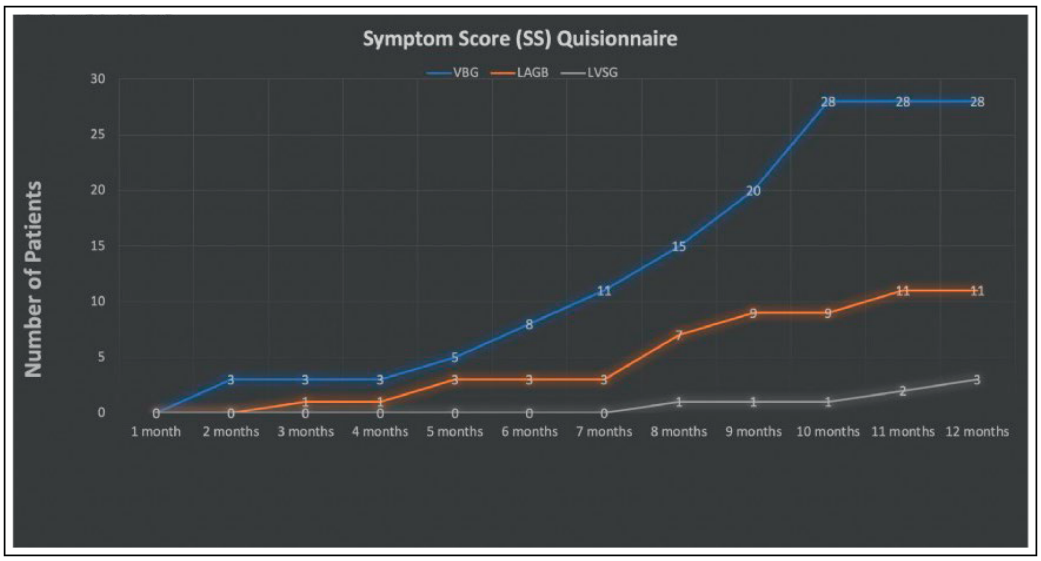


Fig. 1. Result 3.

GC4.028

Outcomes of a Swallowable Intragastric Balloon (ElipseTM) on 96 Overweight and people with obesity

Abdelaal, M.[1]; *Taha, O.*[2]

[1]Osama Taha Group, Cairo, Egypt
[2]Assiut University Hospital, Assiut, Egypt

Background: The traditional gastric balloons have been used for several years to reduce weight in overweight and people with obesity but the need for sedation and upper endoscopy leading to several limitations. The current series is the first study that evaluates the safety and effectiveness of the swallowable gastric (ElipseTM) balloon in our population on the national level.

Methods: Ninety-six patients (mean BMI was 33.6 ± 4.3 kg/m^2) participated in this study. All patients swallowed one ElipseTM balloon intended to remain in the stomach for 4 months, self-empty, and then pass. Each balloon was filled with 550 mL of filling fluid. Anti-emetics and anti-spasmodic drugs were prescribed for 2–3 days after insertion; proton pump inhibitor was prescribed twice daily 1 week before the procedure and continued until the end of residence time (16–20 weeks).

Results: In the current series, at end of the procedure (after 4 months), the overall mean weight loss (WL) was 11.2 ± 5.1 kg, mean waist circumference reduction was 10.9 ± 2.1 cm, and a mean BMI reduction was 4.9 ± 2.0 kg/m^2. The percentage of total body weight loss (TBWL%) was 12.1 ± 5.2%. The ElipseTM therapy reported improvements in the metabolic parameters investigated.

Conclusion: This swallowable gastric balloon (ElipseTM) can be safely and successfully swallowed, filled, imaged, and passed with accepted weight loss and clinical improvement in factors related to the metabolic syndrome.

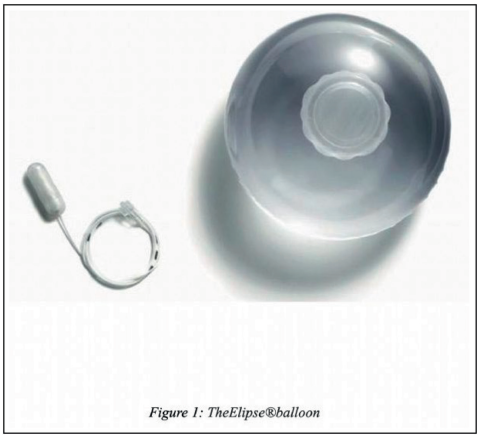
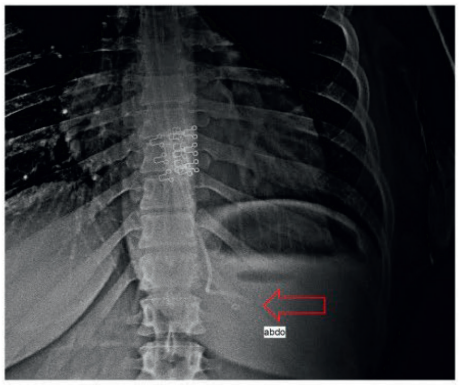


Fig. 1.

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• *Figure 2: X-ray of Elipse™ after it is swallowed but before it is filled. The radiopaque catheter (red arrowhead) is seen entering the stomach.*

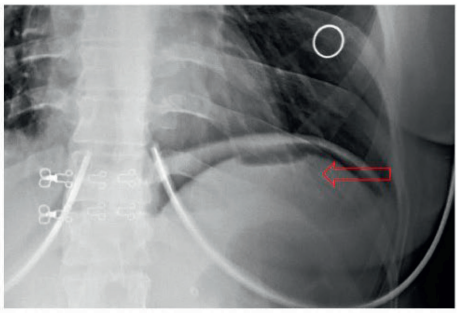


Figure 3: X-ray of Elipse™ after it is filled. The outline of the Elipse™ balloon and the radiopaque marker inside the balloon (red arrowhead) can be seen on x-ray

Figs. 2 and 3.

GC4.029

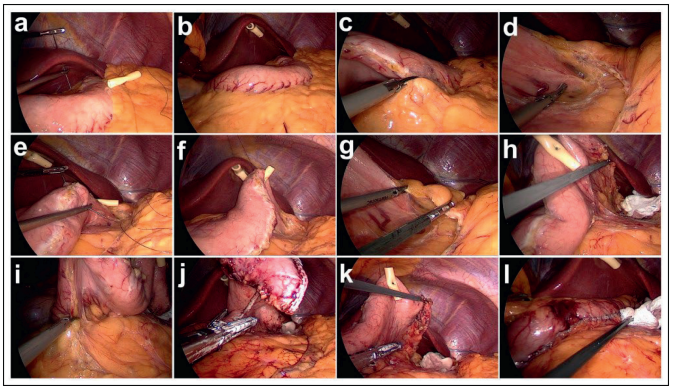
Single Port Sleeve Gastrectomy Versus Multiple Port Sleeve Gastrectomy

Gu, Y.; Widjaja, J.

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Background: Due to limited technical demand, single-port sleeve gastrectomy (SPSG) is a feasible laparoscopic technique for sleeve gastrectomy (SG). However, compared to the multiple ports technique, additional difficulties exist in the SPSG technique. In this retrospective study, we proposed a slight improvement in the SPSG technique by creating a gastric suspension through the greater curvature.

Methods: Patients with obesity who underwent laparoscopic SG between January 2022 and May 2023 at our hospital were included. The patients



Graphics illustration of the single-port sleeve gastrectomy technique with gastric suspension. a. Performing the liver suspension using a minimally invasive single puncture technique; b. The liver suspension was completed; c. Mobilization of the stomach; d. There was severe adhesion around the fundus area (this patient had a history of pancreatitis preoperatively); e and f. The gastric suspension was performed and completed using a technique similar to the liver suspension; g, h, and i. Complete mobilization of the greater curvature; j and k. Creation of the gastric sleeve through stapling made easy with the gastric suspension technique; l. View of the finished procedure following suture reinforcement.

Fig. 1.

Tabs. 1 and 2.

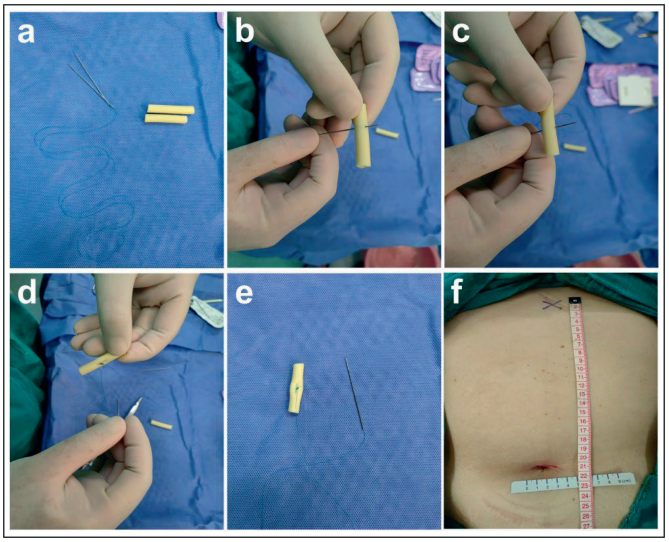
Item	T0	T1	P-value
Weight (kg)	92.7 ± 16.3	81.5 ± 12.7*	p < 0.0001
BMI (kg/m²)	33.6 ± 4.3	28.7 ± 3.8*	p < 0.0001
Waist circumference (cm)	141.3 ± 13.2	130.4 ± 12.4*	p < 0.0001
Triglyceride (mg/dl)	161.5 ± 72.8	108.1 ± 54.2*	p < 0.0001
LDL Cholesterol (mg/dl)	134.1 ± 47.1	116.2 ± 39.8*	p < 0.0001
HbA1c (%)	5.4 ± 0.9	5.0 ± 0.7*	p < 0.0001

Table 1: The Baseline Demographic Data.
*Data presented by mean ± (SD), * for significant difference (P < o.o5), T0: day of deployment; T1: end of treatment* (4 months after insertion).

Placement	Number (%)
Swallowed without Stylet	55 (57.3%)
Swallowed with Stylet	41 (42.7%)
Placement failed	Zero (0%)
Balloon passage	**Number (%)**
Stool	90 (93.8%)
Vomiting	3 (3.1%)
Endoscopic removals	3 (3.1%)
Surgical removals	Zero (0%)

Table 2: Placement and balloon passage.

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Graphics illustration for the preparation of the gastric suspension device (a, b, c, d, e); f. Location of the incision for the single-port sleeve gastrectomy (the "X" mark indicates the xyphoid process).

Fig. 2.

were classified into two groups:1) SPSG and 2) multiple ports SG (MPSG). The parameters for this analysis were the patients' age, gender, weight, body mass index (BMI), conversion rate, drainage placement,30-day readmission rate, and postoperative complications.
Results: 171 patients were included in this study:1) the SPSG group (n = 96), and 2) the MPSG group (n = 75). No statistically significant difference was observed within the preoperative (age, gender, height, weight, and BMI) and the perioperative parameters between SPSG and MPSG (operation time, drainage placement, 30-day readmission) ($p>0.05$). Per Clavien-Dindo's grading, two patients in the SPSG group suffered grade 1 complications; for the MPSG group, one patient sustained grade 2, and another suffered grade 3b complication. No statistical significance was observed on the %TWL between the two groups ($p>0.05$).
Conclusion: It is crucial to better understand the abdominal anatomy of the patient before performing the single-port technique. With better preoperative preparation and intraoperative technique, SPSG can be an excellent choice for many patients and can be promoted further.

GC4.030

Elevated Tumor Marker Levels in Patients with Obesity and the Effect of Bariatric Surgery

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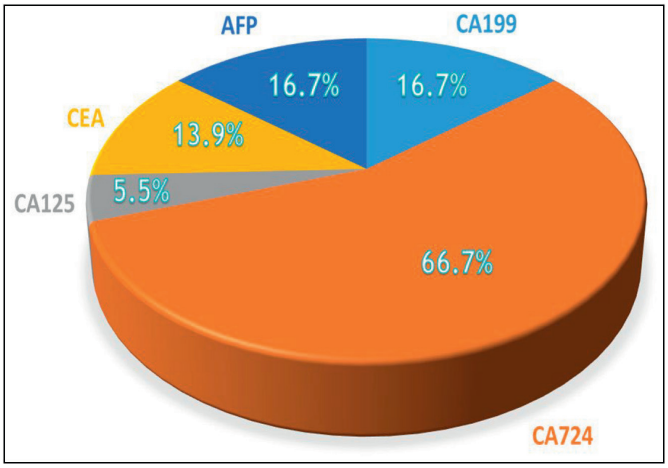
Background: Obesity has been associated with an increased risk of several types of cancers including breast, ovary, endometrium, oesophagus, stomach, intestine, liver, gallbladder, pancreas, and so forth. And through 2035, it is projected that about 40% of endometrial, more than 25% esophageal, and about 20% of liver cancers worldwide will be attributable to having a high body mass index (≥25 kg/m^2).
Objectives: The prevalence of abnormal tumor markers in patients with obesity has rarely been reported. In this study, we aim to report the prevalence of several abnormal tumor markers in patients with obesity and the impact of bariatric surgery short-term wise.
Methods: Patients who underwent laparoscopic bariatric surgery between January 2022 and May 2023 at our hospital were included. The patients were classified into two groups: 1) patients with normal preoperative tumor markers and 2) patients with abnormal preoperative tumor markers. The parameters for this analysis were the patients' age, gender, weight, body mass index (BMI), tumor markers (CEA, AFP, CA724, CA199, and CA125), fasting blood glucose, and glycosylated hemoglobin (HbA1C). Postoperative three months tumor markers level were re-evaluated and analyzed.
Results: 174 patients were included in this study and in which 36 (20.6%) patients have at least one abnormal tumor markers. Out of these 36 patients, 24 patients have elevated CA724 (67%), 6 patients with elevated CA199 (17%), 6 patients with elevated AFP (17%), 5 patients with elevated CEA (14%), and 2 patients with elevated CA125 (5%). Three months postoperatively, only one patient still with elevated tumor marker level (CA125). Resulting in 35 out of 36 patients (97%) with normal tumor marker levels after bariatric surgery.
Conclusion: In our small sample size study, approximately 20% of bariatric patients have elevated tumor marker levels. Out of these patients, most of the patients (67%) have elevated CA724 level. Furthermore, bariatric surgery leads to normalized tumor marker levels as early as 3 months postoperatively.

Tab. 1.

Characteristics	SPSG with Gastric Suspension (n=96)	MPSG (n=75)	P-value
Operation time (min)	92.2 ± 16.2	91.1 ± 14.0	0.641
No. of cases needed additional trocar	2 (2.1%)	-	-
No. of cases needed drainage placement	8 (8.3%)	9 (12.0%)	0.450
Postoperative length of stay (d)	2.8 ± 0.7	2.7 ± 0.8	0.385
30-days readmission	1 (1.0%)	2 (2.7%)	0.426
Clavien-Dindo Grade 1 Grade 2 Grade 3a Grade 3b	2 (2.1%) 0 0 0	0 1 (1.3%) 0 1 (1.3%)	0.211 0.258 1.000 0.258
%TWL 1 month 3 months	12.1 ± 2.9% 20.8 ± 4.2%	12.8 ± 1.8% 21.2 ± 6.5%	0.069 0.627

Data are shown as mean ± S.D. SPSG, single-port sleeve gastrectomy; MPSG, multiple-port sleeve gastrectomy; %TWL, percentage total weight loss.

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Classification of Elevated Tumor Markers Specifically.

Fig. 1.

Tab. 1. Demographics of patient with obesity and the prevalence of elevated tumor markers.

Characteristics	Patients (n=174)
Age, y	33.3 ± 7.9
Gender, Female/Male	126 / 48
Weight, kg	95.8 ± 22.6
Height, cm	165.0 ± 7.9
BMI, kg/m^2	36.5 ± 6.6
FBG, mmol/L	5.8 ± 1.8
HbA1C, %	6.0 ± 1.1
Elevated Tumor Marker, n (%)	36 (23.5%)

GC4.031

Bone mineral density and turnover after gastric bypass versus sleeve gastrectomy in people with severe obesity and type 2 diabetes: 5-year results from the Oseberg randomized clinical trial

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Introduction: Increased bone turnover and reduced bone mineral density (BMD) may explain increased risk of osteoporotic fractures after bariatric surgery. Data on the long-term effects of gastric bypass (GB) versus sleeve gastrectomy (SG) on these bone health biomarkers, in people with obesity and type 2 diabetes (T2D), are scarce. Short-term (1-year) results from the Oseberg trial showed GB to produce both lower BMD and greater increase in bone turnover markers compared with SG. We hypothesized that long-term (5-year) BMD and bone turnover would remain more unfavourable after GB than SG.

Methods: Single-centre, parallel group randomized controlled trial assigning (1:1) adult patients with severe obesity (BMI ≥ 35 kg/m^2) and T2D to either GB or SG. The primary clinical outcome was 1-year remission of diabetes. Predefined secondary outcomes included 5-year changes in areal bone mineral density (aBMD) measured with Dual x-ray absorptiometry and the bone turnover markers; Procollagen type 1 N-terminal Propeptide (P1NP) and C-telopeptide of type I collagen (CTX-1). Any fracture was registered at each follow-up. All patients were prescribed 20 µg vitamin D3/1000 mg calcium carbonate, with doses adjusted according to predefined treatment algorithms. Outcomes were analysed in the intention to treat population, using generalized linear mixed models for repeated measures with identity link (continuous outcomes). A causal mediation model explored whether a potential effect of the surgical procedure on change in aBMD and bone turnover markers could be explained by weight change. Statistical analyses; Stata (ver.18).
Results: Ninety-two participants (GB = 44 and SG = 48, mean [SD] age 48.7 [9.0], BMI 41.3 [4.3] kg/m^2, 98% White, and 71% females (45% postmenopausal)) were included in the analysis. Thirty-six participants had prior fractures, none received osteoporotic treatment. At 5-year follow-up, a significantly greater reduction in aBMD was seen after GB as compared with SG (Estimated treatment differences: Femoral neck -4.7% [95% CI -7.2 to -2.2], total hip -4.5% [95% CI -7.0 to -2.0], and lumbar spine -6.0% [95% CI -8.4 to -3.6]). P1NP and CTX-1 increased significantly more in the GB group than in the SG group (both p <0.001), 78% vs 40% and 78% vs 28%, respectively. Body weight loss was 22.2% [95% CI 20.2 to 24.3] after GB vs 17.8% [95% CI 15.8 to 19.8] after SG, estimated treatment difference 4.4% [95% CI 1.6 to 7.3]. The mediation analysis (adjusted for age and gender) showed the effect of the surgical procedure on aBMD and bone turnover markers not to be mediated by weight change. Three traumatic fractures (rib and clavicle), and one low-energy fracture (ankle) were reported during the 5-year follow-up.
Conclusion: Our results demonstrating greater long-term reduction in bone mineral density and greater increase in bone turnover markers after GB than after SG, may partly explain previous findings of greater risk of osteoporotic fractures after GB than after SG. This knowledge should be used in the shared decision-making process in advance of surgery, and should be taken into consideration in the post-operative follow-up.

GC4.032

Improvement in dilated cardiomyopathy after bariatric surgery – a case study

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Introduction: In people with obesity we can detect different types of heart failure. Here we present a case study of a patient suffering from obesity, dilated cardiomyopathy, type 2 diabetes (T2D) and his profit from bariatric surgery.
A Case Study: A male born in 1964 underwent a sleeve-gastrectomy (SLG) in our hospital in 2021. He was diagnosed with arterial hypertension and cardiac failure with reduced ejection fraction of left ventricle (LVEF) reaching 20-25 % based on dilated cardiomyopathy ten years ago. In 2013 he received an implantable cardioverter-defibrillator as prevention of sudden death and was diagnosed with T2D and treated for depression, reaching maximal body weight of 135 kg (BMI 44 kg/m^2). Before the bariatric surgery he had a stable hearth failure NYHA class III and LVEF 35-40%. Regarding the antidiabetic medication he was treated by peroral medication: metformin, empagliflozin, linagliptin reaching HbA1c 59 mmol/mol and body weight of 123 kg, he had intolerance to GLP-1 analogs. The bariatric surgery was performed without any complications and postoperative care in ICU was also without any complications. A year later patient´s body weight stabilized on 91 kg, reached partial remission of T2D and improvement in LVEF to 50-55 % according to the echocardiography. The quality of life has markedly improved especially by reaching NYHA class I-II.

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Conclusion: Vicious circle of heart failure, obesity and other comorbidities can be effectively solved by bariatric surgery in suitable patients. Our case study is pointing out the possibility of reverse hearth remodeling in dilated cardiomyopathy and other benefits after SLG.

GC4.033

A case of choledochal stenosis that was diagnosed in the early period following sleeve gastrectomy

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Introduction: Bariatric surgery which is widespread nationally and globally, requires careful preparation and follow-up. Detailed imaging before surgery and close post-operative monitoring can help reduce potential complications. Here, we present a patient who experienced abdominal pain, increased amylase, lipase, liver function tests and bilirubins after undergoing sleeve gastrectomy, ultimately diagnosed with choledochal stenosis.

Case: A 21-year-old female patient presented to the ER with epigastric pain that began 2 days ago. She had undergone sleeve gastrectomy 1 month earlier in another city and was following a diet progression from liquid to pureed foods. She had no medication/supplement use or surgery-related complaints prior to admission. She had a history of chronic hepatitis B, previously treated with Tenofovir, which she discontinued after surgery. Physical examination revealed tenderness in the epigastric region, with other findings being normal. Routine tests showed elevated amylase-lipase levels and general surgery consultation stated that it wasn't a post-operative complication and was considered as non-biliary acute pancreatitis. The patient was admitted to the internal medicine clinic.

Oral intake was stopped, IV fluids and PPIs were initiated. Lab results were as follows: WBC: 8250, Hct:%35.4, Plt: 302 000, FBG: 102 mg/dl, urea:13.1 mg/dl, cr:0.6 mg/dl, AST:716 U/L, ALT: 529 U/L, GGT: 742.8 U/L, ALP 304.5 U/L, Amylase 1325.9 U/L, Lipase 3046.8 U/L, t.protein 73.3 g/L, albumin 43.5 g/L, direct bilirubin 3.10 mg/dl, total biliriubin 3.51 mg/dl, INR: 1.0, TSH:1.64 mU/L, HBsAg 1465, anti-HCV: 0.0544, anti-HIV 0.752, HbeAg: 5.61, Anti HBs 2, AntiHBe:1.17, antiHBcIgM 0.07, AntiHBcIgG 0.01, HBV DNA PCR quantitative 293 IU/mL. Hepatobiliary US:Normal, Abdominal CT: Increased intrahepatic bile ducts and choledoc diameter compared to normal.

Infectious diseases consultation ruled out hepatitis reactivation and suggested the continuing Tenofovir treatment+Meropenem 3*1 g IV + Metronidazol 4*500 mg IV. Due to MRI anxiety (claustrophobia), abdominal MR/MRCP was delayed. D.bilirubin increased to 5.15 mg/dl, t.bilirubin to 5.44 mg/dl, but no additional complaints were reported. A second general surgery consultation suggested liver failure or hepatitis activation and advised MR-MRCP. Following psychiatry consultation, the patient consented to undergo MRI under sedation. Liver enzymes and bilirubin levels gradually decreased. The latest lab results were as: AST: 45 U/L, ALT: 131 U/L, GGT: 257.5 U/L, ALP: 199.9 U/L, Amylase: 129.5 U/L, Lipase: 523.8 U/L, direct bilirubin: 1.54 mg/dl, total bilirubin: 1.56 mg/dl. Abdominal MR/MRCP revealed choledocholithiasis. ERCP couldn't be performed due to recent surgery, and the patient was transferred to general surgery clinic.

Conclusion: The increasing prevalence of bariatric surgery reflects the current reality of the global obesity pandemic. It is imperative that the preparation and follow-up of these widely accepted treatment methods are conducted meticulously by operating centers that are easily accessible and equipped with essential resources.

Conflict of interest: None

Funding: None

GC4.034

Addressing technological challenges affecting compliance in micronutrient and protein supplementation after metabolic and bariatric surgery (MBS)

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Introduction: Nutritional deficiencies in persons who have undergone MBS influence morbidity, mortality and quality of life. Long-term compliance with vitamin and mineral supplementation is generally poor and data on compliance is limited (1).

Methods: Literature review on compliance with supplementation and describe the practical challenges affecting compliance.

Results: Ben-Porat et.al. (2) compared compliance between the first to fourth postoperative years. In fourth year only 37% were supplementing with multivitamin, 11% with vitamin D and 3.7% with calcium supplements.

It is often challenging to formulate multivitamin and minerals containing recommended dosages to be user friendly. First problem is capsule size. This problem can be solved with tabletting, as compression diminishes volume of the pill. Additionally, several nutrients have repulsing taste and smell, especially iron. This can be solved with film coating that masks the taste and smell. After iron supplementation, nausea, vomiting and constipation are frequent. Some iron forms are better tolerated, such as ferrous bisglycinate. Special care should be taken with multivitamin in forms of »gummies« and chewable tablets, as they usually do not contain or contain insufficient amounts of iron. Persons post MBS should get 1200 mg of elemental calcium in form of calcium citrate (3). Calcium citrate contains ~21% elemental calcium, therefore they need to ingest 5.8 g of pure calcium citate. This is usually achieved with at least two chewable tablets or effervescent tablets with diameter of 25 mm and thickness up to 10 mm (~five stacked 2€ coins). The main challenges in compliance are size and unpleasant chalky texture of calcium citrate chewable tablets and taste, volume and large sediment of effervescent suspension. As calcium citrate has low solubility (0.95 g/L at 25 °C), most of it stays in the sediment, which uneducated persons discard. 3 months post Roux-en-Y gastric bypass and sleeve gastrectomy, lest than 20% of persons consume more than 60 g of protein per day (4). This should be improved combining two approaches: Firstly, every meal should contain a source of quality protein (milk, meat, egg, soy) in sufficient quantity. One of easiest and cost-effective ways to enriching meals is by addition of skim milk powder. 30 g contain about 10 g of protein and also 387 mg of calcium. Secondly supplementation in form of protein powders, protein drinks, protein yoghurts and protein puddings.

Conclusions: Persons post MBS need regular, long-term dietetic counselling that includes advice on multivitamin, calcium and protein supplementation and instruction such as techniques for easier pill swallowing, use of better tolerable iron sources and protein enrichment of meals.

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GC4.035

Anti-angiotensin II type 1 and anti-endothelin 1 type a receptor autoantibodies concentration are modulated by bariatric surgery in patients affected by severe obesity

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Introduction: Cardiovascular diseases (CVDs) still represent the main cause of death and poor quality of life worldwide, with obesity being a main risk factor for their development. However, the mechanisms by which obesity leads to CVDs development are complex and not entirely understood. Hyperglycemia and chronic inflammatory state are the main risk modulators, but recently the role of autoimmune-related vascular damage has been proposed. The autoantibodies anti-angiotensin II type 1 receptor (AT1R) and anti-endothelin 1 type A receptors (ETAR1) seem involved in some vascular diseases such as systemic sclerosis and heart transplantation rejection [1, 2], with higher concentrations associated with increased clinical severity, but no data are reported in obesity.
Methods: We enrolled 29 patients with severe obesity recruited from our Center for the Study and Integrated Treatment of Obesity at the University Hospital of Padova and evaluated them before metabolic surgery with general clinical parameters and a complete metabolic laboratory assessment. In all patients, plasma levels of anti-AT1R and anti-ETAR1 autoantibodies were determined. Patients were re-evaluated one year after laparoscopic sleeve gastrectomy. Ten healthy individuals were considered as the control group.
Results: At baseline, patients with obesity showed significantly higher plasma levels of anti-AT1R autoantibodies with respect to control group (28 + 20.4 vs 13.5 + 2.8 U/mL, $p<0.005$) but not anti-ETAR1 (14.2 + 1.3 vs 13.3 + 2 U/mL, $p=0.1$). In addition, anti-AT1R concentration showed an increasing trend concentration with increasing severity of glucose impairment. Twelve months after surgery, patients with obesity showed a significant reduction in body weight and amelioration of several metabolic and inflammatory parameters. A significant reduction was observed also for anti-AT1R and anti-ETAR1 concentration (28.1 + 20.4 U/mL vs 22.6+ 16 U/mL, $p<0.05$) and anti-ETAR1 (14.2 + 1.3 U/L vs 13 + 1.6 U/L, $p<0.01$).
Conclusions: Cardiovascular complications represent the main cause of morbidity and mortality in patients with obesity, and we reported that patients with obesity show higher plasma levels of anti-AT1R autoantibodies which are also related to the grade of insulin resistance, and that their concentrations are reduced with metabolic/bariatric surgery. These autoantibodies may contribute to the increased risk of CVD in obesity and may represent possible biomarkers of organ damage.

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Conflict of Interest: None to Disclose.

Funding: No funding to report with regard to this study.

GC4.036

Health outcomes after bariatric surgery for patients suffering from mental illness compared with the general population: a retrospective cohort study using a large mental health database

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Aim: To provide evidence on bariatric surgery outcomes for patients living with severe mental illness (SMI) compared to the general population.
Methods: patients who had a bariatric surgery procedure at age 18+ and who were living in the South London & Maudsley NHS Foundation Trust (SLaM) catchment boroughs between 1st January 2007 and 31st December 2019 (n=3,007) were selected from national Hospital Episode Statistics data. A cohort of patients who had received a mental illness diagnosis in linked SLaM records prior to the first instance of bariatric surgery was assembled, and a comparison cohort comprised the remainder of population living in the SLaM catchment area who had no contact with SLaM prior to the index date. Outcomes of interest included length of stay, mortality, and 30-day readmission. Odds Ratio (OR) and Incidence Rate Ratio (IRR) were calculated.
Results: the age- and gender-standardised admission ratio for bariatric surgery for the SMI cohort was 1.74 (95% CI: 1.61-1.89), OR for readmission within 30 days was 1.56 (95%CI = 1.05-2.33) and the duration of a repeated hospitalisation after index surgery was longer (IRR = 1.49, 95%CI = 1.37-1.62). For gastric bypass surgery specifically, the SMI cohort had higher 30-day readmission (OR = 2.31, 95%CI = 1.33-3.99) and longer duration of repeated hospitalisation (IRR = 1.22, 95%CI = 1.07-1.40). No significant differences were found for mortality.
Conclusion: higher rates of bariatric surgery and worse outcomes were experienced by people with SMI. Tailored policies are needed toaddress sources of health inequality in this population.

GC4.037

Telephone-based cognitive behavioral therapy for post-operative bariatric surgery patients: Long-term psychosocial outcomes from a multi-site randomized controlled trial

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Background: Though surgical interventions are effective in treating patients with severe obesity, approximately 50% will experience weight reoccurrence within the first 1.5 to 2 years. Research from the largest randomized controlled trial (RCT) to date on telephone-based cognitive behavioural therapy (Tele-CBT) for bariatric surgery patients demonstrated sustained improvements in eating pathology and psychological distress 3-months post-intervention. During the follow-up phase of this large multi-site RCT, we examined whether 7-sessions of Tele-CBT delivered at 1-year post-surgery was efficacious in sustaining improvements in emotional eating and psychological distress at 3-years post-surgery.
Methods: 306 participants (Tele-CBT, n=152; Control n=154) were recruited from 3 bariatric centres and randomized 1:1 to receive Tele-CBT or standard bariatric care. Eligible participants were 1-year post-operative bariatric surgery. Outcome variables included the Generalized Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9), Emotional Eating Scale (EES), and Binge Eating Scale (BES) administered at baseline (1-year post-op), post-intervention, 1.5 years, and 3 years post-surgery.

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Tab. 1. Psychological Distress and Disordered Eating Outcomes between Tele-CBT and Control Conditions Spanning 1.5-Years for Post-Operative Bariatric Surgery Patients.

	Baseline (1-year post-op)			Post-Treatment (1.25-year post op)			3-month follow-up (1.50-year post op)			1-year follow-up (2-year post-op)			1.5-year follow-up (3-year post-op)		
Outcome Variable	Tele-CBT	Control	*p*	Tele-CBT	Control	*p*	Tele-CBT	Control	*p*	Tele-CBT	Control	*p*	Tele-CBT	Control	*p*
PHQ	5.73	5.94	.710	3.60	6.24	**<.001**	4.51	6.81	**.001**	5.33	6.78	**.035**	6.17	6.97	.248
GAD	4.75	4.78	.950	2.94	5.37	**<.001**	3.40	5.42	**<.001**	4.33	5.35	.117	5.17	5.01	.798
BES	21.24	20.60	.662	17.33	21.83	**.003**	26.98	30.11	**.005**	25.02	26.30	.408	29.86	30.60	.520
EES Total	49.93	50.99	.650	40.23	49.20	**<.001**	41.98	49.86	**.001**	45.63	54.59	**.001**	48.06	54.55	**.014**
EES Anger	19.86	20.56	.516	16.25	20.87	**<.001**	16.85	20.95	**<.001**	18.30	22.11	**.001**	19.09	22.42	**.007**
EES Anxiety	16.68	16.94	.756	13.65	17.09	**<.001**	14.12	17.48	**<.001**	15.31	18.82	**<.001**	16.09	18.78	**.004**
EES Depression	11.91	12.05	.803	9.19	11.24	**<.001**	9.69	11.42	**.003**	10.62	12.12	**.021**	11.43	11.79	.572

Bold: sig. at p <. 05

Note: Results are from a one-way ANOVA measuring the statistical significance between the intervention condition (Tele-CBT, $n = 152$) and control condition (Control, $n = 154$)

Results: There were significant decreases on the PHQ-9 (p<.001) GAD-7 (p<.001), BES (p=.003), EES-Total (p<.001), EES-Anger (p<.001), EES-Anxiety (p<.001) and EES-Depression (p<.001) post-Tele-CBT and these significant decreases on outcome variables were maintained 3-months post-intervention. However, 1.5-years post-intervention (i.e., 3-years post-operative), these psychosocial/eating improvements were only maintained on the EES-Total (p=.014), EES-Anger (p=.007), and EES-Anxiety (p=.004).

Conclusion: Although 7 sessions of Tele-CBT has been shown to be an effective intervention for improving psychological distress and disordered eating for patients 1-year post-operative bariatric surgery, these benefits were not sustained 1.5 years later with the exception of some sustained benefit in emotional eating 3-years post-surgery. Further research on the optimal booster dose of CBT following an initial intervention and additional factors contributing to response should be explored.

GC4.038

Evaluation of weight loss, metabolic outcomes and long-term mental health in people with obesity undergoing bariatric surgery

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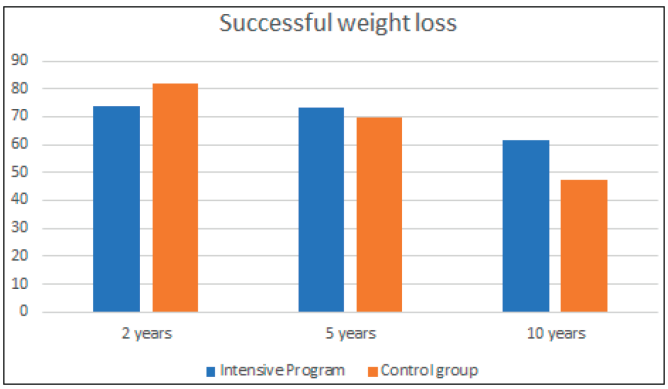
Introduction: Long-term outcomes after bariatric surgery depend on several factors. The implementation of an intensive, multidisciplinary program before bariatric surgery could have a positive effect on long-term outcomes. The main objective was to determine if there is a difference in the long-term outcomes of bariatric surgery between patients who completed an intensive, multidisciplinary program before surgery and those who did not.

Methods: Clinical records of patients who underwent bariatric surgery from 2008 to 2013 were reviewed. Anthropometric variables, metabolic comorbidities, and psychopathology were obtained upon admission to the obesity clinic, before bariatric surgery, and at 2, 5, and 10 years of follow-up.

Results: 177 patients with complete data were evaluated at the initial visit and before bariatric surgery. 54.2% completed an intensive, multidisciplinary program before surgery. The mean age of the group that received an intensive program versus the control group was 42.0±10.3 vs. 41.1±11.7, baseline weight 130.6±26.8 vs. 128.1±24.0, pre-surgical weight 132.4±26.8 vs. 125.6±23.7, pre-surgical BMI 48.4 ±8.0 vs. 46.4±8.7; respectively. There being no statistically significant baseline differences between the groups in age, sex, BMI, type of surgery, and comorbidities, a higher prevalence of prediabetes was only found in the group that received an intensive multidisciplinary program (57.2% vs 46.9%, p=0.015) and anxiety disorder (15.9% vs. 5.1%, p=0.026).

In the post-surgical follow-up, body weight was lower in the group that received an intensive, multidisciplinary program before surgery at 2 years (86.3±16.9 vs. 92.8±18.5, p=0.032), 5 years (86.3±20.3 vs. 95.0± 20.3, p=0.006) and 10 years (91.8±22.3 vs. 101.1±22.4, p=0.069) of follow-up compared to the control group. Regarding BMI, the group that received an intensive program had a lower trend in BMI at 2 years (32.8±5.1 vs. 33.6±5.5, p=0.083) at 5 years (32.2±6.9 vs. 34.7±6.2, p= 0.015), and 10 years of follow-up (34.5±6.1 vs. 37.2±6.9, p=0.073). However, there were no significant differences between the groups in the percentage of patients who successfully responded to bariatric surgery at 2, 5, and 10 years (defined as excess weight loss ≥50%), nor in the control of long-term comorbidities. In the logistic regression analysis, age, sex, BMI, and number of visits attended did not predict success in weight loss at 2, 5, and 10 years of follow-up.

Conclusions: Patients receiving an intensive, multidisciplinary program before bariatric surgery have lower BMI and body weight 2, 5, and 10 years of follow-up after surgery. However, these are not correlated with a higher percentage of successful weight loss and control of long-term comorbidities.



Successfully weight loss after bariatric surgery (defined as excess weight loss ≥50%).

Fig. 1. Comparison of successful weight loss.

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Tab. 1. Baseline Characteristics.

Table 1. Baseline Characteristics				
Variables	All participants (n=177)	Intensive Program (n = 96)	Control Group (n= 81)	*P* value
Sex at birth, n (%)				
Women		72 (75%)	50 (61.7%)	0.083
Age years, mean (SD)	41.5 (11.1)	41.4 (11.9)	42.0 (10.3)	0.599
Anthropometric, mean (SD)				
Weight (initial), kg	129.4 (25.4)	128.1 (24.0)	130.6 (26.8)	0.532
Weight (before surgery), kg	128.7 (25.3)	125.6 (23.7)	132.4 (26.8)	0.080
BMI, kg/m²	47.3 (8.43)	46.4 (8.70)	48.4 (8.02)	0.120
Metabolic comorbidities, n (%)				
Prediabetes	93 (52.29	55 (57.2)	38 (46.9)	**0.015**
Type 2 diabetes	50 (28.2)	28 (29.2)	22 (27.5)	0.867
Hypertension	111 (62.7)	59 (61.5)	52 (65.0)	0.642
Dyslipidemia	104 (58.7)	56 (61.5)	48 (61.5)	1.00
Hypertriglyceridemia	55 (31.0)	25 (35.2)	30 (40.5)	0.608
Hypercholesterolemia	30 (16.9)	13 (18.6)	17 (23.0)	0.545
Hypoalphalipoproteinemia	66 (38.5)	38 (52.1)	28 (37.8)	0.098
Psychopathology, n (%)				
Major depressive	37 (20.9)	22 (24.7)	15 (19.0)	0.456
Anxiety disorder	18 (10.1)	14 (15.9)	4 (5.10)	**0.026**
Binge eating disorder	11 (6.21)	8 (9.10)	3 (3.80)	0.219
BMI: Body Mass Index				

GC4.039

Better Family APGAR score Can Make Better Weight Loss after Bariatric Surgery

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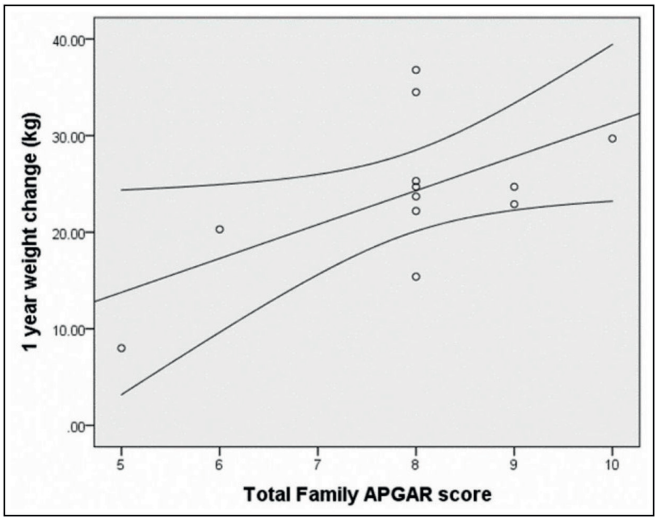
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Introduction: Postoperative weight loss is a very important part of postoperative patient management in bariatric surgery. Family function play significant role in preventing obese or weight gain. But there are insufficient studies about effect of family function on bariatric surgery. So, we investigated the effect of family function on patients after bariatric surgery.

Method: We use cohort data from single center to investigate the differences in weight change according to the family APGAR score after bariatric surgery.

Result: Total 35 patients was enrolled. 11 patients underwent sleeve gastrectomy, 28 patients underwent sleeve plus proximal jejunal bypass surgery, one patients underwent Roux en Y gastric bypass surgery. Mean weight loss was 30.84 kg in 12 month after surgery. Mean Family APGAR score was 8.18 point. The better APGAR score was associated with more weight loss in 12 month.

Conclusion: Family function may play an important role in weight management after bariatric surgery. Better family function can help maintain weight loss after surgery. Measuring the Family APGAR score in bariatric surgery patients will be helpful in determining the prognosis of weight loss.



This is scatter plot that contains trend line from linear regression analysis. Curved line means standard error.

Fig. 1. Association between family APGAR score and weight cha.

Linear regression analysis according to Family APGAR score

Individual dependent variables	B	beta	p value
3 month weight changes	0.058	0.018	0.919
3 month HbA1c change	-0.147	-0.306	0.137
3 month total cholesterol change	-14.977	-0.430	0.036
3 month LDL cholesterol change	-10.856	-0.397	0.054
3 month triglyceride change	-5.061	-0.090	0.675
3 month systolic BP change	2.688	0.239	0.239
3 month diastolic BP change	0.786	0.098	0.649
1 year weight change	3.511	0.596	0.041
1 year HbA1c change	-0.539	-0.673	0.023
1 year total cholesterol change	14.675	0.381	0.312
1 year LDL cholesterol change	11.121	0.338	0.374
1 year triglyceride change	-29.441	-0.775	0.464
1 year systolic BP change	11.595	5.470	0.072
1 year diastolc BP change	5.177	0.450	0.224

Comparisons of progress after surgery

Variables	Baseline	Post-op 3M	Post-op. 1y
Weight(kg)	108.8(21.5)	89.8(17.88)	78.0(15.89)
BMI	39.8(7.67)	32.6(6.44)	29.1(6.15)
Systolic BP (mmHg)	136.9(15.47)	125.4(16.07)	120.6(17.46)
Diastolic BP(mmHg)	82.2(11.19)	75.0(11.6)	73.2(12.81)
AST(U/L)	29.4(18.45)	19.1(7.20)	17.5(3.36)
ALT(U/L)	38.8(29.56)	19.2(11.38)	13.1(2.70)
ALP(U/L)	63.1(21.17)	69.9(27.45)	60.4(17.73)
Total cholesterol(mg/dL)	175.6(44.89)	169.5(27.45)	183.3(34.83)
LDL cholesterol(mg/dL)	116.4(34.79)	114.5(25.13)	112.7(40.55)
HDL cholesterol (mg/dL)	45.5(10.04)	57.0(30.04)	64.6(18.15)
Triglyceride(mg/dL)	169.9(104.07)	90.1(39.53)	116.7(44.48)
HbA1c(%)	6.3(1.18)	5.8(0.86)	5.9(1.18)

mean (SD)

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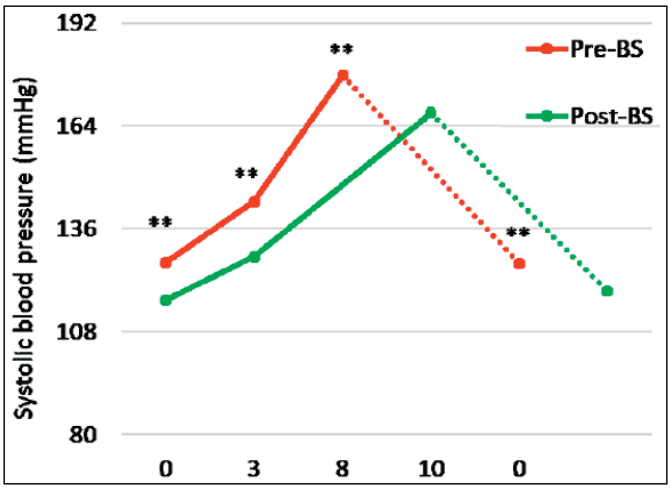
GC4.040

Workload-indexed blood pressure during submaximal and maximal exercise in patients with severe obesity before and after bariatric surgery

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Introduction: Obesity is accompanied by increased resting blood pressure. Exaggerated blood pressure during exercise correlates with cardiovascular events independently from baseline blood pressure levels. High workload-indexed blood pressure (W-SBP) and particularly a value ≥10 mmHg/METs is significantly associated with an increased mortality risk.
Aim: to evaluate blood pressure response and W-SBP during a cardio-pulmonary exercise test (CPET) before and after bariatric surgery (BS).
Methods: 257 patients with severe obesity performed maximal incremental CPET one month before and six months after BS using the same incremental protocol. Systolic blood pressure was measured at rest (SBPrest), at the same submaximal intensity of 3 METs (SBPsubmax), at peak exercise (SBPpeak) and in the recovery phase. The submaximal and maximal W-SBP (W-SBPsubmax and W-SBPpeak, respectively) were calculated with a dedicated formula.
Results: Age was on average 45.5±10.3 years, BMI before BS was 43.9±6.4 Kg/m^2 and 73.5% were females. SBPrest decreased significantly after BS (-10.2±15.8 mmHg; p <0.0001), also when considering percentage variation. SBPsubmax and SBPmax showed significant reduction after BS both as absolute change (-15.0±19.7 mmHg and -10.3±25.1 mmHg; p<0.0001, respectively) and as percentage change. Furthermore, W-SBP decreased significantly during submaximal exercise (-3.0±12.2 mmHg/METs; p<0.0001) and at peak of exercise (-2.1±4.8 mmHg/METs; p<0.0001), despite a higher exercise tolerance after BS, determined as the workload reached at the peak of exertion (Figure 1). A logistic regression analysis showed that the probability to have W-SBPpeak ≥ 10 mmHg after BS was independently determined by age, W-SBPpeak and functional capacity before BS.



The figure represents the behavior of systolic blood pressure during exercise (solid line) and the recovery phase (dashed line) in PwO before (red) and after bariatric surgery (green). Significant differences of blood pressure recorded in the same phase of exercise testing before and after bariatric surgery are expressed as **<0.0001. As visible, despite reaching a higher exercise intensity after bariatric surgery PwO showed a lower blood pressure than before.

Fig. 1. Systolic blood pressure during exercise test before and after bariatric surgery.

Conclusions: After BS, a marked reduction of resting and exercise blood pressure values was observed. W-SBPsubmax and W-SBPpeak, as an expression of load-independent pressure response, decreased significantly, despite a significant increase in exercise tolerance after BS. Age, W-SBPpeak and functional capacity at baseline significantly determined the probability to have high W-SBPpeak post BS.

GC4.041

Instauration of protein supplementation immediately after bariatric surgery ensures achieving minimal protein requirements

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Introduction: Bariatric surgery patients fail to comply with protein requirements established by clinical guidelines in the first months after surgery. The aim of the present study was to analyze if the use of protein modules immediately after surgery facilitates adequate protein intake, thereby helping to reach the established requirements.
Methods: A total of 142 patients (68% females) with a mean age of 46.7 ± 12.6 years undergoing bariatric surgery [62 (44%) sleeve gastrectomy and 80 (56%) Roux-en-Y gastric bypass] during the years 2021 and 2022 at the Clínica Universidad de Navarra (Pamplona, Spain) were included in the study. Dietary records and compliance with protein supplementation referred by the patients at baseline and after 1, 3, 6 and 12 months post-surgery were analyzed.
Results: The mean preoperative protein intake was 114 ± 30 g/d, 20% of the total energy value. During the first month after surgery, patients had a mean protein intake of 71 ± 11 g/d, including the protein supplementation recommendation of 30 g/d, which was met by 97% of the patients. At all timepoints the mean protein intake reached the established requirements of 60 g/d protein intake. Nonetheless, a lower percentage of patients (79%) met the minimum protein intake recommendation 3 months after the surgery compared to 1 (87%), 6 (85%) and 12 (92%) months post-operatively. Only 40% of the patients maintained the protein supplementation 6 months after the surgery, decreasing to 18% once the first year had elapsed. No statistically significant differences between type of surgery and protein intake were observed.
Conclusion: Instauration of protein supplementation immediately after surgery ensures that minimal protein requirements are covered. Due to the incorporation of solid diet after 3 months of the surgical intervention and the subsequent decrease in protein supplementation, achieving the

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minimal requirements can be compromised. Therefore, our data suggest that maintenance of protein supplementation in order to maximize beneficial outcomes should be encouraged during the first year after surgery.

Conflict of Interest: none disclosed.

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GC4.042

Behavioral Change for Bariatric Surgery Patients using a mobile application - A Comprehensive Approach

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Introduction: Despite recommendations for compliance to treatment and lifestyle changes following bariatric surgery, the current levels are suboptimal. This single-center project aims to address this challenge by implementing the Health Action Process Approach (HAPA) as behavioral change strategies for participants with obesity who underwent bariatric surgery. The primary objective is to improve long-term engagement and compliance, with secondary goals focusing on refining patient profiling methodologies and automating data collection through smartphones and wearables.
Methods: A cohort of 500 patients will be tracked using a smartphone application, with participants divided into two groups. Both groups will utilize a mobile application (moveUP nv, Brussels, Belgium), but the control group (CG) will focus on limited follow up by the bariatric coordinator, data collection and access validated education materials. The intervention group (BC) will receive automated motivational messages and additional support under the behavioral change umbrella, including personalized goal setting, action plans, coping strategies, and digital follow-up by a multidisciplinary team comprising a bariatric coordinator, dieticians, psychologist, physical therapist, and treating surgeon. Just-In-the-Moment Adaptive Interventions (JITAI's) will be tailored to individualized treatment protocols, with usual care continued alongside app usage.
Results: The project started with 72 patients. Preliminary findings reveal higher adherence to data collection in the BC group compared to the CG (BC: 84%, CG: 55%). Assessment of compliance to behavioral change components is underway. Results will be presented from psychological, clinical, and economic perspectives, including motivational intentions, quality of life, therapy adherence, appointment attendance, follow-up period, patient satisfaction, cost-effectiveness, and application usage.
Conclusion: This ongoing project seeks to elevate post-bariatric care by leveraging innovative strategies in patient profiling, data collection, and behavioral change interventions. The incorporation of HAPA and personalized support through the mobile application holds promise in improving patient engagement and compliance, contributing to advancements in obesity management. Results from diverse angles will provide a comprehensive understanding of the project's impact on patient outcomes, healthcare efficiency, and the integration of technology in bariatric care.

GC4.043

TSD-OC as a Measure of Disability in Patients with Severe Obesity Before and After Sleeve Gastrectomy

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Introduction: Severe obesity is frequently associated with social and functional disability significantly impacting quality of life[1]. The aim of this study was to retrospectively evaluate obesity-correlated disability in patients before and after Sleeve Gastrectomy.
Methods: To measure Obesity-related Disabilities we used the TSD-OC[2]. This is a 36-item questionnaire divided into 7 sections (pain, stiffness, ADL and indoor mobility, housework, outdoor activities, occupational activities, and social life), developed by the Italian Society of Obesity (SIO) in 2009 and validated in the Italian population[3]. Disability is defined by a cut-off value > 33%. 70 consecutive patients, who underwent laparoscopic Sleeve Gastrectomy (SG) surgery at the Bolzano Hospital, completed the TSD-OC before (T0) and 12-24 months (T1) after SG.
Results: Among 70 adult patients 77% were female and 23% male. At T0 the mean BMI was 43.6 kg/m² ± 6.1, the mean TSD-OC was 36.0% ± 20.0 and the prevalence of disability was 57.1%. Higher initial disability values were present among males, patients aged ≥50 years, and patients with comorbidities (diabetes mellitus type 2, OSAS and osteoarticular problems). At T1, the mean BMI was 31.2 kg/m² ± 4.6, mean total body loss was 27.8% ± 27.7. 67.2% lost more than 50% of their excess weight (%EWL). The mean TSD-OC at T1 was 6.3% ± 10.2 and the prevalence of disability dropped to 4.3%. Statistically significant reductions of subscores were observed in each section of TSD-OC. Greater disability reduction was observed in males, participants aged <50 years, patients with BMI≥40kg/m² and those without comorbidities. Patients with %EWL>50 had major disability reductions than people with %EWL<50. No significant differences in disability reduction were found between patients with initial TSD-OC-scores >33% and <33%.
Conclusion: Severe obesity is associated with significant disability, as also evidenced in our study. We observed a significant reduction in disability at 12-24 months after Sleeve Gastrectomy. The percentage of TSD-OC score reduction was similar in participants with and without initial disability. Further studies with larger sample sizes and study duration are necessary.

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GC4.044

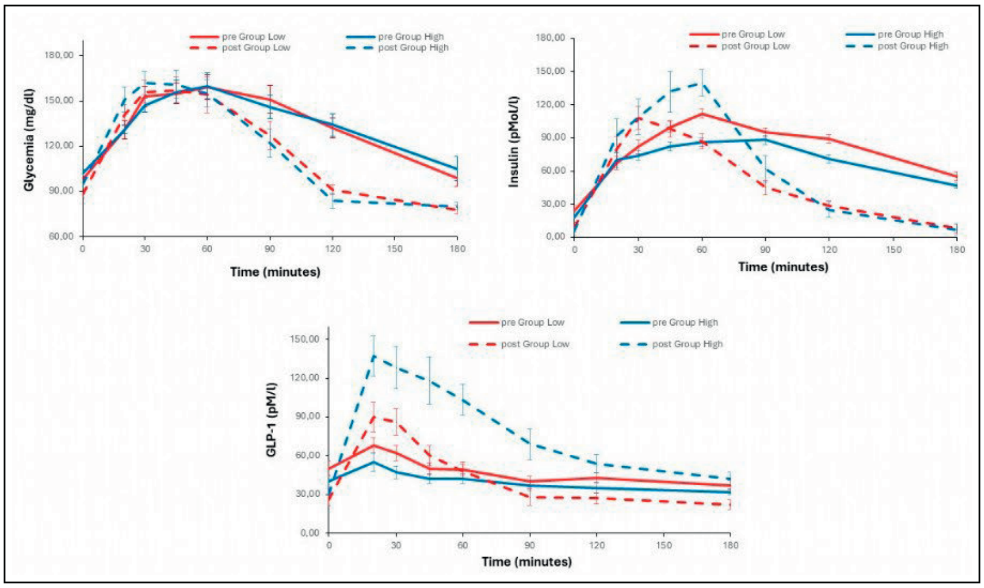
Potential role of endogenous GLP-1 on arterial stiffness and renal hemodynamics following bariatric surgery

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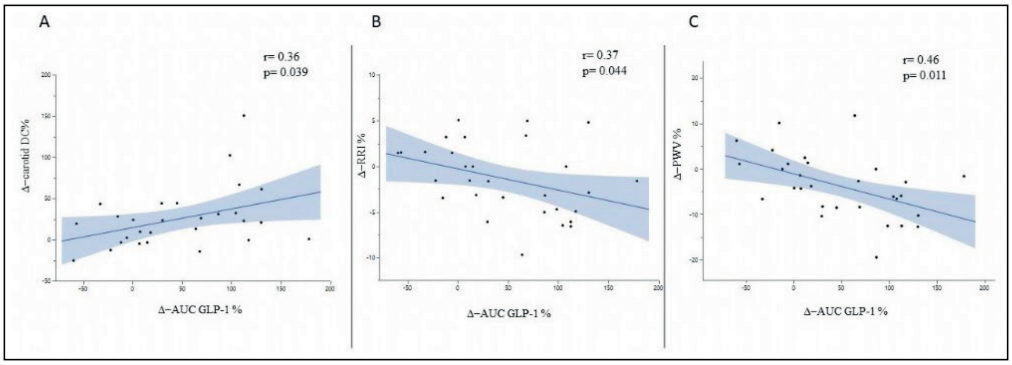
Background and Aims: Cardiovascular trials have revealed the positive impact of GLP-1 receptor agonists (GLP-1 RAs) on cardiovascular outcomes in type 2 diabetes (T2D). However, the specific effects of endogenous GLP-1 on arterial stiffness and renal function remain understudied. This study aimed to explore the influence of endogenous GLP-1 response post-bariatric surgery on arterial stiffness and renal hemodynamic.
Materials and Methods: Thirty individuals affected by morbid obesity scheduled for Roux-en-Y Gastric Bypass (RYGB) were included. Clinical parameters, 3-hours oral glucose tolerance test (OGTT) with serial sampling for glycemia, GLP-1 and insulin, carotid-femoral pulse wave velocity (cf-PWV), carotid diameters and distensibility coefficient (carotid-DC) and renal resistive index (RRI) measurements were conducted pre-surgery and 1 year post-surgery. Participants were categorized into High-Response and Low-Response groups based on their post-surgery increase in GLP-1 (median increase of 104% and 1%, respectively, pre- vs post-surgery).
Results: Post-surgery, High-Response group demonstrated a greater reduction in cf-PWV compared to Low-Response (p=0.033) and a greater increase in carotid-DC (p=0.043). These enhancements were observed independently of weight loss or blood pressure changes in multivariate analysis. Moreover, only the High-Response group exhibited a reduction in RRI (p=0.034), although this association was influenced by improvement in pulse pressure. Finally, a multivariate stepwise regression analysis indicated that the percentage increase of GLP1, delta-GLP1(AUC)%, was the best predictor of percentage decrease in cf-PWV (p=0.014).

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Fasting glycemia, glucose AUC during OGTT and fasting insulin levels were reduced after surgery, with no differences between groups. Insulin AUC decreased after surgery, showing a trend towards a slightly greater reduction (p=0.071) in the Low-Response group. Regarding GLP-1, basal levels decreased significantly in both groups, but more markedly in the Low-Response group. After surgery, the peak of GLP-1 after OGTT significantly increased in both groups, with a significantly higher increase observed in the High-Response group.

Fig. 1.



Through univariate analysis, we investigated the primary associations between continuous variables before and after surgery, expressed as variance percentage (ΔX%), using the formula (ΔX% = [(Xf − Xi) / (Xi) × 100] %, where i = pre-surgery and f = post-surgery). In univariate analysis, the delta-GLP1(AUC)% was negatively correlated with Δ-RI% (r=0.37, p=0.044) and delta-PWV% (r=0.46, p=0.011), while it was positively correlated with Δ-carotid DC% (r=0.36, p=0.039).

Fig. 2.

Conclusions: Elevated endogenous GLP-1 response following RYGB was associated with improved arterial stiffness and renal resistances, suggesting potential cardio-renal benefits. The findings underscore the potential role of endogenous GLP-1 in influencing vascular and renal hemodynamics independent of traditional weight loss.

GC4.045

Dietetic Intervention to Optimise pre Bariatric Surgery Glycaemic Management

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Introduction: Bariatric surgery is an effective treatment for complex obesity and Type 2 diabetes (T2DM), but surgery may be delayed if a significantly out of target glycated haemoglobin (HbA1c) is identified in pre-surgery assessment. Although data guiding the pre-operative management of glycaemia in bariatric surgery is limited, HbA1c below 8% is a suggested target (1). We describe the introduction of a pre-surgery glycaemia optimisation clinic, led by a Clinical Specialist Dietitian, in a Level 4 Bariatric surgery service in Ireland.

Methods: Patients identified with above target HbA1c at pre-surgical medical screening were referred. A protocol was developed for a dietitian led, telehealth clinic providing intensive support around dietary management and medication adherence. The dietitian contacted referred patients to explain the intervention and invite them to attend the clinic via video call. A diary for self-monitoring food, blood glucose levels, activity and medication was emailed to patients with instructions to keep it for the week prior to the appointment and return it by email. Consultations focused on assessing and developing patients' nutritional knowledge and understanding of dietary impact on glycaemic management. Facilitated reflection on patient records was used to identify weekly behavioural goals with the patient.

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In cases where medication review was indicated, for example limited scope for further dietary manipulation, or tolerance issues, medication optimisation was supported by the Consultant Endocrinologist. Review appointments were offered fortnightly until glycaemic management was improved to target HbA1c or the patient opted out. Data were gathered and analysed on Microsoft Excel and presented as mean +/- standard deviation.

Results: The clinic commenced in September 2023, data has been analysed to January 2024. Of the 13 patients offered appointment, a total of 11 patients were seen for initial assessment, and 1 patient dropped out. Baseline HbA1c was 77.8 ±8.56mmol/mol. Repeat HbA1c was available for 4(40%) patients (68mmol/mol±11.3 mmol/mol), with a reduction of 13.75±9.4 mmol/mol after 3.75 ±1.8 appointments. Areas addressed most frequently included carbohydrate portion management, meal pattern stabilisation, self-monitoring, consistency with taking medications, and meal planning. New medications were commenced for 3 patients (2 GLP-1, 1 insulin).

Conclusion: An intensive, remotely delivered, dietitian-led pre-bariatric surgery glycaemia optimisation clinic significantly improved both HbA1c and health behaviours that contribute to long-term diabetes and obesity self-management. There was good uptake of this treatment to reduce barriers to bariatric surgery and evidence-based obesity care. A Clinical Specialist Dietitian working at the top of their license is ideally skilled to develop this type of intervention, and it should be considered as in all bariatric surgery services.

Reference

Busetto L, et al. Practical Recommendations of the Obesity Management Task Force of the European Association for the Study of Obesity for the Post-Bariatric Surgery Medical Management. Obes Facts. 2017;10(6):597–632.

GC4.047

Breast cancer risk following bariatric surgery - implications of genetic variation in the Fat mass and Obesity-associated protein (FTO) -gene

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Introduction: Obesity is increasingly recognized as a primary risk factor for cancer, but the underlying mechanisms that contribute to the increased risk of cancer in individuals with obesity are still not fully understood. Women with obesity have an increased breast cancer risk, and it has been shown that bariatric surgery reduces this risk. Studying the genetic variations potentially underlying this reduction in breast cancer risk may reveal new targets for breast cancer prevention. The 'fat mass and obesity-associated gene' (FTO) has been suggested to be a common genetic basis of obesity and cancer, and we therefor studied the role of the FTO Single Nucleotide Polymorphism (SNP) rs9939609 on breast cancer risk in women of the Swedish obese subjects (SOS) study.

Methods: The prospective, matched Swedish Obese Subjects (SOS) study, ClinicalTrials.gov, NCT01479452, was designed to examine outcomes after bariatric surgery. The present study includes 2867 women with obesity, 1420 that underwent bariatric surgery and 1447 contemporaneously matched controls who received conventional obesity treatment. The rs9939609 was genotyped in patient DNA using the using TaqMan allelic discrimination PCR assay. Information on breast cancer events was captured from the Swedish Cancer Registry.

Results: The rs9939609 was successfully genotyped in DNA from 2584 women (99.5 %). During follow-up, 135 breast cancer events were observed, 91 in the TA/AA-group and 44 in the TT-group. For women carrying the risk allele (TA/AA genotypes), bariatric surgery was associated with a decreased breast cancer incidence compared to controls (HR=0.51 (0.33-0.77), P=0.002). Conversely, women without the risk allele (TT genotype) did not display a significant difference in breast cancer incidence between the treatment groups (HR=1.12 (0.62-2.04), P=0.699). In addition, a significant treatment-genotype interaction was observed (p=0.032). There was no difference in weight loss between the genotype groups during follow up.

Conclusion: In summary, our study revealed an association between the FTO rs9939609 SNP and the risk of breast cancer in women with obesity. Among carriers of the risk allele (TA/AA genotype), treatment with bariatric surgery was found to normalize the risk of breast cancer to a level comparable to that of the general Swedish population.

Conflict of Interest: Dr. L Carlsson has received consulting fees from Johnson & Johnson. All other authors declare they have no competing interests.

Funding: The study was financed by grants from the Swedish state under the agreement between the Swedish government and the county councils, the ALF-agreement.

GC4.049

Exploring primary care and specialist weight management services healthcare professionals' views, experiences, and behaviours around long-term post-bariatric surgery care in the UK

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Introduction: While recognised as the most clinically and cost-effective treatment for severe/complex obesity, in the long-term bariatric surgery can result in multiple issues such as nutritional deficiencies, psychological issues, alcohol/substance misuse and excess skin. Although weight-loss in the first two years post-surgery is usually significant, from 18-24 months weight regain can occur. Guidelines have highlighted the importance of post-bariatric surgery follow-up and the role of primary care. However, in the UK, there is no specific funding available to support GPs to undertake annual reviews at present; and there are no established services or pathways that have been implemented. The aim of this study was to understand views and experiences of healthcare professionals (HCPs) around managing patients long-term after bariatric surgery and to explore barriers and facilitators to care provision.

Methods: Semi-structured interviews with primary care and specialist weight management services HCPs were undertaken to investigate experiences and views on the long-term management of patients post-bariatric surgery. The discussion guide and analysis were theoretically informed by the Capability-Opportunity-Motivation-Behaviour model (COM-B) and the Theoretical Domains Framework (TDF), as this is an approach designed to elicit modifiable determinants of change (barriers and enablers), as well as potential processes for addressing these determinants (mechanisms of change).

Results: Interviews were completed with 26 HCPs, including GPs (n=10), Bariatric Dietitians (n=5), Bariatric Clinical Psychologists (n=4), Bariatric Physicians (n=2), Bariatric Surgeons (n=2), Bariatric Pharmacists (n=2), and a Bariatric Nurse (n=1). Four themes related to barriers and facilitators to providing long-term post-bariatric follow-up in primary care emerged during data analysis: (1) the complexity of patient presentations post-bariatric surgery, (2) knowledge and understanding amongst HCPs, (3) systemic challenges facing primary care, and (4) opportunities to support patients long-term.

Conclusion: There was consensus amongst HCPs that patients should receive long-term follow-up in primary care after bariatric surgery. This could be formally structured around an annual review, including, for

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example blood tests to assess micronutrient status, and an assessment of wellbeing. HCPs emphasised the heterogeneity of this patient group in terms of associated co-morbidities, and therefore recommended a tailored approach to follow-up beyond a standard review. However, long-term support for patients post-bariatric surgery was contingent upon capacity to manage follow-up in primary care and access to specialist support. Given increasing pressures on GPs' time, some participants proposed that follow-up could be administered by other HCPs working in primary care with additional training provided as required. In the absence of funded specialist support, referral to community initiatives and peer support groups could improve patient wellbeing. Follow-up could also be modelled on, or integrated with, the management of other long-term conditions in primary care.

GC4.050

Treatment of obesity: comparison of bariatric surgery versus pharmacotherapy versus lifestyle modifications and their combinations

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Background: The treatment of obesity is based on lifestyle changes, pharmacological and surgical therapy. To date, bariatric surgery represents the most effective therapy in patients with severe obesity both in terms of weight loss and reduction of complications. However, patients undergoing bariatric surgery may develop weight regain or insufficient weight loss. In the first part, as a primary objective, the study aims to compare the effectiveness of four different therapeutic approaches: bariatric surgery, pharmacological therapy (liraglutide or naltrexone/bupropion) and lifestyle modification. In the second part, a comparison was performed among three different strategies to treat weight regain or insufficient weight loss two years after bariatric surgery: by strengthening lifestyle changes or by introducing pharmacological therapy with liraglutide or naltrexone/bupropion.
Methods: This retrospective observational study recruited patients suffering from obesity within the Center for the Study and Integrated Treatment of Obesity (CeSTIO) of the University Hospital of Padua and consists in two parts. In the first part, a population of 1097 patients was analysed and 1080 patients were ultimately studied. Among these, 655 underwent bariatric surgery, 177 were treated with liraglutide, 167 with naltrexone/bupropion and 81 with lifestyle modifications. In the second part, a population of 191 patients was studied and 125 patients were recruited with criteria for weight gain or insufficient weight loss two years after bariatric surgery: after surgery, 71 patients were treated with lifestyle modifications alone, 27 with liraglutide and 27 with naltrexone/bupropion.
Results: In the first part, weight loss at 12 months of follow-up was greater in the surgical group (surgery - 35 kg vs liraglutide -7 kg vs naltrexone/bupropion -7 kg vs lifestyle -7kg; $p < 0.001$). Corrispondingly, the prevalence of patients who experienced type 2 diabetes and hypertension remission was greater in the surgical group (diabetes: surgery 12% vs liraglutide 0% vs naltrexone/bupropion 0% vs lifestyle 4.8%; hypertension: surgery 25% vs liraglutide 4.5% vs naltrexone/bupropion 0.8% vs lifestyle 0%). In the second part, weight loss at 12 months of follow-up in post-surgical patients with weight-regain was greater in those who took the pharmacological treatment, without significant differences between liraglutide and naltrexone/bupropion compared to those following the intensification of lifestyle alone (liraglutide - 6 kg vs naltrexone/bupropion - 5 kg vs lifestyle +2 kg – $p < 0.001$). Furthermore, a greater prevalence of resolution of hypertension was observed in the liraglutide group (liraglutide 8.7% vs naltrexone/bupropion 0% vs lifestyle 1.6% - $p < 0.044$).
Conclusions: Bariatric surgical therapy is the most effective therapy both in terms of weight loss and resolution of diabetes and hypertension. In patients with weight regain two years after surgery, pharmacological therapy (liraglutide and naltrexone/bupropion) is the most effective compared to simply intensifying lifestyle changes.

GC4.051

Lower postprandial hyperinsulinemic hypoglycemia like symptoms may help identify patients with lower post-bariatric late dumping syndrome: a retrospective observational study

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Introduction: Postprandial Hyperinsulinemic Hypoglycemia (PHH) or late dumping syndrome is a common complication of bariatric surgery, characterized by hypoglycemic symptoms occurring 1 to 3 hours after a carbohydrate-rich meal and 6 to 12 months after the surgery. Identifying predictive risk factors for the development of PHH might help select susceptible patients before the surgery. The primary outcome of this study is to evaluate whether the presence of hypoglycemia (glycaemia < 60 mg/dL) during the preoperative Oral Glucose Tolerance Test (OGTT) could predict the risk of developing symptoms suggestive of PHH in patients with obesity undergoing bariatric surgery. Investigating whether the preoperative presence of symptoms suggestive of hypoglycemia might predict the risk of developing the same symptoms suggestive of post-surgical PHH was the secondary outcome. Preoperative risk factors for the development of post-surgical hypoglycemic symptoms were also investigated.
Methods: A questionnaire, adapted from the Edinburgh Hypoglycemia Symptom Scale (EHSSQ), investigating the same items regarding the pre and post-operative hypoglycemic symptoms, was administered to patients who underwent bariatric surgery at least 6 months before the study visit. Patients were classified into two groups, High Suspicious risk (HS) and Low Suspicious risk (LS), based on the EHSSQ derived clinical suspicion of having hypoglycemic symptoms before and after surgery. Biochemical and physical parameters were also registered during pre and postoperative visits.
Results: 190 subjects underwent the following bariatric procedures: 131 (68.9%) VSG, 53 (27.9%) BPG, 2 (1.1%) gastric banding, 4 (2.1%) mini-BPG. Subjects were divided into the HS group 64 (33.68%) and the LS group 126 (66.32%) after surgery. Subjects in the HS were more prevalent in the BPG group (P =.005) than in the others procedures. Hypoglycemic events during preoperative OGTT did not differ between HS and LS groups (P =.274). A logistic regression analysis could not identify the hypoglycemia during preoperative OGTT as a risk factor for having high risk of PHH symptoms after surgery (OR 2.188 95% CI (0.597-8.019), P =.237). Logistic regression showed that subjects in the LS before surgery had a lower risk of being in the HS after surgery (OR 0.35 95% CI (0.186-0.757), P =.001). T-test for independent samples showed that the preoperative BMI and the delta-BMI did not differ between the postoperative HS and LS groups.
Conclusions: The absence of preoperative symptoms suggestive of PHH showed to be a strong predictor of a low risk of postbariatric PHH symptoms. This study supports the role of screening patients for symptoms of PHH prior to bariatric surgery to identify those at higher risk of developing postbariatric PHH. Having this information before surgery may help select the surgical procedure with a lower risk of PHH and improve the patients' knowledge on handling PHH awareness and treatment.

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GC4.052

Study of sex differences in bariatric surgery: a single-center study

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Introduction: gender medicine studies the influence of biological, socio-economic, and cultural differences between the sexes on health status. Deepening these aspects could be useful in the development of new and more targeted treatments of patient with obesity, even in case of bariatric surgery both in the short and in the long term. For this reason, we wanted to see if there are different outcomes in male and female patients undergoing bariatric surgery, studying the eligibility for surgery, weight loss after surgery, post-surgical complications, and eating behaviour.
Methods: we evaluated patients with obesity referring to our center for obesity treatment. We extracted key demographic data, medical history, and examined weight loss in response to surgery and post-surgical complications seeking for statistically significant differences between male and female patients.
Results: we examined 598 patients and evaluated their eligibility for bariatric surgery, finding no statistically significant differences between males and females: 379 out of 448 female patients were eligible, 132 out of 150 male patients were eligible. Among eligible patients, 237 patients underwent bariatric surgery, 184 females and 53 males; the different types of bariatric surgery of our sample were sleeve gastrectomy (SG) (156 patients, 65.8%), bioenteric intragastric balloon (BIB) (69 patients, 29.1%), one anastomosis gastric bypass (OAGB) (7 patients, 2.9%), adjustable gastric bending (AGB) (3 patients, 1.3%), overstitch procedure (1 patient, 0.4%), vertical banded gastroplasty (VGB) (1 patient, 0.4%). We found no differences between male and female patients concerning weight loss 1 month, 3 months, 6 months, and 12 months after surgery. Furthermore, we found no differences concerning eating behaviour (craving, hyperfagia) and complications after surgery (nausea, vomit, diarrhea, headache, and dumping syndrome) at 1 month, 3 months, and 6 months follow up, except for constipation 1 month after surgery, which was significantly more prevalent among females than males (OR: 2.875; 95%CI 1.32-6.27; p=0,009).
Conclusion: we found no significant differences between males and females in our cohort of patients seeking for obesity treatment and undergoing bariatric surgery in terms of eligibility for surgery, weight loss, eating behaviour, and post-surgical complications, except for constipation, which appears to be significantly more frequent in females than males in the early post-operative period.

GC4.053

Experiences of conducting online workshops on long-term post-bariatric surgery care with a combination of healthcare professional, commissioner and patient participants in the Promise Care Study

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Introduction: While recognised as the most clinically and cost-effective treatment for severe/complex obesity, in the long-term bariatric surgery can result in multiple issues such as nutritional deficiencies, psychological issues, weight regain and excess skin. Guidelines have highlighted the importance of post-bariatric surgery follow-up and the role of primary care. However, in the UK, there is no specific funding or pathways available to support long-term care post-bariatric surgery.
The Promise Care Study seeks to gain a comprehensive understanding of the issues involved in delivering long-term care post-bariatric surgery including barriers and enablers to effective care and stakeholder views. Part of the Promise Care Study has involved a series of online workshops to develop a system map on long-term post-bariatric surgery care. Most of these workshops have been held with a combination of healthcare professional, commissioner and patient participants attending to discuss this challenging area of healthcare. Our experiences and learning from conducting these workshops will be presented.
Methods: At an early stage of planning the workshops the advice of our patient and public involvement and engagement advisory group (PAG) was sought. In particular, around ensuring patient participants were comfortable and supported in attending the workshops. Support was also offered to all participants (both professionals and patients) prior to the workshop to discuss any concerns they had and/or provide technical help with attending an online meeting. Prior to holding the workshops potential issues that may arise and plans to mitigate them were discussed between the study team.
Results: Input from study PAG members led to several important changes to how the workshops were conducted, for example including a "pre-meeting", which was led by members of the PAG and allowed participants to meet each other informally before the workshop began, and PAG input on the ground rules important to include at the start of the workshops. Healthcare professional, commissioner and patient participants worked collaboratively during the workshops to successfully develop a system map on long-term post-bariatric surgery care. Healthcare professional, commissioner and patient participants all appeared to find taking part in the workshops to have been a positive experience. In particular, some patient participants reported valuing the opportunity for healthcare professionals to hear their views and that some healthcare professionals were trying to improve their care.
Conclusion: It is possible to successfully conduct online workshops discussing a challenging area of healthcare with healthcare professionals, commissioner and patient participants all attending together. Fostering a sense of shared purpose amongst participants, discussing clear ground rules with the group, offering support pre-meeting and input from the study PAG were all key to the workshops being a positive experience for participants and successful for the research study.
We'd like to thank the members of our PAG for all their help with the study.

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GC4.054

Impact of Socioeconomic Status on Medium Term Outcomes of Bariatric Surgery in a Universal Healthcare System Setting

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Introduction: Obesity is a major health issue worldwide with a multifactorial origin. One of these multiple factors is socioeconomic status (SES) that negatively correlates with the prevalence of obesity. The most effective option in the treatment of obesity is bariatric surgery for its important and sustained weight loss and its remarkable reduction in co-morbidities and mortality. Nevertheless, in healthcare settings without equitable access to bariatric surgery, the lack of personal resources of lower income patients can hinder the persistence of the results of such a therapeutic option. This study aims to assess the impact of SES on medium term outcomes of bariatric surgery in an environment of universal healthcare with equitable access to such a treatment.

Methods: We performed a single-center retrospective study including patients that underwent bariatric surgery between 1997 and 2018 with a minimum follow-up of five years. Four bariatric techniques were considered: Roux-en-Y gastric by-pass, sleeve gastrectomy, bilio-pancreatic diversion, and vertical banded gastroplasty. The primary variable was the percent of excess body weight loss (%EBWL), defining bariatric surgery success as an %EBWL exceeding 50%. Median net income per person, according to the census section of the National Institute of Statistics, reflects the economic position of the patient and, therefore, was used to determine the SES. Statistical analysis included analysis of variance to correlate %EBWL and median net income (expressed in quartiles) with different secondary variables. Cox regression model was carried out to evaluate the influence of several factors on bariatric surgery success in the short and medium term.

Results: One hundred and seventy five patients with mean age of 44 (SD 12,1) years, and BMI of 48,4 (SD 8,2) Kg/m^2 had a mean follow up from the surgery of 6,3 years. At medium term, bariatric surgery revealed to be successful in 60,3% of the patients with no differences between %EBWL and income quartiles in the analysis of variance (p=0.473). Multiple regression model for %EBWL adjusted for covariates such as SES, type of surgery, and years since surgery did not yield statistically significant relationships. Female gender and the presence of diabetes are factors that negatively impact on %EBWL during follow-up. Neither %EBWL nor SES had a significant impact on mortality rates in the medium term, assessed with Log Rank test (p =0.485).

Conclusions: In a universal healthcare system setting, bariatric surgery as a treatment of severe obesity proves to be highly effective independently of patient' socioeconomic status. In the medium term, the conditions that can affect negatively weight loss maintenance appear to be female sex and co-existence of diabetes mellitus. Moreover, in our study, the more efficient bariatric techniques were Roux-en-Y gastric by-pass and sleeve gastrectomy compared to biliopancreatic diversion and vertical banded gastroplasty.

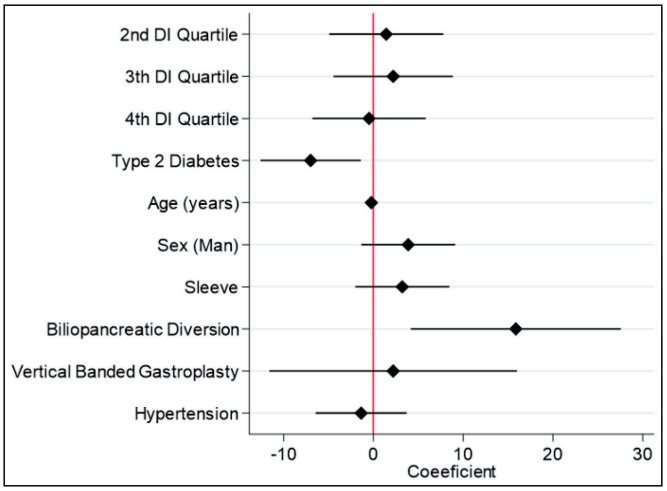
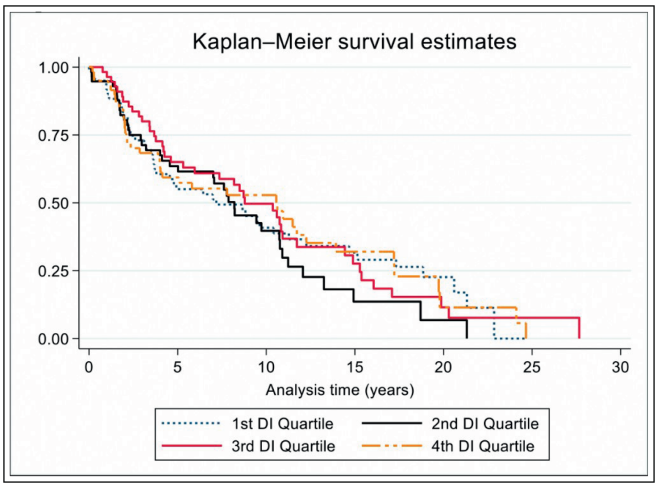


Fig. 1. %EBWL at first year after bariatric surgery (n = 205). Multiple regression analysis.



Time of follow-up (years) 6.3 years (3.1 – 10.8) IQR There were no statistical significant differences in mortality between the quartiles (Log Rank p=0.485).

Fig. 2. Kaplan-Meier Survival Analysis of Bariatric Surgery Outcomes, Stratified by Deprivation Quartiles.

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Tab. 1. Demographic and clinical characteristics across quartiles of deprivation index.

Variable	Obs n=220	Q1 n=57	Q2 n=55	Q3 n=53	Q4 n=55	p value
Sex (women)	64 (29.1%)	17 (29.8%)	20 (36.4%)	16 (30.2%)	11 (20.0%)	0.301[1]
Age (years)	44.0 ± 12.1	43.8 ± 11.52	49.2 ± 11.1	39.4 ± 11.4	42.2 ± 10.0	<0.001[2]
Hypertension	97 (43.6%)	29 (50.9%)	33 (60.0%)	17 (32.1%)	17 (30.9%)	0.003[1]
Type 2 Diabetes	54 (24.6%)	16 (28.1%)	22 (40.0%)	7 (13.2%)	9 (16.4%)	0.004[1]
BMI (Kg/m^2)	48.4 ± 8.2	48.9 ± 7.5	47.5 ± 7.5	47.9 ± 6.9	48.9 ± 10.2	0.814[3]
Surgery (%)	RYGB 61 (27.7%) SG 141 (64.1%) BPD 11 (5.0%) VBG 7 (3.2%)	RYGB 10 (17.5%) SG 39 (68.4%) BPD 7 (12.3%) VBG 1 (1.8%)	RYGB 18 (32.1%) SG 34 (60.7%) BPD 1 (1.8%) VBG 3 (5.4%)	RYGB 15 (27.8%) SG 33 (61.1%) BPD 2 (3.7%) VBG 4 (7.4%)	RYGB 18 (32.1%) SG 36 (64.3%) BPD 1 (1.8%) VBG 1 (1.8%)	RYGB 0.228 SG 0.880 BPD 0.031* VBG 0.641
EBW (%)	119.9 ± 36.6	122.9 ± 33.9	115.5 ± 33.7	118.4 ± 30.8	122.6 ± 46.4	0.669

Roux-en-Y gastric bypass: RYGB. Sleeve gastectomy: SG. Biliopancreatic Diversion: BPD. Vertical Banded Gastroplasty: VBG. Excess body weight (EBW) = Actual weight – Ideal body weight (IBW). Analysis: 1. Ji-squared 2. ANOVA 3. Kruskal wallis.

Tab.2. Clinical and outcome characteristics of bariatric surgery patients stratified by socioeconomic status.

Variable	Obs n=179	Q1 n=43	Q2 n=48	Q3 n=39	Q4 n=49	p value
Follow-up (years)	6.3 (3.1 – 10.8)	7.2 (3.6 - 15.0)	6.8 (2.4 -10.0)	7.8 (4.1 -10.7)	5.1 (2.1 -10.62)	0.204[1]
Final BMI (Kg/m^2)	33.8 ± 6.5	34.54286 ± 5.97	32.27255 ± 6.05	33.70026 ± 6.06	34.86144 ± 7.49	0.209[2]
EBW (%) loss	54.5 ± 21.7	53.2 ± 17.6	58.8 ± 24.4	53.07348 ± 22.14	52.76237 ± 22.0	0.473[2]
> 50% EBW loss	108 (60.3%)	24 (55.8%)	31 (64.6%)	24 (61.5%)	29 (59.2%)	0.854[3]
Death	5 (2.79%)	0	2 (4.2%)	2 (5.1%)	1 (2.0%)	0.484[3]

1. Kruskal wallis 2. ANOVA 3. Ji-squared

GC4.055

Metabolic benefits following bariatric surgery in male versus female patients

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Introduction: Bariatric surgery (BS) is a widely used intervention for individuals afflicted with obesity, with a notably higher prevalence among women than men. Gender-specific differences in cardiovascular (CV) disease risk underscore the importance of investigating potential variations in the risk profiles of men and women with obesity. The interplay between gender, diabetes, and weight loss both pre- and post-BS remains unclear. Therefore, this study aimed to explore gender disparities in metabolic parameters and weight loss outcomes among patients undergoing BS.
Methods: We enrolled 1398 patients with obesity (mean age 40±12 years, 1077 (77%) females, 321 males, mean BMI 44.4±8.8 kg/m^2, mean HbA1c 6.0% ± 1.2, mean LDL Cholesterol 118 mg/dl ± 35.4, mean HOMA IR 6.1±4.6) before BS. Follow-up was conducted 2 years post-BS for 462 patients. A 75g oral glucose tolerance test (oGTT) was performed for patients without diabetes, with diabetes mellitus defined by ADA criteria. In addition to demographic and CV risk factors, renal and inflammation parameters, along with insulin levels, were assessed.
Results: No significant differences were observed in age (39.9±11.8 vs. 40.3±12.4 a; p=0.187) or BMI (43.9±8.9 vs. 45.9±8.5 kg/m^2; p=0.644) between women and men. However, men exhibited higher baseline HbA1c levels (6.6±1.5 vs. 6.0±1.0 %; p<0.001) and greater baseline weight (148.8±26.1 vs. 123.1±20 kg; p<0.001) before bariatric surgery. Following bariatric surgery, men demonstrated a significant excess weight loss (-49.3±20.5 vs. -37.8±34.4; p=0.007) and a slightly higher but not statistically significant excess BMI loss compared to women -17.1 (-44.1; 29.0) vs. -13.79 (-32.0; 27.9) p=0.137. Before surgery, 18.9% of female patients and 30.7% of male patients had type 2 diabetes (p<0.001). After bariatric surgery, a higher but not statistically significant percentage of women still had diabetes compared to men (3.7% vs. 2.0%; p=0.409), and men experienced a significant reduction in HbA1c levels (5.1%±0.4 vs. 5.5%±2.4; p=0.053). Furthermore, men exhibited greater improvements than women in terms of HOMA-IR (p=0.014), LDL cholesterol levels (p=0.030), triglyceride levels (p<0.001), and HDL cholesterol levels (p<0.001) after bariatric surgery.
Conclusion: Our findings suggest that, despite similar excess BMI loss, men derive greater benefits from bariatric surgery in terms of diabetes management and lipid profile improvements compared to women. In situations where surgical capacity is limited, it may be worth considering a preference for men over women for bariatric procedures.

GC4.056

Differences in Diabetes Prevalence and Metabolic Syndrome Regarding Gender in Patients with Obesity

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Introduction and Objective: Obesity treatment facilities predominantly cater to female patients. Yet, gender-specific cardiovascular disease risk factors vary. With bariatric surgeries more frequently performed in women, the differential benefit for men, given their risk profiles, remains underexplored. This study aims to examine gender-specific disparities in cardiovascular risk factors among a large cohort of patients with obesity.
Materials-Methods: This study included 1398 patients with obesity (mean age: 40±12 years; 77% female). Average BMI was 44.4±8.8 kg/m^2, HbA1c 6.0 ± 1.2 %, LDL cholesterol 118 ± 35.4 mg/dl, and HOMA-IR index 6.1±4.6.

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Tab.1. Cardiovascular risk factors in comparison of women versus men with obesity.

	Systolic BP	Diastolic BP	BMI	Weight	Fasting Glucose	HbA1c	LDL	Triglycerides	HDL	eGFR	HOMA	Albumin	Prevalence of metabolic syndrome according to ATPIII
	mmHg	mmHg	kg/m²	kg	mg/dl	%	mg/dl	mg/dl	mg/dl	MDRD		mg/dl	%
female	140±33	89±11	43,9±8,8	123,0±19,9	101±33	6,0±1,0	107±33	152±86	49±13	93±22	5.7±4.5	62±47	33%
male	147±18	93±13	45,9±8,5	148,2±26,1	112±41	6,6±4,8	118±38	193±134	41±16	100±24	8.8±8.9	63±9,3	66%
p-value	0.772	<0.001	0.574	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.126	<0.001	0.575	<0.001

Results: The table presents relevant cardiovascular risk factors regarding gender differences; No significant differences were observed in age (39.9±11.8 vs. 40.3±12.4; p=0.187) or BMI (43.9±8.9 vs. 45.9±8.5 kg/m²; p=0.644) between genders. However, men exhibited higher HbA1c (6.6±1.5 vs. 6.0±1.0; p<0.001) and initial weight (148.8±26.1 vs. 123.1±20 kg; p<0.001), alongside elevated fasting glucose (112±41 vs. 101±33 mg/dl; p<0.001) and lipid profiles (LDL: 118±38 vs. 107±33 mg/dl, Triglycerides: 193±134 vs. 152±86 mg/dl; p<0.001). A significant difference was observed regarding diabetes (30.7% men, 18.9% women; p<0.001) and prevalence of metabolic syndrome (66% men, 33% women; p<0.001). Moreover, the data indicated that men, on average, presented with elevated blood pressure readings compared to women. These differences, while not statistically significant, showed higher systolic (147±18 mmHg vs. 140±33 mmHg) and diastolic (93±13 mmHg vs. 89±11 mmHg) blood pressure levels in men (p=0.772), categorizing them within the threshold of Grade I arterial hypertension.
Conclusion: This study reveals significant gender disparities in cardiovascular risk factors among patients with obesity, with men exhibiting a higher risk profile. These findings underscore the need for gender-tailored approaches in obesity management and emphasize the importance of heightened awareness and early intervention for cardiovascular risk factors, particularly in men, to improve health outcomes.

GC4.057

Why and how can we improve nutritional care for pregnant women after bariatric surgery? The NUMASURG project

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Introduction: Pregnancies after bariatric surgery (BS) are at risk for nutritional deficiencies, small-for-gestational-age (SGA) infants, and, to a lesser extent, prematurity[1]. Data on long-term outcomes remain scarce. Optimal management of these pregnancies relies on nutritional supplementation[2–3], which is complicated by the lack of specific reference values for nutritional biomarkers[4]. The main objective of the NUMASURG project (maternal NUtritional MArkers during pregnancy and child outcomes: a study in the general population and after bariatric SURgery) is to develop new biological references and improve recommendations for the nutritional care of pregnant women after BS.
Methods: More specifically, we will: 1) Establish a cohort of 1000 pregnant women after BS followed in the Specialized Centers of Obesity Management; 2) Establish reference values for nutritional biomarkers (vitamins A, B9, B12, 25(OH)-D, zinc, ferritin) from two birth cohorts of the French general population: the EDEN (Étude sur les Déterminants pré- et postnatals précoces du développement psychomoteur et de la santé de l'Enfant)[5] and Elfe (Etude Longitudinale Française depuis l'Enfance)[6] cohorts; 3) Compare the nutritional status between pregnant women after BS and in the general population for these nutritional biomarkers, and study the associations with SGA and prematurity; 4) Study the development and health up to the age of 4 years of children born after BS using the French medico-economic and administrative databases.
Expected Results: The NUMASURG project started in September 2023 and will run for 4 years. It will allow the implementation of new recommendations for the monitoring and nutritional supplementation of women who have undergone bariatric surgery, the improvement of their nutritional status, as well as the monitoring of the health and development of their children. Standardizing practices and structuring a standardized clinical database within each French Specialized Center for Obesity Management will enable future research projects in this field.

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GC4.058

Barriers to obesity management - lived experiences of people with obesity in Mexico

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Introduction: Obesity is a prevalent, multifactorial, progressive, and relapsing chronic disease characterised by an abnormal and/or excessive accumulation of dysfunctional body fat that impairs health. People living with obesity face prejudice and stigma that contribute to increased morbidity and mortality. The aims of this study were to: a) investigate the perspective of patients have experienced weight regain post-bariatric surgery and identify personal, medical, and social barriers they face in their long-term disease management process; and b) to develop recommendations for improving long-term follow-up obesity care, including medical and social support systems.
Methods: This qualitative study analyses 24 group sessions that were recorded and transcribed. The group sessions were conducted by two study coordinators. Participants (n = 10) were mostly women (n = 9), with an average age of 48 years. All participants underwent bariatric surgery in a public hospital in Mexico.
Results: Weight regain post-bariatric surgery impacted participants' mental health outcomes, with feelings of guilt causing the most concerns. Participants mentioned experiencing feelings of guilt related to many aspects of living with obesity, such as weight regain post-bariatric surgery, feeling hungry, having excess weight and body fat, wanting to be thin, and

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for feeling that they have failed their doctors and family for not being able to keep the weight off. This guilt plays against patient self-care and obesity management processes because it generates chronic stress and anxiety. Although participants expressed that support from family and friends is important, more support from health professionals was perceived as critical for long-term disease management.

Conclusion: Post-bariatric surgery weight regain may impacts patients' mental health and social wellbeing. Patients need support to adjust to living with a progressive and relapsing chronic illness, which can be psychologically demanding. Healthcare professionals can support their patients in this adjustment by acknowledging patients' feelings of guilt associated with weight regain, providing information and education about obesity as a chronic and relapsing illness (characterized by dysfunctional adiposity that impairs health not solely based on weight and body size), establishing a long-term therapeutic relationship, providing access to sustainable evidence-based obesity care, and by providing a genuine sense of hope. Obesity care approaches should also include healthcare professional support that focuses on patients' physical and mental health outcomes, as well as overall quality of life rather than solely on weight loss and appearance.

GC4.059

Investigating the efficacy of GLP-1 receptor agonist in combination with sleeve gastrectomy using rats with obesity and diabetes

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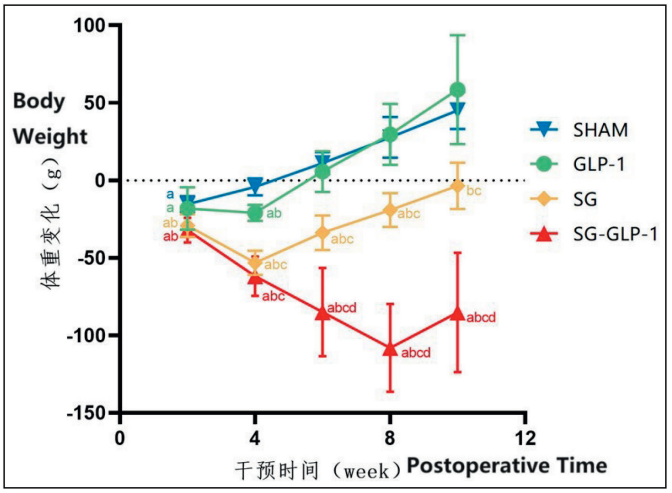
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Objective: To investigate the efficacy of Glucagon-like Peptide-1 receptor agonist (GLP-1) in combination with sleeve gastrectomy (SG), versus standalone GLP-1 or SG treatment in rats with obesity and type 2 diabetes mellitus (T2DM).

Methods: The model of rats with obesity and diabetes were achieved through eight weeks of high-fat diet and intraperitoneal injection of low-dose streptozotocin (STZ). Thirty-two successfully modeled rats were randomly divided into GLP-1 group, SG group, SG-GLP-1 group and sham operation group (SHAM group), making sure of 6 rats in each group. Changes in body weight, fasting blood glucose (FBG), oral glucose tolerance test (OGTT) and insulin tolerance test (ITT) were measured before and 1-10 weeks after the intervention.

Results: The mortality rate of the operation group was 15.62%, and there was no statistically significant difference between the pre-intervention parameters (P> 0.05). Four weeks after intervention, the body weight and ITT AUC in the SG-GLP-1 group were significantly lower than those in the SHAM group and the GLP-1 group (P < 0.05). Eight weeks after intervention, the body weight, FBG and ITT AUC in the SG-GLP-1 group were significantly lower than those of SHAM group, GLP-1 group and SG group (P < 0.05), but there was no significant difference in OGTT AUC between SG-GLP-1 group and SG group at each time point (P > 0.05). The SG-GLP-1 group had significantly superior and more sustainable weight loss outcomes, and with higher percentage of total weight loss (%TWL) than that in the SHAM group, SG group and GLP-1 group (P < 0.05).

Conclusions: The addition of pharmacotherapy (GLP-1 receptor agonist) to SG improves the weight loss and anti-diabetic outcomes of standalone SG. More studies are needed to investigate whether combination therapy of SG and GLP-1 receptor agonist can be as effective as other stronger surgical therapy, such as gastric bypass and duodenal switch.



Changes in the body weight of four groups of rats before and after intervention. a: Compared with before intervention, P<0.05; b: Compared with the SHAM group at the current interval, P<0.05; c: Compared with the GLP-1 group at the current interval, P<0.05; d: Compared with the SG group at the current interval, P<0.05.

Fig. 1.

GC4.060

Participants with sarcopenic obesity have greater glycemic variability, muscle mass loss and mild cognitive impairment after bariatric surgery

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Introduction: The population living with Obesity (PlwO) have a higher risk of developing Sarcopenic Obesity (SO). An association has been established between Obesity and Mild Cognitive Impairment (MCI), even in young population (< 60yo). In the elderly, SO is a predictive factor for MCI. However, there is no data in the young PlwO (<60yo). In people with T2D, MCI has been associated with increased glycemic variability (GV). However, the role of GV on MCI in people with OS without (w/o) T2D is still to be elucidated. Bariatric Surgery (BS) induces significant weight loss and remission of comorbidities, but it has also been related to substantial muscle mass loss. Furthermore, we do not know the impact of BS on cognitive function in young patients without T2D, and its relationship with muscle mass loss and GV.

Aim: To evaluate whether the presence of SO is associated with higher GV in patients <60 years of age w/o T2D. To evaluate the impact of GV on MCI screening tests. To evaluate the impact of CB on muscle mass, GV and MCI screening tests.

Materials-Methods: Prospective single-center study that includes PlwO (BMI > 40kg/m^2), age < 60 years, w/o T2D. All participants underwent BS (Roux en Y gastric bypass [RYGB]) from May 2021 to March 2022. Data collected before and 1 year after surgery includes: Anthropometrics, biochemical analysis, body composition X-ray absorptiometry (DXA), bioimpedanciometry (BIA) (Bodystat Quadscan 4000), Montreal Congnitive Assessment Test (MoCA), and GV parameters using FreeStyle2 Glucose monitor device.

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Results: 31 patients were recruited (16 wSO and 15 W/oSO), 74.2% women, mean age 46.3yo. There were no differences between groups in age, sex, BMI, HOMA-IR, HbA1c at baseline. However, compared to its counterpart, the group w/SO had a worse score on the MoCA test (24.8±2.2 vs 26.6±2.2, p<0.05), increased GV both pre and post BS, with more events of postprandial hypoglycemia after BS (7.07± 8.9 vs 1.79 ± 1.8, p>0.01), and greater muscle mass loss after BS (7.1±2.8 vs 2.8± 2.1, p<0.001). Furthermore, muscle mass (kg) directly correlated with MoCA score, and inversely with hypoglycemic events. The presence of sarcopenia was found to be a predictor of MCI (AUROC 0.840, p 0.02, CI [95% 0.721-0.976]).
Conclusions: In our study of PlwO, <60 years of age, w/o T2D, the presence of SO was associated with greater GV, and both were associated with greater cognitive impairment. CB induced greater VG and postprandial hypoglycemia in the group of patients with OS.

GC4.061

Laparoscopic Sleeve Gastrectomy (LSG) after laparotomic central hepatectomy is challenging but feasible

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Introduction: A 24-year old girl, with class III obesity (weight: 134 kg, height: 1.6 m, BMI: 51,5 kg/m^2) with a history of autoimmune polyendrocrine syndrome, PCOS, severe OSAS was admitted to the emergency room for abdominal pain, nausea, vomiting and jaundice in 2019.
A US scan revealed a 6 cm hypoechoic hepatic lesion at biopsy, firstly defined as moderately differentiated HCC and referred to our Hospital. Specimen were reviewed and the mass was defined as NET.
PET-MRI showed a single hot lesion involving S4, S5, S7 and perihilar region, 6 cm diameter, without detection of other lesions. In January 2020 the patient underwent central hepatectomy via a suprahumbilical laparotomy with extended right subcostal incision for a 6 cm liver metastasis from an occult NET (G2, Ki67 5%, Synaptophysin +, Chromogranin A+, Cytokeratin 7 +, NSE +, focally + for Cytokeratin 20). No Chemotherapy was needed according to Oncology consultation. At the last follow-up (March 2022) she was considered NED (negative CgA and imaging) and referred to us for severe obesity.
Methods: After multidisciplinary assessment, the patient underwent LSG in September 2022.
Weight at operation was 126 kg after 21 days VLCD regimen. BMI at 3,6,12 months, post-operative complications, oncological outcome and comorbidities resolution or regression were monitored.
Results: Operative time was 100 minutes, 7 trocars were placed. POD-1 gastrografin swallow showed a good transit without leaks and the patient was uneventfully discharged on POD-3. Early or late complications were not reported.
BMI at 3,6,12 months resulted respectively 42, 36, 31 kg/m^2, still loosing weight.
She practices regular physical activity.
No nutritional deficiencies were detected at lab tests, OSAS was remitted.
Oncological assessment resulted negative at each follow up after bariatric surgery.

GC4.062

Dietetic medical nutrition therapy support needs following bariatric surgery: data from a national bariatric service in Ireland

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Introduction: Bariatric surgery is an effective, evidence-based treatment for obesity. Registered dietitians play a key role in the bariatric journey; in supporting patients to prepare for surgery, in meeting nutritional requirements in the peri-operative period, and in adjusting to the dietary limitations and changed relationship with food bariatric surgery may bring. In Ireland, the Model of Care for Obesity recommends dietetic resourcing as part of the bariatric care pathway, with 1.5 whole time equivalent Clinical Specialist Dietitians suggested in Level 4 bariatric centres. We can estimate resourcing needs based on a standard care pathway but little is known about patients requiring additional dietetic support after surgery. We audited fidelity to the standard bariatric dietetic care pathway and the need and indications for additional dietetic support in the Centre for Obesity Management in St Columcille's Hospital Dublin over a 24 month period.
Methods: Data were gathered and analysed from electronic clinical databases used to track patients on Microsoft Excel 2010 (Microsoft, USA) for all bariatric patients with a surgical date from January 2022 – December 2023. Contact points on the bariatric dietetic care pathway were recorded at 3 time points; 2 days post-op (prior to discharge), 6-8 days post-op and any additional review required prior to a 6-8 week post-op multidisciplinary clinic appointment. This was cross referenced with activity data including number of contact points and time spent in dietetic consultations.
Results: Data were available on 253 individuals (70.7% female). Two-hundred and twenty-nine (90.5%) had a recorded review at 2 days post-op (prior to discharge) and 246 (97.2%) had a recorded review (mainly by telephone) at 6-8 days post-op. Fifty-five patients (22%) had at least one additional dietetic review prior to their 6–8-week post-op multidisciplinary clinic appointment. Detailed activity data were available for 46 of these consultations with a median of 2.0 (range 0.25-5.25) hours spent across 3 (range 1-9) appointments for each patient. The main indications for additional review were support to meet nutrition and hydration requirements (including nutritional supplementation); managing gastrointestinal symptoms including nausea, vomiting or constipation; support with progression through the recommended consistency and portion stages; and support with psychological adaptation to post-op dietary restrictions.
Conclusions: Despite high fidelity to the standard bariatric dietetic care pathway immediately following surgery, almost a quarter of patients needed additional dietetic support in the first 6-8 weeks after surgery. The time needed and number of appointments varied considerably. This data will be helpful for estimating dietetic resourcing requirements in bariatric services both in Ireland and internationally. Dietitians delivering medical nutrition therapy in the immediate peri-operative period need to be skilled in bariatric nutrition, management of gastrointestinal complications and supporting patients with adjustment post-op.

Conflict of Interest: None disclosed.

Funding: No funding to report.

GC4.063

Fertility and Contraception In Post-Bariatric Surgery Patients

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Introduction: Obesity (OB) is a pandemic that negatively impacts quality of life, rates of chronic diseases and mortality, also impairing fertility and worsening gestational outcomes. Bariatric surgery (BS) is the most effective treatment for OB and is growing in popularity, particularly sleeve gastrectomy (SL) and Roux-en-Y gastric bypass (GB). Half of the women undergoing BS are in childbearing age. Challenges involving pregnancy and contraception in BS patients are frequently not properly addressed. Conflicting evidence and paucity of studies contributes to lack of assertive information in these issues.
Methods: A search was performed in Pubmed database using the following strategy: "((contraception) OR (contraceptive methods) OR (contraceptive agents) OR (contraceptive devices)) AND ((bariatric surgery) OR (gastric bypass) OR (sleeve gastrectomy))", and 130 articles were selected. A filter was applied to include only reviews, systematic reviews, randomized controlled trials and meta-analysis in the last 10 years, retrieving

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25 articles. Based on their titles, 17 were considered relevant. One was excluded because the full text was not accessible online.
Results: Most studies (11) were narrative reviews, 1 was a systematic review, 3 were guidelines and 1 was an expert opinion review article. Analysis showed that bariatric surgery (BS) can improve fertility, increasing conception rates in 33-100%, leading to an increased risk of unplanned pregnancies. BS reduces the frequency of gestational diabetes mellitus, preeclampsia and macrosomia, but studies report an increased risk of small to gestational neonates: GB (Odds-ratio OR 2,16) and SG (OR 1,14). Since nutritional deficiencies are more frequent during the rapid weight loss phase after BS, a time to conception shorter than 12 months was linked to increased frequency of inadequate gestational weight gain (75%) and reduced long-term weight loss. Guidelines recommend avoiding conception for 12 to 24 months after BS, but up to 1.6% women conceive in the first 18 months.
There is no consensus about efficacy of oral contraceptives (OC) in post-BS patients, so they should not be the first line choice, due to potential failure risk and increased risk of venous thromboembolism. Guidelines recommend using long-acting reversible contraceptive strategies (LARCs) such as progestin intrauterine devices (IUD), since in addition to being highly effective, they have an impact on reducing menstrual blood loss. Subcutaneous implants and bilateral salpingectomy concurrent with BS might be viable alternatives. Contraception counseling is performed to 30-85,7% of post-BS patients, but 30% report no contraception and 33% report using OC after disabsorptive BS. These results emphasize the need to improve contraceptive counseling in BS patients and suggest referral to a gynecologist as a standard multidisciplinary approach.

GC4.064

Prevalence of pre- and post-operative nutritional deficiencies in different types of bariatric surgery

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Introduction: Obesity, a significant public health concern, has become widespread over the past 50 years and is closely associated with other health conditions, as well as deficiencies in essential nutrients. Bariatric surgery has emerged as an eRective treatment for obesity, utilizing various surgical techniques—restrictive, malabsorptive, or a combination thereof. However, these procedures can lead to or worsen nutritional deficiencies. In this study, we examined several articles to evaluate how diRerent bariatric surgical approaches impact nutrient absorption.
Method: We adopted a PICO strategy to explore the prevalence of nutritional deficiencies in individuals undergoing bariatric surgery. We utilized MeSH and DeCS descriptors, including 'Bariatric Surgery,' and specific nutrients such as iron, cobalamin, vitamin B12, protein deficiency, copper, folate, and vitamin D, to conduct the search in PUBMED. Initially, we identified 1415 articles, which reduced to 949 after applying a filter for publications from the last 10 years. Focusing on systematic reviews, reviews, and meta-analyses further refined the search to 186 articles. The inclusion criteria encompassed patients aged 18 and above, undergoing bariatric surgery, with nutritional deficiencies. We excluded papers that were not articles or not in English, resulting in 87 articles for comprehensive analysis.
Results: Analysis of the articles revealed that the most prevalent micronutrient deficiencies in individuals undergoing bariatric surgery include iron, vitamin D, and vitamin B12. Notably, vitamin D deficiency was the most widespread, aRecting nearly 93% of patients. Vitamin B12 deficiency was observed in 18% of patients with obesity, a figure that rises to up to 30% in regular users of proton pump inhibitors. Following surgery, iron deficiency emerged as the most common, with a prevalence of 30%, particularly notable in the Roux-en-Y Bypass technique, statistically more significant compared to restrictive surgeries. Vitamin B12 deficiency was more pronounced in restrictive surgeries, such as vertical gastrectomy. Regarding calcium, post-surgical deficiency prevalence was 3.9%, more common among malabsorptive surgeries. Physiological studies have corroborated lower serum concentrations of PTH and phosphorus compared to malabsorptive and restrictive surgeries.
Conclusion: Each bariatric procedure exhibits a distinct pattern, and based on this review, malabsorptive surgeries demonstrate a higher prevalence of nutritional deficiencies compared to restrictive surgeries. Thus, nutritional evaluation and oversight by a qualified professional for appropriate pre- and post-operative supplementation are crucial to mitigate or prevent the consequences of these deficiencies, enhancing treatment success and improving patients' quality of life. Further studies are warranted to deepen understanding and prevent these nutritional deficiencies.

GC4.065

Assessment of preoperative predictive factors for type 2 diabetes remission 3 years after bariatric surgery: results from a portuguese cohort

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Introduction: Bariatric surgery (BS) is capable of inducing type 2 diabetes (T2D) remission (DR) through several metabolic effects beyond weight loss, creating the concept of metabolic surgery. However, not all patients with T2D who undergo BS achieve DR. In this study, we aimed to assess the preoperative factors that are predictors of DR 3 years after bariatric surgery.
Methods: We conducted an observational retrospective study, selecting patients with T2D who underwent BS at ULS São José between 2017 and 2020. We collected anthropometric, metabolic, and therapeutic data before and 3 years after BS. We used the definition of DR according to the 2021 ADA/EASD/ES/DSS/Diabetes UK consensus (1). We performed a univariate analysis for each variable of interest using binomial logistic regression.
Results: We included 121 patients (87 women) with available data. At the time of BS, mean age was 54±9 years, median T2D diagnosis duration was 6 (IQR 3-12) years, mean HbA1c was 6.9±1.3%, mean C-peptide 4.2±2.2 ng/mL and mean C-peptide index (CPI) was 0.598±0.311 (calculated by dividing C-peptide in ng/mL per glucose in mmol/L). Twenty patients were on insulin therapy, with a median daily dose of 17 (IQR 13-24) units. In total, 104 patients underwent restrictive-malabsorptive BS, and 17 had restrictive BS. Follow-up showed DR in 81 (70%) patients 3 years after BS. DR was greater in patients who underwent restrictive-malabsorptive BS (OR=6.514; p<0.001) and with greater CPI (OR=8.923; p=0.018). Age (OR=0.937; p=0.009), T2D duration (OR=0.839; p<0.001), and the need for insulin therapy (OR=0.108; p<0.001) were negatively associated with DR. Sex, body mass index, Hb1Ac, and C-peptide levels did not show a significant effect on the probability of DR at the third year of follow-up.
Conclusions: Restrictive-malabsorptive procedures, greater β-cell reserve (assessed by CPI), younger age, lower diabetes duration, and no need for insulin therapy were predictive factors for DR 3 years after BS. Determination of CPI may provide more information than isolated C-peptide levels regarding pancreatic function when evaluating patients with T2D who are candidates for BS. The inclusion of these factors in the decision-making process may contribute to a more effective surgical treatment of people with T2D.

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GC4.066

Semaglutide 2.4 mg/sem is effective for weight loss at 1 year with or without prior bariatric surgery

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Introduction: While bariatric surgery (BS) is a recognized treatment for obesity (1), many patients still face inadequate weight loss (WL) or regain weight, leading to persistent severe obesity (BMI >40 kg/m^2). Recently, GLP-1 analogs, especially Semaglutide 2.4 mg/week, have emerged as an answer for people living with obesity. In this context, GLP-1 analogs, particularly Semaglutide 2.4 mg/week, have become prominent pharmacological alternatives (2). Building on our previous 6-month findings (3), where Semaglutide showed similar efficacy in patients with or without a history of BS, this study extends the evaluation to a 1-year timeframe, offering a longer-term perspective on its effectiveness.
Objective: The study aims to assess the long-term effectiveness of Semaglutide 2.4 mg/week over a period of 52 weeks in patients with severe obesity, both post-BS and without BS, focusing on sustained WL.
Methods: In this retrospective cohort study, we analyzed data from 129 patients with severe obesity (BMI ≥ 40 kg/m^2), divided into two groups based on their history of BS: 39 patients in the BS group (BS+) and 90 in the non-surgery group (BS-). Treatment involved a 52-week course of Semaglutide, starting at 0.25 mg/week and increasing to 2.4 mg/week. We focused on the percentage of total WL and excess weight loss (EWL) as primary endpoints. The analysis was conducted on an intention-to-treat basis using univariate and mixed model statistical methods.
Results: Of the BS+ group, 28 patients had undergone sleeve gastrectomy, and 13 had bypass surgery. Semaglutide treatment resulted in an overall significant WL of 14.1%. In the BS+ group, WL was 15.4%, compared to 13.5% in the BS- group (p = 0.4). EWL averaged 33.1%, with 37.2% in the BS+ group and 31.2% in the BS- group (p = 0.3). Longitudinal analysis over the 52-week period revealed no significant differences in WL dynamics between the BS+ and BS- groups.
Conclusion: This 1-year study reinforces the potential of Semaglutide 2.4 mg/week as a viable treatment for severe obesity. It provides crucial insights into the long-term efficacy of this medication, especially for those who have not achieved desired results with BS, thereby addressing a critical gap in obesity management.

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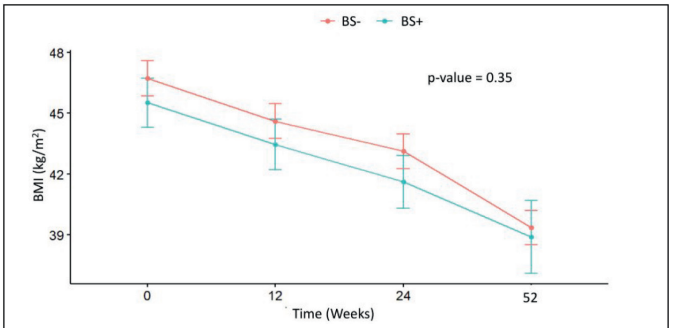


Figure: Body mass index (BMI) change at 24 and 52 weeks. Intention-to-treat analysis. BS, bariatric surgery; BS+, patients with a history of BS (n = 39); BS, patients without a history of BS (n = 90).

Fig. 1. Body mass index (BMI) change at 24 and 52 weeks. Intention-to-treat analysis. BS, bariatric surgery; BS+, patients with a history of BS (n = 39); BS, patients without a history of BS (n = 90).

GC4.067

One anastomosis gastric bypass vs roux-en-y gastric bypass: short- to medium-term effectiveness in a single center

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Introduction: Bariatric surgery stands out as the most effective treatment for obesity and its comorbidities. Commonly performed procedures include Roux-en-Y gastric bypass (RYGB) and one anastomosis gastric bypass (OAGB). Existing evidences suggest a superiority of OAGB in terms of percentage of excess body weight loss (%EBWL) and type 2 diabetes (T2DM) remission. Moreover, OAGB offers technical advantages and it's surgically time-saving compared to RYGB. However, few studies on this topic are available.
Methods: We retrospectively analyzed 184 patients, attending the Bariatric Multidisciplinary Center at S.Orsola University Hospital in Bologna, who underwent either RYGB or OAGB between 2018-2023. The primary aim of the study was to compare surgical outcomes of both procedures, focusing on %EBWL and metabolic parameters evaluated at 6-12-24 months after surgery. A secondary objective was to assess differences in %EBWL between primary and re-do surgeries within each of the two intervention techniques.
Results: Of the 184 patients, 101 (63%) underwent RYGB (primary surgery 69%; re-do 31%) and 83 (37%) OAGB (primary surgery 31%; re-do 69%). Among the re-do surgery cases, 61% had previously undergone gastric banding and 39% sleeve gastrectomy. The 31% of all patients were affected by T2DM at baseline.
Effectiveness of RYGB and OAGB was assessed by comparing %EBWL at 6 months (67.1% for RYGB vs. 55.6% for OAGB; p<0.05), 12 months (80.7% vs. 65.3%; p<0.05) and 24 months (80.5% vs. 68%; p=0.06). Therefore, in the overall population, RYGB was superior to OAGB in terms of %EBWL. However, after adjusting for baseline BMI, which was higher for patients undergoing OAGB (RYGB: BMI 40.7 kg/m^2; OAGB: BMI 48.3 kg/m^2), no significant difference was observed. Both surgical techniques showed significant reduction of blood pressure, glycated hemoglobin, and LDL cholesterol after 6 months compared to baseline (p<0.01), with non-significant changes in the following months.
Primary intervention showed better results than re-do surgery in terms of %EBWL at all timepoints (p<0.01) for both RYGB and OAGB. This result

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was confirmed even after adjusting for baseline BMI. No significant differences were observed between the two intervention techniques within each group (primary and re-do).
Conclusion: In our population RYGB was found to be superior to OAGB on weight loss during the first 24 months. However, after standardizing for initial BMI, this difference was not confirmed. A possible explanation could be given by OAGB being offered to patients with more severe obesity or those experiencing weight regain after bariatric surgery, while RYGB is mostly performed as a primary intervention in our population. Both procedures effectively improved comorbidities at all timepoints. Expectedly, primary interventions were found to be more effective than conversion ones regardless of baseline BMI. No differences between the two interventions were observed within both primary and re-do subgroups, perhaps due to the limited sample size within these subgroups. Larger studies are required to validate these findings and assess long-term outcomes and differences between RYGB and OAGB.

GC4.068

Weight Loss and Changes in Body Composition One Year After Single Anastomosis Sleeve Ileal bypass and Sleeve Gastrectomy

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Introduction: Changes in body composition after different bariatric surgeries have been studied thoroughly, but there are no studies which assess the effects of novel type of bariatric procedure, SASI bypass and compare it with other bariatric surgeries. This study was conducted to evaluate the effects of the single anastomosis sleeve ileal (SASI) bypass and Sleeve Gastrectomy (SG), on weight loss, body composition and the reduction in skeletal muscle mass (SMM) and fat mass (FM) 1 year after bariatric surgery.
Methods: In the current retrospective study, patients who had SASI bypass or SG and a complete 1-year follow-up record, were included. We recorded weight, body mass index (BMI), SM, and FM before and 1 year after surgery. We analyzed 128 patients (30 males and 98 females) who underwent SASI bypass (n=67, 52,3%) or SG (n =61, 47,7%) between February, 2017 and December, 2022.
Results: SASI bypass conferred significantly higher %TWL at 12 months than SG (35,6 Vs 30,3%, p 0,006). Skeletal muscle mass loss was also significantly higher 1 year after SASI bypass comparing with SG (5,64 Vs 4,22 kg, p 0,015) as well as fat mass loss (38,8 Vs 30,5 kg, p 0,003).
Conclusion: SASI bypass effectively decreased weight and body composition indices, comprising FM and SMM, and demonstrated significant difference with SG.

Conflict of Interest: None Disclosed

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GC4.069

Impact of bariatric surgery on the reduction of premature ageing in obesity

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Objective: Obesity is associated with the development of chronic diseases, poorer quality of life and reduced survival. Excess body fat and the associated increase in inflammation generate mechanisms of premature ageing. Telomere length, levels of cognitive function, or metabolic age, are considered markers of ageing. One of the treatments for extreme obesity is surgical treatment through laparoscopic gastrointestinal bypass surgery (LRYGB) and laparoscopic sleeve gastrectomy (LSG). The aim of this study was to evaluate the impact of surgical treatments for obesity on the reduction of premature ageing.
Methods: In this prospective cohort study patients with severe obesity BMI >= 40 kg/m^2 or >= 35 kg/m^2 with comorbidity qualified for LRYGB or LSG were recruited in the 2nd Department of General Surgery in Jagiellonian University Medical College from July 2020 to May 2021 with a 2-year follow-up period. DNA material sampled from serum leukocytes was isolated for PCR telomere length (TL) assessment, the Colour Linkage Test with the assessment of time of resolving test as a cognitive function assessment was performed, body composition was analysed by bioimpedance before (preoperative cohort, n=100) and after surgery (follow-up cohort, n=40).
Results: A mean percentage loss of excess body weight of 58.24 and a mean percentage loss of excess BMI of 57.43 in 2-years-follow-up were obtained. The telomere dynamics 2-years after surgery showed an increase in mean TL (3947 vs 8498 bp, p<0.05). Increases in the rate of performance on both CTT-1 and CTT-2 cognitive function assessment tests were observed between tests performed before and after surgery (CTT-1 centyl 46 vs 56; CTT-2 61 vs 70). The normalization group did not differ in preoperative and follow-up cohort. The metabolic age index was significantly reduced 2-years after surgery (79.89 vs 62.96).
Conclusions: Bariatric surgery not only affects weight reduction, but also has a positive influence on biological age markers such as TL, cognitive function and metabolic age.

GC4.070

Naltrexone-buproprion for weight regain following bariatric surgery: a retrospective study

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Introduction: Some patients experience insufficient weight loss or weight regain after bariatric surgery. Pharmacotherapy for weight management, such as the fixed combination of naltrexone-buproprion (NB), can induce significant weight loss in obesity, but data after bariatric surgery remain scarce.
Methods: In this single-centre retrospective cohort study performed at the University hospital of Leuven, the effectiveness of NB for weight management in patients with weight regain after bariatric surgery was studied. Data was collected on all patients started on NB after multidisciplinary consult, between June 2016 and August 2022. Standard, weekly uptitration was advised upto a maximal dose of 4 tablets of 8/90mg daily or maximally tolerated dose. Weight evolution, metabolic status, therapy adherence and side effects were analyzed 4 months after start of therapy.
Results: Forty-two patients were started on NB to control weight regain post bariatric surgery. Mean time after bariatric surgery was 10.2±7 years with 21 (50%), 11 (26.2%) and 10 (23.8%) patients having undergone roux-en-Y gastric bypass, sleeve gastrectomy or other bariatric surgery respectively. The mean BMI at intake was 43.4±7 kg/m² with a mean weight regain of 33.2 +- 22.6 % compared to their lowest reached weight post-surgery. At 4 months 28 patients (66.7%) were still taking NB of whom twelve patients (28.8%) received a submaximal dose. This was either due to side effects (5 patients) or because the patient reported sufficient subjective effect with this submaximal dose (7 patients). Sixteen patients (57.2%) lost ≥ 5% of their body weight at 4 months and 8 patients (28.6%) lost ≥ 10%. This was independent of whether or not the patient took the maximal dose (p = 0.67).
Conclusion: Real life data shows that NB treatment is as effective in patients with weight regain after bariatric surgery compared to surgery-naive patients. The amount of weight loss was independent of the maximal tolerated dose.

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GC4.071

Effect of bariatric surgery on TSH levels and levothyroxine dosage in patients with thyroid disease: Sleeve gastrectomy vs Roux-en-Y Gastric bypass

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Background: Some evidence indicates how bariatric surgery impacts the thyroid function test and, in patients living with hypothyroidism, the dose of levothyroxine (LT-4), but data are not univocal.
Aim: To examine, in a single center retrospective analysis, the relationship between change in body weight, plasma levels of TSH and dosage of LT-4 in patients with thyroid disease undergoing bariatric surgery and to compare the effects of Roux-en-Y gastric bypass (RYGB) vs sleeve gastrectomy (SG).
Methods: The data was collected from medical records of hospitalization of 235 patients (104 SG and 131 RYGB) who underwent pre-surgical work-up and from outpatient medical records of the same patients at 45 days, 3–6 months and 1 year visits after surgery. In the analysis were include both patients in LT4 therapy (40 Th-RYGB and 29 Th-SG) and patients without thyroid diseases with normal thyroid function (54 Ct-RYGB and 43 Ct-SG), who served as age and BMI matched controls.
Results: The body weight reduction was in mean 31%, without difference between groups. In the two Control groups TSH levels remained stable throughout the observation period, without differences for type of surgery and without relationship with body weight. Free-T3 levels, decreased significantly at all follow-ups, in both CT groups and in Th-RYGB ($p < 0.01$). After bariatric surgery, the patients treated with LT-4, belonging to both Th-RYGB and Th-SG, needed to increase the pro/kg of body weight dosage of the drug to achieve stable TSH. At 1 year, the increase of LT4/kg/die was higher in the Th-RYGB group than Th-SG group (0.46 vs 0.29 mcg/kg/die, $p = 0.014$). From simple regression analysis, in both Th-SG and Th-RYGB, body weight was not associated with the dose of LT4 (p = ns for both groups).
Conclusions: In patients with severe obesity with normal thyroid function, TSH levels are not related with body weight change. Patients treated with LT-4, after bariatric surgery need to increase the dosage pro kg of body weight of the L-T4 and the increase is higher after surgery with malabsorptive component (RYGB) compared to restrictive surgery (SG). These data support a major role of the impaired drug absorption consequence of bariatric surgery rather than of the new body weight in determining the subsequent LT-4 dosage.
The results should be confirmed on a larger sample.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.072

Correlation between irisin and renal function in patients with obesity undergoing bariatric surgery

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Introduction: Obesity-related kidney dysfunction is a well-known, but poorly characterized entity, its complex pathogeny involving adipokine dysregulation amongst a multitude of other mechanisms. Irisin is a novel adipo-myokine, considered to exert protective functions on numerous organs, including the kidneys. We aimed to determine the correlations between irisin and glomerular filtration rate in a cohort of patients with obesity undergoing laparoscopic sleeve gastrectomy (LSG).
Methods: We performed a retrospective study including 73 patients (34 males, 39 females) comprehensively evaluated before and 6 months after LSG. Clinical and anthropometric data were collected, as well as a biological pannel including serum irisin. Body composition assessment was performed using dual X-ray absorptiometry (DXA) scan. Glomerular filtration rate (eGFR) was estimated using the creatinine-based CKD-EPI 2021 formula.
Results: Mean baseline body mass index was 42.87 kg/m^2 (± 4.09 kg/m^2) and mean 6 months excess weight loss percentage was 71.37% (±18.15%). Mean eGFR (ml/min/1.73 m^2) was 87.4 (±14.76), with a cumulative prevalence of mild and moderate renal dysfunction of 60.3%. Six months after LSG, mean eGFR increased to 95.78 (±15.14; $p<0.001$), and the prevalence of renal dysfunction decreased to 38.4.%. This improvement did not correlate with serum irisin variation, which showed a slight postoperative increase, but did not reach statistical significance (1.78 vs 1.59 ug/ml, $p=0.1$). Preoperatively, mean serum irisin declined with declining eGFR, albeit not meeting statistical significance. Subgroup analysis revealed that in the third mean irisin tertile, serum irisin was an independent predictor of eGFR in a model adjusted for BMI, age, visceral adipose tissue mass and serum adiponectin levels (beta=0.42, $p=0.02$). These results were not replicable in the postoperative state.
Conclusion: Renal dysfunction is prevalent in patients with obesity and irisin dysregulation might be involved in its etiopathogenesis. The impact of irisin appears to be variable in patients with different degrees of adiposity. This warrants more ample studies since, as previously suggested in literature, it might point to a therapeutic value of irisin in kidney disease.

GC4.073

Soluble P2X7 receptor may represent a novel biomarker of inflammation in obesity and its plasma levels are reduced by metabolic surgery

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Introduction: obesity represents a relevant risk factors for cardiovascular diseases mainly due to the development of a chronic low-grade systemic inflammation leading to deleterious effects on vascular health. The P2X7 purinergic receptor (P2X7R), belonging to the family of the receptors for extracellular ATP, is involved in the inflammatory response promoting the activation of the NLRP3 inflammasome even in the adipose tissue [1], leading to the adipocytes dysfunction [2]. Recently it has been demonstrated that P2X7R may be measured in the circulation as shredded portions of the receptor (soluble P2X7R, or sP2X7R) [3], hypothesizing its use as an inflammatory circulating biomarker.
Methods: in this study, we evaluated the plasma levels sP2X7R in a group of fifteen patients with III grade obesity referring to our Center

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for the Study and the Integrated Treatment of Obesity at the University Hospital of Padova before and one year after metabolic/bariatric surgery. Furthermore, we evaluated the relationship between sP2X7R, anthropometric measurement, metabolic parameters and inflammatory markers such as C-reactive protein (CRP), TNF-α and IL-6 before and after surgical weight loss.

Results: we observe that sP2X7R plasma levels are higher in patients with severe obesity respect to a control group from a healthy population. Interestingly, while no association was reported with metabolic parameters such as body weight, BMI and waist circumference, in the patients group we observed an indirect correlation between sP2X7R and CRP ($p<0.001$), TNF-α ($p=0.05$) and IL-6 ($p<0.001$) at baseline. One year after metabolic surgery we observed the reduction of plasma concentration of sP2X7R (0.001) along with the other considered cytokines.

Conclusions: given the role of P2X7R in inflammation, our results suggest that sP2X7R could represent a novel marker of chronic low-grade inflammation further contributing to the development of obesity-associated complications.

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GC4.074

Beyond restrictive: Sleeve Gastrectomy to Single Anastomosis Duodenoileal Bypass with Sleeve Gastrectomy as a spectrum of one single procedure

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Introduction: Different bariatric techniques are often empirically chosen for each patient, based on the severity of their obesity and metabolic dysfunction. Single-anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) is restrictive/hypoabsorptive procedure recommended for patients with obesity class 3. For safety reason, SADI-S can be safely split into two stages by performing a sleeve gastrectomy (SG) first. This stepwise approach also provides an unprecedented opportunity to disentangle the weight loss mechanisms triggered by each component. In this study, we compared weight trajectories and postprandial endocrine and metabolic responses of patients with obesity class 3 submitted to SADI-S or sleeve gastrectomy (SG) as the first step of SADI-S.

Methods: Patients submitted to one-stage SADI-S (n = 7) or SG (n = 7), at a tertiary referral public academic hospital without previous abominal surgery, underwent a liquid mixed meal tolerance test (MMTT) pre-operatively and at 3, 6, and 12 months post-operatively, to assess the fasting and post-prandial profile of glucose and pancreatic hormones.

Results: Anthropometric parameters, as well as metabolic and micronutrient profiles, were not significantly different between groups, neither before nor after surgery. Fasting and post-prandial glucose, insulin, C-peptide, ghrelin, insulin secretion rate (ISR) and insulin clearance during MMTT were similar between SADI-S and SG patients. There was no lost to follow-up.

Conclusion: Glucose and pancreatic hormone profiles after one-stage SADI-S and SG were similar, supporting the surgical restrictive component as the main driver of weight loss and metabolic adaptations during the first 12 months after SADI-S. This data provides support for a surgeons' choice of a two-step SADI-S without risking the weight loss outcomes.

GC4.075

Secondary hyperparathyroidism, bone remodeling markers and lean mass after bariatric surgery

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Introduction: Bariatric surgery (BS) can lead to secondary hyperparathyroidism (SHPT), bone and muscle loss, and an increased risk of fractures. The mechanisms underlying the development of SHPT and sarcopenia after BS, in addition to nutrient malabsorption, are unknown.

Methods: The aim of this study was to evaluate lean mass by DXA analysis according to serum PTH and bone markers in patients who underwent Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG).

Results: We studied 103 patients (90% female, 51% RYGB, 41.8±6.7 years). SHPT was more prevalent in RYGB (26%, BGYR>SG), p=0.01). The mean PTH was 93.4±38.4 pg/ml in the SHPT (+) group. SHPT (+) group had a greater post BS interval (6.3±4.4 vs 3.8±3.3 years, p= 0.001), BMI (34.1±4.3 vs 30.5±5.39 kg/m^2, p=0.002), abdominal circumference (99.9± 13.3 vs 94.0±12.3 cm, p=0.038), and lower serum calcium (8.8±1.1 vs 9.2±0.5, p=0.016), than SHPT (-) group. Although the SHPT (+) group had higher levels of alkaline phosphatase (AF) (9.2±0.5 vs 8.8±1.1, p= 0.016) and CTX (0.620±0.26 vs 0.480±0.23, p= 0.042), the bone mineral density (BMD) were similar between the groups. SHPT (+) group had lower appendicular skeletal mass adjusted for BMI (ASM-BMI) (22.7±3.3 vs 24.7±3.6, p=0.041), and we found an inverse correlation between ASM-BMI and PTH (r Pearson= - 0.1977, p = 0.0325). There were no differences in physical performance or muscle strength according to the presence of SHPT. After linear regression analysis, RYGB technique, post BS interval, higher serum CTX and lower serum calcium were independently associated with SHPT.

Conclusion: SHPT is common after BS, especially after RYGB, and is associated with decreased lean mass and increased bone turnover.

GC4.076

The role of modulation of cellular senescence in the metabolic effects of bariatric surgery

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Introduction: Bariatric surgery is the most efficient approach to the treatment of obesity, however the detailed mechanism of its positive metabolic effects beyond weight loss is still not fully understood. Cellular senescence arrests the damaged cells thus prevent further spreading of the damage. However, excessive persistence of senescent cells especially in adipose tissue can contribute to subclinical inflammation and development of type 2 diabetes and other chronic metabolic diseases. Our study explored the effects of bariatric surgery on the circulating markers of cellular senescence and the presence of senescent cells in adipose tissue before and after surgery.

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Methods: 47 patients with obesity with or without type 2 diabetes mellitus undergoing bariatric surgery (sleeve gastrectomy) were included into the study. Subcutaneous (SAT) adipose tissue and fasting blood samples were collected during the surgery (V1) and 6 month after the surgery (V3). The analysis of samples included RT-qPCR (mRNA transcription in SAT) and standard biochemical methods, ELISA or Luminex for detection of hormones and other relevant parameters in plasma.
Results: Bariatric surgery reduced amount of senescent cells in adipose tissue (57% reduction) along with decreased oxidative stress and markers of inflammation. Decreased recruitment of pro-inflammatory macrophages as measured by RT-qPCR was also observed. In addition, after bariatric surgery, we found lower plasma levels of molecules produced by senescent cells and related to cardiovascular risk including soluble E-selectin (31.3+/-14.0 ng/ml vs. 22.6+/-11.4 ng/ml, p=0.03), ICAM-1 (387.4+/-98.7 ng/ml vs. 338.6 vs. 92.5 ng/ml, p=0.04) and Galectin 3 (12.6+/-8.6 ng/ml vs. 10.0+/-4.9 ng/ml, p=0.12) as well as decreased plasma levels of ACE2 (1.6+/-1.9 ng/ml vs. 0.8+/-1.4 ng/ml, p=0.04). Importantly, we observed decreased expression of ADAM17 in SAT, which plays a crucial role production of a soluble form of ACE2, currently representing a new predictor of cardiovascular damage.
Conclusions: Bariatric surgery reduces the amount of senescent cells in adipose tissue along with attenuation of inflammation and oxidative stress in fat and decreased circulating levels of markers of cardiovascular risk produced by senescent cells. These changes could contribute to the improvement of inflammation and metabolic parameters in patients with obesity along with reduced risk of cardiovascular complications.

GC4.077

Bariatric surgery: Does it improve pain or opioid use?

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Introduction: Bariatric surgery is a well studied, successful and durable treatment for obesity and has become increasingly common. It is well documented that suboptimal post-surgical pain management may lead to chronic pain. However, very few studies examine pain trends after bariatric surgery.
Purpose: This longitudinal, correlational study was designed to examine acute & chronic pain and opioid trends post bariatric surgery.
Methods: Fifty-eight bariatric surgery subjects who underwent either laparoscopic gastric bypass or sleeve gastrectomy at one surgical centre were followed longitudinally. Data was collected at seven time points from preoperatively to 6 months postoperatively.
Results: Average acute postoperative pain severity was moderate immediately following surgery and generally decreased over time. However, there was an increase in acute pain 24hrs after discharge. There was no correlation between acute pain severity and the amount of opioid administered while in hospital. Opioid usage was significantly less at 1-month post-op compared to 48-hours post-discharge ($p < 0.01$).
At 6 months post-op, the incidence of chronic pain was significantly reduced ($p = 0.031$), with pain interference in life activities also significantly improved ($p < 0.01$). No significant difference was found in pain interference in sleep following surgery.
Conclusion: Acute pain appears to be reasonably well controlled following laparoscopic bariatric surgery. Clinicians should be aware that postop pain may spike at discharge & incorporate this into discharge planning and education. Chronic pain and pain interference were both improved at 6 months postoperatively. This study supports the evidence from other longitudinal studies that opioid use initially decreases following bariatric surgery. However more research is needed to examine long term opioid use among bariatric patients who are chronic opioid users.

GC4.078

Ontario Bariatric Network (OBN) and Project ECHO - working towards excellence in obesity care in Ontario, Canada

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With the rise of obesity across the world and its recognition as a chronic illness by the World Health Organisation (WHO), access to excellent, evidence based obesity care has become increasingly important. As a first step to this, building capacity among primary providers is critical.
This presentation will describe: a) medical and surgical obesity treatment options available through the Ontario Bariatric Network (OBN) Centers of Excellence, and b) Project ECHO: an educational model which uses telemedicine technology to to improve access to obesity care and share best practices to build capacity among primary care providers through practice based learning.
The Ontario Bariatric Network is a centralised, collaborative network consisting of 11 Bariatric Centers of Excellence across Ontario, Canada. Each centre provides comprehensive, interdisciplinary medical and surgical bariatric services.
Project ECHO is an interdisciplinary, case-based 'Hub & Spoke' model that connects healthcare professionals from Bariatric Centers of Excellence to community providers across the province to provide educational support and clinical consultation expertise at their fingertips through videoconferencing. The 'Hub' is the Ontario Bariatric Centres of Excellence interdisciplinary team. The "Spokes" are the community providers across the province. Each session includes a didactic, evidence based presentation followed by specialty consultation for real cases brought by the community providers. Written recommendations are provided for each case. This model seeks to build capacity for excellence in obesity care.
Both of these programs are fully funded by the Ontario Ministry of Health and offered at no cost to Ontario resident and community participants.

GC4.079

Supporting ethnically diverse populations within a national diabetes intervention; a qualitative evaluation of the experiences of coaches delivering the NHS Low Calorie Diet Programme Pilot

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Background: The management of type 2 diabetes within diverse ethnic populations requires a culturally tailored approach. However, little is known about the experiences of coaches delivering interventions for type 2 diabetes (T2D), such as the NHS Low Calorie Diet (LCD) Programme, to people with diverse ethnic backgrounds. T2D disproportionately affects certain ethnic groups such as South Asian and Black ethnicities, with age-standardised prevalence of 13%, 20% and 15% in people of Indian, Pakistani or Bangladeshi ethnicity respectively, and 14% and 11% in people of Black Caribbean and Black African ethnicity respectively. Understanding the challenges, successes, and nuances faced by coaches delivering interventions is paramount for shaping tailored healthcare strategies and reducing health inequalities.
Aims: The aim of this paper is to explore the experiences of health coaches in delivering the programme to ethnically diverse populations to ensure equitable and culturally tailored care. Given the disproportionate impact of T2D on certain ethnic groups, the study aims to bridge the significant knowledge gap regarding the challenges, successes, and nuances faced by coaches in culturally tailored diabetes management interventions, in order to inform future service development.

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Methods: One-to-one in-depth interviews were conducted with seven health coaches delivering the NHS LCD programme. Reflexive thematic analysis was used to analyse the transcripts. Inclusion criteria included delivering the NHS LCD programme and being from a minoritised ethnic background or delivering the programme to those from ethnic minority backgrounds. Among those recruited, self-reported ethnicity included Pakistani (n=2), Indian (n=1) and White British (n=4).
Results: Key themes highlighted the following experiences of delivering the LCD programme: 1. Training and support needs; 2. The impact of language; 3. The use of resources in providing dietary advice; 4. Needing to understand culture and ethnicity; and 5. Experiences of cultural tailoring.
Conclusion: These findings describe the experiences of health coaches in tailoring delivery, and emphasise the essential role of cultural competence in ensuring equitable and effective healthcare interventions for diverse populations. This learning can inform future programmes and policies aimed at promoting inclusive healthcare practices. The findings from this study have implications for NHS LCD programme delivery and future policy and practice within the healthcare sector, particularly in the context of supporting service providers in providing culturally tailored and effective approaches to diverse ethnic populations. In healthcare programmes, care should be person-centred, with lifestyle interventions involving culturally-tailored approaches, particular in relation to dietary and lifestyle advice. There is a need to develop an understanding of different cultures and ethnicities and the factors that may contribute to inequity for different populations to support the delivery of future health programmes.

GC4.080

Innovative Strategies in Obesity Management: A Holistic Approach

Ghazanfar, R.

departmeny

Obesity has become a global health crisis, necessitating innovative and comprehensive management strategies. This abstract explores the effectiveness of personalized interventions, incorporating dietary modifications, physical activity, behavioural therapy, and, where applicable, pharmacological treatments. Additionally, it delves into the role of technology, such as mobile apps and wearable devices, in enhancing patient engagement and adherence to obesity management programs. The abstract highlights the importance of a multidisciplinary approach, integrating healthcare professionals, nutritionists, psychologists, and sports therapists to provide tailored solutions for individuals struggling with obesity. By examining the latest advancements and successful case studies, this abstract emphasizes the significance of a multifaceted approach in addressing the multifactorial nature of obesity.

GC4.081

Prevalence and associated risk factors of overweight and obesity among adult population in Dubai: A population-based cross-sectional survey in Dubai, the United Arab Emirates

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Objective: To study the prevalence of overweight and obesity and determine the associated risk factors among adults in Dubai.
Design And Setting: A cross-sectional survey with a multistage, stratified random sampling design was conducted in the Emirate of Dubai in 2019.
Participants: The study included 2142 adults aged 18+ years in the Emirate of Dubai.
Results: The overall prevalence of obesity, which was defined as body mass index (BMI) ≥30 kg/m^2, was 17.8%. The highest obesity rates were reported among women (21.6%) and the United Arab Emirates (UAE)-nationals (39.6%). Moreover, 39.8% of the population was overweight (BMI ≥25–29.9 kg/m^2). Multivariate logistic regression showed associations between obesity and age, sex, nationality, hypertension and occupation. Obesity increases with age, with the highest risk at age group 50–59 years (OR 4.30; 95% CI 1.57 to 11.78) compared with the reference group (18–24 years). Females had a higher risk of obesity than males (OR 1.62; 95% CI 1.10 to 2.38). Compared with those in the reference group (Western and others), UAE nationals, other Arabs and Asians were more likely to be obese ((OR 2.08; 95% CI 1.18 to 3.67), (OR 3.61; 95% CI 2.41 to 5.44) and (OR 1.98; 95% CI 1.12 to 3.50), respectively). Clerical and service workers (OR 4.50; 95% CI 2.54 to 8.00) and elementary and unskilled occupation categories (OR 2.57; 95% CI 1.56 to 4.25) had higher risks of obesity than the reference group (professionals), p<0.01). Hypertensive individuals had a higher risk of obesity than normotensive individuals (OR=3.96; p<0.01).
Conclusions: Obesity and overweight are highly prevalent among adults in Dubai and are remarkably associated with sociodemographic and behavioural risk factors. Comprehensive strategic initiatives are urgently needed to control obesity in the high-risk populations in the Emirate of Dubai.

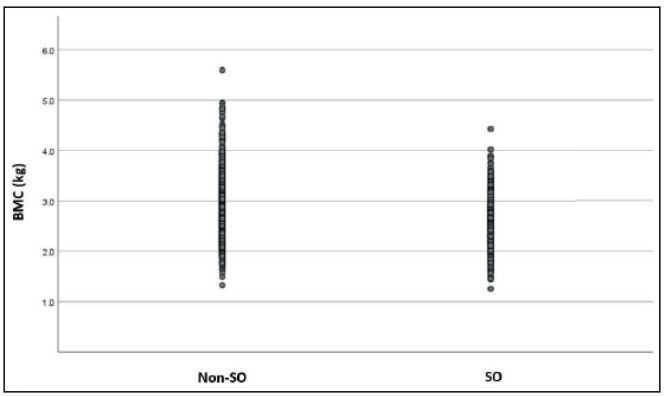
GC4.082

Is Osteosarcopenic Obesity a New Phenotype to Consider in Weight-Management Settings? A crosstalk between fat, muscle and bone

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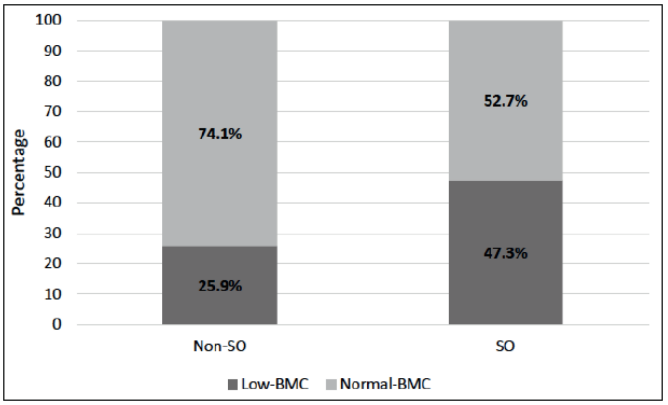
Introduction: In this study we aimed to investigate the association between obesity, sarcopenia and low bone mass, and to assess the prevalence of a new entity that combines excessive fat deposition, reduced muscle mass and strength, and low bone mass defined as Osteosarcopenic Obesity (OSO).
Methods: Body composition was completed by means of dual-energy X-ray absorptiometry (DXA) scan in 2604 participants with obesity [body mass index (BMI) ≥30 kg/m^2], categorized as with or without sarcopenia, according to the ratio of Appendicular Skeletal Muscle Mass (ASM) (kg) adjusted for Body Mass Index (kg/m^2) (ASM/BMI), with cut-off points <0.789 kg/m^2 for males and <0.512 kg/m^2 for females. Low-BMC was defined as those who fell into the lowest BMC for height tertile, otherwise they were classified as Normal-BMC if falling into the medium or highest tertiles. Finally, OSO was defined as a new entity that combines obesity, sarcopenia and Low-BMC.



Scatter plot of mean BMC (kg) in groups with and without SO.

Fig. 1.

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Prevalence of low BMC by category of Non-SO and SO.

Fig. 2.

Results: Among the entire sample, 901 (34.6%) participants met the criteria for sarcopenia. This group performed a reduced mean BMC (2.56±0.46 vs. 2.85±0.57, p<0.01), and displayed a higher prevalence of individuals with low BMC with respect to those without SO (47.3% vs. 25.9%, p<0.01). Logistic regression analysis showed that the presence of sarcopenia increases the odds of having low BMC by 92% [OR=1.92; 95% CI: (1.60-2.31), p<0.05] after adjusting for age, body weight, and body fat percentage. Finally, 426 (16.4%) out of the total sample were affected by OSO.
Conclusions: Our finding revealed a strong association between sarcopenia and reduced bone mass in adults with obesity, and this introduces a new phenotype that combines an increased body fat, reduced muscle mass and strength as well as low bone mass (i.e., OSO) and appears to affect 16% of this population.

GC4.083

The impact of sweeteners on eating behaviours during a weight maintenance RCT in adults and children with overweight: SWEET project

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Introduction: Little is known about the long-term effects of sweeteners and sweetness enhancers (S&SEs) on eating behaviour in the context of weight maintenance (WM) following prescribed weight loss (WL). This exploratory analysis of a multicentre, parallel, randomised, controlled trial aimed to investigate diet satisfaction, eating behaviour traits and quality of life-related outcomes during weight maintenance for 1-year after ≥5% induced weight loss in adults, and children with overweight.
Method: The sample included 341 adults with overweight (18-65 years, body mass index (BMI) ≥25 kg/m^2) and 38 children with overweight (6-12 years, BMI-for-age>85th percentile) recruited at centres in Denmark, Spain, Greece, and The Netherlands. After achieving ≥5% WL to qualify for inclusion in the WM phase (for adults) or receiving dietary advice to maintain body weight (for children), participants were randomised to the sugar group or S&SE group and followed a healthy, low sugar (<10% energy) ad libitum diet in the 10-month WM phase. The secondary outcomes reported in this study included diet satisfaction, control over eating, explicit liking and implicit wanting for food, eating behaviour traits (Three Factor Eating Questionnaire), physical activity and quality of life assessment. These measures were taken at baseline, after 2 months (end of weight-reduction), 6 months, and 12 months (12 months from baseline, 10 months after randomisation).
Results: Results in adults showed that the S&SE group had greater diet satisfaction (when eating out, p =.038), increased positive mood (p =.013), and lower craving for sweet food (p =.034) at 6 months (n = 232) than the sugar group. In contrast, the sugar group had greater explicit liking bias for sweet foods at 6 months (n = 234, p =.023) and 12 months (n = 189, p =.005) than the S&SE group. There were no differences between the S&SE group and sugar group on eating behaviour traits (n = 192), physical activity (n = 179), or quality of life (n = 193). In children, there were no differences between the S&SE group and sugar group on assessed outcomes (explicit liking, implicit wanting (n = 18), eating behaviour traits (n = 20) or physical activity (n = 21)). There was a significant interaction between S&SE/sugar group and uncontrolled eating (UE), in which baseline UE scores moderated the effect S&SE/sugar group on UE at 12 months. If UE scores were higher at baseline, UE scores at 12 months were lower in the S&SE group compared to the sugar group (p =.021).
Conclusion: In adults with overweight, presence compared to lack of S&SEs in the context of a healthy, low sugar, ad libitum diet for WM following ≥5% WL was associated with improved well-being at 6 months. Conversely, avoidance of S&SEs was associated with higher liking for sweet over savoury foods, and this was persistent at 6 and 12 months. There was no impact of S&SEs on eating behaviour traits, physical activity, or quality of life. In children, there was no impact of S&SE strategy on eating behaviour or physical activity. However, inclusion of S&SEs may benefit children with high levels of UE.

GC4.084

GPSO (Gestion du Parcours de Sante dans l'Obesitéé) Obesity Clinical Pathway Management in Primary Care

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Introduction: Obesity is a chronic disease affecting over 17% of the French population. Despite this, persons with obesity seldom receive weight management treatment during their primary care physician (PCP) visits. The primary barriers include a lack of training in obesity medicine, brief visit durations, and the absence of patient insurance coverage for lifestyle interventions. In the context of the French Health Care Innovation Strategy, GPSO is an experimental initiative designed to overcome these barriers.
Methods: GPSO is implemented at the territorial level, with the aim of developing a personal medical and therapeutic educational approach. It is based on a local network of primary health professionals and is a clinical pathway managed and coordinated by a multi-professional team: a dietitian, psychologist, physical activity coach (PAC), and PCPs who have volunteered to participate. All team members have received training in supporting persons with obesity. The inclusion criteria are a BMI > 30 or between 25 and 30 with comorbidity. Patients are included by their PCP. The pathway consists of three steps: 1) evaluation and inclusion by the PCP, 2) a nine-session group behavioral life-style intervention delivered by the dietitian, psychologist, and PAC, and 3) a two-year follow-up by both the PCP and a member of the local educational team. The expenses of the pathway, including evaluation, PCP visits, behavioral intervention, and coordination, are covered by a flat rate of €597 per participant with obesity, with no remainder payable by the patient.
Results: The experiment has been in operation for two years and is now implemented by 20 teams and 60 PCPs. 302 patients have been included.

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The initial qualitative evaluation shows that PCPs feel more confident in managing obesity, due to both the training and collaboration with a local team. 80% of participants with obesity remain in the program. The experiment is gradually being replicated in different territories and is expected to be included in the general reimbursement insurance

Conclusion: The networking and training of primary care actors enable long-term support for individuals. The experiment demonstrates that reducing the barriers allows for the management of persons with obesity in primary care.

GC4.085

Overcoming Obesity and Type-2-Diabetes in Indian Population: A Holistic Lifestyle Intervention Approach

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Introduction: Obesity raises the risk of metabolic disorders, including type 2 diabetes (T2D), posing a global public health concern. Lifestyle modifications have the potential to manage obesity and enhance metabolic outcomes.

Aim: To assess the efficacy of a one-year lifestyle intervention program for obesity management and improvement in metabolic outcomes in individuals with T2D.

Methods: Data on anthropometric, biochemical, and medical history from 1690 patients with obesity and T2D (aged >18, BMI > 25 kg/m², not on insulin) who underwent a one-year online lifestyle intervention program at Freedom from Diabetes Clinic in Pune, India (2020-2022) was collected. The intervention included a personalized plant-based diet, physical activity, psychological support, and medical management. HOMA-IR, HOMA-β, and QUICKI were calculated.

Results: At baseline, 96% of patients were on oral hypoglycemic medication, 54% on antihypertensive medications, and 58% on medications for dyslipidemia. After the intervention, significant reductions in median weight, HbA1c, fasting blood glucose, fasting insulin, and HOMA-IR, and an increase in QUICKI were observed ($p<0.05$). Additionally, 43% of patients showed a significant improvement in BMI, with 31% moving to the overweight category (BMI 23-25 kg/m²) and 12% to the normal BMI category (BMI<23 kg/m²) ($p<0.05$). Compared to baseline, there was a significant decrease in triglycerides (9.9%) and an increase in HDL-C (male:17%; female: 15%) ($p<0.05$). Furthermore, more patients achieved ABC goals (HbA1c<7%, Blood pressure< 140/90 mmHg, and LDL-C<100 mg/dl) post-intervention (16.5% to 24.6%) ($p<0.05$).

Conclusion: The one-year lifestyle intervention program showed significant improvement in weight loss, glycaemic control, insulin resistance, BMI, triglycerides, HDL-C, and ABC goal accomplishment. These results highlight the effectiveness of lifestyle interventions in managing obesity and related metabolic issues in T2D patients.

GC4.086

Changes in cardiorespiratory fitness, maximal leg strength, and body weight in patients with severe obesity – A clinical prospective cohort study

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Introduction: Cardiorespiratory fitness (VO2max) has become a useful diagnostic and prognostic health indicator for patients with obesity in clinical setting (1). The leg muscles bear the majority of the body weight, and impact the ability to perform daily activities. The primary objective of this study was to investigate changes in cardiorespiratory fitness, maximal leg strength, and body weight after a 3- month intensive lifestyle intervention program in a secondary care obesity clinic.

Methods: Patients with severe obesity (n=108, mean BMI 39.4, SD 5.4) underwent a 3- month intensive lifestyle intervention program in a secondary care obesity clinic at Vestfold Hospital. Cardiorespiratory fitness was measured (n=108) by indirect calorimetry (Jaeger Oxycon Pro), and one-repetition maximum leg strength (n=78) by a maximal leg press machine (Lexco master). Body weight was measured on a digital scale (Scanvaegt). The intensive lifestyle intervention consisted of 1-hour regular exercise sessions 3 days a week, together with energy restriction.

Results: Cardiorespiratory fitness (VO2max) increased significantly with a mean (95% CI) change of 2.3 (1.8-2.9) ml*kg-1*min-1 (11%), $p<0.001$. One-repetition maximum leg strength increased with a mean change of 7.6 (-2.4-17.6,) kg (2%), $p=0.133$. Body weight decreased significantly with a mean change of 5.0 (-4.3-5.8) kg (4%), $p< 0.001$.

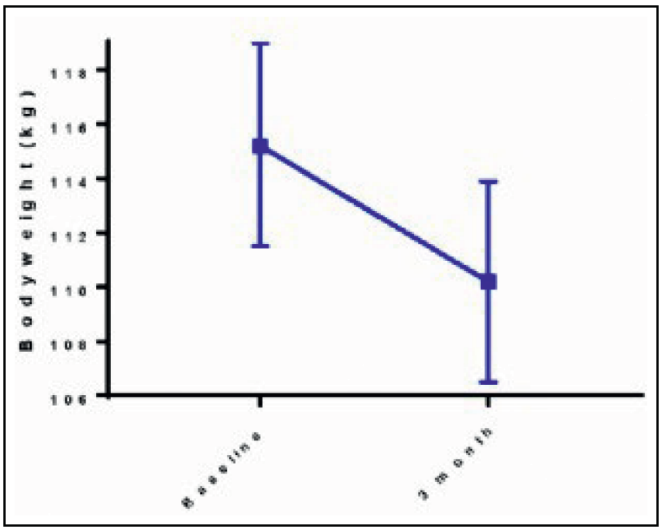
The absolute value of cardiorespiratory fitness increased with a mean change of 0.16 (0.09-0.22) L*min-1 (7%), $p<0.001$. The scaled value of cardiorespiratory fitness that eliminates the difference in body weight (kg-0.75) increased with a mean change of 7.2 (5.3-9.1) ml*kg-0.75*min-1 (10%), $p<0.001$. Fat mass and waist circumference decreased with a mean change of 3.7 (3.0-4.2) kg and 4.7 (3.9-5.4) cm (7% and 4%), respectively, both $p<0.001$). Further, changes in fat mass and waist circumference correlated significantly with weight loss (Pearson r= 0.77 and 0.68, both $p<0.001$).

Conclusion: Cardiorespiratory fitness demonstrated clinically significantly improvement concurrently with a reduction in body weight following a 3- month intensive lifestyle intervention. By contrast, one- repetition maximum leg strength did not change substantially.

Reference

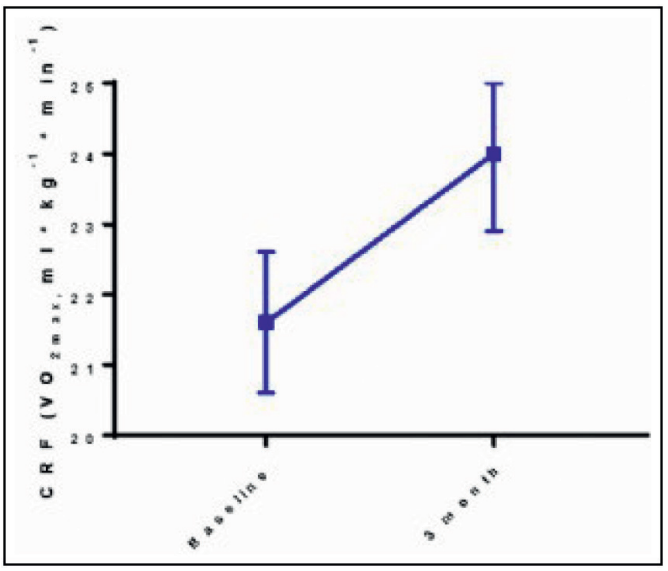
1. Berge J, Storen O, Hertel JK, Gjevestad E, Smastuen MC, Hjelmesaeth J. Associations between cardiorespiratory fitness and weight loss in patients with severe obesity undergoing an intensive lifestyle intervention program: retrospective cohort study. BMC Endocr Disord. 2019;19(1):69.

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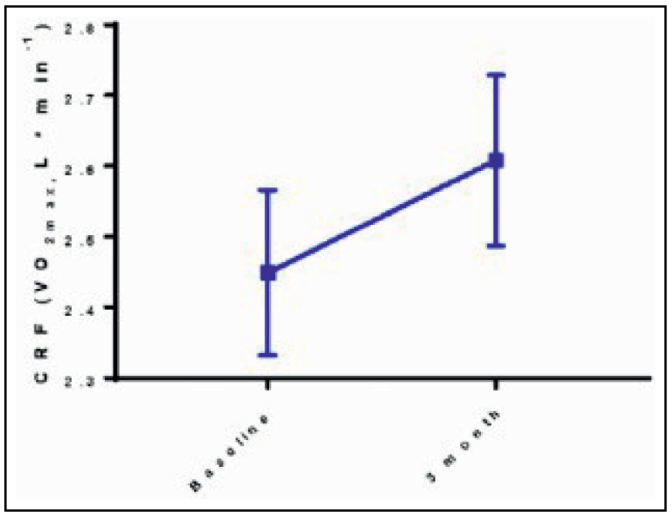
Body weight at baseline and after a 3- month intensive lifestyle intervention program. Values are presented as mean (95 % CI).

Fig. 1. Body weight.



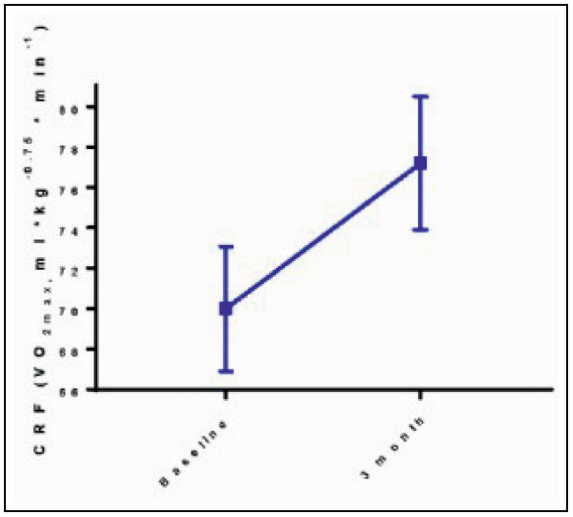
Cardiorespiratory fitness measured as maximum volume of oxygen consumed (VO2max, ml*kg-1*min-1) at baseline and after a 3- month intensive lifestyle intervention program. Values are presented as mean (95 % CI).

Fig. 2. Cardiorespiratory fitness.



Cardiorespiratory fitness measured as maximum volume of oxygen consumed, absolute value (VO2max, L*min-1) at baseline and after a 3- month intensive lifestyle intervention program. Values are presented as mean (95 % CI).

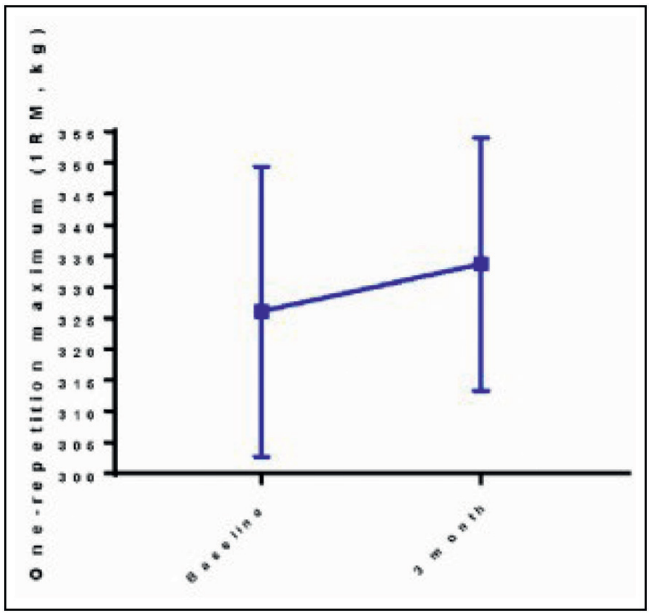
Fig. 3. Cardiorespiratory fitness, absolute value.



Cardiorespiratory fitness measured as maximum volume of oxygen consumed, scaled value to eliminate the difference in body weight (VO2max, ml*kg-0.75*min-1) at baseline and after a 3- month intensive lifestyle intervention program. Values are presented as mean (95 % CI).

Fig. 4. Cardiorespiratory fitness, scaled value.

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One-repetition maximum leg strength at baseline and after a 3- month intensive lifestyle intervention program. Values are presented as mean (95 % CI).

Fig. 5. Maximal leg strength.

GC4.087

Evaluation of an app-based multimodal lifestyle intervention in persons with obesity – results of a randomized controlled study

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Introduction: In Germany, people with obesity have free of charge access to quality-tested and scientifically evaluated Digital Health Applications (DiHAs) delivering an app-based multimodal weight loss intervention program. This 24-weeks single-center randomized controlled study was conducted to examine the effect of one of these DiHAs on weight loss in adults with obesity.
Methods: Adults with obesity (body mass index (BMI) = 30.0 – 40.0 kg/m²) were randomized to two treatment groups. The ADHOC group received the DiHA for the first 12 weeks and was allowed to use the DiHA in the second 12 weeks. The EXPECT group received the DiHA time-shifted after 12 weeks of "waiting" (= maintaining current lifestyle). At baseline, after 12 and after 24 weeks, anthropometric parameters were measured. Data about quality of life (Euroqol EQ-5D-5L) and user friendliness and acceptance (Technology Acceptance Model 3, System Usability Scale) was collected.
Results: The analyses included a total of 168 participants (64.3 % women) with a mean age of 46.8 ± 11.0 years and a mean baseline BMI of 34.2 ± 2.8 kg/m². In total, 82.7 % (139/168) completed the visit after 12 weeks and 67.3 % (113/168) completed the visit after 24 weeks. After 12 weeks, a mean weight loss of 3.2 ± 3.0 % in the ADHOC group and of 0.3 ± 2.6 % in the EXPECT group was observed with a statistically significant difference of 2.9 % (95 % CI = - 3.8; - 1.9, p < 0.001, standardized regression coefficient β = 0.46, completers analysis). In the second 12 weeks, the ADHOC group maintained the weight loss of the first 12 weeks (mean weight loss of 3.1 ± 4.5 % after 24 weeks, completers analysis). Mean change of quality of life was not significantly different between the ADHOC and EXPECT group (EQ VAS score: + 4.7 ± 14.8 vs. + 0.6 ± 11.0, p = 0.06). Amount of time spent on the DiHA was positively associated with weight reduction (β [95 % CI] = - 0.10 [- 0.18; - 0.01], p = 0.03). Imputation analyses ("Last observation carried forward" and "Copy increments in reference") confirmed the results of the completers analysis.
Conclusion: The multimodal lifestyle intervention program delivered by a DiHA resulted in a statistically significant and clinically meaningful moderate short-term weight loss after 12 weeks. Weight loss was maintained for further 12 weeks.

Conflict of interest: Hans Hauner is a member of the scientific advisory board of Oviva AG (Zurich, Switzerland) and Christina Holzapfel of 4sigma GmbH (Oberhaching, Germany). Hans Hauner and Christina Holzapfel received speaker honoraries by Novo Nordisk (Copenhagen, Denmark).

Funding: The study was funded by the Oviva AG, Potsdam.

GC4.088

Application of DiOGenes study findings in real-life setting: the French RNPC Program for long-term overweight/obesity management

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Introduction: DiOGenes is a pan-European controlled dietary intervention study which was conducted from 2005 to 2009 in 932 adults living with overweight/obesity. The design of the intervention started by a weight loss phase (8-week on low-calorie diet) followed by a 6-month randomized phase where participants underwent a long-term weight stabilization comparing five different dietary compositions. The superior diet was the low-glycemic-load index, higher-protein diet which was found completely to prevent weight regain [1].
Methods: The RNPC (for *Rééducation Nutritionnelle Psycho-Comportementale*, i.e. Nutritional Psycho-Behavioural Reeducation) program is the direct real-life implementation of the findings from the DiOGenes study and have been used since 2006 for overweight/obesity management in 110 centres spread across France. Its three-phase protocol has been extensively described in previous studies [2].
Results: Here, we present an overview of the results obtained from the RNPC Program. Firstly, four retrospective studies have demonstrated the effectiveness and safety of the RNPC program in a cohort of almost 12,000 patients with heterogenous profiles. Moreover, the RNPC program has then been used, for now, in three prospective intervention studies, with the aim to investigate how weight loss with this specific diet and follow-up protocol can favourably modify gut microbiota, and blood parameters and biomarkers of cardiometabolic diseases such as type 2 diabetes, sleep apnea, liver steatosis, renal failure, etc. A fourth study, for which the 2-year recruitment of 10,000 participants has started in October 2023, will extensively profile people with overweight/obesity in the RNPC program, by collecting extensive data to develop precision medicine algorithms to improve the individual outcomes with respect to numerous different aspects of health and wellness.
Conclusion: We demonstrated in several studies that it is possible to translate the DiOGenes study protocol into real-life condition, and offer a realistic solution to help people and health authorities to fight against overweight, obesity, and associated comorbidities.

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GC4.089

Participants' reasons for discontinuing an internet-delivered treatment for obesity: an interview study

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Introduction: The treatment of obesity is challenging, as it is difficult to adhere to lifestyle changes. Many patients need support to make these changes and internet-delivered obesity treatment is one alternative support measure. The dropout rate in treatment programs for obesity is often high and reasons can for instance be lack of motivation or unfulfilled expectations. Understanding individuals' experiences when participating in lifestyle interventions can provide insights about how to tailor interventions to enhance participants' engagement and reduce dropouts.
Methods: A six-month internet-based treatment program to provide support for lifestyle changes for people with obesity was developed. A randomized control trial is ongoing to evaluate the effect of two different ways to deliver feedback to participants. In the intervention group, there are four digital meetings with the therapist and in the control group, there are no meetings. Both groups receive regular written feedback from their therapist via an email function. We conducted digital interviews about experiences of the treatment program with 10 dropouts from both the intervention group (n=4) and control group (n=6), 8 women and 2 men. They were between 37-61 years with BMI 31-43 kg/m² at baseline. The interviews lasted 16-45 minutes and were transcribed verbatim. The interview text was analyzed with Qualitative Content Analysis. This presentation focuses on participants' reasons for discontinuing the treatment.
Results: The preliminary results show that many of the participants discontinued participation because of unexpected life events such as separation or change of work, and they said they would probably have continued the treatment if life had been less troublesome. Some of the participants did not have the time or energy for the treatment, which made them stressed and resulted in discontinuation. Another reason for discontinuing was that the treatment did not meet the participants' expectations as they had expected more focus on weight loss. Other participants said the treatment did not give anything new and felt it was not for them. Several of the participants expressed that they felt alone in the treatment and said they had wanted personal contact with others, a therapist and/or fellow participants. This was particularly true for the participants in the control group. The digital format was an obstacle for some of the participants and they found it difficult to take part in the treatment on the mobile phone.
Conclusion: In conclusion, there seem to be different, sometimes overlapping, reasons for discontinuing the internet-delivered obesity treatment. The results could help to further improve the treatment program by: 1) making the treatment approach more flexible and to recognize different participant needs, e.g. offer closer contact with therapist if desired, 2) consider focusing more on weight loss, and 3) carefully assessing participants' expectations to make sure the treatment is suitable for the individual given their current life situation.

GC4.090

Effectiveness of Slimming World's digital weight management service

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Introduction: The popularity of digital weight management services has increased in recent years, particularly due to the reliance on technology during the COIVD-19 pandemic. The effectiveness of these digital programmes is of key interest to various stakeholders including service users and providers.
Slimming World is a multi-component lifestyle weight management service, supporting people to develop sustainable behaviour changes to lose weight and maintain that weight loss. Although the service is primarily delivered through face-to-face community groups, Slimming World launched their digital programme in 2004, developed to closely align with the behaviour change techniques and support used in their group setting. Working in partnership, in areas where a service is commissioned, front line healthcare professionals are able to provide adults, with obesity and a diagnosis of at least one comorbidity, with a 12-week referral to their digital service at no cost to the patient. The aim of the current study was to evaluate the weight loss outcomes, so far, of this digital referral scheme.
Methods: Data for participants referred to Slimming World's digital programme between 21st July 2021 and 3rd October 2023 were extracted. Data for 12,826 (28.1% male) adults were analysed with a mean age and BMI upon joining of 63.5 ±7.5 years and 37.2 ±5.9 kg/m^2. Primary outcome measures were percentage weight change at the end of the 12-week referral period and the proportion of patients achieving a 3% and 5% weight loss. A multiple regression was also conducted to investigate the factors predicting weight loss.
Results: Mean weight change at the end of 12 weeks was -3.5 ±3.5% with 50.7% and 30.0% of patients achieving a weight loss equal to or greater than 3% and 5% respectively. Mean number of recorded weights was 7.0 ±3.9. A multiple regression analysis revealed that joining BMI (t=-.09,p<.01), age (t=-.10, p<.001) and number of recorded weights (t=-.42, p<.001) were significant predictors of weight loss at the end of the 12 weeks, F(5, 12526) = 753.90, p <.001, r2 =.23. High engagers (those who recorded weight at least 9 times) showed significantly greater weight losses (t(2546.60)=39.1,p<.001) with an average weight change of -5.1 ±3.6% with 72.6% and 49.5% losing 3% and 5% or more respectively.
Conclusion: Referral to Slimming World's digital weight management service supported adults with obesity and a diagnosis of at least one comorbidity to successfully lose weight. Those weighing in more often achieved greater weight loss suggesting that increased engagement was associated with greater outcomes. These findings demonstrate the effectiveness of digital lifestyle weight management interventions in supporting people to lose weight and highlight the role of on-demand digital services in tackling increasing obesity rates.

GC4.091

Weight Outcomes by Socioeconomic Status and Region for Slimming World's Digital Weight Management Service

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Introduction: With rising obesity rates in England, there is an increased need for interventions that can be delivered at scale. While digital interventions stand out as a valuable tool in achieving this goal, research has suggested they could exacerbate existing health inequalities. Therefore, to be effective, digital interventions must both produce consistent outcomes across regions within the country and support people of lower socioeconomic status. Working in partnership, in areas where a service is commissioned, front line healthcare professionals can refer patients with obesity

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and a diagnosis of at least one comorbidity to Slimming World's digital programme for 12-weeks at no cost to the patient. The aim of this study was to investigate the effectiveness of the digital programme by analysing weight outcomes by regions within England and by level of deprivation.
Methods: Data for 12,572 adults referred to Slimming World's digital programme between 21st July 2021 and 3rd October 2023 were analysed. Participants were matched to a lower-layer super output area (LSOA) according to their postcode. LSOAs were then used to map each participant to geographical regions across England and an Index of Multiple Deprivation (IMD) quintile. A multiple regression model using deviation coding examined the outcomes by comparing the overall mean weight change against regions and IMD quintile.
Results: Overall mean weight change at the end of referral period was -3.5 ±3.5% and across regions, ranged between -3.3 ±3.3% (London) to -3.6% (North East and Yorkshire ±3.5%; North West ±3.5%; South West ±3.6%). Across IMD quintiles weight change ranged from -3.4% ±3.6% (Q2) to -3.7% ±3.6% (Q3)). After adjusting for joining age and BMI, a significant regression model, $F(14, 12445) = 269.7$, $p < .001$, $r2 = .23$, found outcomes across most regions did not differ significantly from the overall mean except for outcomes within the North West region which showed slightly greater weight loss ($t=-.12$, $p<.05$) but explained little overall variance in outcomes. The model also showed that percentage weight change did not significantly differ by IMD quintile compared to the overall mean.
Conclusion: Referral to Slimming World's digital programme showed significant weight losses which were demonstrated across regions within England and across levels of deprivation. This analysis demonstrates the effectiveness of digital interventions in helping a diverse range of service users to lose weight with significant outcomes achieved irrespective of socioeconomic status and regions within England.

GC4.092

Evidence-based optimisation of PROGROUP, a group-based intervention for people living with severe obesity: The importance of fidelity to delivery and the patient experience

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Introduction: Individuals referred to specialist weight management programmes face significant waiting times, possible worsening co-morbidities, and stigma. Group-based interventions offer a potentially efficient treatment option and provide numerous benefits for patients, such as support and a sense of shared social identity. The PROGROUP intervention aims to manage group processes and shared social identity to support behaviour change for people living with severe obesity. Data from the PROGROUP feasibility randomised controlled trial (fRCT) was used to assess fidelity of delivery to PROGROUP principles and patient experiences, to optimise the intervention in preparation for the definitive trial.
Methods: Three specialist UK NHS weight management services took part in a feasibility trial, involving five facilitators and 94 patients with severe obesity (defined as BMI ≥40kg/m^2 or 35kg/m^2 with comorbidities). A mixed-methods realist process evaluation used data from 18 patient and five facilitator interviews, 35 hours of audio and six hours of video data of group sessions, two checklists, and a group processes questionnaire to assess fidelity of delivery and patients' experience of the PROGROUP intervention.
Results: Evidence demonstrated that sessions were too content heavy and hindered flexible delivery in accordance with PROGROUP principles. Facilitators felt that some educational content was unnecessary for people living with severe obesity and content contributing to a positive group environment was sometimes overlooked due to time constraints. Patients reported that they valued the behavioural change and psychological-based activities of group sessions. In response to these findings, the intervention content was revised to ensure better balance between educational material and group activities, with greater emphasis placed on activities that supported group empowerment and ownership.
Conclusion: The success of group-based interventions relies on the facilitator addressing the group's needs and creating conditions for a shared social identity and sense of ownership to develop. For patients with severe obesity, there was a desire for more focus on the psychological and behavioural aspects of living with severe obesity over educational content. Facilitator understanding of group needs and finding ways to bring the group together is key to successful delivery and subsequent behavioural outcomes. Facilitator training aims to develop these skills using a format that is feasible and acceptable to healthcare staff.

GC4.093

Educational games in the health promotion of adolescents with obesity: integrative review

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Introduction: The use of digital educational games can be an interesting teaching and learning strategy with a strong presence in the daily lives of many young people and adults. It is believed that the evidence on the use of digital educational games for the management of obesity in adolescents provides support for understanding the scope of the use of these technologies, as their implementation as an educational tool could reduce health problems and benefits the quality of life of these people. public. Firstly, the objective of this study was to analyze the use of digital educational games in the management of obesity in adolescents.
Methods: Integrative literature review, searching the MedLine, LILACS CINAHL and Scopus databases, with fifteen studies included.
Results: Digital games were found, mostly in the active video game model with graphic designs that stimulate body movement with the intention of promoting physical activity practices and some represented by avatars. In this modality, adolescents were encouraged to engage in real-life behaviors, such as having a healthy diet and engaging in physical activity.
Conclusions: The use of digital games contributed to knowledge and instigated planned attitudes towards physical exercise and healthy eating.

GC4.094

Multidisciplinary therapeutic group approach for patients with obesity: a pilot project

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Background: Obesity is a chronic and multifactorial disease that need a multidisciplinary treatment.
We started a multidisciplinary team (MT: physician, dietitian, psychologist and physiotherapist) pilot project with therapeutic groups of patients enrolled at Obesity and Work Centre of Policlinico Hospital of Milan.
Aim: Our aim was to develop a therapeutic group treatment to empower patients in three areas: nutritional, psychological and physical.
Methods: 16 pts (BMI > 27, age > 40y), with previous several weight loss failure, attended 12 encounters once a week with all MT (a total of 3 hours per day, each hour with a single specialist).
We evaluated clinical, biochemical and functional parameters in four steps: T0 and T1 after 12 weeks, a follow-up is also planned.
Results: The percentage of patients who achieved the set goals (5% variation): from T0 to T1 is reported
- Nutritional area: weight loss in 25%, improvement in food education survey in 62,5%
- Reduction of risk factors associated with obesity: systolic BP in 81,3%, diastolic BP in 68,8%, LDL-C 56,3%, PCR in 50%, HbA1c in 43,8%, HOMA IR in 50%

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– Physiotherapy area: 6MWT in 56,3%, Hand Grip Test in 81,3%, Functional Reach Test in 81,3%
– Psychological area: PGWBI test in 18,8%

Conclusions: Based on the results of this pilot project, it can be concluded that the multidisciplinary treatment approach used in this study was effective in achieving the set goals in the nutritional, physical, and psychological areas. The majority of patients experienced weight loss and improvements in food education, as well as reductions in risk factors associated with obesity such as blood pressure, LDL cholesterol, and HbA1c levels. The physiotherapy interventions also had positive effects on physical fitness, as demonstrated by improvements in the 6-minute walk test, hand grip strength, and functional reach test. However, the psychological area showed less improvement, as indicated by the lower percentage of patients with improved scores on the psychological well-being test.

This study highlights the importance of a multidisciplinary approach to obesity management, which addresses the various factors contributing to the disease. By involving a team of healthcare professionals with expertise in different areas, patients can receive comprehensive care and support to develop their awareness and healing potential. Additionally, the group treatment format used in this study provides a supportive environment for patients, allowing them to share their experiences and learn from each other.

Furthermore, this study suggests that this multidisciplinary treatment approach can be a cost-effective and accessible option for patients, as it can be provided within a reasonable timeframe and at the Obesity and Work Centre of Policlinico Hospital of Milan.

It is important to note that this study had a small sample size and further research with larger and more diverse populations is needed to validate these findings. Nonetheless, the results of this pilot project support the use of a multidisciplinary treatment approach for managing obesity and promoting patients' empowerment in various areas of their health.

GC4.095

A systematic review and meta-analysis of appetite-related hormone changes after weight loss induced by calorie restriction, exercise, or both in people with overweight or obesity

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Introduction: Altered gut hormone concentrations may reflect a physiological adaptation facilitating weight regain after weight loss. This systematic review and meta-analysis investigated changes in appetite-related hormones after weight loss achieved through calorie restriction (CR), exercise (EX), or a combination of both.

Methods: A systematic search of PubMed (MEDLINE), EMBASE, SPORTDiscus, Cochrane Library, Web of Science, and ClinicalTrials.gov was conducted to identify randomized controlled trials (RCTs) and non-RCTs reporting either pre- and post-intervention appetite-related hormone concentrations or the changes therein. The appetite-related hormones examined include ghrelin, peptide tyrosine tyrosine (PYY), glucagon-like peptide -1 (GLP-1), and cholecystokinin (CCK), in their total or active form. Standardised mean difference (SMD) was used as the effect size.

Results: 111 studies were included in the meta-analysis, involving 17 RCTs and 94 non-RCTs representing a cohort of 1125 and 3871 participants, for RCTs and non-RCTs respectively. The meta-analysis revealed a significant increase of total ghrelin after weight loss from both RCTs (SMD = 0.48; 95% CI: 0.07 to 0.89; p = 0.022) and non-RCTs (SMD = 0.26; 95% CI: 0.14 to 0.37; p < 0.001). Conversely there was a significant decrease of PYY (total PYY: SMD = -0.18; 95% CI: -0.30 to -0.07; p = 0.002; PYY_{3-36}: SMD = -0.17; 95%CI: -0.32 to -0.02; p = 0.025), active GLP-1 (SMD = -0.12; 95% CI: -0.21 to -0.02; p = 0.024) and CCK (SMD = -0.17; 95% CI: -0.31 to -0.03; p = 0.015) from non-RCTs. There were no changes in the concentrations of PYY and CCK for RCTs and not enough eligible RCTs measured PYY_{3-36} and active GLP-1. No significant changes of acylated ghrelin and total GLP-1 were identified for either RCTs or non-RCTs. Subgroup analysis from RCTs demonstrated a smaller increase in total ghrelin after weight loss induced by exercise versus calorie restriction (CR: SMD = 0.71; 95% CI: 0.12 to 1.29; EX: SMD = 0.06, 95% CI: -0.12 to 0.24; p = 0.039). Few studies examined the impact of combined calorie restriction and exercise on appetite-related hormone changes, and the existing evidence does not demonstrate enhanced benefits arising from this combination. Meta-regression revealed a positive association between weight loss magnitude and total ghrelin concentration increases for RCTs and non-RCTs and negative associations between weight loss magnitude and changes in PYY, GLP-1 and CCK for non-RCTs.

Conclusion: Weight loss is associated with a notable increase in total ghrelin and decreases in PYY, active GLP-1 and CCK concentrations. Weight loss induced by exercise appears to elicit a more modest change in ghrelin than weight loss induced by calorie restriction. Greater weight loss is linked to larger increases in ghrelin concentration and larger decreases of PYY, GLP-1 and CCK. This review contributes critical insights into the hormonal adaptations accompanying weight loss.

GC4.096

Impact of Roczen, a Time Restricted Eating weight management programme on eating behaviours and depression

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Introduction: A growing body of evidence supports the effectiveness of time restricted eating (TRE) for weight management, however little evidence exists on the impact of TRE on eating behaviours. Disordered eating and binge eating (BE) are prevalent in people living with obesity and evidence suggests that dieting may increase the risk of both. The Roczen programme, a clinically-led, digitally-delivered TRE programme for people living with obesity, type 2 diabetes, and related complications, has previously demonstrated positive impact on weight and other health-related outcomes[1]. We aimed to explore the impact of Roczen on eating behaviour and depression.

Methods: Members were supported on a TRE (16:8), low-carbohydrate, moderate protein plan delivered by clinicians and mentors with behavioural and social support. Eating behaviour was assessed using Binge Eating Scale (BES) and Three Factor Eating Questionnaire-18 (TFEQ). Depression symptoms were assessed using the PHQ-9. Data were analysed at 6-months and reported using mean±SD and mean (interquartile range).

Results: A total of 102 members were included in the study (mean age 51.1±10.0 years; mean body mass index (BMI) 34.5±5.0kg/m^2; 57.8% White Ethnicity; 72.5% Female). At baseline, median BES score was 10.0 (6.0, 17.5), mean TFEQ score 43.2±14.0. Mean TFEQ subscales were: uncontrolled eating 2.42±0.57, emotional eating 2.37±0.53, and restraint, 2.29±0.55. Median PHQ-9 was 4.0 (1.0, 7.25). At 24 weeks, mean weight loss was 10.8±6.5kg (p<0.001). There was a significant improvement to BES scores (5.9 point reduction, p< 0.001). Total TFEQ score reduced by 12.3±15.1 (p<0.001). Uncontrolled eating and emotional eating significantly reduced (0.76±0.78 and 0.53±0.95 [p<0.001]) respectively, while restraint did not significantly increase (0.08±0.67). PHQ-9 improved by

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5.2 points (p<0.001). Higher baseline restraint was associated with lower BES score at 24 weeks. There was no difference in weight loss outcomes at 24-weeks between those who had high or low emotional, uncontrolled or restrained eating scores at baseline.

Conclusion: Eating behaviour and mood were not negatively impacted in members enrolled in the Roczen programme. Over six months, BE behaviour, uncontrolled eating, emotional eating and depression symptoms improved despite previous studies having highlighted a potential concern over the association between restrained eating and eating disorder pathology. Restraint at baseline was associated with lower BE at follow-up. Of further interest is that those with high restraint, emotional eating and uncontrolled eating at baseline did not lose significantly more or less weight than those with low scores. Our results suggest that in a clinically-led environment, TRE does not increase risk for onset of eating disorder pathology and can potentially be effective and safe.

Reference

1. Brown, A. et al. (in press), 'Real-World Data of a Digitally Enabled, Time-Restricted Eating Weight Management Programme in Public Sector Workers Living with Overweight and Obesity in the UK: A Service Evaluation of the Roczen Programme', Obesity Science & Practice.

GC4.097

Thalassotherapy in the management of obesity in Bulgaria: 20 years' experience

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Introduction: Thalassotherapy comprises the use of seaside climate, as well as the properties of the sea for prevention and treatment of obesity. Since 2004, program Vital has been functioning for treatment of obesity in Albena at the Black see coast. The aim of this presentation is to demonstrate the Bulgarian 20-year experience of thalassotherapy in the prevention and treatment of obesity in Albena.

Methods: A total of 4 400 patients with overweight and obesity were followed up. They were treated with diet (1460 kcal per day) and high activity regimen (2 863 kcal mean daily energy expenditure). The low-calorie diet (LCD) was 1000 - 1200 kcal/24 h with four times food intake as well as with different thalassotherapy procedures. The percentage of the main ingredients in the daily diet were proteins - 15 – 20 E%, lipids < 25 E% (saturated fatty acids < 10 E%), CHO (carbohydrates 60 – 75 E% (sugar < 2 E%).

Results: The mean weight was 2,1 kg (2,5%) per person for a 10-day period; fat mass was reduced by 1 kg on average; BMI was decreased by 0,7; waist circumference decreased with 3,4 cm, and hip circumference – with 2,4 cm.

Conclusion: The Thalasso therapeutic procedures stimulate and intensify the metabolic processes in the body. Thus, it may lead to reduction of body weight and the cardio-vascular risks, associated with obesity.

GC4.098

Investigating the synergy between intermittent fasting and low-carbohydrate dietary approaches in post-menopausal women with obesity

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Introduction: During post-menopause, women face metabolic changes that increase susceptibility to obesity, type 2 diabetes, metabolic syndrome, and cardiovascular diseases (Mesch et al., 2006; Raman et al., 2023). Various dietary interventions have been proposed to manage these changes and prevent associated health issues (Silva et al., 2021). This study explores the potential synergy between a widely used hypocaloric low-carbohydrate diet (LCD) and intermittent fasting (IF) in enhancing metabolic health benefits.

Methods: A six-month randomized controlled trial with a patient preference design was conducted, involving 26 women who were post-menopausal, with overweight and obesity. 9 participants followed an LCD diet (carbohydrate intake ≤ 50 g/d, 1500 kcal/d), while 17 adhered to an LCD-IF regimen (LCD with IF, consisting of three non-consecutive days/week of time-restricted eating with a 16-hour fasting period/d). The trial included three assessment points (baseline, 3 months, and 6 months) in which different parameters were measured, including body weight, waist circumference, body fat, the thickness of different fat layers, and a comprehensive blood test evaluating renal, hepatic, thyroid, adrenal, and gonadal functions, as well as markers for diabetes and dyslipidemia.

Results: LCD and LCD-IF similarly reduced body weight, waist circumference, subcutaneous fat, omentum fat and perirenal fat at 3 months and these changes were maintained at 6 months. The total body fat percentage was also similarly reduced by both diets at 6 months and HDL cholesterol was significantly increased by both diets at month 6 with no differences between interventions.

Conclusion: Our six-month randomized controlled trial comparing LDC and LDC-IF in post-menopausal women with overweight and obesity, suggests that both dietary interventions demonstrate comparable effectiveness in improving body weight, body composition and metabolic risk factors. Notably, there was no discernible synergy between the two, suggesting no added health benefits from their combination.

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GC4.099

Feasibility of Time-Restricted Eating in the Treatment of Type 2 Diabetes – the RESET2 Pilot Study

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Introduction: Time-restricted eating (TRE) is a type of intermittent fasting reducing the daily time window for eating and drinking, usually without other dietary restrictions. TRE has been shown to improve body weight and glycemic control, but evidence in people with type 2 diabetes (T2D) is lacking. The objective of this pilot study was to investigate the feasibility of a 12-week TRE intervention targeting people with T2D to inform the design of a 1-year RCT.
Methods: In this single-arm pilot study, 10 men and 10 women with T2D (mean (SD) HbA1c: 62 (9) mmol/mol and T2D duration: 15 (6) years) followed a 12-week TRE intervention (see figure 1). The design was informed by a preceding needs assessment study including people with T2D, relatives, and health care professionals (HCPs). The participants initially followed 8 weeks of strict TRE with a self-selected 10-hour eating window to obtain lived experiences with TRE, followed by a 4-week TRE period with individual adjustments and support options. The timing of the eating window was planned during conversations with an HCP at visit 1 (baseline). Through conversations at visit 2 (8 weeks), participants' potential challenges and needs were discussed with an HCP. Individual adjustment and support options were planned for the final 4-week period, and included: occasional rescheduling of the eating window, calorie-free beverages outside the eating window, and support from peers, relatives, and HCPs. Participants received a weekly e-mail with a link to a simple questionnaire to fill in the preceding day's eating window. Body weight and HbA1c were measured at baseline and after 12 weeks. Qualitative interviews were conducted at visit 3 (12 weeks). A deductive content analysis based on conversations (visit 2) and interviews (visit 3) was performed focusing on how adjustment and support options were received and experienced by the participants and how they assisted the maintenance of TRE during the intervention.
Results: Nineteen participants completed the intervention. The median (Q1, Q3) eating window was 10.0 hours (9.8, 10.0) throughout the 12 weeks. Median adherence to the eating window across all 12 weeks was 94%, ranging from 0% to 99%. 17 participants reported to have followed TRE on at least 6 out 7 days. After 12 weeks, mean (95%CI) reductions in body weight of -2.0 kg (-2.9, -1.1) and HbA1c of -4.1 mmol/mol (-6.7, -1.4) were observed. During the last 4 weeks, all participants chose to implement one or more of the individualized adjustment and support options. Overall, adjustments and support eased TRE implementation in daily life by adding flexibility to the eating concept, enabled maintenance of a social life with friends and family, and eased challenging times with TRE. Participants did not report any severe adverse events.
Conclusion: We demonstrated that 12 weeks of TRE was feasible in terms of easy recruitment and high retention and adherence. Moreover, TRE may improve glycemic control and reduce body weight in people with T2D. It seems crucial to offer individualized support and adjustments to improve implementation and sustainability of the TRE concept.

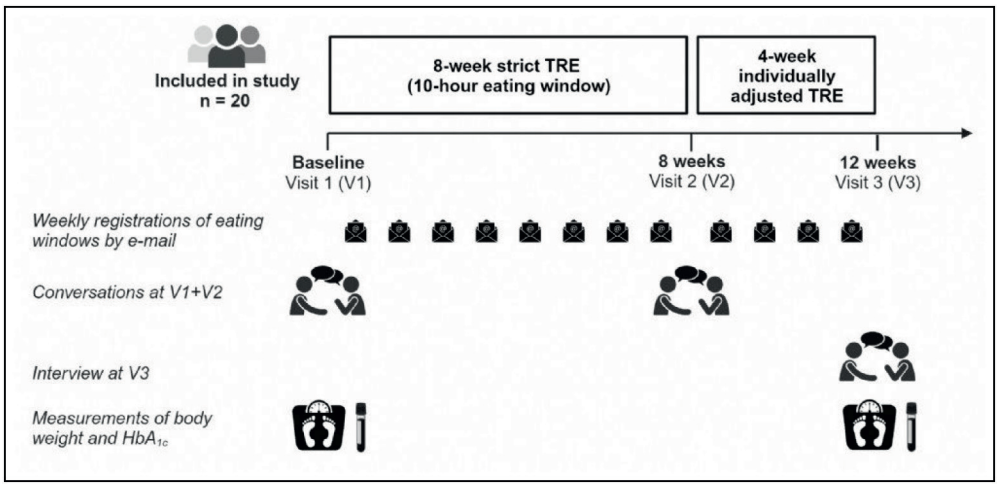
GC4.100

Association Between Physical Activity, Socioeconomic Status, Diet, And Blood Biomarkers in Lebanese Adults

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Introduction: Non-communicable diseases (NCDs), including cardiovascular disease, cancer, diabetes, and chronic respiratory illness, cause 41 million deaths annually worldwide. Inactivity is a major risk factor for NCDs as it can increase blood pressure, glycemia, cholesterol, and obesity. In 2022, the World Health Organization (WHO) reported rising prevalence of physical inactivity among adults in Lebanon (40% Men, 33% Women). Various studies have reported the favorable effect of Physical Activity (PA) on several health parameters. Concurrently, different factors such as gender, age, diet, and sociodemographic factors affect PA performance. The objectives of this study were to examine correlates of PA in Lebanese adults with a focus on blood biomarkers.
Methods: A cross-sectional analysis including 296 adults aged 18-65 years (46.6% Men, 53.4% women) with no prior history of chronic diseases was conducted. Participants completed a brief sociodemographic and 61-item



RESE2 pilot study design.

Fig. 1.

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food frequency questionnaire. Anthropometric measurements and fasting blood samples were also collected. PA was measured using the IPAQ short form. Descriptive statistics were computed for sociodemographic characteristics, BMI, waist circumference, energy intake, PA levels and blood biomarkers. Multivariate logistic regression analysis was carried out to assess the relationship between PA and blood biomarkers levels, adjusted for relevant co-variates.

Results: Gender and marital status differentials were observed in prevalence rates of moderate to vigorous PA level (59.6% M Vs 40.4% W; 65.8% Ever married Vs 34.2% Never married). No association was found between PA, BMI, waist circumference and diet. There was a significant positive association between PA and blood LDL (mg/dl) value, whereby the odds of performing moderate to vigorous PA were increased in participants with moderate risk (OR= 1.944; 95% CI: 1.032-3.659) and high-risk LDL level cut offs (OR=2.442; 95% CI: 1.075 - 5.548). There was no association between PA and other blood biomarkers (HDL, VLDL, CRP).

Conclusion: The findings of this study demonstrate a positive association of PA with gender and disease risk, mainly a biomarker known to jeopardize cardiovascular health. Risk to disease appears to be a driving factor to perform physical activity, more so among women. These results may guide early nutrition interventions endorsing physical activity as a preventive measure to decrease the prevalence of cardiometabolic disorders.

GC4.101

Effects of plant-based diets on markers of insulin sensitivity: A systematic review and meta-analysis of randomised controlled trials

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Introduction: In parallel with an increased focus on climate changes and carbon dioxide footprint, the interest in plant-based diets and their potential health effects have increased over the past decade. The objective of this systematic review and meta-analysis was to examine the effects of plant-based diets on markers of insulin sensitivity in people with overweight, prediabetes, or type 2 diabetes.

Methods: A systematic literature search in MEDLINE, Embase, CINAHL, and CENTRAL was conducted from inception to 23 October 2023. Further, we screened references of the included articles, and articles citing the included articles. Randomised controlled trials investigating the effect of plant-based diets (vegan, ovo-vegetarian, lacto-vegetarian, and lacto-ovo-vegetarian) for at least 14 days on markers of insulin sensitivity in adults (≥18 years) with overweight/obesity (BMI≥25 kg/m^2), prediabetes, or type 2 diabetes were eligible. Control groups were defined as being passive (continuing habitual diet with no dietary changes), or active (receiving other dietary interventions than plant-based diets). Data were extracted for random-effects meta-analyses to calculate the summary effect estimates and 95% confidence intervals (CI).

Results: Of 545 records identified in the database search, 9 trials (747 participants) were eligible. In comparison with passive or active control diets, plant-based diets improved Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) (mean difference -0.97, 95% CI [-1.67, -0.27], p=0.007 (n=609)), but only a tendency towards lower fasting insulin concentrations was found (-2.33 µIU/ml, 95% CI [-5.30, 0.64], p=0.120 (n=674)). Two studies compared vegan diets with ovo-vegetarian and lacto-ovo-vegetarian diets but found no differences in HOMA-IR or fasting insulin.

Conclusion: This systematic review and meta-analysis found that adhering to plant-based diets for at least 14 days may improve insulin sensitivity in individuals with overweight, prediabetes or type 2 diabetes. Some of the effect on HOMA-IR may have been attributed to differences in the macronutrient composition and energy intake in the plant-based diets compared to the control diets. Larger long-term studies are needed to determine whether plant-based diets can improve insulin sensitivity.

GC4.102

Preventing Obesity Through Biologically And Behaviorally Tailored Interventions; Description Of The BETTER4U Project

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Introduction: The obesity epidemic constitutes a leading public health threat, currently seen as an indispensable underlying cause for the manifestation of many non-communicable diseases (NCDs). The growing prevalence of obesity and its association with poor mental and physical health outcomes renders the optimization of obesity prevention measures a public health priority. BETTER4U is designed to address the prevalence of obesity in Europe with the assistance of modern artificial intelligence (AI) technologies and the collaboration of an international, multidisciplinary group of experts.

Methods: BETTER4U aims at the identification and individualized management of all obesity determinants via adaptable, practically assessed and personalized, lifestyle recommendations. The project is, thus, orchestrated in four interrelated and dynamic phases, namely: phase 1 will identify all obesity- related determinants through meta-review and meta-analyses of data from current literature and previous projects conducted by consortium partners (i.e. genetic, and of omics layers beyond, microbiota, socio-economic, geographical, cultural and lifestyle features); phase 2 will focus on the creation of a robust mechanism for applying individualized interventions for the prevention of obesity, based on a model integrating knowledge on the causal association between variables in the form of a graph enhanced by AI along with federated learning; phase 3 will evaluate effectiveness and cost-effectiveness by conducting a pilot study and a randomized clinical trial (RCT) in adults from seven European sites, in which participants will receive personalized recommendations from healthcare professionals via use of an AI platform and technologically-assisted, real-time monitoring tools, aspiring to result in the BETTER4U integrated methodology and, lastly; phase 4 will focus on the communication and dissemination of said methodology.

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Fig. 1. EU-funded project/ EU emblem.

Results: During its nodes and by the conclusion of its entirety, BETTER4U aims to provide three-fold results referring to: i) the creation of an extensive BETTER4U dataset allowing for identification of all types of obesity determinants; ii) the development and use of AI and monitoring tools to derive and implement personalized recommendations; iii) the real-world application of said recommendations through an intervention which will result in personalized methodology guidelines.
Conclusion: Overall, BETTER4U aims to comprehensively decipher the interplay of the multiple determinants linked to the complex obesity etiology. The project will employ AI methods and monitoring tools to develop and evaluate the efficacy of the novel BETTER4ALL intervention methodology. The project seeks to allow for the wide distribution of the BETTER4U obesity prevention intervention methodology guidelines by making the latter publicly available through public health systems and via using people-centered, sustainable care approaches.

Conflict of Interest: None Disclosed.

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GC4.103

The effects of adiposity and exercise training on acylated ghrelin: analyses from the VitaDEx randomised controlled trial

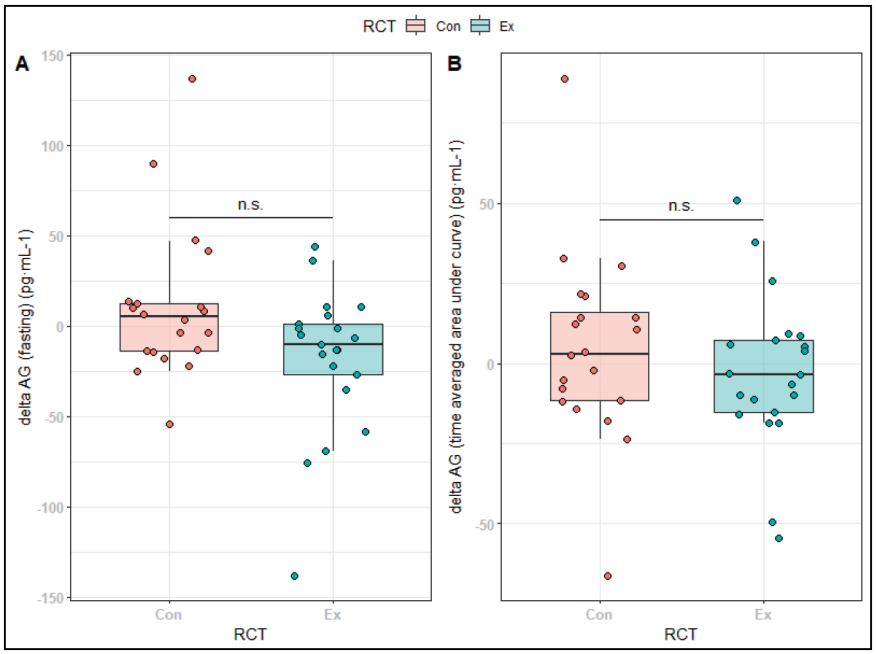
Li, J.[1]*; Thackray, A. E.*[2]*; Jin, Z.*[1]*; King, J. A.*[2]*; Perkin, O. J.*[3]*; Thompson, D.*[3]*; Davies, S. E.*[3]*; Gonzalez, J. T.*[3]*; Stensel, D. J.*[4]

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Introduction: Acylated ghrelin (AG) is well-established as an appetite-stimulating gut hormone and has been shown to increase with exercise-induced weight loss. However, the effect of exercise on AG concentrations in the absence of weight loss has not been studied extensively. The aim of this study was to: 1) compare AG concentrations in individuals of differing adiposity status; and 2) examine the effect of 10-weeks of exercise training without weight loss on AG concentrations in individuals with overweight or obesity.

Methods: In a randomised controlled trial, 41 men and women with overweight or obesity were randomly allocated to an exercise training group (n=21, mean[SD] age 49.0[10.9] yr, BMI 33.1[4.2] kg/m^2) or a control group (n=20, age 48.8[12.2] yr, BMI 33.7[3.7] kg/m^2). The exercise group undertook gym-based aerobic exercise training 4 times/week, with the intensity reaching 70% of VO_2peak by the end. The increase in exercise energy expenditure was compensated for by an increase in energy intake to maintain body mass. Fasting and postprandial AG concentrations and appetite ratings (100 mm visual analogue scales) were measured at baseline (week 0) and after the intervention (week 10) in response to a 4 h mixed meal tolerance test. A baseline assessment of fasting and postprandial AG and appetite was undertaken in a comparator group of 19 men and women who were lean (age 37.0[11.6] yr, BMI 23.0[2.2] kg/m^2). Statistical analysis was performed using linear mixed models, t tests and Mann-Whitney U tests.
Results: The group with overweight/obesity were heavier and had greater fat mass than the group classified as lean: body mass (98.5[13.2] vs 71.3[11.9] kg, P<0.01), fat mass (38.8[9.1] vs 13.1[2.6] kg, P<0.01). Fasting (95.0[52.7] vs 151.3[93.5] pg•mL^{-1}, P=0.01) and the time averaged area under curve (AUC) (71.3[42.6] vs 107.1[60.3] pg•mL^{-1} P=0.01) AG concentrations were lower in individuals with overweight or obesity compared to those who were lean. Fullness total AUC (tAUC) was higher (P<0.05) and hunger tAUC was lower (P<0.05) in individuals with overweight or obesity compared to those who were lean.
Body mass did not change significantly from week 0 to week 10 in the exercise group or the control group. There was no significant difference between the exercise and control groups in the baseline to 10 week change of fasting AG (-18.3[40.5] vs 10.5[42.4] pg•mL^{-1}, respectively, P=0.07) or time averaged AUC of AG (-3.0[24.3] vs 4.6[29.9] pg•mL^{-1}, respectively, P=0.38) (Supplementary Figure 1). Fasting and postprandial subjective appetite ratings were similar between the exercise and control group across the 10-week intervention (P>0.05).
Conclusion: AG concentrations were higher in individuals classed as lean, which coincided with higher ratings of hunger and lower ratings of fullness compared to individuals with overweight or obesity. Exercise without weight loss does not lead to altered circulating AG concentrations or subjective appetite sensations in individuals with overweight or obesity.

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Panel A shows fasting values. Panel B shows time-averaged area under the curve postprandial values from a 4-hour mixed meal tolerance test.

Fig. 1. Bar chart of the change of acylated ghrelin concentrations (delta AG) from week 0 to week 10 in the control and exercise groups with overweight or obesity.

GC4.104

Effects of the MoveMore lifestyle intervention on immunological, psychological and psychological variables in individuals with overweight, or Class I or Class II obesity

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Coventry University

Introduction: COVID-19 highlighted the severity of the silent international pandemic health services have been battling for decades – spiralling rates of obesity. Research shows that interventions focused on increasing physical activity (PA), reducing sedentary behaviours and improving diet can reduce adiposity. However, there is paucity of research investigating how PA and dietary interventions might improve the immunological system in people with overweight or obesity and how immunological changes would interact with other important health indicators such as sleep quality, mental well-being, and feelings about exercise. Understanding the immune response to exercise in sedentary individuals with overweight, or obesity can play a key role to prevent the development of non-communicable diseases in this target demographic and consequently reduce healthcare costs.

To address this research gap, this study will investigate how engagement with a remote access exercise programme and acute response to vigorous exercise alters the chronic low-grade inflammation and physiological maladaptation associated with overweight and obesity. Results could be used to further supporting public health when delivering exercise guidance, and to further understand the immunological effects of lifestyle change in a clinically vulnerable demographic.

Methods: We recruited 17 (14 females) participants. Eligibility criteria included: aged between 18-60 years, body mass index between 25-39.9, and less than 150 minutes of moderate to vigorous PA per week. Following a 4-week control period, participants will be issued workout equipment to conduct a 12-week exercise intervention consisting of 5 x 30 minutes per week of mixed-mode exercise (resistance and aerobic) programme, with remote online video guidance. The intervention will include a guide detailing correct exercise form, and requirements for nutrition and well-being, consisting of calorific intake calculated for the individual, and nutritional education based on NHS guidelines for the target demographic. Resting and post exercise venous blood sample will be taken for subsequent analysis of serum cytokine profile and plasma immunoglobulin concentrations by ELISA.

Secondary physiological measures (BR and HR, stature, mass, body composition, flexibility, HRmax, and V̇O2 peak or V̇O2 max) and psychological measures (SQS, AFFEXX, WEMWBS) will be used to determine the efficacy of this intervention. Upon completion of intervention, participants will take part in semi-structured interviews to investigate their perception about intervention feasibility, and acceptability, and IPA will be used to further contextualise the psychological measures. Intervention effects for quantitative data (i.e. physiological, immunological, and psychological data) will be assessed using analysis of covariance (ANCOVA), and effect sizes calculated using partial eta squared. Furthermore, the correlation between physiological, immunological, and psychological data will be assessed using multiple linear regressions.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.105

The Yazen model: Obesity care through a holistic digital approach integrating medical treatment, lifestyle intervention, and social support

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Yazen Health AB

Obesity is a chronic disease that requires a multifaceted and multidisciplinary treatment approach. Continuous care is necessary for effective and convenient management and must be aligned with the preferences and lifestyles of each patient.

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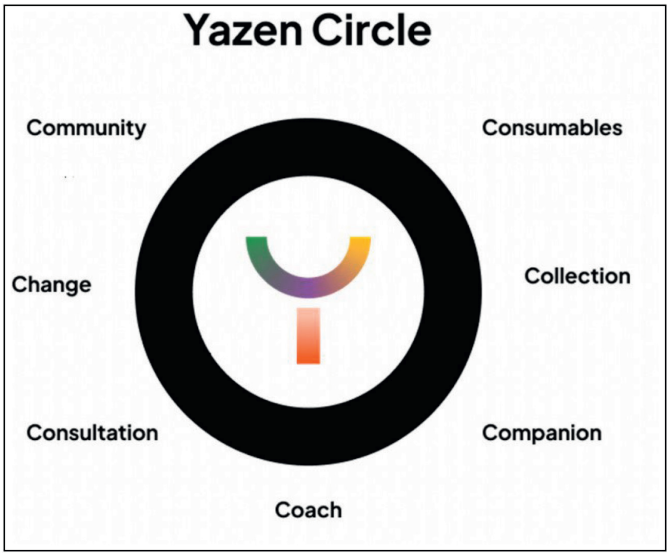
The Yazen model combines modern medical treatment, lifestyle intervention, and support from a health coach and specialized team, all facilitated through a digital platform. The digital approach enhances accessibility, allowing patients to receive personalized care, monitor progress, access resources and join a supportive community conveniently within the app. The Yazen model has proven to be effective in providing rapid weight loss and maintenance as well as improving health-related cardiometabolic factors. Currently (January 2024), roughly 10,000 Swedish persons living with obesity are treated with the Yazen model.

The model includes an educational program, known as Change, it aims to empower patients through knowledge about obesity and the necessary tools for making sustainable lifestyle changes. Change provides patients with information and challenges related to dietary habits, physical activity, and mental health, encouraging self-care and facilitating informed decision-making. The program is divided into 10 modules, containing facts, challenges and reflections that the patients work through at their own pace. It contains helpful tools for self-monitoring and gamification elements such as quizzes and rewards to promote active participation in the journey towards a healthier lifestyle.

Patients are encouraged to set personal goals alongside continuous coaching, support, and medical supervision from a health coach and medical professional. This all happens through asynchronous text-based communication. The health coach has a professional license within the healthcare field, such as a nurse, dietitian or physiotherapist, ensuring a professional and qualified approach. This team-based model also involves specialists such as psychologists, and personal trainers, each contributing expertise to address the diverse elements of obesity management. The digital platform facilitates high accessibility, providing instant treatment and support to patients.

The word 'together' is central to the Yazen model, recognising the importance of support from fellow patients. The app includes a community where patients can connect with others on a similar journey, share experiences, and provide encouragement. The community is also a place where healthcare experts can contribute valuable information and inspiration. The "together" guiding principle permeates the entire Yazen treatment, emphasizing a collaborative approach with the patient.

In summary, the Yazen model goes beyond traditional methods, providing patients with the tools to manage their disease, addressing medical and behavioral aspects, education and social support through a digital platform for accessible, continuous and effective weight loss and management.



The Yazen model includes an educational program, known as Change, it aims to empower patients through knowledge about obesity and the necessary tools for making sustainable lifestyle changes.

Fig. 1. Change, an educational program.

GC4.106

Clinical care pathway for pregnant patients with overweight, obesity and/or excessive weight gain: the experience of the SIAN Nutrition Clinic of Bassano del Grappa (Italy)

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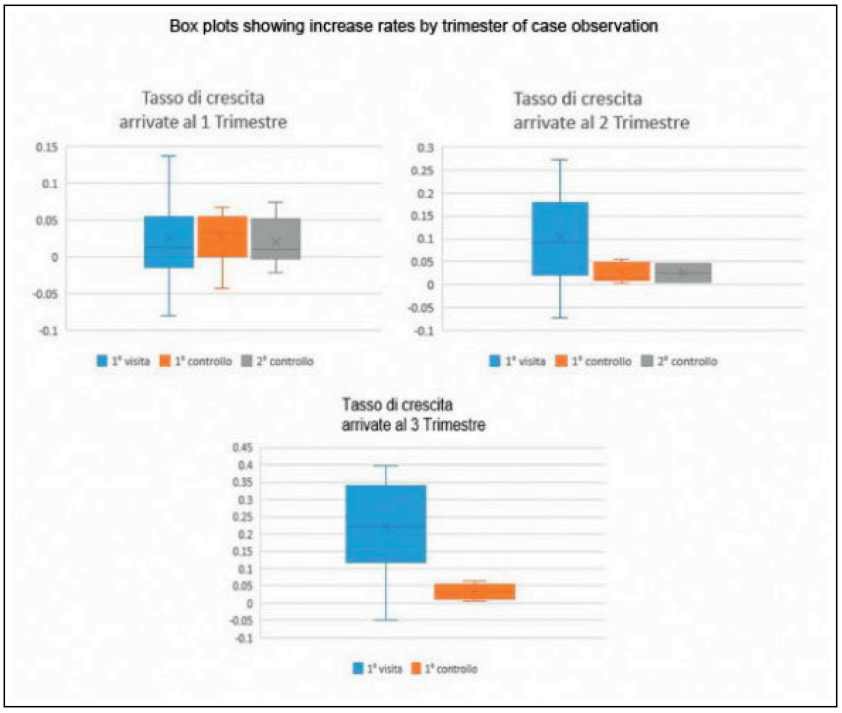
Introduction: In the current context of increasing weight gain in the general population, more pregnancies are occurring in women with overweight or obesity. Scientific consensus suggests that these conditions can lead to complications for both the mother and unborn child during pregnancy and childbirth, as well as to adverse medium- and long-term outcomes and that an early nutritional intervention can have a significant impact.

Methods: Between July 2020 and August 2022, the Sian Nutrition Clinic of the Bassano Del Grappa Prevention Department provided care to 55 pregnant women. The program consisted of an initial visit and subsequent check-ups at approximately 6-week intervals, during which antropometric data and dietary habits were assessed. Patients received counseling on diet and healthy lifestyle, and were advised on their target weight for pregnancy term in accordance with the international IOM/Rasmussen guidelines. To evaluate potential changes, we assigned a score of 0 or 1 to eight major dietary habits based on CREA 2019 at each follow-up, resulting in comparable data. Statistical analyses were conducted using chi-squared tests for independence, paired Student's t-tests, and multivariate regression.

Results: During the visits, there was an improvement in overall dietary habits. Specifically, the mean diet score at the first follow-up significantly increased compared to the first visit (9.70 vs 7.04). There was a trend towards a doubling of the prevalence of good habits at the first check up and a more modest increase at subsequent visits. Additionally, there was a gradual increase in physical activity. Nutritional intervention leads to better weight outcomes in pregnant women under 30 ($p<0.001$), likely due to increased metabolic adaptability. Results of the nutritional intervention vary depending on the trimester of arrival. Those sent in the first trimester with the most disadvantaged preconceptional nutritional status showed a constant rate of increase less than 5%, which is considered low. Patients were referred to our clinic during the second and third trimester if they experienced a high rate of weight gain, up to 22.2%, despite having a more favourable pre-pregnancy nutritional status. However, this rate decreased during the nutritional course. For patients who were already above their target weight during their initial visit, the dietary intervention resulted in weight maintenance throughout the term, with an increase of less than 5%.

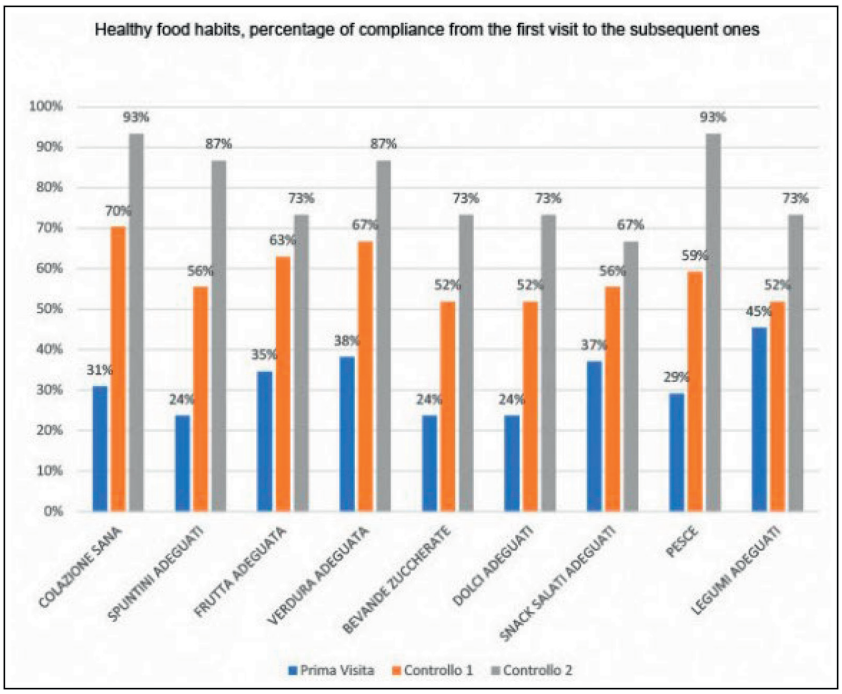
Conclusion: The SIAN Diet Clinic's intervention is based on promoting correct eating habits and an active lifestyle. The success of this method is demonstrated by the fact that all patients have chosen to comply with the indications and improve many aspects of their diet. To prevent adverse maternal and infant outcomes, it is recommended that women with obesity who wish to become pregnant receive nutritional counselling during the pre-pregnancy period. If this is not feasible, it is essential to manage pregnant women with weight and/or nutritional issues early on.

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1st Box plot: Patients sent in the first trimester show a constant rate of increase over time and values within 5% of controls, i.e. low; 2nd Box plot: Patients sent in the second trimester have a more favourable pre-gravid nutritional status (and a higher maximum gestational age) and come to observation with a high rate of increase. This decreases during the nutritional course; 3rd Box plot: Patients sent in the third trimester, starting from even better nutritional states, come to observation with a high rate of augmentation (22.2%). This rate also decreases during the course, although the time available for nutritional intervention is much shorter.

Fig. 1. Box plots showing increase rates by trimester of case observation.



During the visits, there was an improvement in overall dietary habits. Specifically, the mean diet score at the first follow-up significantly increased compared to the first visit (9.70 vs 7.04). There was a trend towards a doubling of the prevalence of good habits at the first check up and a more modest increase at subsequent visits.

Fig. 1. Frequency of specific eating habits during visits.

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Tab. 1. Student's t-test (significance with p> 0.05) on patients divided by trimesters

	number of patients	weight rate prepregnancy-first visit	weight rate prepregnancy-term	difference	T-Test	p	df
1st Trimester	3	13.8%	20.9%	7.10%	0.792	0.5114	2
2nd Trimester	6	17.02%	21.95%	4.92%	2.39	0.062	5
3rd Trimester	7	27.55%	20.41%	2.86%	2.31	0.060	6

In terms of goal attainment, patients who first come in for observation during the second trimester are at a disadvantage because their weight gain is often already above the maximum expected limit at term. Patients who arrive in the first trimester with gains above the expected limit are too few to draw any conclusions. In contrast, patients who arrive in the second or third trimester show an increase of 4.92% and 2.86%, respectively, in weight maintenance at term.

GC4.107

Before screen time and physical activity assessment as predictors of insulin resistance and weight gain problems

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Introduction: Regular physical activity is a milestone for weight maintenance during lifespan. Long before-screen time is usually connected with decrease in physical activity and could lead to weight gain and consequent insulin resistance. The aim of our research is to assess correlation between before screen time and physical activity level as predictors of insulin resistance.
Methods: 107 subjects (55 women, 52 men, mean age 34.01±2.87years) with mean weight 99.07±18.73kg and mean BMI 30.86±6.0kg/sq.m. underwent standardized oral glucose tolerance test (OGTT). They were asked to fill in questionnaires to detect their physical activity habits. Timer on smart phone was used to calculate the exact time spent in sports, open air activities, before screen time and sleep time for a week to assess daily activities. Correlations between parameters were assessed.
Results: Before-screen time (defined as before TV screen, smartphone, computer, etc. time) in 52% of women and 31% of men was limited to be between 60 and 120 minutes per day. 64% of patients answered spending between 60-180 minutes per day at open air activities. Basal minute glucose level shows moderate correlation with weight (phi=0.61, p<0.05). Glucose level on first hour is presenting with more strong correlation (phi=0.72, p<0.05) and the second-hour blood glucose shows not significant correlation (phi=0.47, p=0.24). Insulin level on each minute is presenting with strong positive correlation of before screen time (phi1=0.765, phi2=0.654, phi3=0.665, p<0.05). Basal HOMA-IR index shows negative correlation with level of physical activity.
Conclusion: Comparison of before screen time and physical activity level and glucose and insulin level during OGTT could be used as predictors for weight problems and insulin resistance.

GC4.108

Unmet training needs for staff delivering group-based obesity care: Lessons from the PROGROUP study

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Introduction: Staff delivering obesity care require a broad skillset to provide timely and high-quality support for people living with obesity. Group-based weight management programmes may allow services to support more patients with fewer staff hours, while providing a valuable treatment context for people living with severe obesity to change behaviour through forming meaningful social connections and social identity. However, training requirements for staff to deliver group-based programmes are not well understood; thus, identifying and addressing the training needs of staff working in weight management services is necessary to optimising outcomes for people living with severe obesity.
Methods: Five healthcare professionals from established weight management services across the UK undertook a 4-day remote training package with behaviour change experts to deliver a group-based behaviour change programme ('PROGROUP') for people living with severe obesity. Additionally, staff received support calls with a researcher during the intervention delivery period. Programme delivery was video and audio recorded to assess fidelity. Five interviews were conducted to elicit feedback about training experience. Interviews were analysed using inductive thematic analysis and the Framework approach for data management. A one-day stakeholder workshop and feedback from expert clinicians further informed staff training needs.
Results: Healthcare professionals greatly valued role-play examples with trainers and sharing work experiences and advice with peers. However, healthcare staff were in favour of shorter training days, self-directed training, and more guidance about managing processes that occur within groups, as well the delivery of behavioural components to a group. Fidelity assessment from videos and audios confirmed that healthcare professionals were experienced in delivering educational components of the PROGROUP programme, and highlighted that further skills training to manage group processes that emerge when patients come together in group settings is beneficial.
Conclusion: Group management skills as well the delivery of behavioural components within groups are highly valued by staff delivering group-based obesity care; however, training to provide this care should be flexible and self-directed, with elements of peer support. In response to these findings, the PROGROUP training package has been optimised to adopt an online and self-directed approach to training, with the addition of two online workshops to introduce the programme and consolidate learnings.

GC4.109

Insights of Individuals Living with Obesity Completed an Adult Weight Management Programme in the UK

SIRIN AYVA, A. B.; Kaur Roberts, R.; Edwards, S.; Gately, P.

MoreLife UK

Introduction: Emotional eating is a common behaviour, often linked to mental health issues in those living with obe-sity1. MoreLife UK provides weight management services across the UK and provide therapeutic support as part of their specialist interventions. Evidence-based psychotherapeutic approaches to ad-dress emotional eating and weight management are limited, and MoreLife clients shared their difficul-ties in accessing those services.

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Method: A significant proportion of clients struggle with emotional eating, which is a barrier to their weight loss. MoreLife clinicians (Counselling Psychologist, Dietitian) and therapists co-created with clients a group-based programme to help clients with their emotional eating and improve their relationship with food. The programme consisted of 8 weekly, 90 minute sessions with 6-8 participants. The programme was offered to clients who were struggling with emotional eating and had symptoms of depression and/or anxiety.
The participants of this pilot programme were invited to give feedback on their experiences of the programme via weekly feedback forms. They also provided written responses to our comprehensive Case Example questions.
Results: This pilot had five cohorts and 20 completers in total. Three clients volunteered to be a case studies. All the other participants shared their feedback via client feedback form.

Case Study A
Female, 53 years old.
'I realised that I was binging due to a trauma that happened 45 years ago and realised it with the help of this programme and group. I have other ways to indulge myself and take my mind off from emo-tional eating.'

Case Study B
Female, 38 years old.
'I am not measuring my weight as I can see the difference, my body toning up. I haven't binged for four months. I regularly flick through my notes from the programme and do my regular wellness check in as I learned from the programme.'

Case Study C
Male, 58 years old.
'I don't use food as an emotional crutch anymore. I see it as an enjoyable experience, a necessity to survive but not something to turn to in times of stress as I did previously. I learned coping mecha-nisms on the course and how to use mindfulness that is far more helpful than a full packet of biscuits and the results are more sustained.'
Conclusion: This qualitative feedback adds to the limited literature on effectively treating emotional eating as part of a weigh management programme These case study examples emphasise the effectiveness of evidence-based psychotherapeutic approaches to address emotional eating and weight loss.
The overall feedback highlights that this pilot programme effectively reduces emotional eating and improves the participants' emotion regulation skills. The feedback points to enhanced self-awareness, acceptance, self-monitoring, and mindfulness. Future research is needed to evaluate the long-term impacts of this programme.

GC4.110

Physical exercise and anthropometric variables, body composition and grip strength in elderly people from a low-income day home on the Mexico-United States border

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Introduction: The aging process affects various health variables, including body composition and physical condition. Common changes that occur in older people are an increase in intramuscular fat (Rahemi et al., 2015) and a decrease skeletal muscle mass (Mitchell et al., 2012), which refers to the development of sarcopenia, health complications and increase risk factors of mortality (Xu et al., 2022).
Objective: The aim of this study is to determinate the impact of a 12-week multimodal physical exercise program on anthropometric variables, body composition and grip strength of elderly people from a low-income day home in Tijuana, Baja California (Mexico-United States border).
Method: Pre-experimental study in which fourteen older people between 65 and 89 years of age completed the multimodal physical exercise program that included the following exercise modalities: dance, recreational activities, strength and aerobic resistance circuits; which was developed by implementing three weekly sessions of fifty minutes each for twelve weeks, with a difference of 24 to 28 hours between them. Pre and post intervention, weight, height, BMI, body fat and muscle mass (InBody 770), Waist circumference and grip strength of the right and left hand (Jamar dynamometer) were evaluated.
Results: Nine of the participants were between 81 and 89 years old, four between 72 and 78 years old and only one participant was 65 years old. The average age and results of the different variables pre/post intervention were: weight (kg) 66.4 ±14.9/66.3 ±14.9 (p=.798); BMI 28.4 ±6.1/26.7 ±9.1 (p=.366); waist circumference (cm) 95.3 ±12.5/94.2 ±14.7 (p=.359); body fat (%) 37.5 ±11.1/37.8 ±10.4 (p=.629); muscle mass (kg) 21.4 ±3.9/21.3 ±3.9 (p=.572); right hand grip strength (kg) 21.4 ±9.9/19.4 ±7.1 (p=.324); left hand grip strength (kg) 21.4 ±7.8/20.0 ±9.7 (p=.293). Height (cm) was same pre and post intervention (153.9 ±6.9). The above indicates that none of the variables evaluated showed significant differences.
Conclusion: A multimodal physical exercise program with a frequency of three weekly sessions of fifty minutes each for twelve weeks may have contributed to maintaining body weight, BMI, fat percentage, muscle mass and grip strength in the elderly participants in this study, since no variable decreased significantly, which may refer to an important strategy to delay the development of sarcopenia.

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GC4.111

Real-world Weight Loss Outcomes of Optifast® Total Meal Replacement Program in a Community Clinic

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Background: The aim of the study was to investigate the effectiveness of the OPTIFAST program (OP), a total meal replacement program, for weight loss in a community-based setting of a medium-sized Canadian city. OPTIFAST is an evidence-based total meal replacement program. As a very-low-calorie diet, it has been shown to be an effective weight loss intervention. This is a study of real-world data examining total weight loss, % weight loss, and change in BMI following 12-weeks of the total OP.
Methods: Participants were selected from the only community-based obesity clinic in the city. Participants were selected sequentially if they were adherent >80% of at least 12 weeks of a total OP within November 2019 to June 2022. Clinically relevant variables were collected in a retrospective chart review. Participants were examined for changes in BMI and % change in weight at a 12-14 week follow-up. Weight loss was analyzed both by obesity class and individually.
Results: A total of 35 participants made up the total OP group. Mean age of participants was 47.1 ± 12.2; 83% were female. Baseline BMI was 44.8 ± 9.7 kg/m^2; after 12-14 weeks of total OP, BMI was 38.8 ± 8.6 kg/m^2 (net change in BMI is –6.0 ± 2.1 kg/m^2). Weight change (%) after 12-14 weeks of total OP was –13.3 ± 3.7%. Preliminary analysis suggests that the extent of weight loss was similar among obesity classes regardless of the use of weight loss medications.
Conclusion: After 12 to 14 weeks of total OP, clinically significant weight loss was achieved. The study demonstrated success in a community setting using a total OP. Similar results to the OPTIWIN study (Ard et al.,

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2019) was documented; however, the small sample size and retrospective nature of the study pose as potential limitations. Future directions involve increasing database sample size, investigating changes in weight beyond the 12-week program, and comparing the effectiveness of a partial OP with total OP for weight loss and sustainability.

GC4.112

Changes in microbiota profile persist after a year of having completed the dietary intervention of weight loss with ketogenic diet

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Introduction: The ketogenic diet has demonstrated to be an effective option to lose weight, although its effects in long term have not been described yet. It is known ketogenic diet transform the microbiota profile affecting to the diet outcome. Additionally, previous studies have shown that this dietary protocol supplemented with probiotics might enhancer the weight loss.
The objective is to evaluate changes at gut microbiota profile along 1 year of those patients that previously went through a nutrition intervention (ketogenic diet) for weight loss during 3 months with or without different probiotics supplementation.
Methods: After one year of having completed a weight loss intervention with ketogenic diet (NCT03530501), gut microbiota profile was evaluated. Three branches were assessed: One supplemented with *Bifidobacterium Longum ES1*, one sequentially supplemented with the probiotics and *Bifidobacterium animalis Subsp Lactis*, and a placebo group. DNA was isolated, and subsequently, gut microbiota profiles were analyzed through the 16S rRNA sequencing. Finally, sequences were analyzed by QIIME2-2023.2 software.
Results: While patients lost a mean of 12.30±11.64 kg during the dietary intervention, 4.40±11.97kg were gained after one year. About gut microbiota, β-diversity showed clear differences of gut microbiota population at 1-year in comparison to the basal state (Weighted Unifrac, p-value=0.01). After an increase in biodiversity during the intervention, a slightly decrease was observed at 1-year although without researching basal levels. Nevertheless, subjects supplemented with probiotics improved significantly their biodiversity (Shannon, p-value=0.00488). Regarding taxonomy groups, the volatility (machine learning) model identified *Romboutsia*, *Dialister* and *UGC-003* as the most importance features for the intervention. In fact, Romboutsia increased its abundance in the group supplemented with probiotics (p-value=0.036).
Conclusion: Changes in gut microbiota profile due to an intervention with a ketogenic diet for weight loss persists at long term (1year). The use of probiotics during the intervention also influenced the gut microbiota profile. This valuable data could have consequences in weight regain and deserves to be deeply studied.

GC4.113

Can the delivery of behavioural support be improved in the NHS England Low-Calorie Diet Programme? An observational study of behaviour change techniques

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Introduction: NHS England commissioned four independent commercial service providers to pilot low-calorie diet programmes to treat Type 2 Diabetes. NHS England produced a service specification outlining the required service parameters and programme content, including the use of specific behaviour change techniques. Intervention fidelity (whether an intervention is implemented as intended) might impact intervention outcomes. Previous research has illustrated a drift in the fidelity of behaviour change techniques during the design of the pilot NHS England Low-Calorie Diet Programme. This study evaluated a subsequent domain of fidelity, intervention delivery. Two research questions were addressed: (1) To what extent were behaviour change techniques delivered with fidelity to providers programme plans? (2) What were the observed barriers and facilitators to delivery?
Methods: A mixed-methods sequential explanatory design was employed. Remote delivery of one-to-one and group-based programmes were observed. A behaviour change technique checklist was developed using the Behaviour Change Technique Taxonomy v1; techniques were coded as present, partially delivered, or absent during live sessions. Relational content analysis of field notes identified observed barriers and facilitators to fidelity.
Results: Observations of 122 sessions across eight samples and two service providers were completed. Delivery of the complete NHS Low-Calorie Diet Programme was observed for five samples. Fidelity ranged from 33% to 70% across samples and was higher for group-based delivery models (64%) compared with one-to-one models (46%). Barriers and facilitators included alignment with the programme's target behaviours and outcomes, session content, time availability and management, group-based remote delivery, and deviation from the session plan.
Conclusions: Overall, behaviour change techniques were delivered with low-to-moderate fidelity. Findings indicate a dilution in fidelity during the delivery of the NHS Low-Calorie Diet Programme and variation in the fidelity of programmes delivered across England. An under-delivery of behaviour change techniques during the NHS Low-Calorie Diet Programme might impact participants' ability to sustain behavioural changes and improve their Type 2 Diabetes. Staff training could provide opportunities to practice the delivery of behaviour change techniques. Programme-level changes such as structured activities supported by participant materials and with sufficient allocated time, might improve the delivery of techniques targeting self-regulation.

GC4.114

The effectiveness of primary motivational counseling in patients with obesity and cardiovascular diseases

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Objective: To determine the alimentary-dependent cardiovascular risk in inpatient patients suffering from obesity and cardiovascular pathology, to evaluate the effectiveness of motivational counseling in relation to changes in body weight, waist circumference and eating habits 6 months after motivational counseling.
Material-Methods: 137 patients with cardiovascular diseases and obesity, and undergoing preventive counseling in order to correct nutrition were included in the study. The median age was 61.0 [48.0; 67.0] years. All participants were divided into two groups by gender: 60 men (44%) and 77 women (56%). The median body mass index was 34.34 [32.01; 36.98] kg/m^2. The Diet Risk Score (DRS) was used to assess alimentary-dependent cardiovascular risk. 6 months after the motivational consultation, a telephone survey was conducted regarding the assessment of body weight, waist circumference and eating habits.
Results: A moderate alimentary-dependent cardiovascular risk was detected in 67.9% of inpatient patients suffering from obesity and cardiovascular diseases. 6 months after the motivational consultation, it was possible to change the diet in relation to key parameters. 87.5% of patients introduced 400 g/day of vegetables into their diet, 82.8% of patients added 400 g/day of fruits, 70.3% of patients consume 20 g/day of nuts, 59.4% do fish days 2 times a week ($p<0.05$). In addition, 10% of patients reduced body weight by more than 10%, 10% - by 5-10% and 45% - by less than 5% of the initial body weight, and 15% of patients decreased the severity of abdominal obesity.

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Conclusion: In a group of patients with cardiovascular pathology and obesity, the motivational counseling during hospitalization has a positive effect on weight loss, waist circumference and dietary changes.

GC4.115

The role of emotional intelligence in adult appetite traits

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Introduction: Besides the numerous public health interventions to prevent obesity, the percentage of adults with obesity continues to rise across Europe. Literature suggests that further potentially related factors should be examined. The relation between emotional intelligence (EI) and appetite traits is poorly investigated. This study aimed to examine the role of EI on the Body Mass Index (BMI) and eating behavior across sex, age, and professional specialties groups.
Methods: A cross-sectional design was employed. A total of 339 college students and employees of Metropolitan College participated in the study. Data collection was held through the self-reported Adult Eating Behavior Questionnaire (AEBQ) which measures eight appetite traits (relating to four food approach and four food avoidance) and the self-reported Trait Emotional Intelligence Questionnaire (TEIQue-SF). Also, participants reported their weight, height, sex, age, professional specialty, and status. Independent Samples T-test and Mann-Whitney test were run to detect differences in BMI, appetite traits, and emotional states between groups. Pearson correlation was conducted to explore relationships among continuous variables. Regression analysis was held to detect significant predictors of appetite traits. All analyses were performed with SPSS v26.
Results: Almost half of the participants, 53.4% identified themselves as female, 54% were students and 50.7% had a health allied professional specialty. The median age was 28 years (range 18-63). Approximately 50.01% indicated having a healthy weight. Analyses demonstrated statistically significant differences only for professional specialties in both TEIQue-SF ($p=0.011$) and eating behavior ($p<0.05$ in 5 of 8 AEBQ subscales). BMI (weight/ height2) was negatively related to self-control ($p=0.026$). Regression analysis indicated that TEI predicts aspects of appetite traits (e.g., food fussiness), even after controlling for the professional specialty effect.
Conclusion: The findings of the study underline the significant role of El in adults' eating behavior and identifies 'professional specialty' as a factor that may influence appetite traits. It might be helpful to pay attention to those factors when developing tailored prevention and weight management programs.

Conflict of Interest: None

Funding: No funding to report

GC4.116

Assessment of prediabetes in patients with obesity

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Introduction: The frequency of prediabetes as well as the optimal method to identify glucose abnormalities in patients with obesity is subject to debate. We, therefore, evaluated the frequency of prediabetes and the optimal method for its respective diagnosis in a large cohort of patients with obesity.
Material And Methods: We included 1.626 patients with obesity (mean age 40±12 years, mean BMI 45.0± 6.7 kg/m^2, 77% women). All patients without manifest type 2 diabetes (T2D) underwent a 75g oral glucose tolerance test (OGTT). HbA1c was measured. Prediabetes was diagnosed according to the criteria of the American Diabetes Association (ADA). In addition, HOMA index, parameters of renal function and lipid metabolism as well as demographic data and other cardiovascular risk markers were examined.
Results: 438 (27%) patients were excluded due to pre-existing T2D. 1188 study participants (73%) were screened for the presence of prediabetes, of which 33% had normal glucose metabolism and 40% had prediabetes. 653 people with obesity (40%) fulfilled at least 1 prediabetes criterion, 229 (14%) at least 2 criteria and 56 (3%) 3 criteria. Patient's characteristics are depicted in table 1.
The following percentages of applicable criteria refer to the 1188 people without pre-existing T2D (Figure 1): 231 persons (19%) met the criterion of elevated fasting glucose, 179 persons (15%) met the criterion of impaired glucose tolerance and 528 persons (44%) met the criterion of elevated HbA1c. 599 people (50%) met the criterion of increased fasting glucose and/or increased HbA1c. 596 people (50%) met the criterion of impaired glucose tolerance and/or increased HbA1c. 340 people (29%) met the criterion of increased fasting glucose and/or impaired glucose tolerance.
Conclusions: The results of our study indicate that fasting glucose and HbA1c levels are sufficient to diagnose prediabetes in people with obesity. This is of particular interest in patients who have undergone surgery on the upper gastrointestinal tract, such as bariatric surgery. In such cases, the change in gastrointestinal anatomy leads to accelerated gastric emptying and therefore to limited interpretation of the OGTT due to the high variability of glucose levels. Furthermore, the OGTT can also provoke hypoglycemia in the form of dumping syndrome.

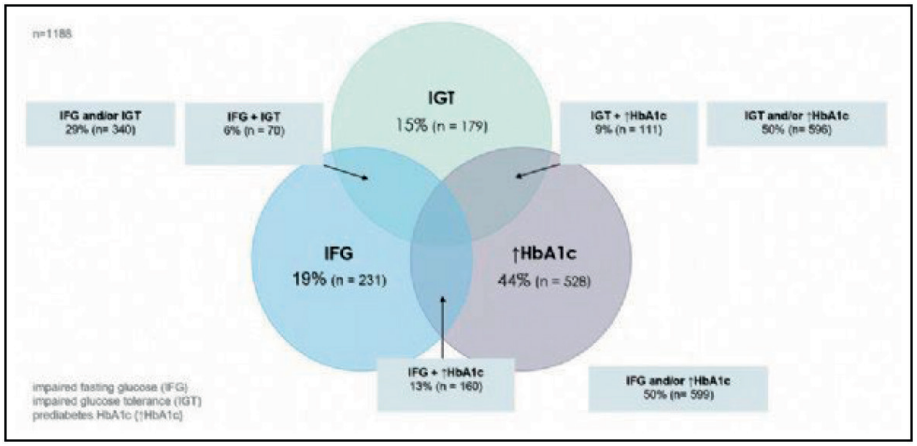


Fig. 1. Applicable prediabetes criteria in people with obesity without pre-existing type 2 diabetes.

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Tab. 1. Characteristics of the study population by glucose metabolism status.

	normal glucose metabolism	prediabetes	type 2 diabetes	p-value
age (years)	34±11	40±11	47±11	<0.001
weight (kg)	126±23	129±24	131±24	<0.001
BMI (kg/m^2)	44.0±6.3	45.1±6.6	46.0±7.0	<0.001
creatinine (mg/dl)	0.78±0.12	0.96±3.8	0.84±0.32	0.419
eGFR (ml/min/1.73m^2)	99±20	94±22	94±26	<0.001
total cholesterol (mg/dl)	195±37	201±40	196±44	0.015
HDL (mg/dl)	50±14	47±13	45±17	<0.001
LDL (mg/dl)	118±32	123±34	112±38	<0.001
triglycerides (mg/dl)	120 (86; 170)	138 (102; 190)	167 (119; 238)	<0.001
HbA1c (%)	5.3±0.3	5.8±0.3	7.5±1.5	<0.001
HOMA-IR	4.0 (2.7; 5.7)	5.7 (3.9; 8.1)	8.4 (6.0; 13.6)	<0.001

GC4.117

Examining the effectiveness of lifestyle intervention in pilot community based health promotion program

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Introduction: The numerous causal factors of obesity determine the possible directions of prevention: modification of lifestyle at the level of the individual, appropriate influence of the physical and mental environment at the level of communities, modification of the harmful effects of the natural and artificial environment at the level of society. In addition to multidisciplinary treatment of obesity, early detection, and prevention of progression of weight gain are of paramount importance. In primary prevention of obesity, prenatal care, infant nutrition, preschool nutrition, educational work, school sports activity are of great importance. In the secondary prevention the aim is to prevent the development of obesity. Balanced nutrition, increasing physical activity and stress relief are essential, while in tertiary prevention consists of regular check-up, medication and/or surgical intervention in complex care to prevent aggravation.
Objective: To develop, implement and measure the effectiveness a community-based pilot health promotion lifestyle program based on balanced nutrition, increased physical activity, and regular controls.
Material-Method: From 26 persons we followed during the 6-month period N=25 cases. The mean of age was: 63.6 years, body weight: 74.7 kg (SD: 9.1), BMI: 28.1 kg/m^2 (SD: 3.1). Medical and laboratory examination, nutrition assessment with individual recommendation were made at the beginning and at 3 and 6 months. Biweekly control and consultation, bio-impedance measurement was registered. Walking programs were included 3 times a week. During the controls we registered the daily physical activity by activity watches, and organized education programs.
Results: The mean of steps were: 8171 steps/day (SD:2514) min: 4253-max:13941, coefficient of variation: 30.8%. Program ran from late September to early April, the lowest daily number of steps were registered at the end of the year and the beginning of the new year. Heart rate, like literature, decreased during the first 6 weeks. Decreased tendency to systolic and diastolic blood pressure (NS). Lab and bio-impedance results were examined for 3 and 6 months, respectively. Body weight and BMI ($p<0.01$), BFM and BFP ($p<0.001$) decreased significantly for the first 3 months and abdominal circumference decreased significantly ($p<0.01$) for 6 months. Blood glucose decreased for 3 months ($p<0.01$) and HbA1c for 6 months at strong significance levels ($p<0.001$). GFR, in the tendency of uric acid, changed favorably, hCRP decreased. Number of steps correlated with skeletal muscle index.
Conclusions: The 6-month walking-based lifestyle program in an aging population living with overweight was shown to be diabetic-protective, cardio-protective, and nephroprotective. For 6 weeks, the heart rate decreased significantly, then remained at the same level throughout the program. The program is widely recommended for health promotion as a basic, community prevention program for people living with normal and overweight.

GC4.118

In people with obesity and newly diagnosed with chronic kidney disease, does weight loss delay disease progression? A population-based cohort study using the UK clinical practice research datalink

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Introduction: Obesity is a chronic, multifactorial disease and a significant risk factor for chronic kidney disease (CKD). Although obesity in patients with CKD is associated with accelerated CKD progression and mortality, there is limited evidence as to whether weight loss is beneficial to the progression of CKD. This study investigated whether people with obesity who are diagnosed with CKD can delay kidney disease progression by losing weight versus maintaining or increasing weight.
Methods: This was a retrospective cohort study using primary care data from the UK Clinical Practice Research Datalink (CPRD Aurum), which is linked to UK hospital and mortality records, between January 2008 and May 2021. Included were patients with stage 1–3 CKD at first CKD diagnosis based on estimated glomerular filtration rates (eGFR), which were calculated using serum creatinine levels, and albuminuria. Weight changes occurred during a 2-year baseline period after CKD diagnosis. Patients with cancer, limb amputation or a record of unintentional weight loss during the baseline period were excluded. Follow-up started at the end of year 2 (Figure 1). Weight reduction (10–35%) was assessed relative to those participants maintaining their weight (±2.9%) for the primary outcome. The primary endpoint was the time to a composite CKD outcome: eGFR <15ml/min/1.73m² persisting for ≥3 months, a single eGFR drop <15ml/min/1.73m² and then dialysis (for >28 days) or a kidney transplant, a ≥40% decline in eGFR from baseline sustained over at least 4 weeks or a kidney-related death, whichever occurred first. In a secondary analysis, CKD progression in participants who gained or lost weight versus those with stable weight was assessed. Analyses used Cox proportional hazard regression adjusted for baseline covariates such as age, sex, CKD stage, body mass index, baseline comorbidities and medications.

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Results: The average age at CKD diagnosis was 69 years. Among 12,133 participants with stable weight and 2,054 with 10–35% weight loss (of which 103 had an anti-obesity drug prescription and 19 were referred for bariatric surgery assessment), in the 2 years following diagnosis, weight loss was associated with accelerated disease progression (hazard ratio [HR], 1.76; 95% confidence interval [CI], 1.35–2.29), and the association was stronger with higher age (Figure 2). In the secondary analysis, an association was found between 10–35% weight gain and increased outcome risk, which decreased with higher age (HR, 1.42; 95% CI, 1.28–1.57). **Conclusion:** Weight loss in people living with obesity and newly diagnosed with CKD did not appear to slow the progression of CKD, but was instead associated with accelerated CKD progression, particularly in older age groups. The real-world nature of the dataset precluded determining how and why patients lost weight, leaving room for potential residual confounding due to disease-driven weight loss.

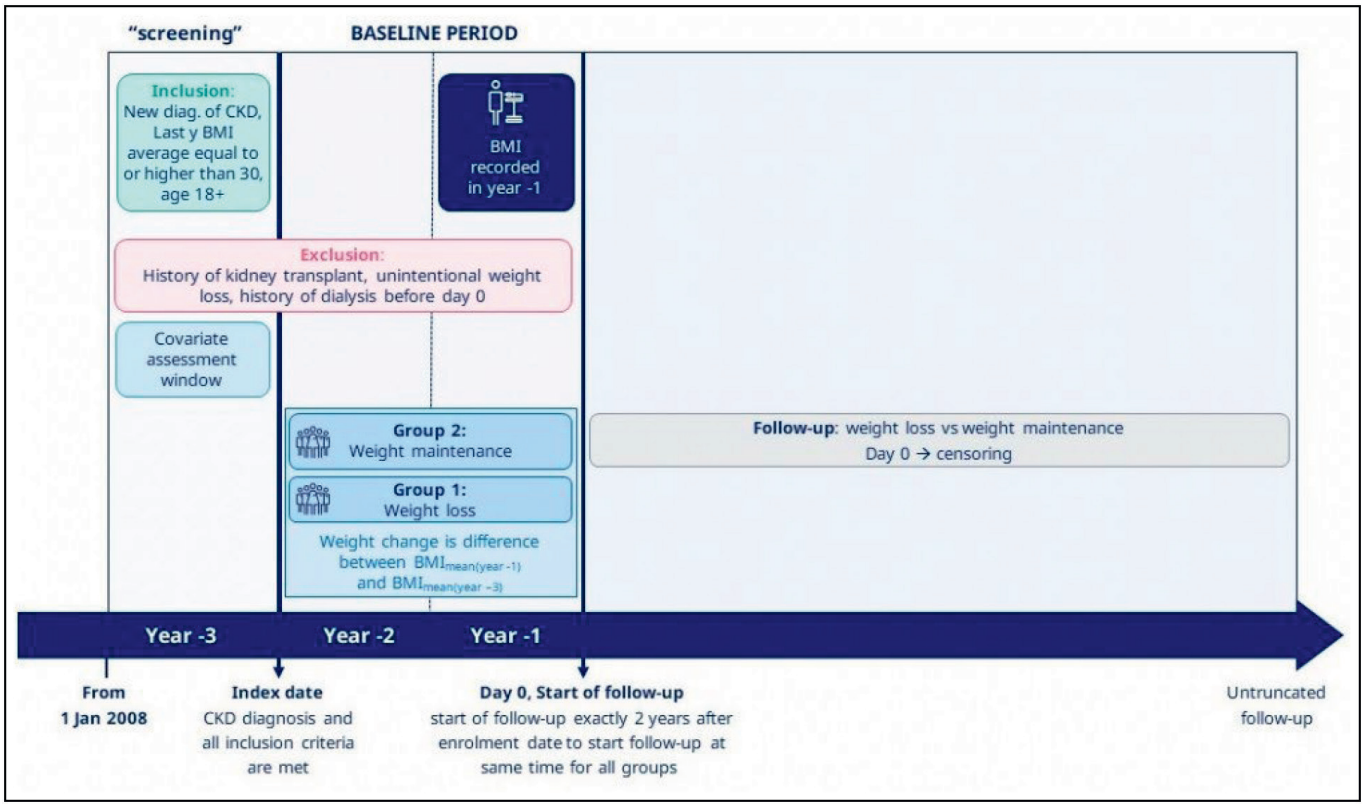


Fig. 1. Study design.

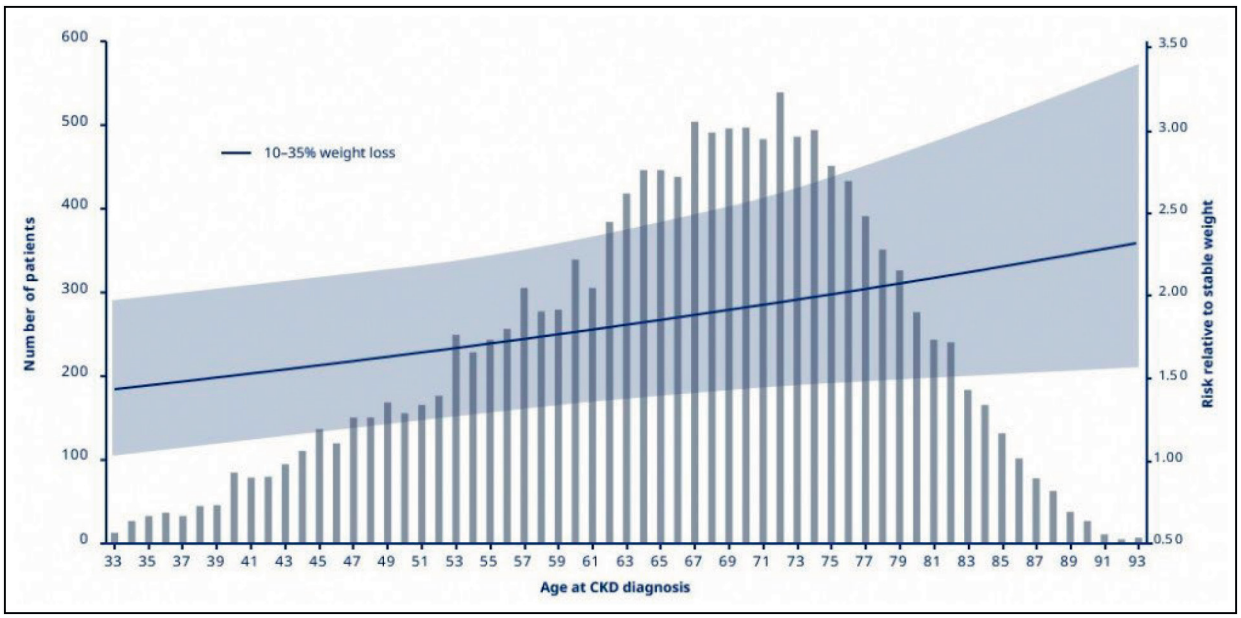


Fig. 2. Association between weight loss versus stable weight and CKD progression according to age at diagnosis.

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GC4.119

Evaluating the Psychometric Properties of LOCES and LOCES-B: A Comprehensive Analysis in a Portuguese Community Sample and Among Individuals Undergoing Bariatric Surgery

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Introduction: Loss of control over eating is a crucial construct closely linked to broader transdiagnostic constructs of eating disorder behavior. The LOCES self-report measure was developed to comprehensively and continuously assess multiple aspects of loss of control eating in diverse populations. This study investigates the psychometric properties of LOCES and its brief version (LOCES-B) within a community sample and among patients who underwent bariatric surgery.
Methods: A cross-sectional study was conducted with two convenience samples: individuals from the community (341 = 246 (72.1%) women and 95 (27.9%)), and patients who underwent bariatric surgery (262 (100%) women).
Results: Results indicate robust validity evidence for LOCES and LOCES-B based on their internal structure, including dimensionality, reliability, and measurement invariance across community and bariatric surgery samples. Gender-based measurement invariance was also assessed in the community sample, further affirming their applicability. Positive correlations were observed between both measures and BMI, eating disorder psychopathology (ED-15), negative urgency (UPSS), depression symptoms (DASS), difficulties with emotional regulation (DERS) and self-criticism (FSCRS), indicating strong convergent validity. LOCES (H = 97.453, p <.001, ηp2 =.162) and LOCES-B (H = 88.84, p <.001, ηp2 =.147) effectively discriminated between participants scoring above or below the ED-15 cutoff value, showcasing their concurrent validity. LOCES (R2 =.107, p<.001) and LOCES-B (R2 =.075, p<.001) could also predict eating-related psychopathology 6 months after the baseline assessment, providing evidence of their predictive validity.
Conclusions: In conclusion, LOCES and its brief version showed promising validity evidence in a Portuguese community sample and among women who had undergone bariatric surgery. Their ability to categorize individuals and predict eating disorder psychopathology underscore their potential as a valuable screening tool. Future directions for research will be discussed.

GC4.120

Evaluation of the effect of Advanced Hybrid Closed-Loop Therapy on body weight: Outcomes in a real-world Setting'

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Objective: To analyze the weight evolution and BMI in real life after starting a treatment with different AHCL systems.
Methods: A prospective observational study was carried out with adults with type 1 diabetes who started treatment with an AHCL system in our center. Glycemic control data were collected, in terms of HbA1c and CGM glucometric parameters, as well as anthropometric data, at baseline and at 6 months.
Results: 40 patients were included (27 started Minimed 780G, 6 Tandem Control-IQ and 7 DIABELOOP DBLG1 patients). The mean age was 39.9 ± 14.3 years, the majority were women (67.5%), with a mean duration of diabetes of 26.9 ± 12.4 years. 32.5% were participants with overweight and 7.5% people living with obesity. After 6 months of treatment, HbA1c was reduced from 7.26 ± 0.91% to 6.98 ± 0.76% (p=0.002), as well as the IRR increased from 65 (IQR 56-71) % to 77.5 (IQR 71-85) % (p=0.0003). At 6 months, no statistically significant changes were observed in weight (from 69.79 ± 14.97kg to 70.2 ± 15.08kg, p=0.552) or in BMI (from 24.54 ± 4.16 kg/m^2 to 24.72 ± 4.2kg/m^2, p=0.552), despite the fact that the percentage of patients who achieved optimal control after therapy increased from 17.5% to 75% (p<0.0001).
Conclusions: Although patients achieved better glycemic control after starting therapy with AHCL systems, contrary to what would be expected, there were no significant changes in the weight or BMI of the patients. This fact may be due to the increase in TIR with a decrease in time in hypoglycemia. Therefore, closed-loop systems could play a very important role in reducing comorbidities, improving glycemic control and preventing weight gain.

GC4.121

Long-term Support Following Bariatric Surgery: 18-month outcomes of a Stepped Care Intervention Program using social media

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Introduction: APOLO_Bari Stepped-care Intervention is a novel, cost-effective, stepped-care intervention designed to optimize weight loss and prevent weight regain post-bariatric surgery. It includes two different steps 1) 18 months low-intensity intervention (delivered by Facebook®), and 2) 12 months high-intensity cognitive-behavioral-therapy program (delivered in an online format) and phone call. This study presents the outcomes of the 18 months of the APOLO-Bari Stepped-care Intervention.
Methods: Utilizing an interntion-to-treat two-arm randomized controlled trial design, 499 bariatric surgery patients from the University Hospital Center of São João were initially screened based on medical records. Following exclusions, 241 participants (Intervention Group (IG) = 136(56%); Control Group (CG) = 105(44%)) received intervention or treatment as usual, respectively. Baseline and midterm assessments at 6, 12 and 18 months included self-report measures of pathological eating behavior, psychological impairment, negative urgency, emotional regulation, and self-criticism.
Results: Generalized Estimating Equation analysis revealed a significant time-by-group interaction effect on measures of grazing behavior (b =.353, Wald χ2 = 11.076, p <.001), emotional eating (b =.150, Wald χ2 = 9.047, p =.003), loss of control eating (b =.299, Wald χ2 = 11.062, p <.001), difficulties with emotion regulation (b =.168, Wald χ2 = 7.206, p =.007), and negative urgency (b =.257, Wald χ2 = 4.930, p =.26), indicating different evolutions between groups. The IG demonstrated improvements in eating-related psychopathology and psychological variables over time while the CG exhibited a decrease.
Discussion: the APOLO_Bari Stepped-care intervention demonstrated positive effects on psychological factors crucial for weight loss maintenance post-bariatric surgery. Assessing long-term efficacy will provide valuable insights for clinical practice and future research.

GC4.122

Comparison of HbA1c and weight change during long treatment of patients with obesity and type 2 diabetes with semaglutide and dulaglutide

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GLP-1 analogues semaglutide and dulaglutide are very effective in treatment of patients with obesity and type 2 diabetes. The aim of this analysis was to compare the semaglutide and dulaglutide induced weight and HbA1c change during treatment. Both drugs are available for approx.4 years.

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Patients And Methods: In retrospective analysis we have analysed data from 40 patients with severe obesity and type 2 diabetes treated with semaglutide 1mg (22 patients BMI 39.6kg/m^2) or dulaglutide 1.5 mg (18 patients BMI 37,4 kg/m^2) once weekly- 40 patients treated for 3 years and 18 treated for 4 years. Decrease of weight and HbA1c was compared between the two drugs. Correlation of weight and HbA1c decrease was calculated for the 3years treated groups for both drugs and compared.
Results: The HbA1c in 0, 1, 2, 3, 4 year was 63.7, 49.3, 45.5, 44,1, 46.7 mmol/mol for semaglutide and 65.7, 50.9, 52.6, 50.5, 50.6 mmol/mol for dulaglutide. The weight in 0, 1, 2, 3, 4 year was 116, 110, 108, 106, 101 kg for semaglutide and 111, 107, 106, 105, 84 for dulaglutide. There was not any significant difference in t- test between the two drugs in all intervals. The results of the 4th year are limited by the lower number of patients.
The Pearson correlation of weight and HbA1c change was positive in both drug: 0.50 for semaglutide and 0.26 for dulaglutide. The correlations were calculated for the difference 0-3 year. The difference between correlations was not significant (p= 0.22 using Fisher R-to-Z transformation Z=0.76).
Conclusion: There is not any difference in the Hb1c and weight decrease in the treatment using dulaglutide and semaglutide. In dulaglutide the correlation between weight and Hb A1c decrease is not significantly lower bud arithmetically two times lower. The relation of HbA1c and weight during dulaglutide therapy can be less uniform with different individual effect on weight and HbA1c.

GC4.123

Long-term effects of physical activity on weight loss, glyco-metabolic parameter and blood pressure in people undergoing bariatric surgery: a 5-year follow-up study

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Introduction: Bariatric surgery stands as an effective long-term intervention for weight loss and improved metabolic control in people with obesity. However, long-term studies indicate significant weight regain and T2D relapse post-surgery in a notable percentage of people. This study aimed to explore the role of physical activity (PA) after Roux-en-y gastric bypass (RYGB) and its impact on body weight, metabolic parameters and blood pressure over a 5-year follow-up.

Materials-Methods: 191 people with severe obesity underwent RYGB between 2015 and 2017. Of these, 148 people completed scheduled examinations over five years. Physical assessments and laboratory tests were conducted pre-surgery, 2 months after surgery, and annually thereafter. PA levels were evaluated using the Minnesota Leisure Time Physical Activity Questionnaire. Since 70% of our participants did not reach during the 5-years follow-up the 500 METs/week, while the 30% exceeded 2000 METs/week, we divided the population into two groups, No-PA and PA, for further analysis.
Results: among 76 people affected by type-2-diabetes (T2D) before surgery, 15 performed regular physical activity (PA) after surgery and 61 were sedentary (No-PA) throughout the follow-up period, while, out of the 72 participants without pre-existing type-2 diabetes (T2D), 29 were engaged in physical activity (PA), while 43 were not (No-PA).
Among people with T2D before surgery, PA group showed significant reductions in systemic blood pressure ($p<0.001$) during the follow-up period. This result was confirmed by a linear mixed model analysis, in which PA group showed lower values of systemic blood pressure in all time points considered ($p<0.001$) needing less antihypertensive drugs.
On the contrary lipid profiles remained substantially unaffected during the 5-years of follow-up. T2D recurrence was lower (6.7% vs. 36% at the end of follow up, $p=0.036$) in PA group compared to No-PA group.
Among people without T2D, the PA group led to a higher BMI decrease ($p<0.001$) and to a better systolic and diastolic blood pressure control ($p<0.001$ for both) for the entire duration of follow-up compared to No-PA group. In particular, in this PA group the median BMI further decreased from the first to the fifth year of follow-up by -1.6 kg/m^2 [-3.3 to 0.9], while in the No-PA group it gradually increased by 0.6 kg/m^2 [-1.4 to 2.1].
Concerning blood pressure control, in the No-PA group recurrence hypertension after the first year of follow-up was 19%, resulting at the end of the 5-years of follow-up period in an overall prevalence of 28%. In contrast, among PA group, the prevalence of hypertension in the first year after surgery was 6.9%, and it remains stable until the end of the 5-years follow-up.
Conclusion: Regular PA following RYGB exhibited significant benefits in maintaining weight loss, improving blood pressure, and preserving glycemic control. Integrating PA as a crucial component of post-bariatric surgery care could offer enhanced long-term outcomes for patients.

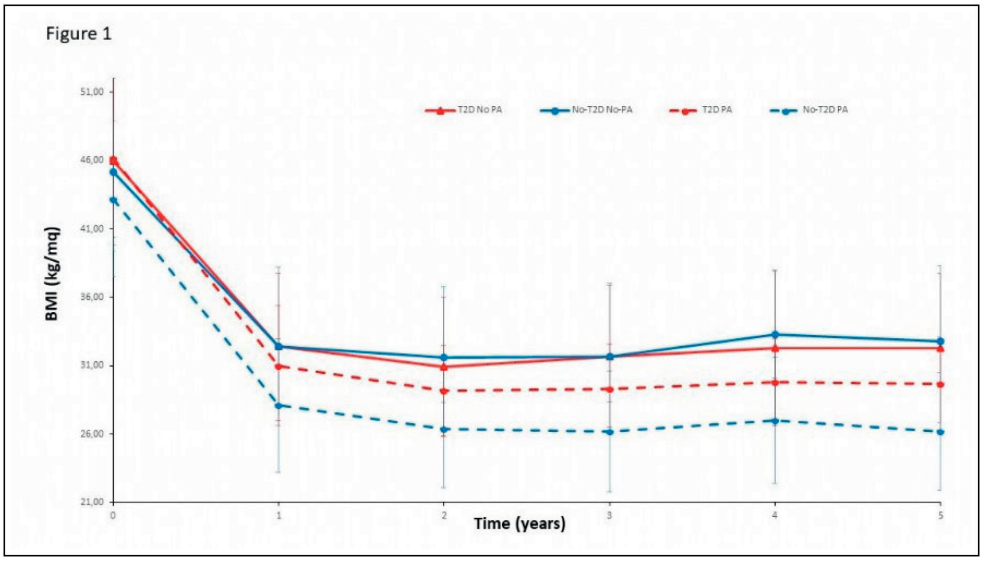


Fig. 1.

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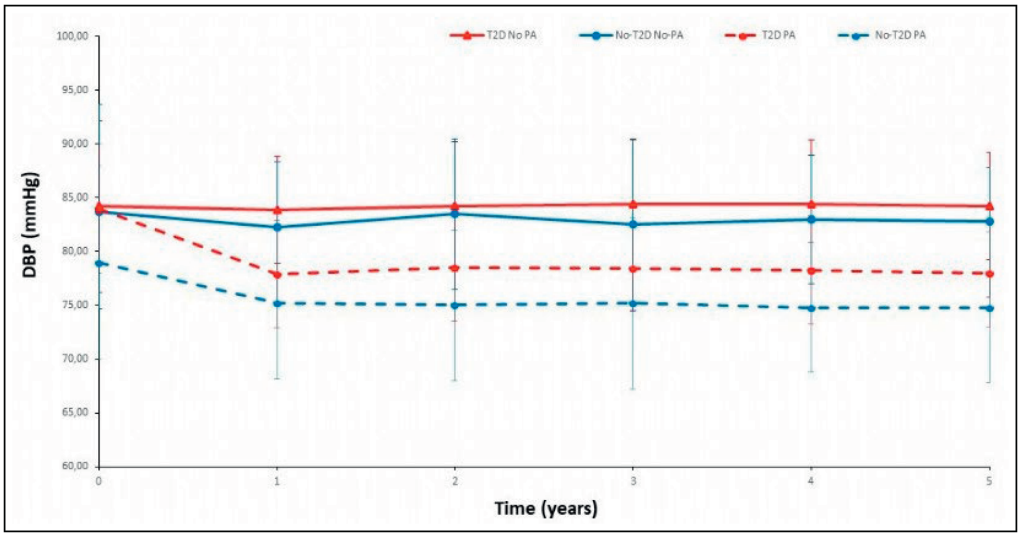


Fig. 2a.

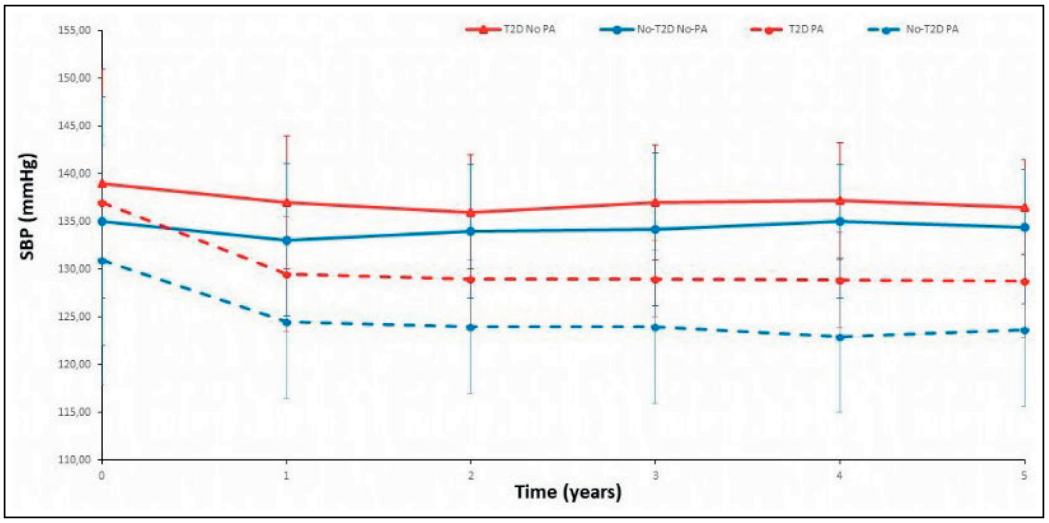


Fig. 2b.

GC4.124

Cardiovascular benefit of SGLT2 inhibitors in kidney transplant recipients with diabetes mellitus

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Background: Type 2 diabetes mellitus (T2DM) poses an increased cardiovascular (CV) risk as well as high risk for chronic kidney disease. Kidney transplant recipients (KTR) with diabetes mellitus are at even higher risk for developing CV events. Sodium-glucose cotransporter-2 inhibitors (SGLT2i) were proven to decrease the risk for major adverse CV events (MACE), as well as CV mortality in large randomized controlled trials. Nevertheless, KTR were excluded from these studies. Hence, we aimed to assess the CV effects in KTR with diabetes mellitus.

Method: We performed a retrospective cohort study comparing KTR with diabetes mellitus treated with SGLT2i (SGLT2i group) and KTR with diabetes mellitus who were treated with other anti-hyperglycemic agents (control group). Data were collected from electronic medical records of patients who were being followed up at Rabin Medical Center, Israel. The primary outcome was a composite of acute coronary syndrome (ACS), stroke/transient ischemic attack (TIA) or all-cause mortality. Secondary outcomes included each of the primary outcomes separately, and a composite outcome of congestive heart failure or all-cause mortality.

Results: Two hundred and forty patients were included in each group, (20% women, median age 63 and 64 years in the control and SGLT2i group, respectively; maximum follow-up 3 years). 45% had a history of ischemic heart disease and 21% had cerebrovascular disease prior to initiation of SGLTi treatment (versus 42% and 16%, respectively, in matched control, p>0.05). The incidence of ACS, stroke/TIA or all-cause mortality was 7.9 compared to 13.6 events/100 person-years (adjusted HR 0.64, 95% CI 0.42-0.97, p=0.039). The number of events per 100 person-years of congestive heart failure or all-cause mortality was lower in SGLT2i users

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(5.7 compared to 11.6), although the incidence of this composite outcome was similar between the study groups after adjustment to other independent predictors (HR 0.82, 95% CI 0.50-1.32, p=0.410).
Conclusions: KTR patients with diabetes mellitus treated with SGLT2i seem to have MACE benefit similar to non-transplant patients with diabetes mellitus. Special consideration should be taken into account in this special population due to safety concerns, however, the benefit may be even more robust due to the high CV risk of these patients.

GC4.125

What can we learn about sustainable weight loss from members of an online community of practice?

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Introduction: The rise of internet and social media have revolutionized how people can access information and enable providers to promote weight loss solutions across geographically diverse populations. People seeking to lose weight find short-term success through most commercially available diet programs, but sustaining weight loss over time has proved challenging for most and many find themselves on a roller coaster of loss-gain-loss-gain. Sustained engagement is a factor in whether a person will successfully reach their health or weight-loss goals (Dumas et al., 2018; Locke, 2020), however, there is a lack of research into factors that support the sustained engagement of members of online weight loss communities (Raggatt et al., 2018), specifically from the perspectives of members. This study reports promising data on the sustainability of weight loss at 12 and 24 months post-program, from an exploratory case study of a weight loss program offered through a closed Facebook group.
Methods: Quantitative and qualitative data were generated from members who had completed the program and self-identified as being "in maintenance and no longer actively seeking to lose weight" through web-based (Survey Monkey) survey (n=372) and focus groups conducted over Zoom (n=38). Survey data were analyzed using descriptive statistics and an iterative approach was used to identify common themes and meaning from the focus groups (Miles et al., 2014).
Results: Percentage body weight loss reported at the end of the program, and at 12 months and 24 months post program, reveal that a small number of participants had regained the weight they originally lost (15, 4.0%), yet the overwhelming majority had maintained clinically significant weight loss. The average percentage weight loss did decrease with time post-program, however it remained greater than 10% of original body weight at 2-years post-program. The participants self-identify as having a history of seeking to lose weight through several diets. They credit their capacity (and confidence) to sustain their weight loss over time to several factors including: what they learned about their body and nutrition during the program; a renewed relationship with food; the time taken to lose weight slowly; and the non-judgmental, safe and supportive community of the weight-loss program.
Conclusion: These data, that include insights from the members, suggest that an individual's capacity to engage in healthy and sustainable weight loss can be supported through learning in a in the company of others in a safe non-judgemental community and being provided with the opportunity to deepen one's knowledge of nutrition and health. Sustained engagement in an online weight loss program is fostered through attention to the creation of a community of practice (Lave & Wenger) comprising experts and peers and ensuring opportunities for situated learning alongside of others with shared goals. This relational, community approach to sustainable weight loss is accessible and sustainable over diverse geographic and demographic populations and offers an approach worthy of further research on a larger scale.

GC4.126

Association between glycemic status and all-cause mortality among individuals with dementia: a nationwide cohort study

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Introduction: The longitudinal evidence between glycemic status and all-cause mortality among individuals with dementia has been limited. We investigated this association using a nationwide representative cohort of individuals with dementia in Korea.
Methods: We included 146,832 adults aged ≥40 years with dementia who underwent Korean National Health Insurance Service health screening between 2008 and 2016 and were followed-up until the end of 2019. Individuals were categorized according to the various glycemic status based on the presence of type 2 diabetes, fasting plasma glucose, and the duration of diabetes. We calculated the adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) for all-cause mortality using multivariable Cox proportional hazards regression analysis.
Results: During the mean follow-up of 3.7 ± 2.1 years, there were 35.2% (n = 52,118) deaths among individuals with all-cause dementia. The presence of diabetes was associated with increased risk of all-cause mortality compared with the absence among individuals with all-cause dementia (HR 1.34, 95% CI: 1.32–1.37). Compared to those with normoglycemia, the HRs for all-cause mortality increased in the highest among those with diabetes ≥5 years (HR 1.43, 95% CI: 1.40–1.47), followed by those with new-onset diabetes (HR 1.35, 95% CI: 1.30–1.40), those with diabetes <5 years (HR 1.17, 95% CI: 1.13–1.21), and impaired fasting glucose (IFG) (HR 1.03, 95% CI: 1.01–1.05). These associations persisted among individuals with Alzheimer's disease (AD) and vascular dementia (VaD), and were prominent younger individuals with all-cause dementia and AD and men with VaD.
Conclusions: Among individuals with dementia, the presence of type 2 diabetes and even IFG was associated with an increased all-cause mortality risk. Particularly, diabetes newly diagnosed and with longer duration was associated with the most risk of mortality. Appropriate interventions to prevent and control of type 2 diabetes can help improve survival in this population.

GC4.128

Characteristics of diabetic neuropathy with or without abdominal obesity in type 2 diabetes: Results from a National Health Insurance Service–National Sample Cohort, 2015

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Introduction: Several studies reported associations between obesity and diabetic neuropathy (DN). It remains unclear whether the relationship between abdominal obesity and DN. To investigated the clinical characteristics of diabetic neuropathy (DN) with or without abdominal obesity in type 2 diabetes
Methods: From the target population a representative sample cohort of 1,021,208 participants was randomly selected, comprising 2.1% of the total eligible Korean population in 2006, and followed until 2015. Data source: NHIS-NSC: National Health Insurance Service–National Sample Cohort. We conducted a clinical analysis of 9,426 peoples with type 2 DM with DN in 2015 among cohort subjects.

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Results: According to the analysis, 40.5% were diagnosed with DN with abdominal obesity. 3,815 Subjects with abdominal obesity in DN had high body mass index(27.4±3.0 vs 23.0±2.4 kg/m^2) and high waist circumference(93.6±6.3 vs 80.0±5.7 cm) and obesity(81.0% vs 20.6%) than 5,611 subjects without abdominal obesity. People with abdominal obesity in DN showed that older age, being female, non-smoker, low physical activity and eGFR, high fasting glucose, low use of oral glucose lowering drugs, high use of antihypertensive drugs, stain and aspirin, the presence of hypertension or dyslipidemia, cardiovascular disease, Metabolic dysfunction associated steatohepatitis(MASH), low eGFR and high medical cost than without abdominal obesity in DN.
Conclusions: People with abdominal obesity in DN had elderly people, poor life style habits, high co-morbidities and complications.

GC4.129

Prevalence of difficult experiences in childhood among people living with obesity and the effect on treatment

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Introduction: Increased awareness has been in Iceland on the effect of difficult experiences in childhood on physical and mental health later in life. Difficult experience in childhood has been shown to have negative impact on health with for example increased prevalence of cardiovascular diseases and diabetes 2. Here we look at how prevalent difficult experiences in childhood were among patients treated at an obesity clinic in Iceland and what effect it had on the results of intensive multidisciplinary behavioural treatment.
Methods: Patients who were met for evaluation interview with a physician at Reykjalundur Obesity Clinic were asked to participate. Participants answered the ACE questionnaire (Adverse Childhood Experience) for difficult experience in childhood, a questionnaire on Quality of Life (QoL) and the DASS questionnaire measuring depression, anxiety, and stress (Depression Anxiety Stress Scales). Information on physical and mental health was collected and a bioelectrical impedance analysis (BIA) was made at beginning of treatment. At the end of treatment, the patients were asked to answer the QoL and the DASS questionnaires again.
Results: Basic information was collected for 146 patients seeking treatment, 92 female, 53 male and 1 binary. At the end of treatment, one to two years later, 62% of the patients were reevaluated. Mean age was 41,8 years in the beginning. Mean number of adverse childhood experiences (n=141) was 3 different experiences but 37% had a history of 4 or more adverse childhood experiences. Patients with ACE score < 4 had mean BMI 47,1 kg/m^2 in the beginning and 46,1 kg/m^2 at the end (p<0.001), the percentage of fat mass was 49,3% in the beginning, respective 48,6% in the end (p=0,001), the QoL mean score was 80,2 at the beginning of treatment, increasing to 86,5 at the end of treatment (p<0.001). Average score on the DASS questionnaire in the beginning and in the end was for depression 10,3 and 5,3, anxiety 7,4 and 4,1 and for stress 12,3 and 7,2 (p<0.001 for all variables). Patients with ACE score ≥ 4 had mean BMI 48,8 kg/m^2 in the beginning and 47,6 kg/m^2 at the end (p=0.027), percentage of fat mass 51,5% in the beginning and 50,6% at the end, for QoL mean score was 69,5 at the beginning of treatment, increasing to 81,9 at the end of treatment (p<0.001). Average score on the DASS questionnaire in the beginning and in the end was for depression 17,7 and 8,1, anxiety 12,5 and 7,9 and for stress 18,1 and 12,1 (p<0.001 for all variables). Diagnosis of mental disorder had 66% percent of patients with ACE score ≥ 4 respective 44% of patients with ACE score < 4.
Conclusion: Prevalence of having an ACE score ≥ 4 were high among patients seeking treatment at Reykjalundur obesity clinic. They had higher BMI, more fat mass, higher prevalence of mental disorders and scored higher for depression, anxiety and stress beginning treatment. Both groups benefitted from the treatment with total weight and fat mass loss and a better quality of life with less depression, anxiety, and stress.

Conflict of Interest: None disclosed.

Funding: None to report.

GC4.130

Relationship among the triglyceride–glucose index, blood uric acid levels, and prevalence of gout in Korean adults: Eighth Korean National Health and Nutrition Examination Survey (2019-2021)

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Background: The triglyceride and glucose (TyG) index is a useful marker of insulin resistance and metabolic syndrome. Several studies have reported a link between this index and serum uric acid levels. However, few studies have shown a concrete association among the TyG index, uric acid levels, and prevalence of gout. The objective of this study was to investigate the correlation between this index and uric acid levels, as well as their potential associations with the incidence of gout.
Methods: Data derived from the Eighth Korea National Health and Nutrition Examination Survey conducted from 2019 to 2021 were used. The study population included adults >19 years of age and consisted of 16340 participants who were subjected to blood tests to measure fasting blood sugar and triglyceride levels. Additionally, the participants responded to a questionnaire regarding the diagnosis of gout, making them eligible for inclusion in the study. The TyG index was categorized into quartiles.
Results: Of the 16340 total subjects, 321 (2.1%) were diagnosed with gout. After an adjustment for age and metabolic parameters, the TyG index was positively related to serum uric acid levels ($\beta = 0.283$, $p < 0.001$). Compared with the risk in the lowest quartile group, as a reference, the adjusted odd ratio, with the 95% confidence interval, for the incidence of gout was 2.002 (1.157–3.465) in the highest quartile group.
Conclusion: An elevated TyG index is associated with increased blood uric acid levels, and the TyG index is also associated with the prevalence of gout.

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Tab. 1. Regression Coefficients of the metabolic parameters for serum uric acid levels.

	Model 1		Model 2		Model 3	
	β	P	β	P	β	P
Tyg index	0.402	<0.001	0.283	<0.001	0.247	<0.001
Age	-0.012	<0.001	-0.011	<0.001	-0.012	<0.001
Sex	1.403	<0.001	1.334	<0.001	1.291	<0.001
BMI			0.071	<0.001	0.061	<0.001
smoking			-0.053	0.119	-0.053	0.12
alcohol			0.083	<0.001	0.081	<0.001
physical activity			0.019	0.398	0.026	0.241
Hypertension			0.218	<0.001	0.195	<0.001
Diabetes			-0.442	<0.001	-0.422	<0.001
dyslipidemia			-0.182	<0.001	-0.189	<0.001
systolic BP					0.004	<0.001
AST					0.006	<0.001
ALT					0.002	0.036

*; Age and Sex

**; additional including BMI, smoking and alcohol history, and physical activity, medication history of hypertension, diabetes mellitus, and dyslipidemia

***; additional including systolic BP, AST and ALT

Tab. 2. Odds ratios and 95% confidence intervals for gout incidence by TyG quartiles.

	TyG quartiles			
	Q1	Q2	Q3	Q4
Unadjusted	1.00 (Reference)	2.020(1.204-3.388)	3.864(2.410-6.197)	6.256(3.962-9.876)
Adjusted				
Model 1*	1.00 (Reference)	1.424(0.849-2.388)	2.305(1.434-3.706)	3.134(1.962-5.006)
Model 2**	1.00 (Reference)	1.258(0.739-2.142)	1.918(1.161-3.169)	2.521(1.517-4.191)
Model 3***	1.00 (Reference)	1.201(0.691-2.087)	1.703(0.995-2.913)	2.002(1.157-3.465)

*; Age and Sex

**; additional including BMI, smoking and alcohol history, and physical activity, medication history of hypertension, diabetes mellitus, and dyslipidemia

***; additional including systolic BP, AST, ALT and uric acid

GC4.131

Increased physical activity is associated with faster gastric emptying in people with overweight or obesity at high risk of type 2 diabetes

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Introduction: Gastric emptying is essential for the control of blood glucose and appetite in response to a meal. Acute exercise decelerates gastric emptying in an intensity-dependent manner and cross-sectional studies have observed faster gastric emptying in physically active compared to physically inactive individuals. However, the impact of changes in physical activity level on gastric emptying in individuals at high risk of type 2 diabetes is poorly understood.

Methods: This posthoc analysis includes a subsample of 32 participants from the RESET study in which 100 men and women with BMI ≥25 kg/m^2 and prediabetes (HbA1c 39-47) or BMI ≥30 kg/m^2 were randomized to 3 months of either 1) time-restricted eating (TRE, n=13) or 2) habitual living (control group, n=19). During TRE participants were instructed to consume all foods and beverages (except water) within 10 hours/day. At baseline and after 3 months of intervention, participants ingested a standardized mixed meal followed by a wireless motility capsule (SmartPillTM, Medtronic) to measure gastric emptying time (GET). Physical activity was measured using accelerometers (Axivity AX3) for 7 days at baseline and after 3 months. Associations between changes in physical activity (total physical activity, sedentary time, and physical activity at low-light, high-light, moderate, and moderate-to-vigorous intensity) and changes in GET were assessed using linear regression analysis adjusted for age and sex.
Results: 18 women and 14 men were included in the analysis. Mean (SD) GET at baseline was 292 (74) min. For each hour increase in total physical activity, GET decreased by 0.41 hour (95%CI: -0.60; -0.22) (p<0.001) and for each additional hour spent on high-light intensity physical activity, GET decreased by -0.62 hour (-1.00; -0.26) (p<0.001). Per one hour increase in sedentary time, GET increased by 0.41 hour (0.08; 0.74) (p=0.015). No significant associations were observed between changes in

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physical activity at low-light, moderate, or moderate-to-vigorous intensity and changes in GET.

Conclusion: Our results suggest that increased total physical activity and high-light intensity physical activity are associated with a shortening of GET, whereas increased time spent sedentary is associated with prolonged GET in individuals at high risk of type 2 diabetes. Future randomized controlled trials should investigate whether increased physical activity at different intensities affect GET and appetite.

GC4.132

Does Obesity Reduce the Efficacy of PDL1 Therapy in Triple Negative Breast Cancer?

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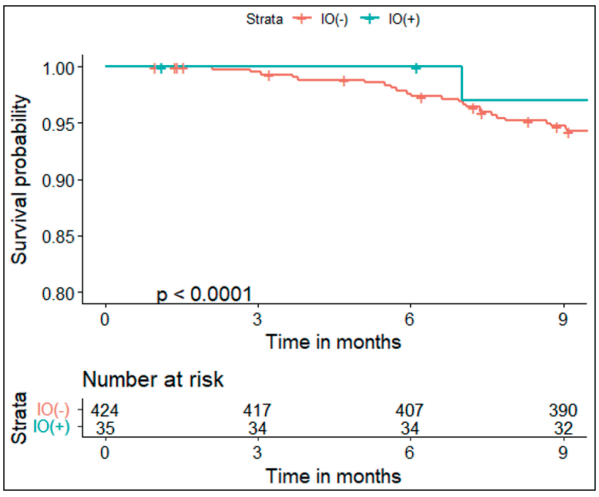
Introduction: Among all breast cancer subtypes, triple negative breast cancer (TNBC) is an aggressive subtype which tend to have worst clinical outcome due to the inability of targeted therapy and hormone therapy. PDL1 immunotherapy has provided a potential strategy for treating TNBC. The association between obesity and the incidence and progression of postmenopausal TNBC are recognized. However, the effectiveness of PDL1 immunotherapy in patients with obesity in TNBC subtype remains uncertain. Therefore, we try to investigate the relationship between weight status, the effectiveness of PDL1 treatment, and the prognosis of patients in TNBC subtype.

Methods: Data for this study are obtained from the Chang Gung Research Database spanning the years 2005 to 2020. The enrolled patients are classified into two weight groups: non-obesity (excluding underweight status) and obesity. To evaluate overall survival (OS) and progression-free survival (PFS), we employ Kaplan-Meier curves. Furthermore, chi-square and student t-tests are performed to explore the correlation between demographic factors and weight status. Finally, the Cox proportional hazards regression model is utilized to identify independent risk factors that might influence the outcomes of interest.

Results: 41 patients in TNBC subtype who undergo PDL1 therapy are identified from the dataset, comprising 35 patients with non-obesity and 6 patients with obesity. There are no discernible differences observed between these two groups in terms of tumor size, age, menopause condition, tumor histology grade, or clinical stage. However, it is worth noting that all patients receiving PDL1 treatment have intermediate or high histology grades, indicating the severity of the disease among the participants.

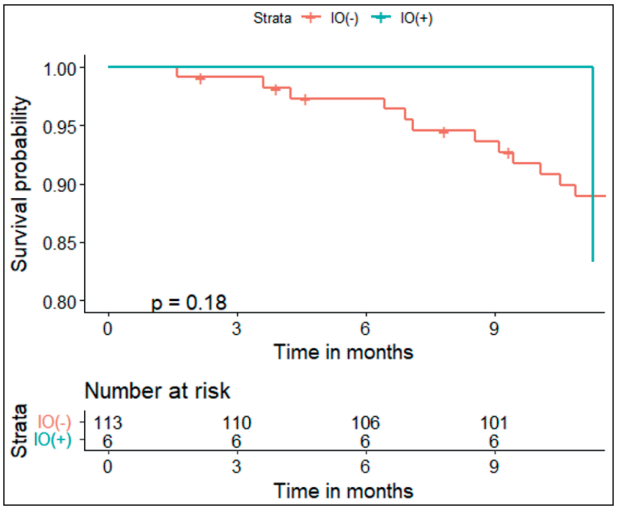
In terms of one-year PFS, our findings show a significant benefit of PDL1 treatment comparing to non-treatment in patients with non-obesity ($p < 0.0001$). However, this advantage is not observed in patients with obesity receiving PDL1 therapy ($p = 0.18$). Interestingly, no significant differences in OS between PDL1 treatment and non-treatment patients, regardless of their weight status. These results indicate the variable responses to PDL1 treatment based on weight status, and patients with non-obesity generally display a more favorable response compared to patients with obesity. The multivariate analysis also reveals that obesity is an independent risk factor for the effectiveness of PDL1 therapy, with a hazard ratio of 1.4 for one-year PFS.

Conclusion: When evaluating the PFS and response of tumor shrinkage in TNBC, patients with obesity reveal worse outcomes. This might have something to do with obesity impacts the immune system, leading to disruptions of normal function and subsequently reducing the effectiveness of immunotherapies such as PDL1 treatment. Hence weight management might need to consider for patients with obesity in TNBC subtype while giving PDL1 therapy.



There is significant benefit of PDL1 treatment comparing to non-treatment in patients with non-obesity ($p < 0.0001$). IO: Immunotherapy.

Fig. 1. Progression Free survival in patients with non-obesity.



There is no significant difference in PFS between patient with obesity and non-obesity in TNBC subtype. IO: Immunotherapy.

Fig. 2. Progression Free survival in patients with obesity.

Tab. 1. Demography.

label	levels	Non-Obesity n (%)	Obesity n (%)	p value
Meno_condition	Post	14 (53.8)	2 (50.0)	0.796
	Pre	12 (46.2)	2 (50.0)	
Size_of_tumor	2-5cm	22 (62.9)	5 (83.3)	0.492
	5-10cm	9 (25.7)	1 (16.7)	
	<2cm	2 (5.7)		
	>10cm	2 (5.7)		
Lymph_node_meta	positive	27 (77.1)	4 (66.7)	0.454
	negative	8 (22.9)	2 (33.3)	
Distant_meta	positive	5 (14.3)	2 (33.3)	0.329
	negative	30 (85.7)	4 (66.7)	
Grade	High	11 (73.3)		0.279
	Intermediate	4 (26.7)	1 (100.0)	

Demography of patients with non-obesity and obesity.

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GC4.133

The impact of regular exercise on cardiometabolic fitness and memory is related to reduced levels of residual platinum in testicular germ cell cancer survivors

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Introduction: The risk of metabolic syndrome and functional decline in cancer survivors is increased by platinum-based chemotherapy. Evidence indicates that exercise has a potential to reduce chemotherapy-related toxicity. The aim of this study was to assess the effects of a 6-month aerobic-strength training on body composition, metabolism, physical fitness and cognitive functions in testicular germ cell tumor (TGCT) survivors, treated with platinum-based chemotherapy.
Methods: TGCT survivors were enrolled in the 6-month intervention trial (supervised aerobic-strength training / controls n=20 / 8, age 42.1±7.6 yrs. BMI:27.7±3.8kg/m^2, VO2max:29.2±6.7 mlO2/kg/min, 1-20 years post-treatment). Abdominal adiposity (MRI), cardiorespiratory fitness (VO2max, cycle spiroergometry), muscle strength (horizontal leg-press and chair dynamometry), energy metabolism (indirect calorimetry), cognitive functions (FACT-Cog, computerized test Memtrax, CogState, Auditory Verbal Learning Test/AVLT), serum glycemia, insulinemia, lipid profile, plasma adiponectin (ELISA), platinum and zinc (Inductively Coupled Plasma Mass Spectrometry) were assessed before and after the 6-month intervention.
Results: Training reduced visceral adiposity (MRI, p<0.01), increased circulating HDL-cholesterol (p<0.01), cardiometabolic fitness (VO2max) and muscle strength (both p=0.01), and improved delayed and short-term memory recall (AVLT), compared to non-active controls. Training-induced changes in delayed memory recall positively correlated with improvements in VO2max, supporting a link between cognition and cardiorespiratory fitness. Plasma adiponectin, glycemia and insulinemia were unaffected by exercise training (p>0.1), while intervention normalized residual plasma platinum and increased plasma zinc levels (both p<0.01), with no change in controls. Platinum levels (P<0.001) and number of chemotherapy cycles (p=0.06) were the best predictors of memory function.
Conclusions: Aerobic-strength exercise reduced visceral adiposity and circulating residual levels of platinum, improved physical fitness and cognitive functions in TGCT cancer survivors. Our observations support a role for exercise as an effective complementary treatment for cancer survivors, with a potential to reduce residual chemotherapy burden and cardiometabolic risk, which could be linked to improved cognitive functions.

Conflict of Interest: None Disclosed

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GC4.134

Association of Neck Circumference with Dyslipidemia and Cutoff Point Determination for Cardio-Metabolic Risk in the Korean Population: Insights from KNHANES 2019-2021

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Background: This study aims to explore the correlation between neck circumference and dyslipidemia, determining potential cutoff points for neck circumference in diagnosing cardio-metabolic risk factors in the Korean population.
Methods: A total of 11,364 Korean adults aged over 40 participated in the Korea National Health and Nutrition Examination Survey (KNHANES) from 2019 to 2021. Participants were categorized into quartiles based on neck circumference, and dyslipidemia diagnoses were compared. Data adjustments were made for age, sex, income, education, occupation, smoking, drinking, physical activity, diabetes mellitus, and hypertension, with the prevalence of dyslipidemia examined.
Results: Neck circumference exhibited positive correlations with waist circumference, body mass index, LDL cholesterol, and total cholesterol levels in the Korean population, along with a negative correlation with HDL cholesterol. After adjusting for confounding factors, higher quartiles of neck circumference showed a greater association with dyslipidemia (Q2 OR = 1.264, 95% CI 1.095, 1.458; Q3 OR = 1.390, 95% CI 1.208, 1.600; Q4 OR = 1.661, 95% CI 1.447, 1.905). Moreover, the odds ratio of dyslipidemia increased with higher BMI. While waist circumference was associated with dyslipidemia, no significant difference was observed between 90-100cm for men and 85-95cm for women (<95/90 OR = 1.115, 95% CI 0.955, 1.303; <100/95 OR = 1.092, 95% CI 0.921, 1.296).
Conclusion: Neck circumference is positively associated with dyslipidemia, independent of various confounding factors. This association is consistent with BMI and waist circumference, indicating that neck circumference could be a valuable screening tool for identifying individuals at risk of metabolic disorders such as dyslipidemia in the Korean population. The results emphasize the importance of considering neck circumference as a potential indicator for metabolic syndrome and cardiovascular risk assessment.

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GC4.135

Long-term preservation of lean mass and loss of fat mass after intensive lifestyle intervention in older adults with obesity and type 2 diabetes

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Introduction: Lifestyle interventions combining caloric restriction with resistance exercise have the potential to preserve lean mass during weight loss. Additional protein intake can further improve lean mass.[1] However, it is unclear whether these effects are sustained over time after completion of the intervention. This study aimed to evaluate the long-term effect of a 3-month lifestyle intervention, with or without supplementation of a protein drink, to preserve lean mass in older adults with obesity and type 2 diabetes at 6 months post-intervention.
Methods: Adults (n=123) aged ≥55 years with obesity and type 2 diabetes were enrolled in a 3-month intensive lifestyle intervention with hypocaloric diet, resistance exercise and high-intensity interval training. Participants were randomised to either receive a leucine and vitamin D-enriched protein drink or isocaloric control drink. The 3-month intervention was followed by a 6-months phase without intervention. At baseline, 3 and 9 months (follow-up), body composition, physical functioning, and quality of life were assessed. Statistical analysis was performed using a linear mixed model.
Results: Body weight loss was largely sustained at follow-up (-2.1 kg compared to baseline, 95% CI -2.8 to -1.5), and comprised a sustained loss of fat mass (-2.6 kg, 95% CI -3.2 to -2.0) with simultaneous gain of lean mass (+0.7 kg, 95% CI +0.2 to +1.2). Improvements in 400m walk speed (+0.05 m/s, 95% CI +0.03 to +0.08) and chair stand test time (-1.5 s, 95% CI -1.9 to -1.1) were sustained at follow-up. There were no differences in these changes between the protein supplementation group and the control group at follow-up.
Conclusion: Older adults with obesity and type 2 diabetes preserved their lean mass, their loss of fat mass, and their improvements in physical functioning, 6 months after completion of a 3-month intensive lifestyle intervention. Protein supplementation during the intervention did not affect outcomes at follow-up.

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GC4.136

Very low-calorie ketogenic diet (VLCKD): a tool for fat kidney?

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Background: Obesity can damage kidney via directly, through the production of pro-inflammatory adipocytokines, and indirectly due to systemic complications of obesity. Several strategies are available for weight loss, such as the modification of lifestyle, anti-obesity drugs and surgery therapy, but there are no clinical practice guidelines to manage participants with obesity and chronic kidney disease. Very low-calorie ketogenic diet (VLCKD) is an effective and increasingly used tool for weight loss in participants with obesity. Thus, we aimed to investigate the effects of VLCKD on participants with obesity and mild kidney failure (MKF).
Methods: A cross-sectional study was conducted on 92 participants with obesity (35.85 ± 4.61 kg/m^2; 27M/65F aged 52.03 ± 11.41 years) that underwent to a VLCKD. Forty-nine participants had MKF (eGFR 60-89 ml/min/1.73m^2) and 43 had normal kidney function (NKF) (eGFR≥90 ml/min/1.73m^2) and were therefore designated as control. Anthropometric parameters (weight, height and waist circumference) and biochemistry data were collected before and at the end of active phase of VLCKD.
Results: In the entire study population, the average weight loss was nearly -10.67 ± 4.29 % of initial weight, with significant reductions in BMI (from 35.85 ± 4.61 to 32.50 ± 4.35 kg/m^2, p<0.001) and waist circumference (from 107.01± 11.32 to 99.98± 11.42 cm, p<0.001) at the end of the active phase of VLCKD. We also reported an improvement of several metabolic parameters: fasting blood glucose from 100.23 ± 15.56 to 91.01 ± 13.08 mg/dl (p<0.001), insulin from 17.71 ± 10.29 to 8.31 ± 4.38 μIU/ml (p<0.001), HOMA-IR from 4.50 ± 3.21 to 1.90 ± 1.12 (p<0.001), total cholesterol from 208.20 ± 40.37 to 169.75 ± 35.44 md/dl (p<0.001), LDL from 127.15 ± 37.30 to 100.26 ± 29.35 mg/dl (p<0.001) and triglycerides from 126.36 ± 71.21 to 92.47± 32.94 mg/dl (p<0.001). No clinically relevant variation regarding liver and kidney function were detected.
Of note, at the end of the active phase of VLCKD, we found out significant reduction of eGFR in participants with NKF (from 104.53 ± 7.30 to 100.76 ± 11.39 ml/min/1.73m^2; p=0.031) while a significant increase in participants with MKF (from 79.33 ± 7.82 to 84.61 ± 11.65 ml/min/1.73m^2; p=0.001). Finally, 30.6% of patients with MRF reported normalization of glomerular filtrate after the VLCKD.
Conclusion: Obesity can damage the kidney through alterations in the hemodynamics resulting in glomerular hyperfiltration, proteinuria and, finally, impairment of the GFR. VLCKD on the one hand reduced glomerular hyperfiltration in participants with obesity with still NKF, and on the other hand improves filtration in those participants who have already suffered a reduction in GFR. Consequently, VLCKD is a safe and effective tool in the prevention and treatment of obesity-related kidney complications.

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GC4.137

Efficacy of Psychological Interventions in the Management of Overweight and Obesity: A Scoping Review

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Background: The global escalation of overweight and obesity—conditions of excessive adipose tissue impacting health—necessitates multifaceted treatment approaches. Psychological factors play a significant role, with affected individuals displaying higher psychopathology rates, particularly women who are more susceptible to depression and low self-esteem (Rashid et al., 2020; WHO, 2021).
Methods: A systematic review and meta-analysis were conducted by searching nine databases up to January 31st, 2023, focusing on the effects of psychotherapy on overweight and obese populations. Inclusion criteria were broad but excluded studies without measurable outcomes. Three physicians, specializing in pediatrics, obesity medicine, and psychiatry, analyzed the data.
Results: The search yielded nine reviews, two articles, and two protocols. Cognitive-behavioral therapy weight loss (CBTWL) interventions showed a mean weight loss of -1.70 kg, with a moderate impact on cognitive restriction and emotional eating, but without superiority in reducing depressive symptoms (Jacob. A. et al., 2018). Mindfulness interventions had mixed results; they were beneficial in reducing impulsive eating but showed variable effects on weight loss, contingent upon the duration of the intervention (Ruffault et al., 2017; Mercado et al., 2021). Interpersonal psychotherapy displayed minimal efficacy in weight reduction and depression management (Toledo et al., 2023).
Conclusions: This review indicates that CBTWL and mindfulness can positively influence obesity-related behaviors. Nevertheless, interpersonal psychotherapy appears to have limited effects. There is a clear need for more rigorous, long-term studies to solidify the role of psychotherapeutic interventions in obesity management, considering the heterogeneity of current research and intervention durations. Tailoring specific psychotherapeutic approaches to obesity's psychological aspects may amplify their effectiveness, necessitating further investigation with controlled population groups.

GC4.138

Advances and Challenges in Sarcopenic Obesity Treatment: A Comprehensive Review of Interventions, Diagnosis, and Prognosis

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Context: Sarcopenic Obesity (SO), characterized by the coexistence of obesity and loss of muscle mass and/or function, poses a significant public health concern with an estimated global prevalence of 100 to 200 million individuals by mid-century. Global prevalence is rising, especially in older populations. Presently, its prevalence is approximately 12.6% in men and 33.5% in women, varying regionally. Individuals with SO are more susceptible to health problems, functional impairment, and reduced quality of life, emphasizing the urgent need for effective interventions. This comprehensive review aims to examine recent advances in SO treatment, emphasizing interventions, diagnosis, and prognosis.
Methods: A systematic review, conducted from November 2023 to January 2024, employed the keywords "sarcopenic" and "obesity" in searches across databases such as PubMed, Elsevier, and SciELO. Inclusion criteria involved meta-analyses and systematic reviews published within the last five years, focusing on SO treatment options, epidemiology, natural history, prognosis, impact on body composition, and metabolic alterations. The applicability of findings was also assessed.
Results: Sarcopenic obesity (SO), rooted in genetics and clinical influences, poses significant risks, including elevated disability and mortality rates. Diagnosis involves meticulous screening and a two-stage process, evaluating functional parameters and body composition. Despite efforts by ESPEN and EASO to standardize SO diagnosis, variability persists, demanding further research for solid criteria. Prognosis for SO is concerning, with increased risks of cardiovascular events and type 2 diabetes. Non-pharmacological interventions prove effective. Exercise emerges as a pivotal treatment strategy. Resistance training 2 to 3 times a week, lasting 20 to 60 minutes per session, significantly reduces percent body fat (MD 1.53%) and improves muscle mass (MD 2.72%) and strength (MD 4.42 kg). Combining resistance and aerobic training yields the most favorable outcomes, with percent body fat decreasing the most. Training plus increased protein intake shows a statistically significant reduction in absolute fat mass (MD 0.80 kg). Nutritional interventions, like protein and vitamin D supplementation, play vital roles in prevention and treatment. Omega-3 usage is highlighted as a promising strategy. Conservative caloric restriction, Semaglutide, Bariatric surgery, and avoiding micronutrient deficiencies, have manifested effectiveness in SO management, including a standardized mean difference of −0.20 for reduced postural sway, −0.19 for decreased time to complete the Timed Up and Go Test, and 0.05 for lower extremity strength gain.
Conclusion: While treatment advances are evident, discrepancies persist due to varied definitions and assessment values. Urgent efforts are needed for diagnostic and monitoring standardization through larger population studies to enhance conclusion confidence intervals. The interdisciplinary approach to SO, integrating exercise, nutritional interventions, and ongoing research, is crucial for a holistic understanding and effective management of Sarcopenic Obesity.

GC4.140

Carotid intima-media thickness is predicted by hepatic steatosis imaging changes but not handgrip strength in patients with obesity

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Introduction: Even in the absence of patent atherosclerosis, increased carotid intima-media thickness (IMT) represents a useful marker in predicting risk of cardiovascular events; hepatic steatosis may contribute to ectopic lipid deposition at the carotid level1. Novel evidence revealed a relationship between carotid IMT and reduced muscle strength in the elderly; however, whether this relationship holds true in people with obesity when accounting for hepatic lipid content is still disputed.
Methods: Patients were recruited at the Experimental Medicine Department of Sapienza University of Rome, Italy. Anthropometry and total-body DXA (dual-X ray absorptiometry) were used for body composition assessment. Handgrip strength (HGS) test was performed using a hand-held dynamometer; mean HGS was defined as the average of six trials (three for each arm). Screening for hepatic steatosis used B-mode and a quantitative ultrasound software index (TSI, Tissue Scatter distribution Imaging2). Common carotid artery IMT (CCA-IMT) was assessed by ultrasonography; high CCA-IMT was defined as values >75th percentile 3 and mean CCA-IMT as the average of right and left CCA-IMT. Venous blood samples at baseline and during a 2h- oral glucose tolerance test were drawn to assess serum glycometabolic parameters.
Results: 95 participants with obesity (females = 68.4%) were included in the final analysis (median age: 55 years, IQR: 49- 59; median BMI 35.6 kg/m^2, IQR: 32.8-38.4). Among them, 66.9% displayed a high CCA-IMT bilaterally. Baseline differences between the high and normal CCA-IMT

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groups were observed for body fat %, fat-free mass, appendicular lean mass-to weight ratio, triglyceride and uric acid levels (all p<0.05). The following independent variables were included in a multiple regression analysis model, which successfully predicted mean CCA-IMT age (β= 0.483, p<0.001), smoking status (β= 0.239, p= 0.007), hypolipidemic therapy (β= - 0.223, p=0.015) and median TSI (β= 0.203, p=0.023). Adding mean HGS to the model reduced its predictive ability, with the four original predictors retaining statistical significance (all p<0.05) as opposed to mean HGS (p= 0.762).

Conclusion: CCA-IMT was predicted by age, hypolipidemic therapy, smoking status and liver TSI values but not mean HGS. Further observational studies on patients with obesity with and without sarcopenia are required to confirm our experimental hypothesis.

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GC4.141

Effect of Exercise and GLP-1 Receptor Agonist Treatment on Sub-clinical Atherosclerosis in Adults with Obesity: A Randomized Clinical Trial

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Introduction: Adverse cardiovascular events associated with obesity may originate from endothelial dysfunction leading to atherosclerosis. Exercise and glucagon-like peptide 1 receptor agonist (GLP-1 RA) treatment have separately been suggested to improve vascular function. Therefore, we investigated the effects of exercise, a GLP-1 RA, and the combination of both treatments on carotid intima-media thickness (cIMT), endothelial function, and endothelial biomarkers attributed to atherosclerosis.

Methods: This study was a randomized, double-blinded, placebo-controlled trial of 215 participants living with obesity without diabetes. Over 8 weeks, 195 adults completed a low-calorie diet (800 kcal/day). Subsequently, participants were evenly randomized to four groups treated for one year with: placebo, exercise (minimum of 150 min/week of moderate-intensity or 75 min/week of vigorous-intensity aerobic physical activity, or an equivalent combination), the GLP-1 RA liraglutide 3.0 mg/day, or a combination of exercise and liraglutide. Of the initial participants, 166 (85%) completed the trial. We assessed predefined secondary outcomes of ultra-sound measurements, including cIMT, brachial flow-mediated dilation (FMD), nitrogen-mediated dilation (NMD), and the biomarkers tissue plasminogen activator (t-PA), von Willebrand factor (vWF), intracellular adhesion molecule 1 (ICAM-1), and vascular adhesion molecule 1 (VCAM-1). Outcomes were analyzed using a mixed linear model and included all 195 participants in the intention-to-treat population.

Results: At randomization, 195 participants, 64% women, mean age 43±12 years, had lost an average of 13.1 kg (12%) body weight during the low-calorie diet, resulting in a BMI of 32.6±2.9 kg/m^2. After one year of treatment, the placebo group regained half of the lost body weight, the exercise and liraglutide groups maintained the weight loss, and the combination group had body weight further reduced. During the low-calorie diet, cIMT increased by 0.01 mm (95%CI, 0.00 to 0.03, p=0.047) from 0.59 to 0.60 mm. After one year, cIMT decreased by 0.03 mm (95%CI, 0.002 to 0.06, p<0.05) in the exercise group, whereas cIMT was unchanged in the other groups. No changes in FMD or NMD were observed during the trial. The low-calorie diet reduced t-PA by 2.04 ng/mL (95%CI, 1.54 to 2.55, p<0.001), reduced ICAM-1 by 14% (95%CI, 0.86 to 0.90, p<0.001) from 0.69 to 0.61 ng/mL but increased VCAM-1 from 0.60 L to 0.66 ng/m (8%-points, 1.08, 1.05 to 1.10, p<0.001). After one year, VCAM-1 decreased in the exercise and combination group by 9% (p<0.05) and 10% (p<0.01), respectively, while no changes were observed in the placebo and liraglutide group.

Conclusion: Our results suggest that exercise at moderate-to-vigorous intensity reduce the risk of atherosclerosis during one-year weight loss maintenance after a low-calorie diet-induced weight loss in adults with obesity without diabetes.

Trial registration: ClinicalTrials.gov: NCT04122716

GC4.142

Hyperhomocysteinemia, Vitamin B12 and Folate Deficiency: The Relationship With Obesity And Cardiovascular Risk

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Cardiovascular events have well-known and widely described hereditary factors. Acquired risk factors have greater repercussions as they are modifiable and highly incident. In individuals with obesity (BMI ≥ 30kg/m^2), a 2.4-fold increased risk of thromboembolic events has been demonstrated compared to a population without obesity. This mechanism is still unclear and speculative. High levels of homocysteine, low levels of vitamin B12, and folic acid have been implicated in an increased risk of venous thrombosis. In patients with homocystinuria, this association is well established. There is still considerable controversy regarding the impact of these associations and the influence of obesity on B12/homocysteine metabolism. We conducted a literature review to support future decisions regarding this population.

Methods: An integrative review of the last ten years was carried out in the research bases COCHRANE, PUBMED, EMBASE, and BVS; using the MESH terms (obesity), (homocysteine), (vitamin B12), (folic acid). Inclusion criteria were: Clinical Studies, WHO defined obesity (BMI > 30kg/m^2) and overweight (BMI > 25Kg/m^2). Exclusion criteria were patients <18 years and >65 years old; pregnancy; other diseases that also involve changes in metabolism (such as cancer, inflammatory or autoimmune disease) or other conditions such as Laboratory and Pre-Clinical Studies.

Results: 489 articles were selected: 94 from the BVS (19.22%); 348 in EMBASE (71.17%), 45 in PubMed (9.20%), and 2 articles in Cochrane (0.41%). 100 duplicated articles were excluded, together with 33 articles with pregnant women (7.91%), 7 pre-clinical (1.68%), 234 with other pathologies or other clinical conditions (56.12%), and 43 articles out of age range (10.31%). The 72 included articles (14.72%) were grouped by the main covered topics: Association between Homocysteine, Vitamin B12 and Folic Acid with Obesity and Metabolic Syndrome, 21 articles (29.17%), Obesity and Type 2 Diabetes, 6 articles (8.33%). Cardiovascular risk and therapeutic interventions with 10 articles (13.89%) each. This association had been evaluated by Meta-analysis and systematic review that ranked 14 articles and found higher levels of homocysteine in individuals with obesity (SMD = 0.76, 95% CI = 0.25-1.27, P <.01), regardless of nutritional status, eating habits, insulin resistance, pathological history, medication in use, or genetic background. The latter was confirmed by an Iranian study that demonstrated no relationship with the polymorphism

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of the MTHFR (Methylene tetrahydrofolate reductase) gene. This was confirmed by another meta-analysis with 66 articles and 87,988 patients, where higher levels of vitamin B12 inversely (OR = 0.87; 95% CI: 0.81–0.93; $p < 0.01$), higher Homocysteine levels (OR = 1.19; 95% CI: 1.14–1.24; $p < 0.01$), but not folate levels (OR = 0.83; 95% CI: 0.66–1.03; $p = 0.09$) were associated with MetS. Selected studies show an association between obesity and high levels of homocysteine and low levels of Vitamin B12. Additional studies should clarify whether the increased cardiac risk is secondary to obesity and Metabolic Syndrome per se or due to homocysteine levels.

GC4.143

Glycemic control and irisin levels in patients with type 2 diabetes mellitus and sarcopenic or non-sarcopenic obesity

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Introduction: Sarcopenic obesity (SO) is characterized by the simultaneous presence of excessive body fat and reduced muscle mass. This synergistic condition significantly amplifies the risk of metabolic diseases compared to the single abnormalities, particularly in relation to insulin resistance (IR). Irisin, a myokine involved in energy homeostasis and glucose control, has been also associated with sarcopenia, although findings are not consistent. This study aims to explore the relationship between irisin levels, glucose control, and IR in individuals with type 2 diabetes mellitus (T2DM) presenting either with SO or non-sarcopenic obesity (NSO).
Methods: We evaluated patients affected by T2DM and body mass index (BMI) >30 kg/m². We collected blood samples for assessment of glycometabolic parameters and irisin. All patients underwent bioimpedance analysis and answered the following questionnaires: SARC-F, IPAQ-EIT, and MEDI-LITE. Muscle efficiency was evaluated using the Handgrip Strength test (HGS) and the 5-times Sit To Stand Test (5-STST). Patients were then categorized into SO and NSO groups according to the 2022 ESPEN/EASO Consensus[1].
Results: Among 67 patients affected by both obesity and T2DM, 50 were classified as NSO and 17 as SO. SO patients were characterized by older age (median [interquartile range], 70 [6] vs 66 [7] years, p=0.028), higher BMI (36.7 [4.3] vs 34.7 [4] kg/m², p=0.036) and fat mass (FM) (41.9 [7.7] vs 37.6 [8.7] kg, p=0.049), higher alcohol consumption (47.1% vs 22%, p=0.048), higher 5-STST (13.3 [4.1] vs 10.8 [3.1] s, p=0.016) and lower HGS results (24 [7.9] vs 36.4 [10.2] kg, p<0.001). No difference in HOMA-IR, HbA1c or irisin levels was found in the SO and NSO groups. However, irisin correlated negatively with HbA1c (r=-0.288, p=0.018), HGS (r=-0.249, p=0.042), muscle mass (r=-0.26, p=0.033) and creatinine (r=-0.308, p=0.011), and positively with relative FM (r=-0.274, p=0.025). Increasing strength at the HGS test predicted lower irisin levels at multivariate linear regression analysis (β=-316, p=0.032). At the multivariate logistic regression analysis, older age was associated with higher risk of SO (odds ratio [OR]=1.16, p=0.02), and there was a trend relationship for insulinemia (OR=1.05, p=0.073) and 5-STST (OR=1.19, p=0.068) (p=0.039, area under the curve=0.804).
Conclusion: In patients with T2DM, SO is associated with worse lifestyle, anthropometric profile, and physical performance. In this cohort, irisin levels are associated with better glycemic control and correlate negatively with muscle mass and strength, raising the hypothesis of a compensatory role of irisin in this context.

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GC4.144

A case report on GLP-1 agonist's dual effect on obesity and osteoporosis in young female patient

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Objectives: This case report aims to explore the broader impact of a comprehensive strategy in managing osteoporosis among young individuals with metabolic anomalies, specifically emphasizing the influence of obesity treatment. The report aims to investigate how addressing obesity not only impacts bone health but also contributes to improvements in insulin resistance, hormonal balance, and overall well-being, promoting a healthier lifestyle.
Case Presentation: A 27-year-old female, initially with a BMI of 35 kg/m², presented with bilateral rib fractures post low-impact trauma. DEXA scan confirmed osteoporosis. The patient reported insulin resistance, irregular menstrual cycles, and functional hypercorticism. Differential imaging, laboratory and genetic testing yielded no conclusive osteoporosis cause.
Management: Cosmetic liposuction targeted obesity, alleviating musculoskeletal strain. Lifestyle changes further supported weight loss. Semaglutide, a GLP-1 receptor agonist, initiated weekly for weight management. Vitamin D and Calcium supplements supported bone health. Regular monitoring ensued.
Outcomes: In six months, significant weight loss achieved, BMI dropped from 35 to 31.2, no fractures are reported. Menstrual cycles regularized, indicative of hormonal balance. Laboratory results indicated improved insulin sensitivity and cortisol normalization, addressing metabolic issues. Enhanced well-being reported.
Conclusion: This case underscores the significance of a holistic approach to osteoporosis, especially in young individuals with metabolic anomalies. The combination of lifestyle changes and Semaglutide demonstrated positive impacts on weight, hormonal balance, and overall well-being. While this integrated regimen proved efficacious, the potential role of bisphosphonates in osteoporosis treatment should be explored, emphasizing the need for personalized therapeutic strategies. Long-term follow-up is crucial to assess sustained efficacy and safety of this approach.

GC4.145

Exploratory post hoc analysis of effect of GlucoLo Plus on average fasting glycemia and weight in the GLEEN randomized trial: Efficacy and Safety of GlucoLo Plus in Type 2 Diabetes Management

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Introduction - Objective: Diabetes is a chronic disease associated with many comorbidities including insulin resistance and excessive or anormal adiposity. GlucoLo Plus is a Complementary and Alternative Medicines (CAM) that has shown clinically significant HbA1c reduction in the GLEEN trial, a previously reported double-blind randomized placebo-controlled trial that evaluated the efficacy and safety of daily GlucoLo Plus. Several pharmacological agents and CAMs have traditionally been associated with weight gain. The data presented here is pertaining to the average fasting glycemia and weight effects of GlucoLo Plus.
Methods: The GLEEN Study was composed of 60 individuals with type 2 diabetes with a mean HbA1c 6.98% [52.8 mmol/mol], mean age 67.3 years [SD 9.5], 26 [43%] women, mean diabetes duration was 3.2 years, and mean body mass index 27.9 kg/m². Participants were randomly assigned to GlucoLo Plus (n=32 [53%]), or placebo (n=28 [47%]). The primary outcome of a significant HbA1c reduction of 0.843% was previously reported. The average fasting glycemia was evaluated by measuring the average morning fasting glycemia prior to the randomization and the monthly visits (3-day average fasting glycemia). The weight effects of GlucoLo Plus was assessed by calculating the difference between the weight of participants at randomization and at the end of the trial.

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Tab. 1. Effects of GlucoLo Plus on 3-day average fasting glycemia, glycosylated hemoglobin and weight during the GLEEN Trial.

	Beginning of Trial (Day 0)	End of Trial (Day 90)	Difference between beginning and end of trial (%)
3-day average fasting glycemia (mmol/L)			
Placebo	7.7	7.51	-2.46
GlucoLo Plus	7.92	7.00	-11.62
Weight (lbs)			
Placebo	183.39	183.61	0.12
GlucoLo Plus	169.5	167.66	-1.08
Glycosylated hemoglobin (HbA1c)			
Placebo	6.84	6.72	-1.75
GlucoLo Plus	7.10	6.28	-11.55

Results: At the end of the 12-week long GLEEN trial, GlucoLo Plus was associated with a 11.55 % HbA1c decrease (7.10 to 6.28%) and a 11.62% decrease in 3-day average fasting glycemia (7.92 to 7.00 mmol/L) while the placebo group had a 1.75% HbA1c decrease (6.84 to 6.72%) and a 2.46% decrease in the 3-day average fasting glycemia (7.7 to 7.51 mmol/L). Regarding the weight effect, GlucoLo Plus was associated with 1.08 % weight loss [(169.5 to 167.66 lbs) or (76.88 to 76.05 kg)] while the placebo arm was associated with a 0.12% weight gain [(183.39 to 183.61 lbs) or (83.18 to 83.28 kg)].
Conclusion: The results of this post-hoc analysis of the GLEEN Study confirms the efficacy of GlucoLo Plus in glycemic management with a clinically significant HbA1c and 3-day fasting glycemia effect of at least a 10% reduction. This post-hoc analysis also suggests that GlucoLo Plus is not associated with weight gain.

GC4.146

Are specific goals to improve diet and physical activity part of care management plans in primary care for type 2 diabetes patients? Evidence from practice

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Obesity is a risk for type 2 diabetes, and addressing it, among others, is a key component of an effective care management plan for people with diabetes. However, healthcare providers underestimate nutrition and other obesity-related factors in their care plans. The Patient Assessment of Care for Chronic Conditions was used to measure the perceptions of people living with diabetes about the management of their diseases by healthcare practitioners during the pandemic. The study was cross-sectional and included people with diabetes, age ≥45, receiving care in primary healthcare settings in Albania. Half of the participants were female. Most of the participants were people living with obesity, 76% of them treated diabetes only with oral medication. 95% had at least one other chronic condition, the most frequent were patients living with hypertension. The majority of participants had been diagnosed with the disease for more than ten years. They stated that healthcare professionals occasionally assist in setting specific goals to improve diet and physical activity. A written care plan with objectives and set skills to manage the disease was never given. They are never asked for their ideas about the treatment plan. 25% of participants did not know if they had eaten healthy during the pandemic. 97% did not know that people with obesity were more at risk for serious viral infections. A statistical relationship was found between education level and the role of nutrition in the management of type 2 diabetes. Participants stated that healthcare professionals never asked them if they were satisfied with the care plan. Specific goals to improve diet and physical activity as part of care management plans in primary care for people with diabetes are not part of clinical practice. It is recommended to educate people with diabetes as well as healthcare practitioners to include these goals in care treatment and actively engage them in their care plan.

GC4.147

Observational study on the prevalence of overweight and obesity in patients aged 18 and older, seen in general medicine, diabetology, internal medicine, and endocrinology consultations in both public and private sectors

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Objectives: Assess overweight and obesity prevalence for patients aged 18 years and older, seen in general medicine, Endocrinology and diabetology and internal medicine consultations in both public and private sectors in Algeria.
Methods: A national, multicentric, observational, cross-sectional epidemiological study was conducted with a representative sample of general practitioners and specialists in internal medicine, diabetology, and endocrinology in both public and private sectors in Algeria. Patients were selected regardless of their body mass index (BMI).
Results: 3547 subjects were enrolled in this study by endocrinologists and diabetologists (38.1%), general practitioners (31.1%), and internists (30.8%) from the public and private sectors in 5 health regions in Algeria. 73% of the included patients had a BMI ≥ 25 Kg/m^2. 36% were overweight (pre-obesity), and 37% were obese. The most common associated pathologies in overweight and obese patients were type 2 diabetes (53.6%, 50.1%), hypertension (37.4%, 47.7%), endocrine diseases (24.9%, 30.9%), dyslipidemia (22.2%, 28.1%), and osteoarthritis (15%, 25.2%). The current strategy for managing overweight/obesity is primarily based on diet and physical activity.
Conclusion: This study is the first representative analysis at the national level, aiming to estimate overweight and obesity prevalence.
The frequencies of overweight and obesity, along with associated pathologies, predict a future growth in healthcare expenses.
These results provide additional evidence of the need to establish strategies to deal with this issue, in order to modify the environment to be less conducive to weight gain and sedentary behavior.

GC4.148

Obesity and PCOS as an implication for diagnosis and treatment

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Introduction: Presently polycystic ovarian syndrome and obesity takes on epidemic proportions. With this clinical case report we are showing the benefits of GLP-1R agonist usage for the treatment of obesity in this specific group of patients. Weight reduction represents the most significant factor affecting pregnancy outcome and fertility. Our case is based on the positive results in patients affected by obesity, with or without diabetes. The administration of GLP-1 RA (liraglutide) alone or in combination with metformin has been investigated in a female patient living with obesity and PCOS. In this case there ware achieved significant weight loss and testosterone reduction, with mixed results relative to improvement in insulin resistance parameters and menstrual patterns.
Methods: Patient demographics, clinical outcomes, medication adherence, and potential side effects will be assessed to provide a comprehensive understanding of the impact of GLP-1 agonists in this specific population.
Conclusions: The weight loss effects of GLP-1 RA offer a unique opportunity to expand the treatment options available to PCOS patients living with obesity.

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GC4.149

Waist Circumference obesity and the risk of rheumatoid arthritis: a prospective cohort study of middle-aged women

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Objectives: There is an increasing trend of obesity globally, however its effect on rheumatoid arthritis(RA) development remains debatable. Overweight or obesity may affect the risk of RA through mediation by immune activation. Our aim was to evaluate the association between overweight, obesity in general, and abdominal obesity, and the risk for development of incident RA.
Methods: The UK Women's Cohort Study (UKWCS) is a large population-based, prospective cohort, which has collected demographic, anthropometric, dietary, lifestyle, and health-related information from 35,372 women aged 35-69 years. Body mass index(BMI; kg/m^2) and waist circumference (WC; cm) as exposures were used in conditional logistic regression models adjusting for smoking status, education levels and physical activity. Cases were matched to controls by age and time at entry to the study. BMI was categorized according to the World Health Organization (WHO) criteria: obesity (≥ 30 kg/m^2), overweight (25.0-29.9 kg/m^2), normal weight (18.5-24.9 kg/m^2), or underweight (<18.5 kg/m^2). Abdominal obesity was defined as waist circumference > 88 cm (women).
Results: 293 RA cases (12.2% with seropositive RA) and 879 matched controls were identified. The adjusted odds ratios (OR) per unit of BMI and waist circumference with RA risk were 1.03 (95% Confidence Interval (CI): 0.99,1.06) and 1.00 (95% CI: 0.98, 1.02). An association was observed for overweight individuals, with an adjusted OR 1.52(95%CI: 1.07, 2.13) when compared with those with normal weight. Women with abdominal obesity were associated with a 4 times increased risk of RA (OR= 4.24, 95% CI: 2.91, 6.17). This risk was especially notable in women under the age of 55 years OR: 8.43, 95%CI(4.88,14.56).
Conclusions: Our findings suggested that being overweight, or having abdominal obesity, were independently associated with an increased risk of RA. This appeared to be more relevant for younger women. These associations need to be examined in longitudinal studies further.

GC4.150

Health Profile of Sumo Wrestlers

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Introduction: Sumo wrestling, an ancient and sacred traditional sport in Japan with a 2000-year history, has recently become a worldwide sport. The International Sumo Federation was established in 1992 and has 88 member countries. The top ranked sumo wrestlers are from Japan and Mongolia. Sumo wrestlers are the heaviest athletes in the world. Their average weight is over 160 kg. The heaviest sumo wrestler weighed 293 kg. This review presents an update on the health profile of sumo wrestlers.
Methods: A systematic search of literature was conducted using the search terms sumo wrestlers, obesity, body composition, health profile, comorbidities, mortality, and life expectancy.
Results: Sumo wrestlers have a high body mass index. Their body composition shows high fat mass and high muscle mass. They also have high bone mineral content and high bone mineral density. Sumo wrestlers have a high resting energy expenditure, but their energy intake (up to 10,000 calories/day) exceeds their energy expenditure over a long period of time for the voluntary objective of weight gain. Because of the type of combats that they are involved in, many sumo wrestlers are at increased risk of multiple injuries including fractures. The most common location of injuries is the lower extremities. The heavy weight and the high fat mass (especially visceral fat) expose the sumo wrestlers to the development of several comorbidities such as insulin resistance, prediabetes, type 2 diabetes, hypertension, dyslipidemia, ischemic heart disease, and osteoarthritis. However, with intensive daily exercise, most sumo wrestlers can maintain normal serum glucose and triglycerides levels but without completely correcting their insulin resistance or normalizing their low serum high-density lipoprotein cholesterol levels. Japanese sumo wrestlers who are in the age group of 35-74 years have a significantly higher mortality rate in comparison to the control population. Cardiovascular diseases are the major cause of death in these people. The life expectancy of Japanese sumo wrestlers is around 65 years, at least 10 years shorter than controls.
Conclusion: Sumo wrestlers are exposed to multiple injuries including fractures and are predisposed to develop comorbidities such as insulin resistance, prediabetes, type 2 diabetes, hypertension, dyslipidemia, ischemic heart disease, and osteoarthritis. The comorbidities associated with excessive fat mass significantly shorten the life expectancy of sumo wrestlers.

GC4.151

Trends in the Utilization of Sodium-Glucose Co-Transporter 2 Inhibitors after Type 2 Diabetes diagnosis in South Korea

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Aims: This study aims to assess the usage trends of SGLT2i in South Korea.
Methods: Using the Korean national insurance claims database, we estimated the prevalence and proportion of SGLT2i use from January 2015 to December 2021. Additionally, we assessed the mean time to SGLT2i initiation following type 2 diabetes diagnosis, considering factors such as cardiovascular and renal disease (CVRD), from January 2015 to December 2019.
Results: From 2015 to 2021, there was an increase in both the number and proportion of SGLT2i users across various treatment types. Specifically, the use of SGLT2i in monotherapy increased from 1.0% to 4.5%, in double therapy from 3.2% to 16.1%, in triple therapy from 2.0% to 19.8%, and in quadruple or more therapies from 9.5% to 26.1%. This upward trend was evident among individuals with or without CVRD, with the most pronounced increase observed in those with heart failure (2.2% to 16.6%). However, despite these increases, the overall rate of SGLT2i use in 2021 was still low at 14.1%. The mean time from diabetes diagnosis to the initiation of SGLT2i treatment decreased from 249 days in 2015 to 158 days in 2019, consistently across sex, age, type of institution, and CVRD status.
Conclusion: In South Korea, there has been an increase in the use of SGLT2i, accompanied by a reduction in the initiation time for SGLT2i treatment. However, the overall utilization of SGLT2i remains relatively low, particularly among individuals with CVRD. This underscores the necessity for strategies to enhance awareness and improve access to SGLT2i, particularly for high-risk patient groups.

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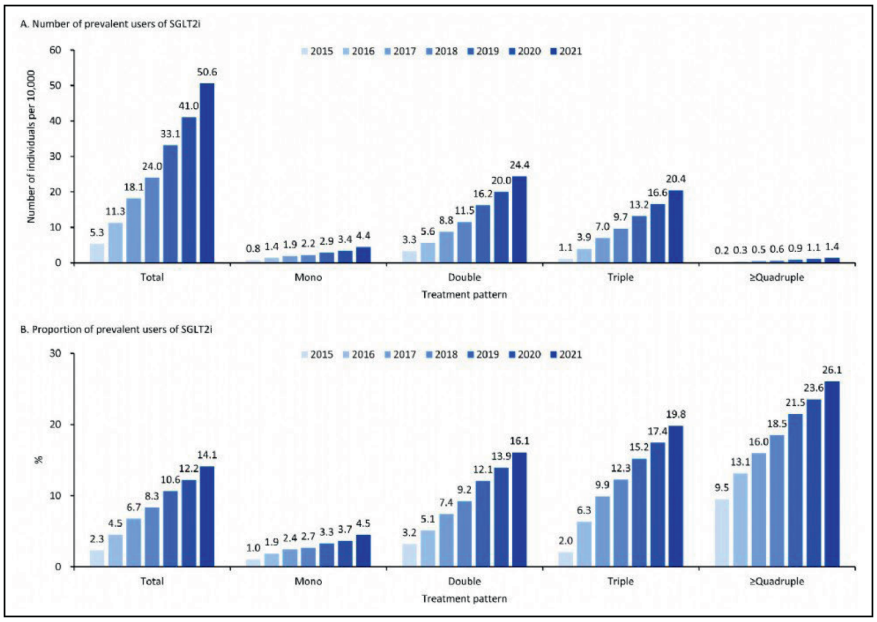


Fig. 1. Trends in the Utilization of Sodium-Glucose Co-Transporter 2 Inhibitors Based on Treatment Patterns.

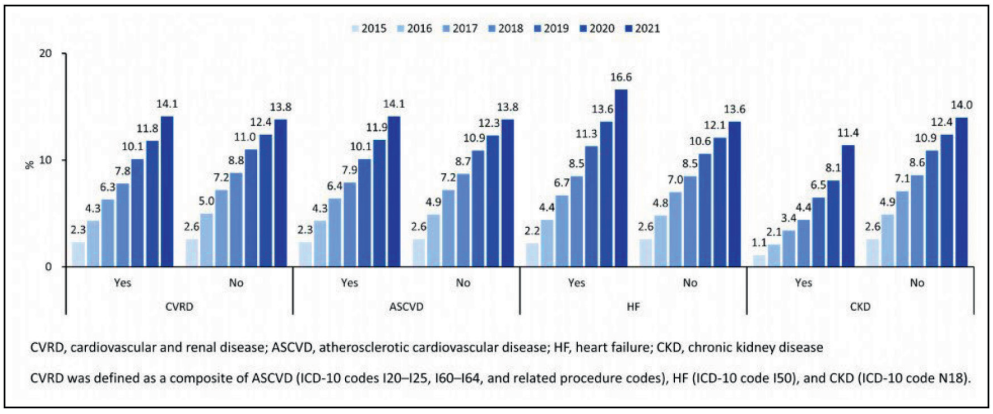


Fig. 2. Trends in the Utilization of Sodium-Glucose Co-Transporter 2 Inhibitors Based on Cardiovascular and Renal Disease Status.

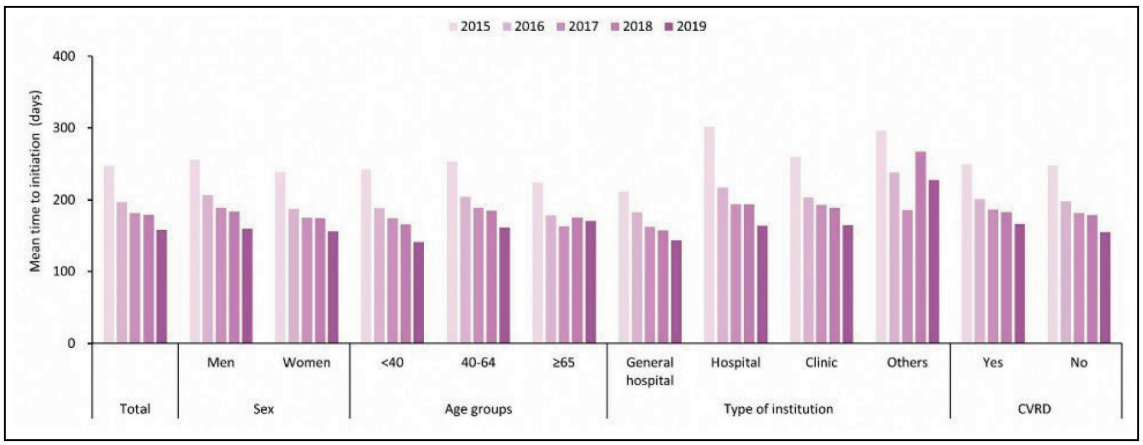


Fig. 3. Trends in the Mean Time from Diabetes Diagnosis to the Initiation of Sodium-Glucose Co-Transporter 2 Inhibitors.

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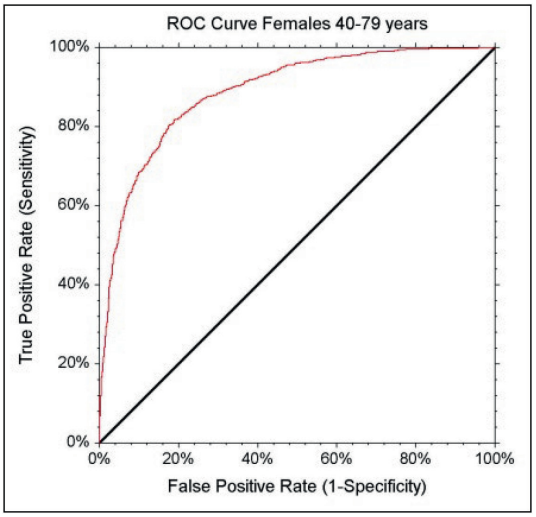
GC4.152

New BMI Cut-Off Points for Obesity in Middle-Aged and Older Adults in Nutrition Settings in Italy

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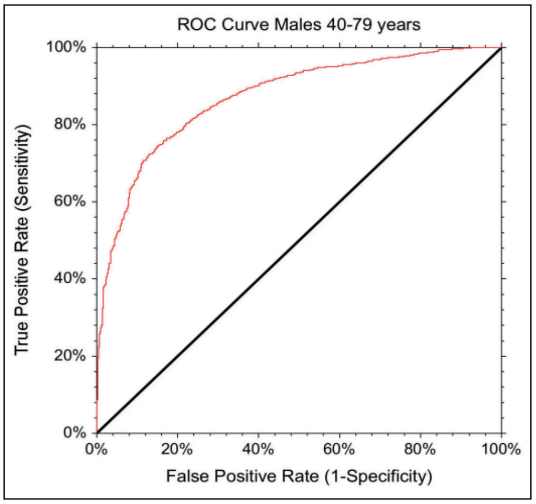
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Introduction: Obesity is a major health problem defined as an excess accumulation of body fat (BF). The World Health Organization (WHO) usually relies on a body mass index (BMI) ≥ 30 kg/m² as an indicator of obesity. Due to changes in body composition that occur across the lifespan, with an increase in BF and a decrease in lean mass, we aimed to test the validity of this BMI cut-off point for adiposity in middle-aged and older adults.
Methods: This study is composed of 4800 adults of mixed gender aged between 40 and 80 years, included (according to the WHO BMI classification) 1087 in normal-weight, 1826 with overweight, and 1887 with obesity who were referred to a clinical nutritional setting in Italy. The sample was then categorized by adiposity status based on the total BF% as measured by dual-energy X-ray absorptiometry (DXA), and the best sensitivity and specificity were attained for predicting obesity according to the receiver operating characteristic curve (ROC) analysis.
Results: The ROC analysis showed that the most appropriate BMI cut-off point for identifying obesity based on BF% was 27.08 kg/m² in females and 27.36 kg/m² in males, and area an under the curve (AUC) of 0.89 and 0.88 respectively indicating the excellent discriminating ability of BMI of nearly 90% chance of detecting obesity. Finally these cut-off points showed a high sensitivity (80.69%) and specificity (83.63%), indicating a low chance of false negatives and false positives.
Conclusions: In our study, we provide evidence that the optimal BMI cut-off point (i.e., ≥27 kg/m²) corresponding to obesity in a middle-aged and older mixed-gender clinical population in Italy varies from the widely used one (i.e., ≥30 kg/m²). Therefore, we recommend that this new cut-off point be applied in clinical settings when screening individuals for obesity in Italy.



Receiver operator characteristic curve in females for BMI cut-off point to detect obesity based on BF%.

Fig. 1.



Receiver operator characteristic curve in males for BMI cut-off point to detect obesity based on BF%.

Fig. 2.

GC4.153

The Risk of Sarcopenia among Adults with Normal-Weight Obesity in a Nutritional Management Setting

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Introduction: Normal-weight obesity (NWO) is a phenotype characterized by excessive body fat (BF) despite normal body weight. Therefore, the purpose of this study was to assess the risk of sarcopenia among patients with NWO within a clinical nutritional setting.
Methods: Two groups of patients with a normal body mass index [BMI (20–24.9 kg/m²)] were selected from a large cohort of participants. Body composition was measured using dual-energy X-ray absorptiometry (DXA), and 748 participants were categorized as NWO or normal-weight without obesity (NWNO) and were classed according to whether or not they were at risk of sarcopenia. The "NWO group" included 374 participants (cases), compared to 374 participants (controls) in the "NWNO group", all of a similar BMI, age and gender.
Results: The participants in the "NWO group" displayed a higher prevalence of the risk of sarcopenia than the control group across both genders (0.6% vs. 14.1% in males; 1.4% vs. 36.5% in females). Regression analysis showed that being in the NWO category increased the risk of sarcopenia 22-fold in males (RR = 22.27; 95%CI: 3.35–147.98) and 25-fold in females (RR = 25.22; 95%CI: 8.12–78.36), compared to those in the NWNO category.
Conclusions: In our study, we demonstrated that NWO syndrome is associated with the risk of sarcopenia in a normal weight population that may appear "healthy" in the first instance. For this reason, our findings emphasize that body composition measurements should be routinely assessed in nutritional settings, even among patients with a normal weight status, so as to identify whether they have the NWO phenotype, as well as the presence of sarcopenia.

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GC4.154

Clinical, DXA and MRI features of Asian men with metabolic syndrome and clinical partial lipodystrophy

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Introduction: Lipodystrophies, characterized by partial or generalized loss of subcutaneous adipose tissue (SAT) in the limbs with increased visceral adiposity, are associated with metabolic syndrome and diabetes. The diagnosis of partial lipodystrophy is challenging due to lack of established criteria and difficulty in differentiating from the normal android pattern of obesity in men.
Methods: We describe clinical features and imaging of 3 patients of Chinese ethnicity with symmetrical limb wasting suggesting possible partial lipodystrophy of the lower limbs. Measurement of skinfold thickness, bio-electrical impedance analysis, and body composition using dual-energy X-ray absorptiometry (DXA) and magnetic resonance imaging (MRI) were performed. For comparison, one male patient with diabetes with normal android pattern was recruited ('control').
Results: The BMI of the 3 patients with clinical partial lipodystrophy and the control patient were 28-30 kg/m^2. Two of the 3 patients had poorly controlled diabetes and high VAT with large abdominal fat depots, in association with subcutaneous fat wasting in the limbs as demonstrated by high VAT-to-SAT ratio, trunk to leg fat mass and % fat trunk-to-% fat leg ratios, and were thus likely to have partial lipodystrophy, in comparison to the control patient who had typical expected android pattern of obesity, higher thigh SAT volume and mild diabetes. Interesting, 1 of male patients with clinical partial lipodystrophy also had severe muscle wasting as well as SAT loss, suggesting a different underlying pathology. Despite an increased VAT, he did not have diabetes.
Conclusion: Our report illustrated the variability in presentation and challenges of diagnosis of partial lipodystrophy in men despite a similar BMI. DXA and MRI may be clinically helpful in characterizing the distribution of adiposity and quantifying the degree of fat and muscle wasting to aid in development of diagnostic criteria.

GC4.155

Frequency of sarcopenic obesity detected by ESPEN-EASO consensus statement in Brazilian adults with severe obesity

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Introduction: Sarcopenic obesity (SO) is defined as the co-existence of obesity and sarcopenia, marked by a decline in lean body mass accompanied by an excess of adipose tissue. SO is frequently observed in the elderly although it can occur at any stage of life. An increase in BMI and adipose tissue also play a crucial role in SO etiology. This may be particularly relevant in individuals with severe obesity. Nevertheless, the lack of standardized diagnostic criteria frequently leads to an important variation in SO prevalence. The purpose of this study was to evaluate the sensitivity and specificity of the ESPEN-EASO algorithm in adults with severe obesity, and to determine the prevalence of SO based on its diagnostic criteria.
Materials-Methods: Eighty adults (20-60 years; 59 women) with severe obesity (40-63.2kg/m^2) participants in the baseline of the clinical trial "Metabolic Adaptation during caloric restriction in obesity - MACRO" (Brazil) were included. Handgrip strength (HGS) was measured by dynamometry. Body fat mass (FM) and appendicular lean mass (ALM) was performed by dual-energy x-ray absorptiometry (DXA). ALM was adjusted by weight (ALM/W). The skeletal muscle function was evaluated by HGS adjusted by BMI. The diagnostic criteria for sarcopenic obesity was defined by the EASO-ESPEN consensus statement. Mean differences were evaluated by ANOVA followed by post-hoc Tukey. Sensitivity, specificity and predictive values of the screening step of the ESPEN-EASO algorithm were calculated using MedCalc.
Results: Participants were divided into 4 groups according to negative (-) or positive (+) screening (EES) and SO diagnostic: EES–SO– (n=26), EES–SO+ (n=7), EES+SO– (n=39) and EES+SO+ (n=8). The screening step demonstrated a sensitivity of 53.3% (95%CI: 26.6 - 78.7), specificity of 40.0% (95%CI: 28.0 - 52.9), and an accuracy of 42.5% (95%CI: 31.5 - 54.1). EES–SO+ group had higher BMI (mean ±SD: 50.8 ±6.8 kg/m^2) and FM (74.1 ±13.9kg) when compared to EES–SO– (43.8 ±3.8kg/m^2 and 60.7 ±7.5kg, respectively) and EES+SO– (44.4 ±3.5kg/m^2 and 61.6 ±9.7kg, respectively), irrespective of the screening step outcome. In both sexes, ALM/W was lower in the EES+SO+ group (19.6 ±2.9%) when compared to the EES–SO– group (23.6 ±3.6%; p= 0.03). Women in the EES–SO+ (0.48 ±0.07 p=0.03) and EES+SO+ (0.45 ±0.02 p=0.01) groups had mean HGS/BMI ratio significantly lower than EES–SO– (0.72 ±0.14). Men in the EES+SO+ group (0.71 ±0.17) also had lower HGS/BMI ratio than EES–SO– (1.07 ±0.20; p=0.01).
Conclusion: Preliminary findings indicated an SO prevalence of 18.7% regardless of the screening outcome. The sensitivity of the screening step in this population of individuals with severe obesity was low. Among individuals with negative screening results, those with SO had higher BMI and FM than those without SO. This suggests a potentially elevated risk of sarcopenia in individuals with a very high BMI and FM, irrespective of associated chronic conditions.

Reference

Donini LM, et al. Obes Facts 2022. DOI 10.1016/j.clnu.2021.11.014.

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GC4.156

Obesity and Weight Management Strategies in Persons Living with Type 2 Diabetes- An Epidemiological Cross-sectional Study

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Introduction: Obesity warrants the implementation of specific weight-loss strategies in all persons living with obesity and more so in those also living with type 2 diabetes (T2D). In Romania, data on the prevalence of obesity is only available for representative samples of general population while in T2D the data is limited. The objective of our study was to determine the prevalence of obesity class II and III- body mass index (BMI)≥35 kg/m^2 in adults with T2D and to identify weight loss strategies recommended in clinical practice according to BMI in this population.
Methods: This was an epidemiological, cross-sectional, descriptive study with individual data collected for adults (>18 years) with T2D from two regions in Romania. First 3 persons presenting for routine diabetes consultation in 4 investigational sites who accepted the participation and signed the informed consent were included until the allocated number of participants was reached. Data on diabetes and obesity history, weight variation during last 12 months, comorbidities, lab results and recommended treatments were collected. Weight, height and waist circumference (WC) were measured with standardized methodology. BMI was calculated as weight (kg)/height(m) 2.

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Results: In total, 755 participants with T2D were enrolled in the study. Two participants were excluded from the analysis (1 for protocol deviation and 1 for missing data on weight and WC). From 753 evaluated participants, 50.5% were males; mean age (standard deviation) was 64.2(9.2) years and with a diabetes duration of 9.8(7.1) years. Class II and III obesity had a prevalence of 24.3% (class II-15.9% and class III-8.4%), while 35.3% had a BMI of 30-34.9. Weight loss during last 12 months was reported by 50.3% participants and no weight change by 35.2%. As strategies for weight loss, 74.6% reported lifestyle changes only, 1.5% used anti-obesity medication and only 1 participant underwent bariatric surgery (while bariatric surgery was recommended in 2.8% of all participants and in 9.8% of those with a BMI≥35). Overall, 31.3% were treated with a glucagon-like peptide-1 receptor agonist (GLP-1 RA) and 33.3% with a sodium-glucose cotransporter-2 (SGLT2) inhibitor. Among those with a BMI≥35, 46.4% were treated with a GLP-1 RA and 25.1% with a SGLT2 inhibitor as compared with 26.5% and 36.0% in those with BMI<35 (p<0.001 and p=0.017, respectively).
Conclusion: Obesity class II and III is affecting 1 out of 4 persons living with T2D but specific drug and surgical strategies are rarely used in our population, the main supposed barrier being lack of reimbursement. The use of GLP-1 RA as antidiabetic medication is prioritized among those with a BMI≥35 compared with lower BMI but the percentage of those treated with this medication is still lower than expected. Efforts should be made to raise awareness on the potential benefits of weight loss in persons living with obesity and T2D and on the need for more intensive and effective available weight loss strategies.

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Prevalence of sarcopenic obesity using the ESPEN and EASO consensus statement criteria of 2022 in female outpatients with obesity

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Introduction: Co-existence of excess adiposity and low muscle mass/function is referred to sarcopenic obesity (SO), a condition increasingly recognized for its clinical and functional features that negatively affect clinical outcome.
This study aimed to investigate the prevalence of sarcopenic obesity, as defined by the European Society for Clinical Nutrition and Metabolism (ESPEN) and European Association for the Study of Obesity (EASO) consensus statement, in adult female outpatients with obesity (BMI≥30 kg/m²).
Methods: Four hundred and twenty eight females (age range 18-70 y) participated into the study (age 39.7±14.3 yrs, weight 101±19 kg, height 161±5 cm, BMI 39.2±7.3 kg/m²)
Maximal Hand Grip Strength (HGSm) for the right and left arms was measured with a handgrip dynamometer and body composition was estimated by bioimpedance analysis (BIA); fat free mass (FFM) and fat mass (FM) was calculated using the Sun equation and skeletal muscle mass (ASM) was calculated using by Janssen equation.
Sarcopenic obesity was determined using the ESPEN and EASO consensus statement (group sarco1:FM≥ 43% and ASM ≤27.6% and HG≤20 kg, group sarco 2: FM≥ 43% and ASM ≤27.6% and HG≤16 kg).
Results: mean FFM was 54.0±7.3 kg, FM 47.2±13.4 kg, FM% 45.9±5.0%, HGS was 23.7±5.3 kg; mean SM was 24.1±3.4 kg and ASM was 24.2±3.5 %. FM≥ 43% was found in 308 (72%) patients; ASM ≤27.6% was found in 363 (84.8%) patients; HG≤20 kg was found in 121 (28.3%) patients and HG≤16 kg in 37 (8.6%) patients.
So, the prevalence rate of sarcopenic obesity was 22.0% (94 patients) in group sarco1, whereas in group sarco2 the prevalence rate was 6.3 % (27 patients). We found a significant difference for age between groups (group sarco 1 42.0±17.1 yrs vs group 2 47.3±16.1 yrs, p=0.038).
Conclusion: Our preliminary findings show that the prevalence rate of sarcopenic obesity was different using different cut.off of HG. Presence of sarcopenia is associated with age even in adults non ederly patients. However, further studies are needed to determine whether the prevalence of SO is associated with other functional and clinical parameters.

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A treat-to-target approach for obesity management: exploring potential treatment targets using real-world data

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Introduction: Unlike many other chronic diseases, obesity lacks an overall treatment target that can drive healthcare and policy decisions. We compared different adiposity measures for indicating whether a low reference risk of obesity-related complications (ORCs) was reached after weight change and to suggest an obesity treatment target that can act as a proxy for achieving low absolute ORC risk.
Methods: We conducted a retrospective cohort study of adults (aged ≥18–≤60 years) with a body mass index (BMI) ≥25 kg/m², using the UK Clinical Practice Research Datalink (UK CPRD Aurum). During a 3-year baseline period (1 Jan 2010–31 Dec 2014), changes in anthropometric adiposity measures (BMI, waist–height ratio [WHtR], weight and waist circumference) were recorded. ORCs evaluated were type 2 diabetes (T2D), hypertension, hip/knee osteoarthritis (OA) and atherosclerotic cardiovascular disease (ASCVD). Data on incident ORCs were collected during follow-up. Low absolute 10-year risk was derived from age- and sex-specific 10-year incidence of each ORC in people with a BMI <30 kg/m². Area under the receiver operating characteristics curve (AUC) was used to compare the use of different anthropometric adiposity measures as a proxy to indicate whether a low disease risk status was reached. Absolute adiposity measures included BMI, WHtR, waist circumference and weight after weight change; relative change measures included percentage change in weight and waist circumference over 3 years. A treatment target was identified by comparing true positive rates (TPRs) with true negative rates (TNRs) for each adiposity measure and achieving low ORC risk status following weight change, to differentiate those who did or did not achieve low 10-year risk with each cutoff.
Results: Data were from 36,168 individuals, and mean follow-up time was 6.3 years. Few individuals were prescribed weight management medication (5.9%) or referred for bariatric surgery (0.4%). After a change in weight, AUC was higher for absolute measures of BMI and WHtR than percentage change in weight and waist circumference for all four ORCs (Figure). For incident ASCVD, AUC was highest with WHtR; for hip/knee OA, AUC was highest with BMI; and for T2D and hypertension, AUC was equally high with BMI and WHtR. Different BMI and WHtR cutoffs were investigated as indicators of low absolute risk of incident ORCs after weight loss; for example, a BMI of 27 kg/m² had a TPR of 34–99% (lowest for ASCVD) and TNR of 80–84%, and a WHtR of 0.53 had a TPR of 44–93% (lowest for hip/knee OA) and TNR of 84–89% (Table).
Conclusion: Absolute measures of BMI and WHtR were more accurate indicators of achieving a low 10-year ORC risk than percentage change in weight or waist circumference, revealing the first step towards a treatment target in obesity management. BMI was a better indicator for hip/knee OA risk, WHtR was a better indicator for ASCVD risk, and both BMI and WHtR were equally good indicators for T2D and hypertension risk. A BMI of 27 kg/m² and/or WHtR of 0.53 after weight loss were good indicators of low incident T2D, hypertension, hip/knee OA and ASCVD risk.

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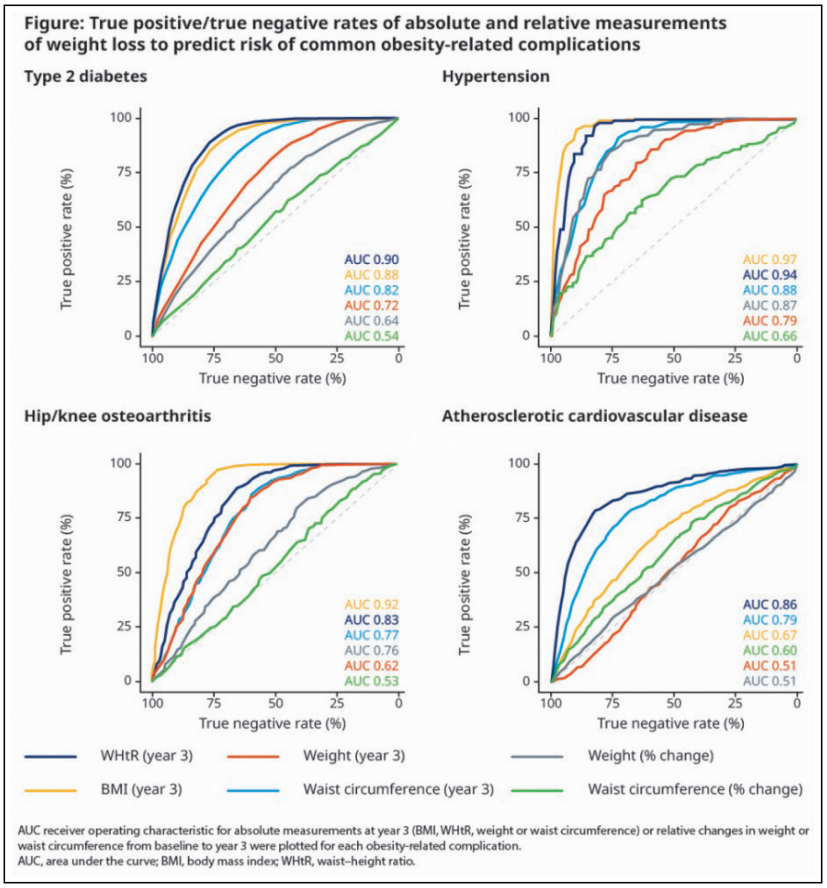


Fig. 1.

Tab. 1.

Table: True positive/true negative rates for different body mass index and waist–height ratio cutoffs as indicators of low absolute risk of common obesity-related complications after weight loss

	Body mass index (kg/m²)				Waist–height ratio					
	26		27		0.52		0.53		0.54	
	TPR (%)	TNR (%)	TPR (%)	TNR (%)	TPR (%)	TNR (%)	TPR (%)	TNR (%)	TPR (%)	TNR (%)
T2D	48	92	70	84	57	91	69	88	78	84
Hypertension	95	89	99	80	86	88	93	84	99	79
Hip/knee OA	67	91	84	84	36	91	44	88	54	84
ASCVD	21	91	34	84	59	92	67	89	73	85

ASVCD, atherosclerotic cardiovascular disease; OA, osteoarthritis; T2D, type 2 diabetes; TNR, true negative rate; TPR, true positive rate.

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Heterogeneity in the association between different adiposity measures and incident obesity-related complications, and the role of body fat distribution: a population-based cohort study

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Introduction: Obesity-related complications (ORCs) are associated with health and economic burden. It is important to understand the relationship between adiposity measures and the risk of ORCs to help develop treatment targets and personalised treatment strategies for the management of obesity. This study examined the association of baseline body mass index (BMI) and waist–height ratio (WHtR) with the risk of developing four ORCs.

Methods: This retrospective cohort study used the United Kingdom Clinical Practice Research Datalink (UK CPRD Aurum). Individuals aged ≥18–≤60 years at the index date (earliest date between 1 Jan 2010 and 31 Dec 2014 at which all inclusion and exclusion criteria were fulfilled) with a BMI ≥25 kg/m², and ≥1 WHtR and ≥1 BMI measurement available during the baseline year prior to the index date were included. Individuals with SNOMED CT codes relating to cancer, limb amputation, pregnancy or unintentional weight loss at baseline were excluded. ORCs evaluated were type 2 diabetes (T2D), hypertension, hip/knee osteoarthritis (OA) and atherosclerotic cardiovascular disease (ASCVD). Cox proportional hazard regression analysis was used to assess the association between BMI and WHtR and the risk of developing incident T2D, hypertension, hip/knee OA or ASCVD. Analyses were adjusted for age, sex, and baseline T2D, hypertension and dyslipidaemia status; models included quadratic and interaction terms of anthropometric measures. BMI and WHtR were standardised so associations per 1 standard deviation (SD) could be compared.

Results: This analysis included 305,496 individuals; 48.3% were women, the median age was 49 years, and 49.1% were living with obesity (Table). The mean (±SD) follow-up time was 8.1±3.1 years, during which there were 11.5, 30.5, 10.8 and 5.8 incident diagnoses per 1,000 patient-years of T2D, hypertension, hip/knee OA and ASCVD, respectively. The adjusted hazard ratios (HR) for the association with incident T2D, hypertension and ASCVD risk were higher for WHtR compared with BMI, per increases of 1 SD (Figure). Among these ORCs, the difference in HR between WHtR and BMI was greatest for T2D, followed by ASCVD, in which the HR for BMI was below 1.0; for hypertension, the difference between HRs for WHtR and BMI was smaller. Conversely, the HR for the association with hip/knee OA risk was higher for BMI than WHtR, per increases of 1 SD (Figure). Among other measures, increased age (5 years), male sex, and presence of dyslipidaemia were associated with a higher risk of T2D, hypertension and ASCVD, and increased age was associated with hip/knee OA risk (Figure).

Conclusion: Body fat distribution, as measured by WHtR, contributes to the risk of developing ORCs in addition to excess body weight. The risks of developing T2D, hypertension and ASCVD were more strongly associated with baseline WHtR than BMI, and the risk of hip/knee OA was more strongly associated with BMI. These findings may help inform obesity management strategies to aid the reduction in incidence or prevention of certain ORCs. The next step is to understand how changes in these adiposity measures affect the risk of developing ORCs.

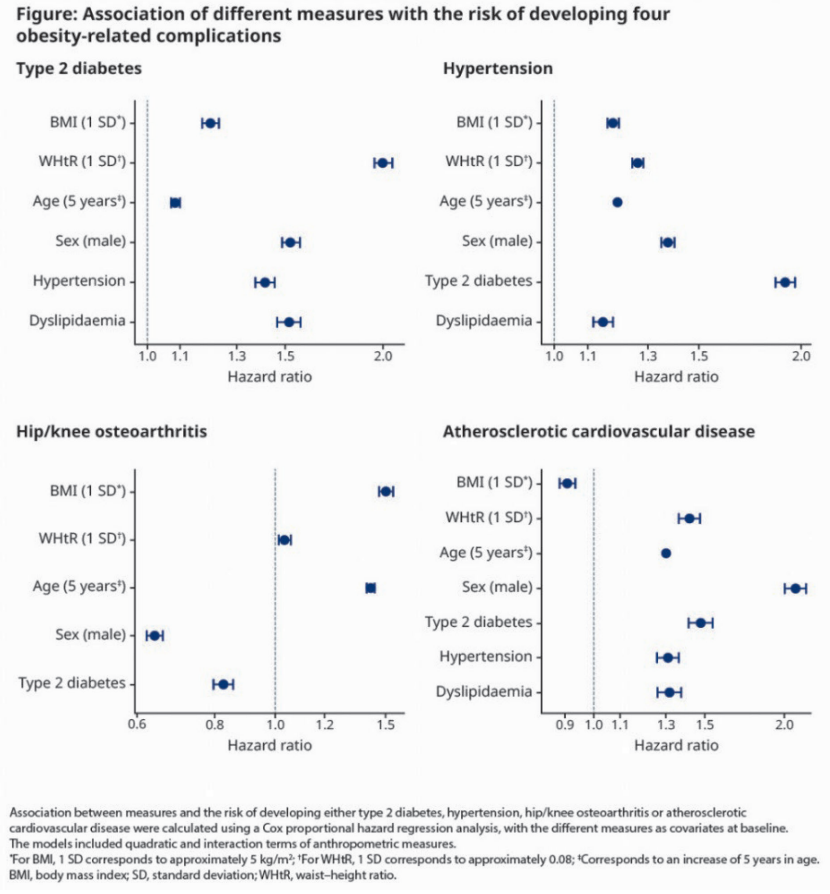


Fig. 1. Association of different measures with the risk of developing four obesity-related complications.

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Tab. 1. Baseline characteristics.

Table: Baseline characteristics

	All participants (N=305,496)
Women, n (%)	147,595 (48.3)
Age, years	49 (43, 55)
Weight, kg	87 (77, 99)
Body mass index, kg/m²	29.9 (27.3, 33.7)
Waist–height ratio	0.58 (0.54, 0.64)
Baseline weight status, n (%)	
Overweight	155,688 (51.0)
Obesity class I	89,730 (29.4)
Obesity class II	37,773 (12.4)
Obesity class III	22,305 (7.3)
Comorbidities at baseline, n (%)*	
Dyslipidaemia	50,612 (16.6)
Hypertension	75,618 (24.8)
Type 2 diabetes	43,049 (14.1)
Hip/knee osteoarthritis	13,981 (4.6)
Atherosclerotic cardiovascular disease	11,466 (3.8)

Data are median (interquartile range [quartile 1, quartile 3]) unless otherwise stated.

*Comorbidities were recorded at the start of the follow-up period (following the index date).

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Epicardial fat thickness is increased in menopausal patients in comparison with premenopausal patients with similar weight excess: a cross-sectional study

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Introduction: nowadays, weight excess and aging are extremely common in the western countries. Both are associated to increased metabolic syndrome prevalence and increased cardiovascular risk. BMI and waist circumference may be not ideal instruments to identify the menopausal female patients affected by weight access who have ectopic fat deposition, that may lead to an increased cardiovascular risk. Our aim is to compare women with overweight and obesity during fertile age and menopause, and identify parameters easily accessible in the clinical settings associated to ectopic fat deposition.
Methods: female patients with weight excess were enrolled among patients referred to the CASCO Center (High Specialization Centre for the Care of Obesity) in Umberto I polyclinic, Rome, Italy. All patients underwent a DXA scan and a cardiac ultrasound, in addition to blood tests to confirm menopausal status, check metabolic profile and assess hepatic steatosis with indirect measurements (Fatty liver index, NAFLD-LFS and HI).
Results: 1392 female patients with overweight or obesity were enrolled. 775 were in the pre-menopausal time, and 617 in the post-menopausal time. Our two cohorts did not differ for body mass index (BMI) nor total body fat and lean mass nor waist circumference. Anyway, a worse waist-to-hip ratio was noted in the post-menopausal group, and it was confirmed by increased trunk fat percentage, that suggests an increase in visceral fat deposition. Epicardial fat thickness was significantly increased in the post-menopausal group. Regarding the metabolic profile, fasting glucose was altered in the post-menopausal group, with an impaired fasting glucose, which was not present in the younger age group. Blood pressure and lipid profile were worsened in the post- menopausal group. According to Fatty liver index, NAFLD-LFS and HIS, hepatic steatosis was present in both groups, but only fatty liver index indicated a higher hepatic fat deposition in the post-menopausal group.
Conclusion: The study's findings underscore a significant association between menopause and the exacerbation of metabolic alterations found in obesity, accompanied by remodelling of adipose tissue. This restructuring leads to an augmented deposition of visceral fat, as demonstrated by the increased waist-to-hip ratio, trunk fat and epicardial fat thickness. Notably, these alterations are greater in menopausal women compared to their pre-menopausal counterparts despite similar BMI and waist circumference. Epicardial fat thickness is a reliable parameter for assessing ectopic fat deposition, and the non-invasive nature of its measurement using ultrasound makes it a practical and repeatable tool in clinical settings where more advanced imaging techniques may not be readily available.

GC4.161

Are variants of the *RBP4* gene associated with atherosclerosis risk expressed by carotid intima-media thickness in women with obesity?

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Introduction: Numerous adipokines, hormones produced by adipose tissue, have been related to various adverse health consequences, including vascular and atherothrombotic symptoms. One of the intriguing adipokines is retinol binding protein-4 (RBP4), which is secreted in the liver and adipose tissue, and – although previously seemed to be primarily related to insulin resistance – it is correlated with increased cardiovascular risk, particularly in individuals with obesity. It has been proposed that *RBP4* gene polymorphisms influence a higher obesity incidence, insulin resistance, hyperinsulinemia, T2DM, and artery thickness. The purpose of our study was to investigate the correlation between *RBP4* gene four selected genetic variants - rs10882273; rs3758538; rs3758539, and

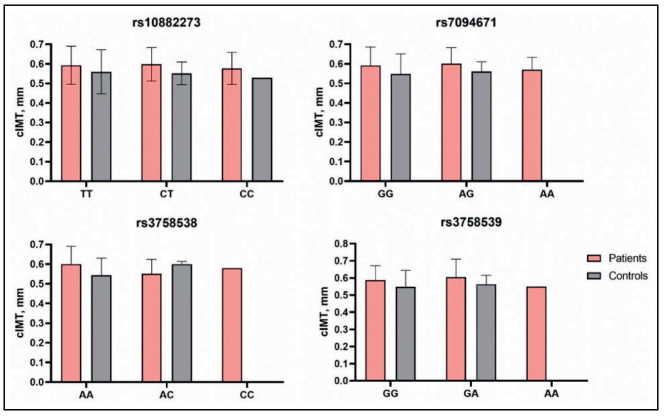


Fig. 1. cIMT results for {RBP4} gene variants in a studied groups.

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rs7094671 - and carotid intima-media thickness (cIMT) values (a marker of subclinical atherosclerosis) among women with obesity.
Methods: 74 female patients between 30-50 years of age with obesity (body mass index, BMI, ≥30.00 kg/m^2 and increased body fat-mass content) were recruited into the study group and 24 women in the same age range with normal body weight (BMI 18.50–24.99 kg/m^2) were chosen as the control group. Genomic DNA from all participants was isolated from peripheral blood and for genotyping of the *RBP4* gene variants in position c.*1539 (rs10882273), c.356-1825 (rs7094671), c.697-1781 (rs3758538), and c.4406G>A (rs3758539) Sanger sequencing analysis was performed. The right common carotid arteries' intima-media thickness was measured using a GE Vivid S6 ultrasound equipment and a 2.4-10-MHz Linear Array Probe.
Results: cIMT did not differ between two groups (p=0.071). The allele frequencies for all variants did not show statistically significant differences between study group, control group and European population data. The correlation results of cIMT values with genetic variants of the *RBP4* gene are presented in Figure 1; however, no significant differences were observed. For variants rs7094671, rs3758538, and rs3758539, minor homozygotes (AA, CC, and AA, respectively) were not present in controls.
Conclusions: Genetic variants rs10882273, rs3758538, rs3758539, and rs7094671 of the *RBP4* gene are not associated with cIMT values among women with obesity. More studies are needed to state whether *RBP4* gene variants have a predictive value for cIMT as a marker of subclinical atherosclerosis.

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Conflict of Interest: None Disclosed. Funding: Large research grant from statutory funding for young researchers - Doctoral School, Poznan University of Medical Sciences (no. SDUM-GB3/03/21).

GC4.162

Association between ICAM-1, VCAM-1, and CRP concentrations and risk of atherosclerosis expressed by carotid intima-media thickness in women with obesity

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Introduction: Chronic vascular inflammation plays a critical role in the development of atherosclerosis. It begins with the endothelial secretion of proinflammatory cell surface adhesion molecules or proinflammatory factors, e.g. intracellular adhesion molecule 1 (ICAM-1), vascular cell adhesion molecule 1 (VCAM-1) or C-reactive protein (CRP). Moreover, currently available studies have found their association with the increased intima media thickness of the right common carotid artery (cIMT) values, which constitutes a useful clinical tool for the detection of early-state atherosclerosis. Furher, some gender differences were observed in the association between inflammation and atherosclerosis.

Tab. 1. Comparison of ICAM-1, VCAM-1, and CRP concentrations depending on median cIMT values in both groups.

	< cIMT median	> cIMT median	p
Study group			
ICAM-1, pg/mL	48772.57±26729.50	45792.27±36439.99	0.303
VCAM-1, µg/mL	911954.80±342388.80	761360.0±307695.20	0.073
CRP, mg/dl	7.20±6.69	5.50±5.76	0.231
Control group			
ICAM-1, pg/mL	34685.86±15867.89	33848.43±16582.81	0.820
VCAM-1, µg/mL	808037.10±192469.40	696255.80±142893.20	0.118
CRP, mg/dl	1.25±1.05	0.84±0.51	0.992

Methods: The study group (SG) included 64 women under 50 years of age with obesity and 25 women under 50 years of age with normal body weight were recruited as a control group (CG). The cIMT was determined by using the GE Vivid S6 Ultrasound Machine with the 2.4-10-MHz Linear Array Probe. The CRP, VCAM-1 and ICAM-1 concentrations were determined using an enzyme-linked immunosorbent assay (ELISA).
Results: The SG had significantly higher concentrations of CRP (4.60 vs. 0.90, p<0.001) with no significant differences in VCAM-1 (753738.30 vs. 810444.90 µg/mL), and ICAM-1 (37907.00 vs. 31807.30 pg/mL) concentrations compared to CG. No differences were also observed in the cIMT values (p=0.071). Therefore, as no differences in cIMT were observed between two studied groups, we decided to divide both groups in regard to median cIMT. In both groups, no significant correlation was observed between ICAM-1, VCAM-1, or CRP and median cIMT. Interestingly, in both groups women with lower cIMT values presented increased concentrations of proinflammatory factors.
Conclusion: Although some differences were observed in the inflammatory state between women with an without obesity, they seem to not affect the subclinical atherosclerosis risk expressed as cIMT values.

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GC4.163

Usefulness of morphofunctional assessment techniques in clinical practice with patients with obesity and metabolic diseases

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Introduction: Obesity is a chronic metabolic disease that causes changes in body composition and functionality of patients. Classical parameters such as weight, BMI or anthropometry do not allow a complete assessment of body composition, so advanced techniques have emerged for the morphofunctional assessment of patients such as nutritional ultrasound®, bioimpedancemetry (BIA) and hand-grip dynamometry (HGS).
Objectives: To evaluate the usefulness of morphofunctional assessment techniques in patients with obesity in our routine clinical practice. To determine the correlation between the different assessment techniques.
Methods: Prospective study of patients attending the "Obesity Unit" of Hospital Quirónsalud Málaga. Morphofunctional data were evaluated using ultrasound (Mindray® Z60), bioimpedance (BIVA Akern® Nutrilab) and hand-grip dynamometer (Jammar®).
Results: 178 patients were included (69.7% female and 30.3% male), with a mean BMI of 36.7± 6.20 kg/m^2. The American Association of Clinical

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Tab. 1. morphofunctional assessment.

BIA Data	Male	Female
FM (%)	35.9 ± 6.56	45.4 ± 5.39
BCM (kg)	42.4 ± 7.76	27.6 ± 3.57
SMI (cm^2/m^2)	11.5 ± 1.78	8.32 ± 1.21
ASMM (kg)	31.3 ± 4.97	20.6 ± 3.06
PhA (°)	6.40 ± 0.96	6.08 ± 0.70
Nutritional & Muscle Ultrasound Data		
RF-CSA (cm^2)	6.11 ± 1.70	4.42 ± 1.10
RF-Yaxis (cm)	1.93 ± 0.39	1.59 ± 0.30
L-SAT (cm)	1.34 ± 0.79	2.02 ± 0.56
Abdominal T-SAT (cm)	2.83 ± 1.15	3.20 ± 0.84
S-SAT (cm)	1.41 ± 0.58	1.67 ± 0.56
VAT (cm)	1.20 ± 0.65	1.08 ± 0.48
HGS (kg)	39.5 ± 8.68	20.9 ± 5.20

Endocrinologists (AACE) scale found 15.7% of patients with Grade 0, 543.8% with Grade 1 and 40.4% with Grade 2.
Through morphofunctional assessment we obtain BIA data (in males and females respectively):
FM (%) 35.9 ± 6.56 45.4 ± 5.39
BCM (kg) 42.4 ± 7.76 27.6 ± 3.57
SMI (cm^2/m^2) 11.5 ± 1.78 8.32 ± 1.21
ASMM (kg) 31.3 ± 4.97 20.6 ± 3.06
PhA (°) 6.40 ± 0.96 6.08 ± 0.70
Nutritional & Muscle Ultrasound Data
RF-CSA (cm^2) 6.11 ± 1.70 4.42 ± 1.10
RF-Yaxis (cm) 1.93 ± 0.39 1.59 ± 0.30
L-SAT (cm) 1.34 ± 0.79 2.02 ± 0.56
Abdominal T-SAT (cm) 2.83 ± 1.15 3.20 ± 0.84
S-SAT (cm) 1.41 ± 0.58 1.67 ± 0.56
VAT (cm) 1.20 ± 0.65 1.08 ± 0.48
HGS (kg) 39.5 ± 8.68 20.9 ± 5.20
We can observe a significant correlation ($p<0.05$) between the morphofunctional assessment techniques. In the muscle mass component; RF-CSA with BCM, SMI, ASMM and HGS (r=0.65, r=0.55, r=0.60, r=0.55), HGS with BCM, SMI, ASMM, RF-CSA and RF-Yaxis (r=0.75, r=0.62, r=0.71, r=0.55, r=0.47). In the fat mass component FM(%) with L-SAT (r=0.66).
Conclusions: It is useful to incorporate morphofunctional assessment techniques into clinical practice in patients with obesity and metabolic diseases. They allow us to know the body composition and functionality of patients, thus enabling individualised monitoring and treatment. Furthermore, there is a good and significant correlation between the assessment techniques.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.164

Phenotype of malnutrition in patients with obesity on hospital admission

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Introduction: The prevalence of hospital malnutrition is also high in people with Obesity. Widespread screening programmes for malnutrition risk, when considering BMI, pay less attention to these patients. Obesity has also been recognised as harmful to health and associated with increased mortality and morbidity.
in the last few years, new nutritional assessment tools have been introduced to complement previous screening methods.
Objectives: Phenotyping of hospital malnutrition in patients with obesity (BMI>=30) and linking it to the search for new screening methods (dynamometry and BIA).
Material-Methods: Retrospective descriptive study of 100 patients admitted to Hospital QuirónSalud Málaga in 2021. A complete nutritional assessment (Malnutrition Universal Screening Tool - MUST and Subjective Global Assessment - SGA) was performed, including bioimpedancemetry (BIA Akern Nutrilab®) and hand-grip dynamometry (Jamar®).
Results: N=100 patients: 50 females and 50 males, mean age 61.8±13.2 years, BMI 33.5±3.5kg/m^2.
Nutritional screening and assessment:
- MUST: Low risk (77%), Moderate risk (17%), High risk (6%).
- SGA: A (67%), B (27%), C (6%).
- ICD10: No malnutrition (75%), Unspecified (5%), Mild or moderate calorie-protein malnutrition (10%), Severe protein or calorie malnutrition (10%).
- 8% of the patients died.
- A diagnostic cut-off point for malnutrition was obtained with dynamometry: 35kg in men and 23kg in women (S76.7% E100% AUC0.908) (S57.89% E100% AUC0.793).
- And with BCMI: 11.6 in men and 8.4 in women (S79.5% E84.6% AUC0.841) (S97.5% E52.6% AUC0.762).

Conclusions: The diagnosis of obesity in hospitalised patients is essential to reduce costs and prolonged stays, and sometimes goes unnoticed. In our sample, 33% of patients with Obesity were found to be at risk of malnutrition, and 25% were diagnosed as malnourished. Dynamometry and bioimpedance would complement routine clinical practice as a screening technique in patients with Obesity.

Tab. 1.

	SGA A (N=67)	SGA B AND C (N=33)
AGE	60.2±13.2	69.5±11.7
BMI	33.5±4.05	33.1±3.01
WEIGHT	93.2±14.9	88.1±9.79
WEIGHT LOSS %	-3.18±9.42	0.3±9.77
HOSPITAL STAY	5.78±6.56	17.7±13.4 (p<00.1)
EXITUS	0	8
ALBUMIN AND PCR	3.72±0.5 y 3.79±5	2.98±0.5 and 9.29±7.5 (p<00.1)
PhA and SPhA	6.4±1.3 +0.5±0.9	4.73±1.2 -0.9±1.4 (p<00.1)
FM kg and %	32.6±10 34.8±9	32±8 37.6±8
NUTRITION SCORE AND BCM	1020±275 y 34±9.5	745±220 and 24.3±7.2 (p<00.1)
HYDRATION SCORE AND ECW%.	73.8±2 y 44.6±5.5	76.5±4.6 and 53.3±7.6 (p<00.1)
DYNAMOMETRY	32.9±10.8	20.9±6.87 (p<00.1)

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GC4.165

The Indicators of Obesity and Metabolic Syndrome: The comparison of discrimination power among BodyMass Index, Waist circumference, Waist-Height ratio

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Introduction: Previous studies have reported that waist-to-height ratio (WHtR) is a better predictor of cardiovascular risk than body mass index (BMI) and waist circumference (WC); however, a recent report questioned the predictive superiority of WHtR over BMI and WC. The aim of this study was to identify the best anthropometric predictor among three indicators of metabolic syndrome.
Materials-Methods: We analyzed 6,160 people with Obesity from the second year of the 4th Korea National Health and Nutrition Examination Survey(4th KNHANES). We carried out receiver-operating characteristic analysis and compared area under the curves (AUCs) of BMI, WC, and WHtR.
Results: Across all ages, the AUC of WHtR was the largest among obesity indicators(men:0.813, women:0.844), suggesting it was most able to predict metabolic syndrome. However, after adjustment for age, WC became the strongest predictor for metabolic syndrome(men:0.834, women:0.876) among them. After age stratification of the study population (19-39 yrs,40-64 yrs, ≥65 yrs), the three obesity indices had similar predictive power in young women. In young and middle-aged men, and middle- and old-aged women, WC and WHtR were equivalent in their predictive ability but significantly higher than BMI.
Conclusion: Therefore, when evaluating adult obesity and metabolic syndrome, the indicator WHtR is not inferior to WC and BMI. Adults with actual visceral obesity are underdiagnosed because their body fat is high even though their BMI and WC are within the normal range. Additionally, even though the BMI is high, the body size is large and overdiagnosis occurs. In fact, for people without obesity, the WHtR as indicator of obesity and metabolic syndrome may be able to compensate for the blind spot of underdiagnosis or overdiagnosis.

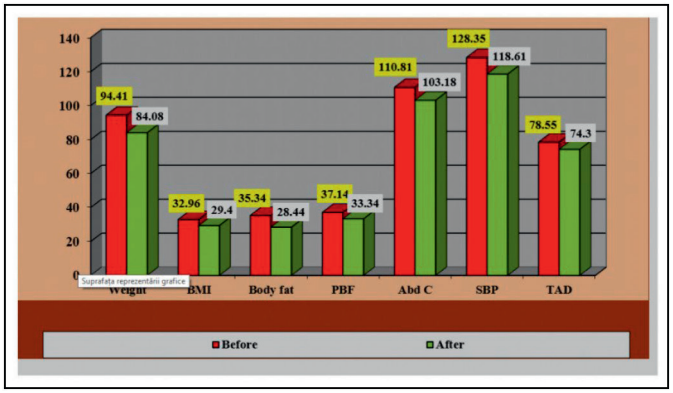
GC4.166

Low calorie diet: the effect on the anthropometric parameters, micro and macro nutrients' intake - results from an interventional study

Posea, M.[1]; *Radulian, G.*[2]

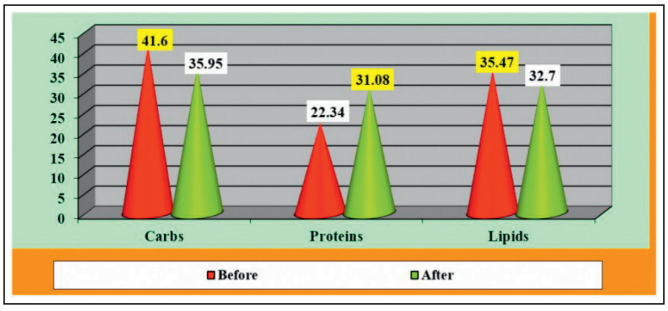
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Introduction: According to WHO European regional Obesity Report 2022, overweight and obesity affect almost 60% of adults and nearly one in three children (29% of boys and 27% of girls)in the WHO European Region.
Low calorie diet is part of the obesity care and should be utilized in decisions shared with patients.
Methods: 238 participants living with pre-obesity and obesity (69 men,169 women) were recruited from a clinic of nutrition. Using a 7-day food log we assessed vitamins and minerals. We measured the body weight with a body analyzer, abdominal circumference, arterial blood pressure and calculated body mass index. The participants followed a hypocaloric diet under supervision of the medical doctor specialized in nutrition.
Results: All mean anthropometric parameters got better by the end of the intervention (p<0,001): body weight from 94.41 to 84.08 kg, BMI from 35.34 to 28.44 kg/m^2, weight of body fat from 40.07 kg to 31.55 kg, percent of body fat from 37,14 % la 33,44 %, abdominal circumference from 110,81 cm la 103,18 cm, systolic arterial tension from 128,35 la 118,618 mmHg, diastolic arterial tension from 78,55 to 74,3 mmHg.
The mean energy intake decreased from 1835.76 to 1222.28 kcal/day as well as sodium intake, from 3159 mg to 2561 mg/day (p<0.01). The macronutrient intake also changed: mean carbs intake decreased from 41.6 to 35.95 % (p<0.01), as well as lipids (from 35.47 la 32.7%, p=0.01). Only proteins increased from a mean intake of 22.34 to 31.08%, p<0.01). The mean intake for B1 and B9 vitamin decreased significantly from 152.67% to 129.61%, (p<0.01) respectively from 94.07% la 79.54%, (p=0.05). The level from food of calcium (79.8 to 68.81 % from daily recommended intake-DRI), magnesium (79.5 to 71.86% of DRI), iron (125.23 to 105.7% of DRI) and copper (138.27 to 120.37 % of DRI), was lower at the end of the intervention, p<0.01. The other vitamins and minerals did not change significantly.
Conclusion: The patients obtained the 2-digit weight loss and still maintained a healthy diet, with an intake within the recommended limits of vitamins and minerals, even they were on a low-calorie diet.



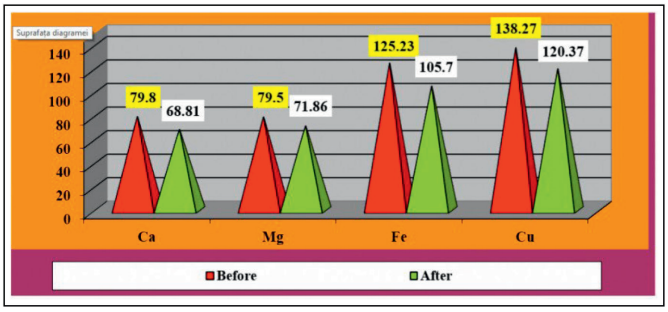
Anthropometric data before and after the nutritional intervention.

Fig. 1. Anthropometric data.



Macronutrients evolution during the nutritional intervention.

Fig. 2. Macronutriients.



Minerals mean intake before and after the intervention.

Fig. 3. Minerals.

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GC4.167

A randomized, controlled clinical trial to evaluate the effect of an 8-week, energy-restricted ketogenic diet on the inflammation-related parameters in women with overweight and obesity

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Introduction: Obesity is associated with low-grade inflammation which can lead to the development of various health consequences. Therefore, it is important to introduce weight management programs to reduce the severity and prevalence of obesity and overweight. Over the last few years, the interest in the ketogenic diet (KD) followed to reduce body weight is growing. However, the physiological effects of this diet are not yet fully understood. Therefore, this study aimed to evaluate the effect of 8-week, calorie-restricted KD on the inflammation-related parameters in women with overweight and obesity.
Methods: A randomized, single-centre, controlled trial was conducted with 80 adult, non-menopausal women with a BMI of 25.5-35 without any chronic diseases. Randomly divided women received food catering with ca.1750 kcal daily containing KD or standard diet (SD), respectively. At the baseline (T0), after 4 weeks (T1) and at the end of the study (T2), the body composition was measured and the blood samples were collected. The inflammation-related parameters including CRP, hCRP, LBP, SHGB, IGFBP-1, and homocysteine and the gut barrier parameters including iFABP and haptoglobin were measured.
Results: The results of 66 participants were included in the analyses (KD N = 32 and SD N = 34). After 8 weeks of the energy-restricted diet, CRP level decreased in KD and increased in SD, however did not exceed the normal range. hsCRP decreased in both study groups. The concentration of homocysteine, IGFBP-1 and SHGB increased in both study groups, irrespectively in the diet composition. The level of haptoglobin decreased in both study groups, while iFABP decreased only in SD, reaching the level obtained in KD for the whole study period. The reduction in body weight and fat mass decreased in a similar way in both study groups.
Conclusions: The energy-restricted diet has a positive effect on the body composition and the inflammation-related parameters, including the markers of gut barrier functioning. The composition of the diet has a lower impact than the calorie intake. The ketogenic diet had a positive effect on inflammation, similar to the standard diet.

Conflict of interest: None Disclosed

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GC4.168

Lipid metabolism in women with overweight after 8-weeks, isocaloric, energy-restricted ketogenic diet

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Introduction: Overweight and obesity are currently a common problems worldwide that lead to a number of health complications. Among many management strategies, diet is a factor that can induce weight loss and improve biochemical blood parameter. The ketogenic diet (KD) is an example of a diet which could have positive effect related to weight loss. KD is characterised by a significant reduced intake of carbohydrates(<50 g per day) with a high fat content, leading to a ketosis state in the body. Although the interest in KD is increasing, still many effects of KD are not fully explained. Therefore the aim of this study was to evaluate the effect of 8-week calorie-restricted KD on the lipid metabolism and liver functions in women with overweight and obesity.
Methods: The study population of 80 women with elevated BMI (25.5 – 35) was randomly assigned to a ketogenic (KD) or standard diet (SD) for 8 weeks. The diets were delivered daily to participants in the form of catering. Both diets were equal in calorie intake (1700 kcal), but diversified in terms of macronutrient composition. The content of fat, protein and carbohydrates was 70, 30 and 20%, respectively, in the ketogenic diet and 20, 30 and 50% in the standard diet. Before dietary intervention (T0), after 4 weeks (T1) and at the end (T2) blood samples were collected from all women and the serum from blood samples was obtained by centrifugation. In serum samples, the lipid profile, including total cholesterol (C), LDL-C, HDL-C, non-HDL-C and triglycerides (TG), free fatty acid (FFA) concentration and the liver parameters (ASPAT, ALAT, GGTP) were analysed. Moreover, AIP was calculated according to the formula: log(TG/HDL-C).
Results: After 8 weeks, 71 women completed the study. Due to the insufficient compliance to the study protocol, another 5 participants were excluded from the analyses. Finally, the results of 66 women were analysed (KD: N = 32 and SD: N – 34). After 8 weeks of KD, a decrease in median of TG, HDL-C, non-HDL-C was observed, observed already after 4 weeks of diet. Contrary, the increasing trend was observed for LDL-C and FFA concentration in the KD group. However, in the subgroup or participants with elevated LDL-C at the baseline, a decrease in LDL-C was observed. Notably, the AIP, informing about the risk of development of cardiovascular diseases decreased after KD, while remained at the similar level in SD group. Irrespectively on the diet composition, a decrease in the level of liver parameters was observed in both study groups.
Conclusions: The obtained results showed that KD affects the lipid metabolism, decreasing TG level and increasing the pool of FFA in women with overweight and obesity type 1. The reduction of body weight, irrespectively on the diet composition, have a positive effect on the liver parameters. Based on the lipid profile and AIP, it can be concluded that KD applied as a weight management may decrease the risk of the cardiovascular diseases development.

GC4.169

Changes in the iron metabolism after 8-weeks, isocaloric, energy-restricted ketogenic diet in women with overweight and obesity

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Introduction: Both obesity and iron deficiency are global health problems. While overweight and obesity are key risk factors for many chronic diseases [1], iron deficiency is the most prevalent single micronutrient deficiency worldwide [2]. Numerous studies have shown that individuals with overweight and obese are in a state of persistent subclinical inflammation that may lead to iron deficiency and defects in Hb formation[3]. Energy-restricted diet-induced weight loss may improve obesity-related hypoferremia and help restore iron homeostasis in individuals with overweight and obesity. Therefore, the purpose of this study was to evaluate the effect of the energy-restricted ketogenic diet (KD) on iron metabolism in women with overweight and obesity.
Methods: 80 women with a BMI between 25.5 and 35 were randomly assigned to either a ketogenic (KD) or standard (SD) diet. Diets in the form of catering contained 1700 kcal, but they were diverse in terms of macronutrient composition (KD: 70:30:20 vs SD: 20:30:50 fat:protein: carbohydrate ratio). Before the dietary intervention (T0), after 4 weeks (T1) and at the end (T2), blood samples were taken for blood morphology (RBC, MCHC, MCH, MCV, haemoglobin, haematocrit, RDW) and iron metabolism markers (ferritin, iron, hepcidin, prohepcidin).

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Results: Out of 80 participants, the results of 66 were analysed (KD = 32 and SD = 34). At the baseline, in each group, 9 women had ferritin levels below 13 ng/mL. Moreover, in 1 woman in KD and 7 women in SD had iron deficiency anaemia (IDA) (Hb < 12 g/dL). In the subgroup with low ferritin levels, both KD and SD resulted in an increase in the ferritin (median 9.20 vs 14.83 in KD and 8.74 vs. 13.62 ng/mL), and hepcidin levels (median 9.76 vs 12.44 in KD and 11.30 vs 22.59 pg/mL in SD). The concentration of prohepcidin decreased slightly in KD group, especially in the first 4 weeks, while in SD, the prohepcidin level increased significantly (85.61 vs 125.38 ng/mL). At the end of the study, in KD there were no participants with IDA, while in SD group, still, 5 participants had Hb below 12 g/dL. After 8 weeks of the energy-restricted diets, 1 and 5 women remained with low-ferritin level, in KD and SD groups, respectively.
Conclusions: The obtained results indicate that KD applied for weight management may have a positive effect on the iron metabolism in women with overweight and obesity. However, more studies focused on the participants with both obesity and anaemia should be performed.

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GC4.171

Green tea kombucha, in the context of a healthy diet with calorie restriction, improves cardiometabolic risk markers in individuals with excess body weight

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Introduction: Green tea kombucha is a fermented beverage that has high concentrations of bioactive compounds with promising effects on human health. We aimed to investigate the effect of green tea kombucha consumption on cardiometabolic risk markers in individuals with excess body weight.
Methods: This is a randomized controlled clinical trial, with 59 individuals with excess weight, who were distributed into two parallel experimental groups: control group, which followed a calorie-restricted diet (-500 kcal/day) and kombucha group, which followed a calorie-restricted diet (-500 kcal/day) plus daily consumption of green tea kombucha (200ml/day). The study lasted ten weeks, during which all participants followed a healthy eating plan. At the beginning and end of the intervention, cardiometabolic health markers were evaluated, including estimated blood glucose, insulin, glycated hemoglobin, apolipoproteins A and B, total cholesterol (TC), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), high-density lipoprotein (HDL), triglycerides (TG), uric acid, systolic and diastolic blood pressure, Homa-IR, triglyceride-glucose index, Castelli indices 1 and 2 (CI1 and CI2), apolipoprotein A/B index, and ankle-brachial index (ABI).
Results: A total of 29 individuals completed the study in the control group (17 women and 12 men), and 30 in the intervention group (18 women and 12 men). At the beginning of the study, none of the markers studied differed between the groups. After intervention, men in the kombucha group had a reduction in estimated blood glucose (p=0.012) and glycated hemoglobin (p=0.010), different from the men in the control group. The other markers evaluated did not differ between the groups in the total sample and separated by sex. In paired analyses, the kombucha group reduced LDL (p=0.025), TG (p=0.012), VLDL (p=0.011), TC (p=0.024), CI2 (p=0.002) and uric acid (p=0.027), while the control group did not change any of these markers. Furthermore, the control group increased estimated blood glucose and glycated hemoglobin (p=0.004), while the kombucha group did not change these markers. Both groups also reduced CI1 (p=0.015 control and p=0.007 kombucha). The other markers did not change after the intervention in any of the groups.
Conclusion: Considering these results, green tea kombucha stands out as a functional beverage that can be incorporated into calorie-restricted diets to reduce cardiometabolic risk in individuals with excess weight.

GC4.172

Results of a 6-month weight loss intervention, using practical portion size estimation aids, in the context of the "Workplace Health Promotion" project

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Introduction: The World Health Organization recommends strategies in community settings to manage modifiable risk factors for chronic disease including poor diet; existing infrastructure in settings such as workplaces may be exploited, considering that the workplace is where most adults spend a substantial amount of time. In this context the multinational ABB, in its Bergamo plants, activated an outpatient nutrition service dedicated to its employees. This service is provided by a registered dietitian directly in the clinics inside ABB plants and supervised by the occupational and the nutrition specialist physicians.
Methods: After the visit of the occupational physician, patients living with overweight or obesity were consecutively enrolled in the study. The personalized dietary intervention consisted of a first one-hour visit with the dietitian, and periodic 30 minutes personal follow-ups every month and a half, for a total length of 6 months. Weight and body composition were measured with tetrapolar bioelectrical impedance Tanita BC 418 MA; waist circumference was measured with Seca 201 measuring tape. Diet prescriptions were personalized with HandyDiet, a software that makes possible using personal hands and other practical tools as portion size estimation aids * **; the diet prescription could be flexibly managed through the dedicated web-app.
Results: 40 patients completed the first 6 months of the study: 33 males and 7 females, average age: 42,5, average BMI: 29,5 kg/m^2. During the first six months patient lost an average of 5,9 kg, equal to 6,4% of the initial bodyweight; BMI decreased from 29,5 to 27,6 kg/m^2; fat mass percentage decreased from 29,2% to 25,8% and waist circumference decreased from 104,4 to 97 cm.
Conclusion: In ABB Bergamo plants (more than 1 K employees) the occupational physician observed, during a 3 year previous observational period, an average weight gain of 1,46 kg / year in 75 % of the employees susceptible to weight gain. These results show that it is possible to obtain sensible results in terms of weight management through the "Workplace Health Promotion" project, taking advantage of the place and working hours to improve employee dietary habits. Practical and flexible dietetic approach, such as handy portion size measuring aids, showed improved eating behaviour in literature *** as well as in this group of patients during the first 6 months.

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Conflict of Interest: None Disclosed

Funding: ABB Group founded the project.

GC4.173

Effects of ESC/ESH-based written generic lifestyle advice and a nutraceutical on 24-hour blood pressure in overweight/obese patients with high-normal office blood pressure and low-moderate cardiovascular risk

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Background: Lifestyle changes, eventually coupled with a nutraceutical, are recommended strategies for managing high-normal blood pressure (BP) in patients with overweight and obesity (PwO) and low-moderate cardiovascular (CV) risk. In a real-life clinical setting, we evaluated the role of overweight/obesity on the impact of generic written lifestyle advice, extrapolated from the 2018 ESC/ESH hypertension guidelines, and a beetroot-based nutraceutical on 24-hour BP in a population with high-normal office BP and low-moderate CV risk.
Methods: A longitudinal observational study was conducted in two ESH Hypertension Excellence Centres on 43 consecutive patients with high-normal BP according to repeated office BP (OBP) measurements and a low-moderate CV risk based on SCORE2/SCORE2-OP. A 24-hour ambulatory BP monitoring (ABPM) was carried out at baseline and three months after lifestyle changes, according to generic written advice from the 2018 ESC/ESH hypertension guidelines, and a nutraceutical containing 500 mg of dry beetroot extract.
Results: Mean age was 50±11 years, with male prevalence (54%). The mean BMI was 25 ± 3 Kg/m^2. The prevalence of patients with overweight and PwO was 58%. Mean OBP was 135±3/85±3 mmHg. At baseline, mean 24-hour BP, daytime BP, and night-time BP were 127±7/80±6 mmHg, 131±8/83±6 mmHg and 118±8/70±5 mmHg, respectively. BP profiles were compatible with hypertension status in some patients. After a median follow-up of 98 (92-121) days, all BPs, except night-time diastolic BP, were significantly decreased: -3±6/-2±4 mmHg for 24-hour BP, -3.9±6.0/-3.0±4.0 mmHg for daytime BP and -3.3±7.4/-1.3±4.7 mmHg for night-time BP, respectively. Statistically significant changes in body weight were detected (Δweight = -0.4±1.2 Kg; p=0.05). The magnitude of BP lowering was independent of the presence or absence of overweight/obesity (p for interaction >0.05 for all the BP considered).
Conclusions: Our exploratory study shows for the first time that written generic lifestyle advice taken from the ESC/ESH hypertension guidelines coupled with a beetroot-based nutraceutical may represent a valid initial non-pharmacological approach in patients with overweight/obesity, high-normal office BP and low-moderate CV risk even without personalized diet interventions. Our population had non-clinically meaningful weight loss, a sign that the BP lowering was likely due to other factors (e.g. lower salt intake).

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Impact of green tea kombucha on inflammation, intestinal permeability, and body composition in individuals with excess weight: a randomized controlled trial

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Introduction: Elevated fat accumulation in the body contributes to metabolic alterations, such as insulin resistance, low-grade inflammation, and a weakening in the integrity of intestinal barrier, leading to endotoxemia. Kombucha, a fermented antioxidant beverage rich in bioactive compounds, could be a new strategy to combat excess weight and dysbiosis. In this manner, we aimed to assess the effect of green tea kombucha consumption on body composition, inflammation, and intestinal permeability in individuals with excess weight.
Methods: This is a randomized controlled clinical trial, with two parallel experimental groups: control group (n=29), followed a healthy diet with caloric restriction (-500 kcal/day), and kombucha group (n=30), under a healthy diet with caloric restriction (-500 kcal/day) + green tea kombucha (200 ml/day) for 10 weeks. Body composition (dual-energy X-ray Absorptiometry), anthropometry, blood and urine collection were performed in the beginning and end of intervention. Plasma interleukins concentrations were determined by flow cytometry and intestinal permeability test was measured by lactulose: mannitol ratio (L/M) in urine using HPLC, and also through plasma LPS-binding protein (LBP).
Results: At the beginning of the study, none of the markers studied differed between groups. Both groups significantly lost weight (control: -2.29 ±2.99 kg, p<0.001; kombucha: -3.02±2.08 kg, p<0,001), decreased hip (control: p=0.024; kombucha: p<0.001) and waist circumference (control: p=0.007; kombucha: p<0.001), BMI and body fat (control and kombucha: p<0.001) after the intervention, but no differences between groups were observed. Furthermore, both groups decreased IL-1β and IL-8, but only control group significantly increased IL-6 (p<0.001) in the end of study, this increase being statistically different from the kombucha group (p=0.023). No differences in LBP plasma levels were observed between groups. The control group, but not the kombucha group, significantly increased the L/M ratio (p=0.019).
Conclusion: Green tea kombucha did not enhance the improvement in anthropometry and body composition. In contrast, the beverage avoided the worsening of inflammatory cytokine profile and intestinal permeability that occurred in the control group. In addition, its intake did not detrimentally affect the metabolic health of individuals with excess weight, suggesting it as an option to replace sugar-rich and ultra-processed drinks in calorie restricted diets employed for weight loss strategies.

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Maintenance of time-restricted eating in individuals with type 2 diabetes: A mixed-methods follow-up study with a dietary counseling perspective

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Background: Time-restricted eating (TRE) is a type of intermittent fasting reducing the daily interval for eating and drinking without other dietary restrictions. While studies have shown that TRE generally is feasible short-term, little is known about longer-term maintenance of TRE.
Aims: We investigated the extent to which participants maintained TRE post-intervention and evaluated changes in body weight and HbA1c. Additionally, we explored any experienced conflicts between previous dietetic guidance and the TRE concept.
Material/Methods: In the planning of a 1-year RCT investigating the effects of TRE on glycemic control in people with T2D and overweight/obesity, a 12-week pilot study was conducted to investigate intervention feasibility to inform the RCT design. This is a follow-up study conducted 6-8 months after the end of the pilot study. Of the 19 participants completing the pilot study, 17 participated in this follow-up study consisting of interviews and measurements of body weight and HbA1c.
Results and Conclusions: During the pilot study, most participants were positive towards TRE and found it easier to follow than expected. However, during the follow-up period, only one had maintained strict TRE. Interviews revealed that some participants followed TRE to a greater extent than they realized when they, during the interviews, talked about their present daily living and habits as compared to before initiating TRE. Thus, several participants had introduced modified versions of TRE to better suit their daily living, e.g., omitting TRE in relation to social activities, holidays, and weekends. Importantly, only one of the participants experienced any conflicts between previous dietetic guidance related to eating patterns and the TRE concept. At baseline, after 12 weeks of TRE, and at follow-up, mean (sd) body weight was 102.6 (17.5) kg, 101.0 (17.5), and 100.9 (17.1), and HbA1c was 60.8 (9.2) mmol/mol, 58.1 (8.3), and 62.5 (10.8). In conclusion, TRE has the potential to become a strategy in the toolbox to treat people with T2D and overweight/obesity. Nevertheless, maintenance of the TRE concept relies on more flexibility and guidance in the concept and incorporation of social support opportunities.

Tab. 1. Body weight and HbA1c.

n = 17	Baseline:	3 month	Follow-up
HbA1c (sd), mmol/mol	60.8 (9.2)	58.1 (8.3)	62.5 (10.8)
Body weight (sd), kg	102.6 (17.5)	101.0 (17.5)	100.9 (17.1)

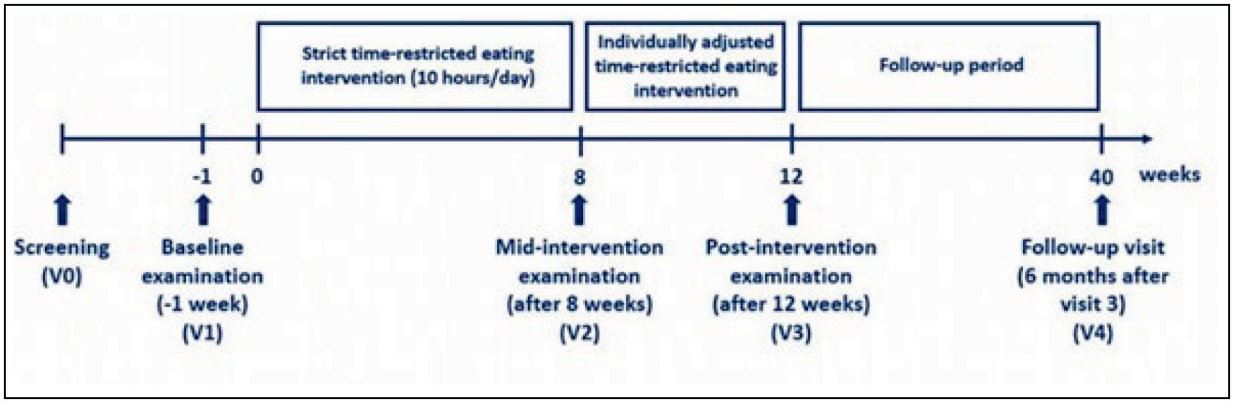


Fig. 1. Study design.

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Evaluation of the utility and the effectiveness of the remote body composition monitoring in patients with overweight or obesity during a lifestyle intervention

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Introduction: The widely used method to evaluate body composition (BC) in clinical practice is bioelectrical impedance analysis (BIA). In the last years, remote visits have been activated and the need to implement remote monitoring systems through new technologies of telemedicine emerged. In this regard, a new BIA device that allows remote monitoring of BC has been developed. The study aims to evaluate the utility and the effectiveness of the remote BC monitoring in patients with overweight or obesity during a lifestyle intervention.

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Methods: 40 adults with overweight or obesity (≥18 years and BMI ≥25 kg/m^2) were enrolled. All patients were divided in 2 groups: 20 patients with remote BC monitoring (BIA-R) through the use of TeleBIA-Meteda device and 20 patients with ambulatorial monitoring of BC (BIA-A). At the baseline (V0) both groups have undergone an ambulatorial nutritional visit, during which metabolic investigations, anthropometric and BC assessments and evaluations of quality of life (IWQOL-Lite questionnaire), eating habits (predimed questionnaire and 24H recall) and physical activity (IPAQ questionnaire) have been performed and low caloric diet and physical activity have been prescribed. Over the 3 months follow-up (V1-V3) the anthropometric values, BC, food diary and physical activity were evaluated in all groups during remote or ambulatorial nutritional visits. At the end of V3, metabolic parameters and quality of life (QoL) were also re-evaluated.
Results: At the V3, a significant ($p<0.001$) and similar reduction of BMI, waist circumference (CV) and fat mass (FM) were observed in both groups (BMI: BIA-R mean -8% vs BIA-A mean -6%, CV: BIA-R mean -6% vs BIA-A mean -6%, FM: BIA-R mean -16% vs BIA-A mean -14%). A significant and similar increase in % of free-fat mass (FFM) and QoL were also observed in the two groups at the V3 (FFM: BIA-R mean 4% vs BIA-A mean 4%, QoL: BIA-R mean -20% vs BIA-A mean -18%). Furthermore, the two groups showed good adherence to the diet and resulted physically active. No significant improvements in metabolic parameters were observed in the two groups.
Conclusion: Patients with overweight or obesity treated with nutritional and physical activity intervention, who were followed with remote BC monitoring, showed clinically significant weight loss and improvement of BC and QoL. Therefore, this study highlights the utility and the effectiveness of the remote BC in the management of overweight and obesity.

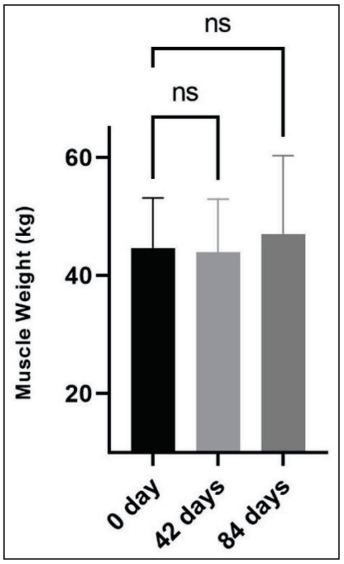
GC4.177

Diethylpropion's efficacy in promoting weight loss and fat loss The first real-world retrospective data on Diethylpropion in Asia

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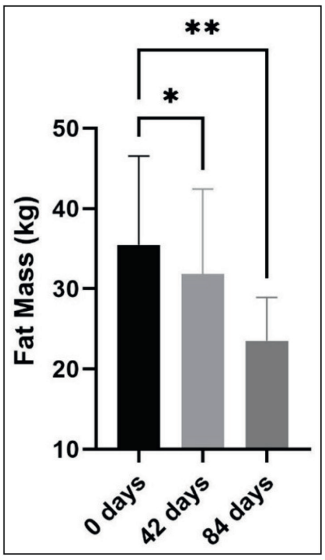
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Introduction: The combination of pharmacotherapy and lifestyle intervention was recommended for patients with class I obesity who failed single lifestyle therapy and patients with class II obesity. Diethylpropion is used as an obesity drug and was approved in Indonesia over Asia Pacific countries.
Aims: This study retrospectively aims to analyze short-term effects of diethylpropion on weight loss in patients with obesity in Indonesia.
Methods: Data was collected retrospectively from 142 patients with a BMI > 25 kg/m^2 who were given diethylpropion for obesity treatment between January 2022 and November 2023 at the Kimia Farma Nutrition Clinic in Bandung. The participants of this study were measured of blood pressure, bodyweight, body height, waist circumference, and body composition to determine fat mass and muscle mass every follow-up. Patients were prescribed diethylpropion 25 mg three times daily for two weeks with lifestyle modification. The data were analyzed using t-test, Mann-Whitney, One-way ANOVA, or Kruskal-Wallis.
Results: This study showed body weight reduction up to 10.0±0.04% on 84 days of treatment although statistically not significant. Waist circumference was insignificantly reduced by 4.90% after 84 days of diethylpropion therapy. Significant fat loss (20.54%) can be seen in our study without significant loss of muscle mass (3.67%). This study reveals the reduction of systolic and diastolic although it showed mild increases after 70 days.
Conclusion: In conclusion, diethylpropion shows remarkable weight loss in 12 weeks duration of treatment although not statistically significant. It is also showed to reduce fat significantly in patients with obesity.



Unsignificant Muscle Changes during treatment.

Fig. 1. Canges of Muscle Mass.



Significant Fat Loss During Treatment.

Fig. 2. Changes of Fat Mass.

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GC4.178

Effects of supplementing a lifestyle intervention with liraglutide 3.0 mg on body composition and visceral fat

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Introduction: While liraglutide has proven to be an useful tool for the treatment of chronic weight management and treatment of type-2 diabetes mellitus, only a few studies have assessed the potential incremental effects of liraglutide on body composition and visceral fat when supplemented to a lifestyle intervention. Aim of this study was to provide data on body fat changes and abdominal visceral fat thickness following a lifestyle intervention with and without liraglutide 3.0 mg treatment.
Methods: Eligible people with obesity seeking a weight-loss treatment were proposed a lifestyle intervention supplemented with liraglutide 3.0 mg, Lifestyle intervention consisted of a hypocaloric diet (based on resting energy expenditure measured by indirect calorimetry, with a Mediterranean pattern, tailored on patient habits) and WHO physical activity guidelines. Liraglutide dosage was brought up from 0.6 mg/week to 3 mg/week over the course of the first month of treatment. At each follow-up examination, body composition was assessed with anthropometric methods, while abdominal subcutaneous and visceral fat thicknesses (VAT) were measured with abdominal ultrasound. Effects of liraglutide supplementation were assessed through coarsened exact matching with historical controls without pharmacological treatment.
Results: A total of 19 patients were studied, 16 (84%) females, with a median (IQR) age of 54 (50, 62) years, a body mass index of 36 (31, 40) kg/m², a body fat mass fraction of body weight (FM%) of 41.1 (37.9, 44.2) %, and a VAT of 5.33 (4.28, 6.22) cm. The follow-up time was 4 (3, 6) months, and during this time the monthly rates of changes were the following: weight -1.3 kg, FM% -0.4%, visceral fat -0.5 cm (all p-values <0.05). The matching procedures matched 15 cases with 98 historical controls, highlighting the following differences between cases and controls at follow-up: weight -2.6kg (95% CI -4.7, -0.5; p=0.02), FM% -0.8 (95% CI -1.9, 0.3; p=0.2), VAT -0.8 (95% CI -1.6, 0; p=0.04).
Conclusion: The supplementation of liraglutide 3.0 mg to a lifestyle intervention produced better weight and visceral fat loss, while limiting detrimental impact on body composition.

GC4.179

Impact of high protein ultra-processed foods on energy and macronutrient balance

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Introduction: Increased consumption of ultra-processed foods (UPF) was associated with dietary protein dilution and a rise in total energy intake. Increasing the protein content of UPF may therefore be an important strategy to prevent energy overconsumption and obesity.
Methods: In a single-blind, cross-over study, 21 healthy adults (25.7 ±3.3 y, BMI: 24.6 ±2.2 kg/m²) were randomized to receive either a high-protein UPF diet (HP, 30% protein) or normal-protein UPF diet (NP, 13% protein) for 54h immediately followed by the alternate diet for 54h. Meals were matched for calories, fat, and fiber and consumed ad libitum. 24h-energy and macronutrient balance (intake and oxidation) were measured in a room calorimeter at a physical activity level of 1.4.
Results: In HP compared to NP, protein intake was higher (31% vs. 13%, p<0.05) and carbohydrate intake was lower (46% vs. 30%, p<0.05) whereas fat and fiber intake did not differ between diets (p>0.05). Both diets were rated as equally palatable. In HP, energy intake was -196 ±396 kcal/d lower and energy expenditure was 130 ±100 kcal/d higher leading to -326 ±399 kcal/d difference in energy balance compared to NP (all p<0.05). However, both UPF-diets led to overfeeding that was significantly lower with HP (+16% vs. +29%) resulting in a gain in protein whereas NP increased fat balance (both p<0.05).
Conclusion: Despite decreased energy intake and increased energy expenditure, consumption of protein-enriched UPF did not prevent overfeeding resulting in protein anabolism rather than an increase in fat mass.

GC4.180

Energy allocation to the brain 'drives' adaptive thermogenesis with weight loss

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Introduction: Weight loss leads to a reduction in resting energy expenditure (REE) which is beyond that explained by the loss in fat free mass (FFM) and changes in its organ and tissue masses. This has been described as adaptive thermogenesis (AT). We hypothesized that AT is associated with the encephalic measure (EM), i.e. energy allocation to the brain to meet brain's energy needs.
Methods: 32 normal weight volunteers (study 1), 45 patients with overweight and 43 with obesity (study 2), aged 20-41yrs, were followed for 3 to 12 weeks during caloric restriction. REE was measured by indirect calorimetry, masses of organs and tissues were assessed by whole body MRI. EM was calculated from relative brain size, i.e., the ratio of observed and predicted brain mass according $VO_2$1.03x 10-0.06 (Armstrong E, Science 22:1302-1304,1983). Hormones were analyzed by standard laboratory techniques.
Results: In study 1 and 2, body weight (-4.2±0.9 and -9.5±3.4kg) and REE (-173±107 and -136±152kcal/d) decreased; AT was 104±38 and112±136kcal/d (all p<0.05). Brain mass remained constant before and after weight loss (study 1, 1.55±0.13 and 1.50±0.11kg; study 2, 1.47±0.09 and1.48±0.09kg) whereas EM increased from 5.45±0.61 to 5.89 ±0.79 (study 1) and from 4.29±0.59 to 4.69±0.62ml/min (study 2, both p<0.01). EM correlated with AT (study 1, r=-0.583; study 2, -0.753, both p<0.01). Plasma leptin and fT3-levels decreased by 1.83±2.39 and 0.27±0.42ng/ml (study 1) and 19.10±0.85 and 3.50±0.46ng/ml (study 2, all p<0.01). In both studies, there were no associations between AT and the weight loss-associated changes in plasma leptin and fT3.
Conclusion: During caloric restriction, the brain may 'drive' whole body AT to meet its own energy supply.

GC4.181

Gender differences in adherence and effectiveness of the Very Low-Calorie Ketogenic Diet for weight loss: real world data

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Introduction: The Very Low-Calorie Ketogenic Diet (VLCKD) is an effective and well tolerated dietary intervention aimed at weight loss, characterized by calorie and carbohydrates restriction. Mean body weight reduction expected is 15 to 20%. The question as to whether VLCKD exerts different effectiveness in male and female remains unanswered. The aim of our study was to assess potential differential gender response of VLCKD on body weight and waist circumference change, and on features of metabolic syndrome.

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Methods: A real-word prospective study was conducted on 209 patients (mean age: 50 ± 11 years, 155 females, 54 males), who met the inclusion criteria (BMI≥30 kg/m^2, age≥18 years, no medical contraindication). All patients followed a well-established VLCKD protocol (800 Kcal/die), characterized by a very low carbohydrate intake (<50 g/day), 1.2–1.5 g protein/kg of ideal body weight and 15–30 g of fat/day. We collected anthropometric measurement and blood samples at baseline and 6-month follow-up.
Results: At 6-month, the expected reduction in weight, BMI and waist circumference was observed in all patients. Significant difference across genders emerged only for ΔBMI (-6 kg/m^2 and -7.9 kg/m^2; p<0.05 in males and females respectively). A statistically significant reduction in blood glucose, LDL, triglycerides, GOT and GGT was found in females. Protocol adherence, in terms of meal consumption, ketone checks, and follow-up visits was complete in 39% of females and 26% of males.
Conclusions: These preliminary analyses suggest that VLCKD is an excellent strategy for weight loss in both sexes, with a statistically significant greater BMI reduction in female. Protocol adherence was greater in female and protocol suspension rate was larger in male. The lower retention rate in male may prevent this wide population from benefiting of the VLCKD induced weight loss. This gender difference requires further investigations.

GC4.182

Examining Ketogenic Diets for Weight Management: A Comprehensive Review Through the Lens of Physiological and Biochemical Nutrition

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Diverse strategies have been proposed to alter dietary patterns in the pursuit of weight loss. Many of these approaches remain contentious, raising questions about their effectiveness and potential health consequences, even in the presence of achieved weight loss. This scrutiny extends to ketogenic diets, whether implemented with or without calorie restrictions. In this systematic review, we scrutinize the evidence surrounding ketogenic diets for weight loss, drawing from studies published between 2019and 2023 identified within the MEDLINE, Scielo, and Web of Science databases. Despite demonstrating discernible effects on weight loss, BMI reduction, and diminished fat percentage, the current body of evidence lacks precision in elucidating the specific physiological mechanisms underlying ketogenic diets. Moreover, a substantial portion of published research fails to comprehensively assess their impact on critical physiological and biochemical parameters, particularly within hepatic, cardiac, and renal tissues. Our deduction asserts that efficacious strategies for managing overweight and obesity need not arbitrarily impose constraints on particular nutrients, notably carbohydrates, nor advocate for increased consumption of food groups linked to various pathologies.

GC4.183

Conservative Treatment of Lipedema with Diet and Supplementation: A Systematic Review

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Introduction: Painful lipohypertrophy, painful lipomatosis, adiposalgia- some of the terms used to define lipedema, often underdiagnosed. It involves abnormal fat deposition predominantly in the lower limbs, accompanied by bruising and localized pain. This chronic and progressive disorder affects approximately 11% of women, with a potentially higher prevalence due to underdiagnosis. The higher prevalence in women is attributed to estrogen-dependent development and proliferation, with potential fluctuations during puberty, pregnancy or menopause. Concurrent obesity is described in over 50% of cases, along with lymphedema, posing an additional challenge in therapeutic approaches. The treatment goal is symptomatic improvement, disease progression management and complication prevention.
Method: Articles on lipedema treatment were researched on Scielo and PubMed databases. A literature review identified 23 relevant articles of which 11, strictly incorporating nutritional approaches in lipedema, were selected. Keywords included lipedema, obesity, diet and supplementation. The selected articles were in English, published between 2017 and 2022.
Results: Among intervention articles, Jeziorek et al compared LCHF vs. MCMF diets in 91 patients, DiRenzo et al compared mMeD in lipedema and non-lipedema patients (totaling 29 patients) and Cannataro et al presented a case study of a patient on a ketogenic diet for 22 weeks. Positive outcomes were mainly observed when there was a significant reduction in animal protein intake, a substantial increase in total fiber intake, a notable decrease in saturated fatty acid intake and a significant increase in EPA and DHA fatty acid intake with a reduced ω6/ω3 ratio. Emphasis was placed on reducing hyperinsulinemia and insulin resistance. No consensus was reached on a specific diet type; rather, consensus focused on the mentioned factors. Additionally, the importance of multidisciplinary approaches in lipedema treatment was discussed, encompassing dietary changes, lifestyle adjustments, physical exercise, compression therapy, manual lymphatic drainage and in some cases, surgery. Identifying and treating comorbidities like obesity, hypertension and diabetes, which can exacerbate lipedema symptoms, was also emphasized.
Conclusion: Combined therapeutic measures demonstrate greater efficacy compared to isolated diet and exercise, as these alone prove ineffective in reducing the disproportionate growth of affected tissue. Currently there is no consensus on the ideal diet or supplementation for lipedema. Encouragement is given for maintaining an anti-inflammatory diet to lower insulin levels, reducing the risk of lipogenesis, edema worsening and insulin resistance. Diets rich in fiber with low animal protein content are recommended. More research is needed in the field to evaluate lipedema supplementation and appropriate diets due to limited and inconclusive studies, coupled with the disease's significant and frequently underdiagnosed nature.

GC4.184

Investigating the Clinical Efficacy of Combination Therapies in Obesity Treatment

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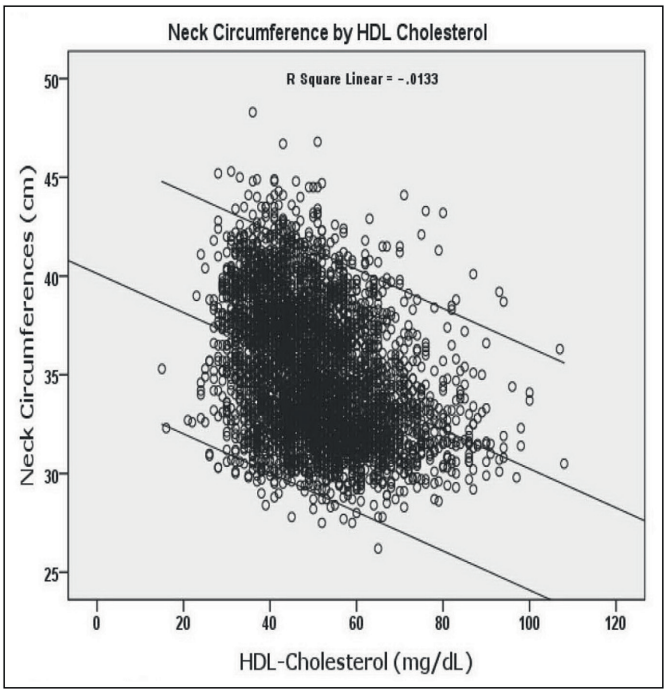
The study aimed to evaluate the clinical efficacy of combining therapeutic modalities involving liraglutide (1.2mg/d) with low-dose phentermine (7.5 mg/d)/topiramate (50mg/d) medication for people with obesity in a bariatric clinic. The retrospective cohort analysis compared the outcomes of medication alone versus the combination for patients attending the clinic.
Study Design and Methods: Design: The study utilized an open design and employed statistical tests (paired t-test, Wilcoxon test) via SPSS software for Windows (ver.18, IL, USA) to compare weight, body fat, and adipose tissue measures.
Participants: One hundred twenty-eight peoples, predominantly female (82.7%), with a mean age of 44.67 (1.18) years and mean BMI of 28.95 (0.39) kg/m^2, were included.
Measurements: Various parameters, including body fat, waist-to-hip ratio, and cross-sectional areas of visceral and subcutaneous adipose tissue, were measured at 0, 4, and 12 weeks.
Results: Medication Groups: 73 people with obesity (57.5%) received medication only, while 54 received medication with liraglutide for 12 weeks.

- Outcomes: The combination group showed greater weight loss (6.2481 kg, 3.564%) compared to the medication-only group (5.4165 kg, 6.8069%).

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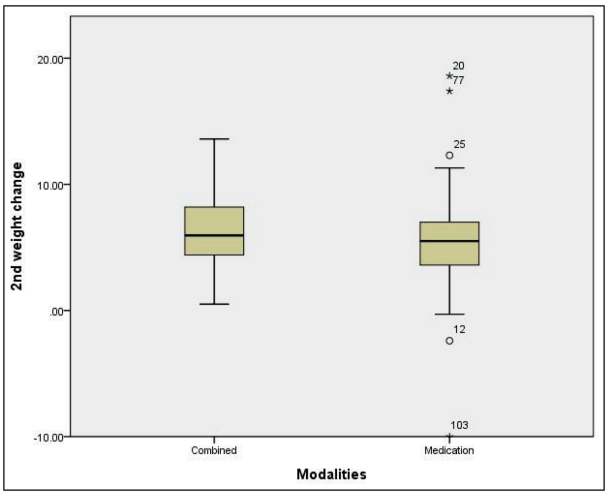
- Adipose Tissue Changes: Both groups exhibited a significant decrease in cross-sectional areas of visceral and subcutaneous adipose tissue, with more pronounced reductions in the combination group.

Conclusion: The study suggests that combining a low dose of phentermine/topiramate with liraglutide is more effective than phentermine/topiramate alone in obesity treatment over 12 weeks. However, the authors recommend further controlled clinical trials for validation.



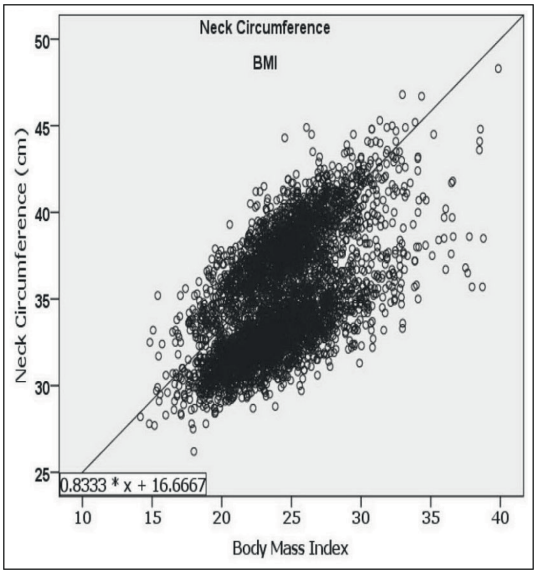
NC by HDL Cholesterol.

Fig. 1.



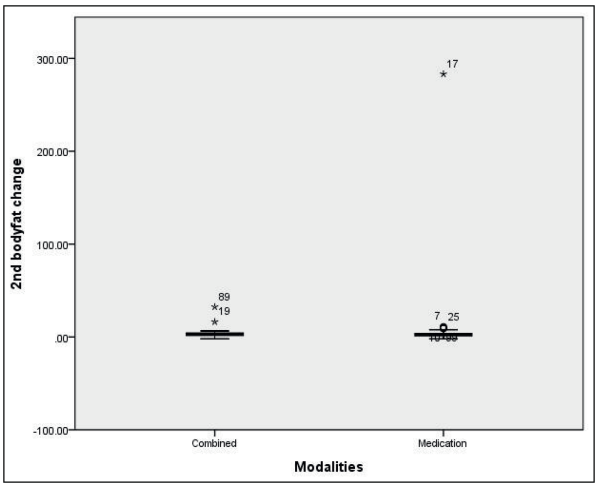
Change of Weight according to Regimens.

Fig. 2.



NC by BMI.

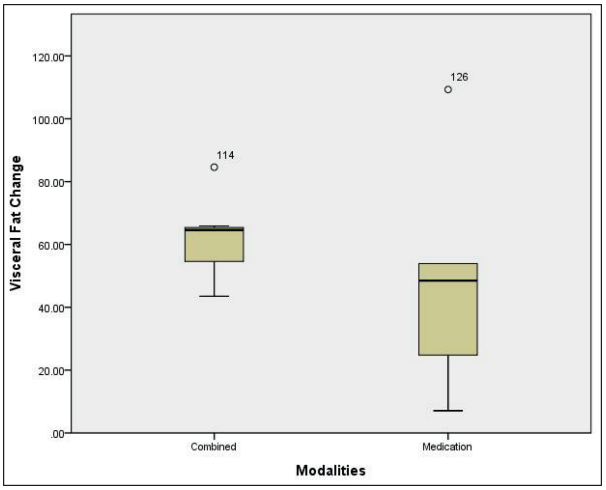
Fig. 3.



Change of bodyfat according to regimen.

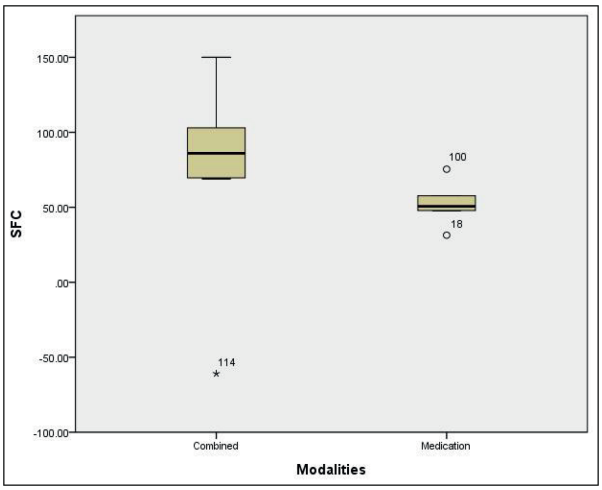
Fig. 4.

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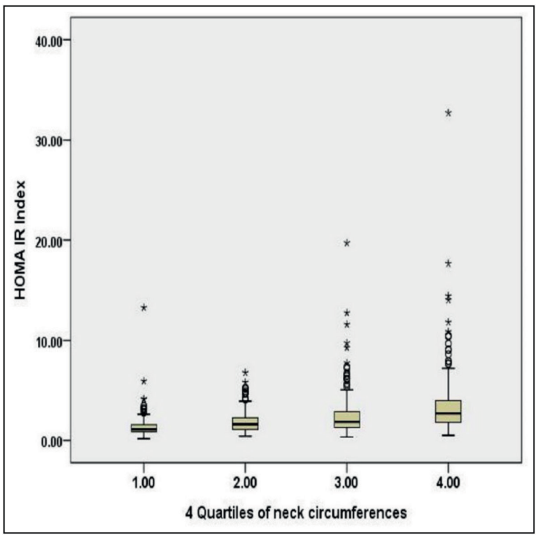
Change of visceral fat according to regimen.

Fig. 5.



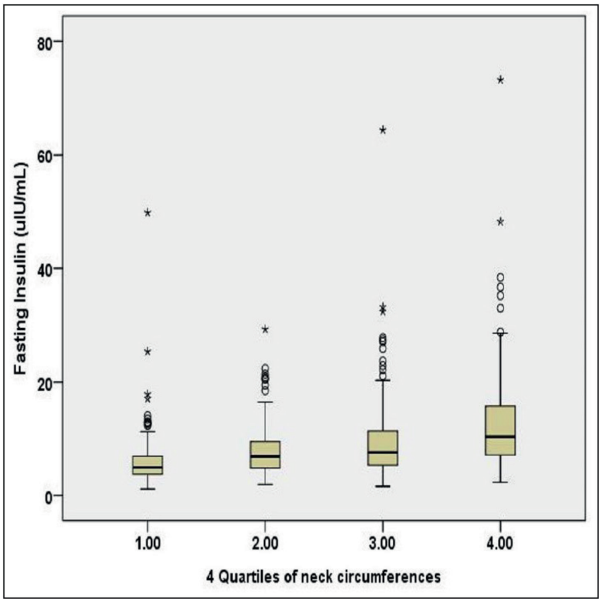
Change of subcutaneous fat according to regimen.

Fig. 6.



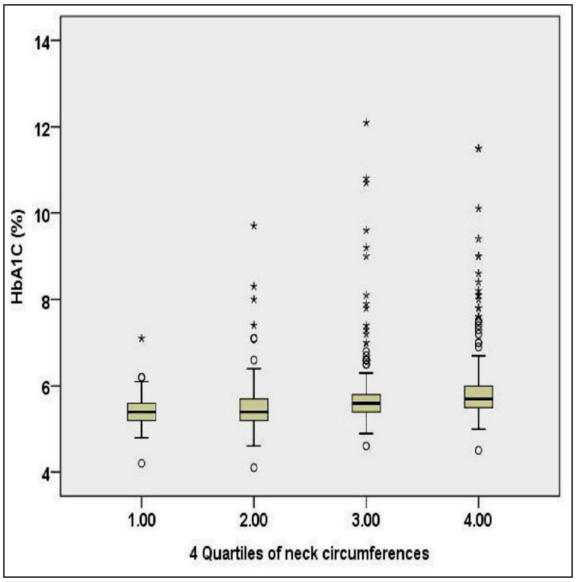
HOMA IR According to NC Q4.

Fig. 7.



Insulin According to NC Q4.

Fig. 8.



HbA1C According to NC Q4.

Fig. 9.

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Tab. 1.

Controlled Variables			NC
Age, TC, HDL-C, TG & BP, Energy Intake, Macronutrient Intake	WC	Corr.	.684
		Sig.	.000
	BMI	Corr.	.727
		Sig.	.000
	HOMA-IR	Corr.	.383
		Sig.	.000
	FPG	Corr.	.196
		Sig.	.000
	HbA1C	Corr.	.252
		Sig.	.000
	Insulin	Corr.	.369
		Sig.	.000

ALwO, CG and HCP perceptions of weight discussions between ALwO and HCPs: who initiated discussions and who should initiate discussions.

GC4.185

Waist-to-height ratio shifts over time in tirzepatide-treated participants – post hoc analysis in SURMOUNT-1 and SURMOUNT-2

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Objective: Waist-to-height ratio (WHtR) is a practical estimate of central adiposity and can be a better predictor of cardiometabolic disease than body mass index (BMI). Tirzepatide (TZP) is a once weekly GIP/GLP-1 receptor agonist approved in the US for treatment of type 2 diabetes and obesity. The objectives of this post hoc analyses of SURMOUNT-1 (SM-1) and SURMOUNT-2 (SM-2) were to assess change from baseline (BL) to Week 72 in WHtR and to assess shift from BL to Week 72 in WHtR risk categories as defined by recent NICE guidelines for individuals with BMI <35 kg/m²: "healthy" (WHtR ≤0.49), "increased" (WHtR >0.49 to ≤0.59), and "high" (WHtR >0.59).
Methods: Post hoc analyses included 737 participants with obesity or overweight with a weight related complication in SM-1 and 474 participants with obesity or overweight and type 2 diabetes in SM-2 who had BL BMI <35 kg/m². Analyses used efficacy analysis sets (on-treatment data in participants with ≥ 1 dose of study drug) and the last non-missing value for WHtR. Changes from BL to Week 72 in WHtR were compared between pooled TZP 10/15 mg and placebo (PBO) using mixed model for repeated measures. The proportion of participants reaching WHtR category thresholds were also evaluated.
Results: In SM-1, TZP treated participants achieved a significantly greater WHtR reduction compared to PBO at Week 72 (-0.11 vs. -0.02, p<0.001). Furthermore, TZP participants (n=486) had substantial shifts in WHtR risk categories from BL to Week 72: "healthy" 0% to 30.9%, "increased" 25.5% to 54.7%, and "high" 74.5% to 13.0%. The PBO participants (n=251) had limited shifts in WHtR risk categories from BL to Week 72: "healthy" 0.4% to 2.0%, "increased" 22.3% to 35.5%, and "high" 77.3% to 61.0%.
In SM-2, TZP treated participants achieved a significantly greater WHtR reduction compared to PBO at Week 72 (-0.07 vs -0.02, p<0.001). Furthermore, TZP participants (n=317) had substantial shifts in WHtR risk categories from BL to Week 72: "healthy" 0% to 9.5%, "increased" 20.2% to 52.7%, and "high" 79.8% to 36.9%. The PBO participants (n=157) had limited shifts in WHtR risk categories from BL to Week 72: "healthy" 0% to 1.3%, "increased" 23.6% to 33.8%, and "high" 76.4% to 63.1%.
Conclusion: Treatment with TZP resulted in a significant reduction of WHtR and a shift to lower WHtR risk categories, with more individuals in "healthy," fewer in "high," and more moving from "high" to "increased" categories. Future studies could further elucidate the effect of TZP on other cardiometabolic parameters and outcomes and how changes in WHtR may explain any such benefits.

GC4.186

Early Weight Loss and Reported Gastrointestinal Adverse Events in Tirzepatide-Treated Participants in the SURMOUNT 1-2 Trials

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Introduction: Tirzepatide (TZP), a once weekly GIP/GLP-1 receptor agonist, led to significant weight loss in the SURMOUNT-1 (SM-1) and SURMOUNT-2 (SM-2) trials; however, it is unknown whether greater early weight loss with TZP is associated with increased occurrence of gastrointestinal (GI) adverse events (AEs). Therefore, the objective of this analysis was to assess whether greater early weight loss was associated with higher incidences of nausea, vomiting, or diarrhea (NVD) in participants treated with TZP in SM-1 and SM-2.
Methods: Post hoc analyses included 1775 TZP-treated participants with obesity or overweight with at least one weight related complication in SM-1 and 609 TZP-treated participants with obesity or overweight and type 2 diabetes in SM-2. Participants were categorized as either early responders (≥5% weight reduction at Week 8) or non-early responders (<5% weight reduction at Week 8). Analyses used the efficacy estimand (randomized participants receiving ≥1 dose of study drug excluding off-treatment data).
Results: In SM-1, early responders (n=1103, 62.1%) achieved a significantly greater percent body weight reduction compared to non-early responders (n=672, 37.9%) from baseline to Week 8 (-7.9% vs. -3.1%, p<0.001) and from baseline to Week 72 (-23.3% vs. -14.6%, p<0.001). During Weeks 0-8, 24.2% of early responders reported mild, 6.4% moderate, and 0.5% severe NVD compared to non-early responders (17.9% mild, 4.5% moderate, and 0.9% severe NVD). The majority of NVD observed during SM-1 were mild to moderate in severity and were reported more frequently during the dose escalation period, with a gradual reduction in incidence in both groups over the course of the study. (Figure)
In SM-2, early responders (n=247, 40.6%) again achieved a significantly greater percent body weight reduction compared to non-early responders (n=362, 59.4%) from baseline to Week 8 (-7.1% vs. -2.5%, p<0.001) and from baseline to Week 72 (-20.0% vs. -10.8%, p<0.001). During Weeks 0-8, 17.4% of early responders reported mild, 4.5% moderate, and 0% severe NVD compared to non-early responders (13.3% mild, 2.5% moderate, and 0.8% severe NVD). The incidence and distribution of NVD in SM-2 was consistent with what was observed for SM-1. (Figure)
Conclusion: In SM-1 and SM-2, participants treated with TZP reported generally mild to moderate NVD more frequently during the first 8 weeks, regardless of the early weight loss category. The incidence of events decreased over the course of the studies and was in general comparable between early and non-early responders, suggesting no meaningful differences in GI tolerability of TZP regardless of the early response or the weight reduction over time.

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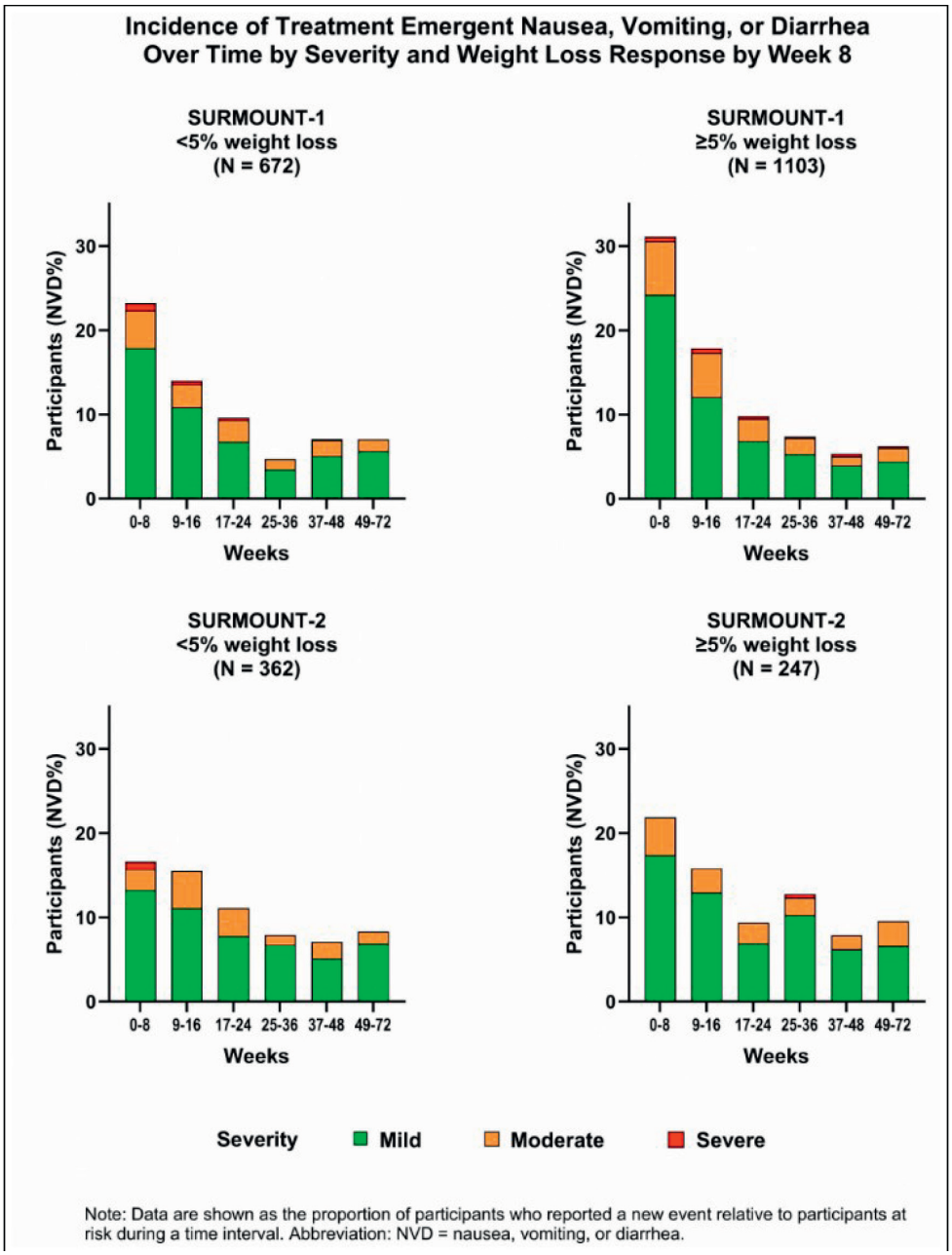


Fig. 1. Incidence of Treatment Emergent Nausea, Vomiting, or Diarrhea Over Time by Severity and Weight Loss Response by Week 8.

GC4.187

Uncovering pharmacological mechanisms of Xie-Re-Xing-Pi-Yin for against obesity by network pharmacology and experimental evaluation in vivo

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Background: Obesity leads to a priority of global health due to its increasing prevalence and its correlation with various complications. Xie-Re-Xing-Pi-Yin (XRXPY), an empirical prescription of Traditional Chinese medicine, has been extensively used to treat obesity for a long time in clinical practice, whereas the underlying mechanism by which XRXPY anti-obesity remains unknown. Consequently, we used network pharmacology and experimental validation to investigate the active ingredients and molecular mechanisms of XRXPY anti-obesity.

Materials-Methods: The main active compounds of XRXPY were detected and identified using liquid chromatography-mass spectrometry (LC-MS) and network pharmacology. Through network pharmacology, we predicted the core targets of anti-obesity and potential anti-obesity core targets of XRXPY. Additionally, we constructed a unique herb–compound–target network diagram for the key active ingredients and core targets of XRXPY anti-obesity, and used protein to protein interaction (PPI), gene ontology (GO) enrichment analyses, and kyoto encyclopedia of genes and genomes (KEGG) signaling pathway analyses to explore the mechanism of XRXPY anti-obesity. Then, molecular docking were used for model the interaction between key active ingredients and core targets. Finally, the potential mechanism of XRXPY on obesity predicted by network pharmacological analysis was experimentally studied and verified in vivo.

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Results: The XRXPY contains a total of 94 active chemical components, and 202 consensus genes were identified as targets of active ingredient targets in XRXPY anti-obesity. We detected Caffeic acid, Luteolin, Quercetin and Acetyl shikonin in both network analysis and LC-MS. Key targets including EGFR, SRC, AKT1, TNF, PIK3R1, CYP3A4, PIK3CA, PTGS2 and key signaling pathways mainly related to PI3K/AKT signaling pathway, cAMP signaling pathway and Insulin resistance. Molecular dynamics simulation showed that AKT and the above four ingredient targets had a good binding ability. Moreover, XRXPY could improve high-fat diet (HFD) induced obesity, including weight loss, alleviating liver lipid deposition, promoting lipid metabolism and glucose homeostasis, which was related with the activation of the PI3K-Akt pathways in vivo experiment.
Conclusion: Our study verified that XRXPY can improve obesity through activating the PI3K/AKT pathway. These findings provides the effective components and molecular targets of XRXPY anti-obesity.

GC4.188

Evaluation of the incidence of gallbladder and biliary diseases with TZP across body weight reduction categories in the SURMOUNT program

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[3]Eli Lilly and Company, Diabetes, Indianapolis, Indiana, USA

Introduction: Systematic review and meta-analysis of RCTs found an increased risk of gallbladder (GD) or biliary diseases (BD) associated with use of GLP-1 receptor agonists, especially when used at higher doses, for longer durations, and for weight loss (WL). Similarly, WL during the post-operative period of bariatric surgery is known to significantly increase the risk of GD.
The aim of this study is to evaluate the association of tirzepatide (TZP), a once weekly GIP/GLP-1 receptor agonist treatment, in the incidence of GD and BD in the SURMOUNT-1+2 (SM-1+2) program. This program investigated the use of TZP for chronic weight management in adults with obesity, or overweight (≥ 27 kg/m²) and a weight related comorbidity. The total number of analyzed participants in SM-1+2 was 2492 (TZP) and 867 (PBO).
Methods: Analysis of incidence of GD and BD across maximum body weight reduction (BWR) categories (<10%, 10-20%, 20-30%, >30% WL) in pooled results from SM-1+2, comparing placebo (PBO) and TZP arms in participants treated for obesity. Analysis of maximum % change in weight prior to onset of acute GD was carried out.
Results: Acute GD was higher in the PBO arm of BWR category ≥10% to < 20% (3.5%, n=144) followed by the TZP arm within the BWR category of > 30% (3.1%, n=355).
Gallbladder related disorders (SMQ - standardized MedDRA query) were higher in the PBO arm of the ≥10% to < 20% BWR category (3.5%, N = 144) followed by the TZP arm of the ≥20 to <30 % BWR category (2.4%, N = 759). Only 18 participants in PBO had > 20% BWR versus 1114 in the TZP group. Gallstone related disorders (SMQ) were highest in the PBO arm of BWR category ≥10% to < 20% (2.1%, n=144) followed by the TZP arm of the > 30% BWR category (1.7%, n=355). Biliary tract disorders (SMQ) were highest in the TZP arm of the >30% BWR category (0.8%, n=355).
The association between onset of acute GD and BWR based on maximum BWR prior to onset of event found that participants in the PBO arm of ≥0% to < 10% BWR category had the highest rate of acute GD (62.5%, n=16) followed by the TZP arm of the same category (38%, n=50).
Conclusion: In the TZP arm, the proportion of participants with ≥ 1 TEAE Acute Gallbladder Disease increased with the augmentation of percentage of WL. In the PBO arm, the proportion of participants with ≥ 1 TEAE Acute Gallbladder Disease was higher in those with BWR below 20%. For participants above 20% BWR, no cases in the PBO group were reported, however, there were just 18 participants in this group (vs 1114 in TZP arm).

Tab. 1. Incidences (SMQ - standardized MedDRA query) of gallbladder, gallstone and biliary tract disorders in participants on TZP across 4 categories of body weight reduction (BWR).

Table 1: Incidences (SMQ - standardized MedDRA query) of gallbladder, gallstone and biliary tract disorders in participants on TZP across 4 categories of body weight reduction (BWR).

MedDRA preferred term	Body Weight Reduction (BWR) Categories							
	≥0% to < 10%		≥10% to < 20%		≥20% to < 30%		> 30%	
	PBO n=705 (%)	TZP n=481 (%)	PBO n=144 (%)	TZP n=897 (%)	PBO n=14 (%)	TZP n=759 (%)	PBO n=4 (%)	TZP n=355 (%)
Participants with ≥ 1 TEAE of Acute Gallbladder Disease	1.6	1.2	3.5	1.6	0	2.5	0	3.1
Gallbladder related disorders (SMQ)	1.6	1.0	3.5	1.4	0	2.4	0	2.3
Cholecystitis	0	0	0	0.4	0	0.3	0	0.3
Cholecystitis acute	0.1	0.4	0.7	0.1	0	0.8	0	0.3
Cholecystitis chronic	0.4	0	0	0.1	0	0.1	0	0.8
Cholecystectomy	0	0	0	0.2	0	0.1	0	0.3
Gallstone related disorders (SMQ)	1.1	0.6	2.1	0.9	0	1.6	0	1.7
Cholelithiasis	1.0	0.6	2.1	0.9	0	1.6	0	1.4
Biliary tract disorders (SMQ)	0.3	0.2	0	0.3	0	0.1	0	0.8
Jaundice	0	0.2	0	0.1	0	0	0	0

Note: Data in this table are based on MedDRA search criteria, for example: Acute GD is a broader search comprising 3 SMQ, (Gallbladder related disorder, biliary tract disorder and gall stone related disorder). Only relevant PTs (Preferred Terms) were included. Abbreviations: n = number of participants in analysis population in BWR category; SMQ = standardized MedDRA query; TEAE = treatment-emergent adverse event; TZP = tirzepatide = all doses of TZP (5 mg, 10 mg, 15 mg).

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GC4.189

Self-Medication with GLP-1 Analogs for Weight Loss: A Pilot Study

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The global increase in obesity and overweight poses challenges in public health, demanding personalized approaches. Hormones like ghrelin and GLP-1 influence appetite and satiety regulation. Stigmatization of overweight favors unsupervised therapies and misuse of medications, such as GLP-1 analogs. This research addresses unauthorized use of GLP-1 analogs, identifying factors and consequences. This pilot study, based on convenience sampling, shows that 86% self-prescribe, attributing it to traditional methods' inefficacy. Positive effects outweigh adverse ones; obese individuals report more adverse effects and higher intention to change treatment. Education varies between self-prescribers and prescription followers. No significant differences found in nutritional status. Expanded and robust studies are needed to establish causes and consequences of self-prescription, considering pilot study limitations. This study underscores the need to comprehensively address the growing self-prescribed use of GLP-1 analogs in obesity and overweight issues.

GC4.190

Efficacy of Semaglutide therapy on continuing weight loss maintenance after weight loss in patients with diabetes and with obesity

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Introduction: Semaglutide, a glucagon-like peptide 1 receptor agonist, is indicated for the treatment of adults with type 2 diabetes mellitus (T2DM) as an adjunct to diet and exercise. Semaglutide is also approved by the European Medicines Agency (EMA) for the long-term treatment of obesity or overweight. In the STEP 4 study, efficacy data on maintaining weight loss of Semaglutide 2.4 mg in patients with obesity and without T2DM are shown. Here, we report the efficacy on weight loss maintenance of Semaglutide, either alone or in combination with other antidiabetic drugs in T2DM patients with obesity.

Patients and methods

We retrospectively evaluated 129 patients with obesity and T2DM (75 F; 54 M; mean age: 61.2±9.8 years) treated with Semaglutide for weight loss and glycemic control. Semaglutide was administered as monotherapy or in combination with metformin or other antidiabetic drugs. Semaglutide was administered once-weekly subcutaneously at starting dose of 0.25 mg and with monthly increases up to 1.0 mg. All patients were required to follow dietary and behavioral advice and concomitant drug treatment. Aim of this study was to evaluate efficacy and safety of Semaglutide in the maintaining weight loss after the steady state weight loss in this setting of patients.

Results: At baseline, mean weight (W) was 101.8±24.6kg and mean body mass index (BMI) was 36.7±8.7kg/m^2.

After 6-month follow up, 115/129 patients (14 patients have not yet reached 6 months of treatment) achieved a mean W of 95.5±24.3kg and mean BMI of 34.3±9.4kg/m^2, with a mean W and mean BMI reduction respectively of -10.3±8.3Kg and -3.8±3.1kg/m^2.

After 12-month follow up, 84/129 patients achieved a mean W of 88.6±17.9kg and mean BMI of 31.9±5.6kg/m^2, with a mean W and mean BMI reduction respectively of -9.1±7.8Kg and -3.3±2.9kg/m^2.

After 24-month follow up, 42/129 patients achieved a mean W of 83.2±14.2kg and mean BMI of 30.7±4.4kg/m^2, with a mean W and mean BMI reduction respectively of -15.8±11.6Kg and -5.8±3.9kg/m^2. There was a statistical significance in mean W and mean BMI reduction at 6 (W p<0.0001; BMI p<0.0001), 12 (W p<0.0001; BMI p<0.0001) and 24 (W p<0.0001; BMI p<0.0001) months of therapy from baseline using the paired Student's t test.

At baseline mean glycated hemoglobin was of 7.7±1.6% and after 6-, 12-, and 22-month follow up was respectively 6.4±0.9%, 6.2±0.7%, and 6.4±1.1%, with a mean percentage reduction of -1.8±1.5%, -1.4±2.0%, and -1.5±1.9%. There was a statistical significance in mean HBA1C reduction at 6 (p<0.0001), 12 (p<0.0001) and 24 (p=0.0024) months of therapy from baseline.

Semaglutide was well tolerated, and no patients experienced severe adverse events as nausea and vomiting.

Conclusions: Our results confirm the efficacy and safety over 24 months of Semaglutide therapy in patients with T2DM and obesity on weight loss and improvement of the HBA1C. In line with the results of the STEP 4 study on patients with obesity, Semaglutide not only induces weight loss but also a continuing weight loss maintenance after 12 and 24 months of treatment.

GC4.191

Real life efficacy of liraglutide therapy on weight-loss in female patients with obesity and with baseline BMI <35 vs ≥35 kg/m^2 and menopausal condition

Del Prete, M.; Vignati, F.; Di Sacco, G.; Gavazzi, L.; Disoteo, O.; Muratori, F.

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Introduction: Efficacy of liraglutide (L) on weight loss (WL) has been documented in major clinical studies as the SCALE trial. Here, we reported the effectiveness of L in association with dietary and behavioral advice, in 73 female patients with obesity followed in our outpatient clinic. This study compared efficacy and safety of L in adults with obesity on WL and baseline BMI <35 vs ≥35 kg/m^2 and menopausal condition.

Patients and methods

We retrospectively evaluated efficacy and safety of L in 73 female patients with obesity and with body mass index (BMI) >30kg/m^2 (Group 1 (G1): 27 patients BMI<35 and age <50; G2: 21 patients BMI <35 and age ≥50; G3: 18 patients BMI ≥35kg/m^2 and age <50; G4 7 patients BMI ≥35kg/m^2 and age ≥50) admitted to our observation to lose W with L. All patients were required to follow dietary and behavioral advice with concomitant drug treatment. L was administered once-daily subcutaneously at starting dose of 0.6 mg with weekly increases up to 3.0 mg. Aim of this study was to compare efficacy and safety after 6, and 12 months of treatment with L in female patients with obesity and with BMI <35 vs ≥35kg/m^2 and menopausal condition.

Results: At baseline, patients of G1, G2, G3 and G4 respectively had mean W of 85.9±8.8kg, 86.4±7.1kg, 105.9±11.7kg and 106.8±13.7kg. Mean BMI was respectively 32.2±1.6kg/m^2, 32.0±1.5kg/m^2, 39.8±4.5kg/m^2 and 38.8±4.5kg/m^2.

After 6-month follow up, patients of G1, G2, G3 and G4 achieved respectively a mean W of 73.6±9.8 kg, 74.2±7.8kg, 91.5±11.9kg and 90.6±9.0kg and mean BMI of 27.4±2.1kg/m^2, 27.7±2.4kg/m^2, 34.5±4.6kg/m^2 and 32.7±3.6kg/m^2, with a mean percentage (%) W and mean BMI reduction respectively of -15.3±6.0%, -13.2±4.8%, -13.5±4.9% and -13.5±3.2%, -5.0±2.0kg/m^2, -4.2±1.4kg/m^2, -5.4±1.9kg/m^2 and -5.1±1.0kg/m^2.

After 12-month follow-up, patients of G1, G2, G3 and G4 had respectively a mean W of 70.0±9.1Kg, 68.0±5.9kg, 82.8±12.8kg and 85.0±0.1kg and mean BMI of 25.5±2.0kg/m^2, 24.8±2.4kg/m^2, 31.3±5.2kg/m^2 and 29.8±1.3kg/m^2, with a mean % W and mean BMI reduction respectively of -29.2±10.7%, -26.0±7.1%, -30.3±8.5% and -24.7±2.6%, -7.3±2.2kg/m^2, -6.3±1.2kg/m^2, -9.2±1.9kg/m^2 and -7.4±1.0kg/m^2 from baseline.

There were no significant statistical differences between menopausal status and BMI < or ≥35 in female patients with obesity.

Conclusions: Our results confirm efficacy of real-life therapy with L in female patients with obesity. Our real-life results show that L therapy had similar efficacy on WL in patients with BMI < and ≥35kg/m^2 and regardless the menopausal condition.

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GC4.192

Comparison of efficacy of injectable and oral Semaglutide treatment in patients with obesity and overweight and with type 2 diabetes

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Introduction: The long acting GLP-1 analogue, Semaglutide (S), is indicated for the treatment of adults with type 2 diabetes mellitus (T2DM) Since November 2021, S has also been approved by the European Medicines Agency (EMA) at a dose of 2.4 mg for the treatment of obesity. Currently, S is the only GLP-1 analogue that is available in both an injectable (IS) and oral (OS) formulation. Here, we report the comparison of efficacy of IS and OS, either alone or in combination with other antidiabetic drugs in patients with obesity and T2DM.

Patients and Methods: We retrospectively evaluated 175 patients with obesity and overweight and T2DM. Of these, 129 patients (75 F and 54 M; mean age 61.2±9.8 years) were treated with IS and 46 patients (24 F and 22 M; mean age 65.7±12.8 years) with OS for glycemic control and for weight loss. At the first visit, respectively mean weight was 101.8±24.6 and kg 95.2±15.0 kg; mean body mass index (BMI) was 36.7±8.7 kg/m^2 and 34.3±5.3 kg/m^2. S was administered as monotherapy or in combination with metformin. IS was administered once-weekly subcutaneously at starting dose of 0.25 mg and with monthly increases up to 1.0 mg, while OS was administered once-daily orally at starting dose of 3 mg and with monthly increases up to 7 mg in all patients and subsequently 14 mg. The aim of this study was to evaluate the efficacy of both injectable and oral S in this setting of patients.

Results: After 6-month follow up, patients had a mean weight of 95.2±24.3kg (IS 115/129; 14 patients have not yet reached 6 months of treatment) and 90.2±12.9kg (OS 46/46) and mean BMI of 34.3±9.4kg/m^2 (IS 47/129) and 33.2±4.3kg/m^2 (OS 46/46), with a mean percentage weight reduction of -9.5±6.5% and -6.8±5.8%; and mean BMI reduction of -3.7±3.1kg/m^2 and -2.5±2.1kg/m^2.

After 12-month follow up, patients had a mean weight of 88.9±17.9kg (IS 47/129) and 89.1±14.1kg (OS34/46) and mean BMI of 31.9±5.6kg/m^2 (IS 47/129) and 31.4±4.4kg/m^2(OS 34/46) with a mean percentage weight loss of -9.2±7.6% and -10.4±5.8%; and mean BMI reduction of -3.3±2.8kg/m^2 and -3.8±2.2kg/m^2. There was no statistical difference in mean weight loss variations and mean BMI changes after 6 and 12 months of therapy.

At baseline mean glycated hemoglobin ((HBA1C) was 7.7±1.5% and 7.6±1.6%. After 6-month follow up was 6.4±0.9% and 6.4±0.8%, with a mean reduction of -1.8±1.5% and -1.4±1.7%. After 12-month follow up was 6.4±0.9% and 6.3±0.7%, with a mean reduction of -1.6±1.6% and -0.7±0.6%.

Conclusions: Our results show a comparable efficacy both with IS and OS therapy in patients with obesity and overweight and with diabetes. In our study Is and OS provide significant weight loss allowing to reach the glycometabolic therapeutic target in a short time.

GC4.193

Gender-difference in response to treatment with Liraglutide 3.0 mg

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Introduction: In clinical trials on anti-obesity drugs, women are generally more represented, but gender-specific analysis is rarely taken into consideration. Since some studies suggest that females show significantly greater weight loss than males, few studies have examined the sex-specific differences. The aim of this study was to investigate the existence of a gender related response to treatment with Liraglutide 3.0 mg in people with Obesity (PwO).

Methods: The study included 64 patients with obesity and without diabetes treated with a titrated dose of liraglutide 3.0 mg, of whom 19 males (29.6%) and 45 females (70.3%). Data were collected retrospectively from the electronic reporting system of the Obesity Unit of the Santa Maria Goretti Hospital in Latin, Italy. Demographic and anthropometric parameters (age, weight, BMI) and clinical data (glucose metabolism, liver and kidney function, and lipid profile) at baseline and after 3 and 6 months, were evaluated.

Results: Baseline data showed no significant differences in BMI (39.5 kg/m^2 vs. 37.5 kg/m^2, p=0.768) in males and females, respectively. In the male group, the results showed a significant reduction in body weight and BMI at 3 months (-10.0 kg; -3.7 kg/m^2, p<0.0001) and at 6 months (-17.1 kg; -6.6 kg/m^2, p<0.0001). Analysis of metabolic parameters showed significant reductions (p<0.0001) in LDL cholesterol (-9.5 mg/dl), AST (-3.5U/L) and fibrosis-4 index FIB-4 (-0.23). There were no significant differences in glycated hemoglobin, blood glucose, total cholesterol, triglycerides, HDL cholesterol, or creatinine. In the female group, the results showed a significant reduction in body weight and BMI at 3 months (-6.4kg, P<0.0001; -2.3kg/m^2, P<0.0001) and at 6 months (-13.7kg; -5.1kg/m^2, p<0.0001). Analysis of metabolic parameters showed significant reductions (p<0.0001) in glycated hemoglobin (-0.30%), GPT (-5.4U/L) and FIB-4 (-0.17). There were no significant differences in blood glucose, total cholesterol, triglycerides, HDL cholesterol, creatinine, LDL cholesterol, AST and GGT. When comparing the two groups, males showed a greater reduction in weight (-10.0 kg vs. -6.46 kg, p<0.0001) and BMI (-3.7 kg/m^2 vs. -2.3 kg/m^2, p<0.0001) than females at 3 months, and this trend was maintained at 6 months (-17.1 kg vs. -13.7, p=0.310; -6.6 kg/m^2 vs. -5.1 kg/m^2, p=0.426). At 3 months, 67% of males vs. 46% of females achieved weight loss > 5% (p=0.04); at 6 months, 33.3% of males vs. 22.2% of females achieved weight loss > 10% (p=0.05). No significant differences in metabolic parameters were observed between the two groups.

Conclusion: Our findings suggest the possible role of physiological and hormonal differences between men and women that may influence the effect of anti-obesity drugs. However, clinical trials conducted to date have not consistently shown significant differences in the efficacy or safety of anti-obesity drugs between men and women, and further studies are needed to justify dose adjustments based on gender.

GC4.194

The effectiveness of liraglutide in a real-life setting: the experience in a semi-residential multidisciplinary lifestyle intervention

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Introduction: Obesity is a major public health issue with increased morbidity and reduced life expectancy. A 5–15% weight loss over a period of 6 months is realistic and of proven health benefit, but an insufficient weight loss induced by lifestyle intervention poses a significant challenge in obesity treatment. New strategies have emerged for treatment of obesity, such as liraglutide, an injectable long-acting GLP-1 agonist. This prospective, observational study investigated in a real-life setting the effectiveness of liraglutide in patients with obesity undergoing 3 month-multidisciplinary weight loss intervention.

Method: Since September 2023, we proposed therapy with liraglutide to all people with severe obesity who did not reach an adequate weight loss (≤3%) after six weeks of multidisciplinary lifestyle intervention, which included medical, psychological, nutritional and physical activity sessions.

Results: Therapy with liraglutide was proposed to 26 participants (23 women, age 52.8±11.4 yrs, BMI 41.6±5.4 kg/m^2) and 15 decided to start (L group) and 11 to refuse (P group) the pharmacological treatment. There were no difference in BMI (42.4±6.6 vs 40.5±3.3 kg/m^2, ns), age (51.7±13.4 vs 54.4 vs 8.3 yrs, ns) and percentage of weight loss after 6 weeks of lifestyle intervention (-1.7±1.5 vs -1.4±1.3%, ns) between L group and P group. 23 patients concluded the 3 month-program. The mean relative weight loss was -6.8±2.8% in the L group and -3.1±2.3% in the P group (p<0.01). The

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5% weight loss was achieved in 77% vs 20% of the participants in L group and P group respectively (p<0.01).

Conclusion: Treatment with liraglutide combined with a lifestyle program induced a 5% weight loss in a great amount of patients with severe obesity.

GC4.195

Real-world use of liraglutide for weight management according to label in the UK: a study using the Clinical Practice Research Datalink primary care databases

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Introduction: Saxenda is indicated for weight management as an adjunct to lifestyle intervention in adults with overweight or obesity, and Victoza (both liraglutide [lira]) for the treatment of type 2 diabetes. The potential exists for their inadvertent use for these indications, or outside of the indicated populations. Both were previously reported to be primarily used according to the European label in Germany and Italy.[1] The objective of this descriptive drug utilisation study was to assess real-world use of Saxenda according to approved indication and Victoza for weight management in the UK.

Methods: This retrospective, observational study included database participants (pts) who initiated lira from 16 January 2017 to 31 December 2021, from the UK Clinical Practice Research Datalink GOLD and Aurum primary databases. Initiators of lira (Saxenda, Victoza or unbranded lira) who had no lira prescriptions documented <12 months prior to their first prescription in the study period (index date) were included. Primary endpoints were measured <6 months before the index date, and per the Saxenda label included pts with body mass index (BMI) ≥30 kg/m² and BMI ≥27–<30 kg/m² with ≥1 obesity-related complication; also included were pts with BMI <27 kg/m², with BMI ≥27–<30 kg/m² and no relevant complications, and with BMI not measured. Secondary endpoints included pts with Victoza prescriptions fulfilling the criteria of daily dose of 3.0 mg or dose information of 3.0 mg/day. Adherence to the Saxenda stopping rule (<5% weight loss in weeks 16–24) and mean weight loss of pts not treated according to the stopping rule were assessed. Outcomes with fewer than 5 pts were presented as 0 or 1–5. Descriptive statistical analysis was performed.

Results: Of the 13,367 pts, most received unbranded lira (n=7,895; 59.1%), followed by Victoza (n=4,868; 36.4%) and Saxenda (n=604; 4.5%). Demographic characteristics are shown in Tables 1 and 2. 306 pts (50.7%) receiving Saxenda had BMI data registered <6 months before the index date (Table 3); most (n=281; 91.8%) had a BMI of ≥30 kg/m². The most reported obesity-related complications in pts with BMI ≥27–<30 kg/m² (n=20; 3.3%) were dysglycaemia (n=6; 30.0%) and other obesity-related complications (n=9; 45.0%); 1–5 pts (5%) had dyslipidaemia, whereas 6 (30.0%) reported no relevant complications. 54 of 306 pts (17.6%) completed >24 weeks of treatment; 15 (27.8%) had ≥5% weight loss and 1–5 pts had <5% weight loss in weeks 16–24; adherence to the Saxenda stopping rule could not be assessed in 38 of 54 pts (70.4%). 11 pts (3.6%) received Saxenda outside the approved indication. Of the 92 pts treated with Victoza and who had available dose information, 1–5 had a recorded daily dose of 3.0 mg/day at any time during treatment.

Conclusions: This report provides descriptive data for initiators of liraglutide in the initial 5-year period following the launch of Saxenda in the UK. Where assessment was possible, Saxenda and Victoza were mostly used according to their approved indication, with minor non-adherence.

Tab. 1.

Table 1. Participant demographics by first therapy prescribed during the study period

Characteristic	Saxenda (n=604)	Victoza (n=4,868)	Unbranded lira (n=7,895)	All (N=13,367)
Gender, n (%)				
Male	82 (13.6)	2,333 (47.9)	3,802 (48.2)	6,217 (46.5)
Female	522 (86.4)	2,535 (52.1)	4,093 (51.8)	7,150 (53.5)
Age, years*	46.5 (11.7)	57.5 (12.0)	57.3 (12.1)	56.9 (12.3)
Follow-up duration, months†	18.7 (13.9)	33.0 (15.9)	36.6 (16.5)	34.5 (16.6)
Treatment duration, months	3.0 (4.5)	9.9 (11.3)	–	–

All data are mean (SD) unless stated otherwise.
**Age is calculated as year of treatment initiation minus year of birth as reported.*
†Study follow-up duration is defined as follows: (end of follow-up in CPRD – treatment initiation date + 1)/30.44.
CPRD, Clinical Practice Research Datalink; SD, standard deviation.

Tab. 2.

Table 2. Additional participant demographics for participants prescribed Saxenda

Characteristic	Saxenda (n=604)
BMI, kg/m²	
<27	1–5
≥27–<30	20 (3.3)
≥30–<40	131 (21.7)
≥40	150 (24.8)
Missing	298 (49.3)
Height, m*	1.7 (0.1)
Weight, kg*	110.9 (26.4)
Baseline complications on or before treatment initiation	
Number of selected obesity-related complication(s)	
0	220 (36.4)
1	142 (23.5)
2	107 (17.7)
3	86 (14.2)
4	31 (5.1)
>4	18 (3.0)
Dysglycaemia†	246 (40.7)
Dyslipidaemia	72 (11.9)
Hypertension	153 (25.3)
Sleep apnoea	56 (9.3)
Hip or knee osteoarthritis	63 (10.4)
Gallbladder disease	52 (8.6)
GERD	71 (11.8)
CVD	84 (13.9)
NAFLD	37 (6.1)

All data are n (%) unless stated otherwise.
**Mean (SD)*
†Refers to prediabetes or T2D.
BMI, body mass index; CVD, cardiovascular disease; GERD, gastro-oesophageal reflux disease; NAFLD, non-alcoholic fatty liver disease; SD, standard deviation; T2D, type 2 diabetes.

Tab. 3.

Table 3. Use of Saxenda in participants with BMI data registered <6 months before the index date

n (%)	Saxenda (n=306)
BMI and obesity-related complications	
BMI ≥30 kg/m²	281 (91.8)
BMI ≥27–<30 kg/m² with ≥1 relevant obesity-related complication*,†,‡	14 (70.0)
Dysglycaemia‡	6 (30.0)
Hypertension‡	0
Dyslipidaemia‡	1–5
Obstructive sleep apnoea‡	0
Other obesity-related complications‡,§	9 (45.0)
No relevant complication*,†	6 (30.0)
BMI <27 kg/m² or ≥27–<30 kg/m² and no relevant obesity-related complication*,†	11 (3.6)
Stopping rule¶	
Completed at least 24 weeks of treatment after index date	54 (17.6)
≥5% weight loss 16–24 weeks after index date and continuing treatment#,**	15 (27.8)
<5% weight loss 16–24 weeks after index date and continuing treatment**	1–5
Treated continuously for ≥24 weeks with no body weight measurements between 16 and 24 weeks after index date	38 (70.4)
Mean % weight loss (SD) in participants not treated according to the stopping rule (n=39)††	4.3 (3.5)

**Before Saxenda first prescription date.*
†Dysglycaemia, hypertension, dyslipidaemia, obstructive sleep apnoea and/or other weight-related complications.
‡Percentages based on the number of participants with BMI ≥27–<30 kg/m² (n=20).
§Other complications include osteoarthritis, gall bladder disease, GERD, CVD and NAFLD.
¶In participants with available BMI at treatment initiation.
#Implying at least one additional prescription.
***Measured 16–24 weeks after first prescription date.*
††Based on last weight measurement observed within the index date and 28 weeks of treatment.
BMI, body mass index; CVD, cardiovascular disease; GERD, gastro-oesophageal reflux disease; NAFLD, non-alcoholic fatty liver disease; SD, standard deviation.

Reference

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GC4.196

Resting energy expenditure and muscle strength are preserved after weight loss induced by liraglutide or naltrexone/bupropion in patients with obesity

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Introduction: Weight loss in obesity is associated with a reduction in resting energy expenditure (REE), which is partly attributable to a reduction in fat free mass. Since reduced REE predisposes to weight regain, it is of utmost importance to identify obesity treatments that induce weight loss while preserving or even increasing REE. In recent years, several pharmacological agents, such as the GLP-1 analogue liraglutide or naltrexone/bupropion, have been approved for treatment of obesity. The aim of the current study was to unravel the effects of these agents on REE and body composition in patients with obesity.

Methods: In this longitudinal study, we evaluated 72 adults with obesity who were treated with liraglutide 3.0 mg (n=47) or naltrexone/bupropion 32/360 mg (n=25). At baseline and at 12 weeks after reaching maximum or highest tolerated dose, anthropometrics, body composition using bio-electrical impedance (Inbody S10, BioSpace, Seoul, Korea), and maximal grip strength (kg) (Jamar) were measured. Predicted REE was calculated using the Harris & Benedict equation and REE was measured using indirect calorimetry (Q-NRG®, Cosmed, Roma, Italy).

Results: Patients treated with liraglutide had a median age of 42.3 years, a baseline BMI of 42.4 ± 8.3 kg/m^2 and 72% was female. 17.0% had a confirmed diagnosis of (mono)genetic obesity. Patients treated with naltrexone/bupropion had a median age of 35.7 years, a baseline BMI of 38.9 ± 6.2 kg/m^2 and 64% was female. 24% had a confirmed diagnosis of (mono) genetic obesity. After Liraglutide body weight and BMI were significantly reduced (-6.8 ± 4.5% and -2.8 ± 1.9 kg/m^2, respectively), with a reduction in fat mass (-5.9 ± 5.2 kg) and fat-free mass (-2.8 ± 3.7 kg) after 12 weeks (all p<0.001). Hand grip strength remained unaltered compared to baseline. After Naltrexone/bupropion also significant weight loss (-4.8 ± 4.0%) and decrease in BMI (-1.9 ± 1.6 kg/m^2) was observed, with a reduction in fat mass (-4.6 ± 4.9 kg) (all p<0.001), but not fat-free mass, and unaltered hand grip strength. While predicted REE decreased after both treatment regimens (-90 ± 78 and -40 ± 88 kcal/day for liraglutide and naltrexone/bupropion, respectively, both p<0.01), measured REE remained equal after both treatments, independent of changes in fat-free and fat mass. For liraglutide, this resulted in an increased ratio between measured and predicted REE (4.0 ± 12.6%, P=0.033). Sensitivity analyses in responders (at least 5% weight loss) upon treatment yielded comparable results with respect to effects on REE.

Conclusion: In adults with obesity, after 12 weeks of liraglutide or naltrexone/bupropion treatment significant weight loss was observed. Interestingly, resting energy expenditure was preserved, independent of changes in fat-free mass, and muscle strength. This potential protecting effect on REE of these agents is clinically relevant as decreases in REE are often observed after non-pharmacologically induced weight loss, which poses patients at risk for weight regain.

GC4.197

Efficacy of Topiramate/Phentermine Extended Release in Weight Management and Metabolic Profiles: A Real-World Multicenter Study in South Korea

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Introduction: Previous studies, such as EQUIP and CONQUER, have demonstrated the effectiveness of topiramate and phentermine combination in weight management. This research evaluates the efficacy and safety of topiramate/phentermine extended release (ER) for weight management, focusing on alterations in body weight and metabolic parameters in a real-world context.

Methods: We retrospectively included participants with obesity who initiated topiramate/phentermine ER between January 2020 and April 2023 at 10 tertiary hospitals in South Korea. The study assessed weight changes at 6 months, and for those who continued, at 12 months, along with metabolic parameters.

Results: The cohort included 2,480 participants (741 men and 1739 women), with a six-month continuation rate of 48%. At 6 months, the mean weight reduction was 8.0%, with sex-specific losses of 7.1% in men and 8.3% in women, aligning with findings from EQUIP and CONQUER. Over 56% of participants achieved more than 5% weight loss, with 23% exceeding a 10% reduction. Women and participants with severe obesity exhibited more pronounced weight loss compared to men participants with moderate obesity, respectively. Concurrently, topiramate/phentermine ER treatment improved glucose regulation, lipid profiles, liver enzymes, and blood pressure. The treatment was well-tolerated, with a 15% incidence of mild adverse events such as tingling (6%), dry mouth (3%), and dizziness (0.2%). At 12 months, participants who persisted in treatment (21%) experienced an average weight loss of 9.5%, with 65% surpassing 5% weight loss.

Conclusion: This real-world study demonstrates that topiramate/phentermine ER is an effective and well-tolerated therapeutic option for weight control in an Asian population. Over 6-12 months, it improved various metabolic parameters and aided in significant weight reduction, underscoring its potential as a comprehensive treatment approach in obesity management.

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GC4.198

Efficacy and Safety of a Fixed Dose Combination of Dapagliflozin and Linagliptin [AJU-A51] in Patients with Type-2 Diabetes Mellitus: A multi-center, Randomized, Double-Blind, parallel group. Placebo-controlled Phase III Study

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Introduction: To evaluate the efficacy and safety of add-on dapagliflozin in patients with type 2 diabetes mellitus who had inadequate glycemic control with metformin and linagliptin.
Methods: In this randomized, placebo-controlled, parallel-group, double-blind, phase III study, 235 patients with inadequate response to metformin (≥ 1000 mg/day) plus linagliptin (5 mg/day) were randomized to receive either dapagliflozin 10 mg/day (n=117) or placebo (n=118) for 24 weeks. After the 24-week treatment, patients who received the placebo were switched to dapagliflozin and treated for an additional 28 weeks. The primary endpoint was change in HbA1c from baseline to week 24.
Results: The baseline characteristics were similar between the two groups. At week 24, the least squares mean difference in HbA1c changes was -0.88%.(95% CI -1·07 to -0·68, p<0·0001). Dapagliflozin add-on to linagliptin and metformin significantly reduced mean HbA1c levels versus linagliptin and metformin. The safety profiles were similar: the incidence rates of treatment-emergent adverse events (TEAE) up to week 24 were 20.51% (95% CI 13.20 to 27.83) and 21.19% (95% CI 13.81 to 28.56) in the dapagliflozin and placebo groups (p=0.89). Of these, severe adverse events (SAE) were reported in three (2.56%) participants in the dapagliflozin group, two (1.69%) in the placebo (p=0.6835). TEAE and SAE were similar between dapagliflozin group and placebo group.
Conclusion: Fix dose combination of Dapagliflozin and Linagliptin [AJU-A51] added on to Metformin was found to be efficacious and well tolerated in the treatment of patients with T2DM, and demonstrated superiority to linagliptin treatment added on to Metformin.

GC4.199

Effects of Pharmacological Therapy for Obesity: Results from a Real-Life Monocentric Study

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Introduction: Management of obesity, a chronic and multifaceted condition, relies nowadays more and more on pharmacological interventions. In Italy, available medications include naltrexone/bupropion (N/B) and liraglutide (L). However, currently there is a lack of data on factors that can predict the treatment response.
Methods: We analysed retrospectively 200 patients followed at the Endocrinology Unit of Sant'Orsola Polyclinic in Bologna between 2017 and 2023 and treated with either N/B or L, prescribed according to the guidelines and taking into account potential contraindications. The primary objective was to evaluate anthropometric and laboratory parameters, as well as the occurrence of side effects. As secondary objective, potential factors influencing treatment response were explored.
Results: In this study 93 participants (46.5% of the cohort) were prescribed N/B, while 107 subjects (53.5%) received L. No statistically significant differences were present at baseline between the two groups. Follow up consisted of: a one-month phone interview, a four-month in-person visit (T1), and subsequent semi-annual assessment (T2 at 31 weeks and T3 at 49 weeks). Weight exhibited a significant reduction in both groups, at all time points, except between T2 and T3. As far as Total Body Weight Loss (TBWL) goes, L was superior to N/B in the first period (T1, p<0,001). Furthermore, more patients treated with L achieved 5% of TBWL compared to N/B at the initial assessment in T1 (p<0,001). N/B was associated with more side effects and was more frequently discontinued due to intolerance. The number of patients reaching full dosage of the drug (3 mg daily for L and 32/360 mg for N/B) was significantly higher in the L group. When considering only patients who attended follow-up at T1 with full-dose therapy, no statistically significant difference in weight changes emerged between the two groups. Both drug were also associated with improvements in anthropometric and laboratoristic parameters, consistent with findings from large randomized clinical trials.
Considering the two treatment groups, we searched whether the choice of drug was significantly influenced by the presence or absence of dysfunctional eating behavior (i.e.binge eating disorder), reported by the patient. A significant difference emerged, indicating a higher prevalence of dysfunctional behaviors in the N/B group. Despite this, TBWL was greater at T1 in patients receiving L, even in the presence of dysfunctional behavior, particularly in individuals with a binge-eating disorder.
Conclusion: While studies directly comparing the two drugs are lacking, here we provide significant insights into the efficacy and tolerability of N/B and L. L demonstrated superior weight loss in the initial months, even in patients with dysfunctional eating behavior, while N/B exhibited lower tolerability that might explain this result. Despite limitations due to its retrospective and real-life setting, our study underscores the potential of these medications and emphasizes the need for identifying predictive factors for a personalized approach in the treatment of obesity.

GC4.200

Correlation Between Semaglutide and Weight Reduction in Individuals with Obesity: A Systematic Review

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Introduction: Semaglutide, an insulinotropic agent and appetite suppressant, emerges as a promising therapeutic option for diabetes. This study seeks to elucidate the therapeutic role of semaglutide in individuals with diabetes.
Methods: Data retrieval for this article spanned a six-month period (January-June 2023). Comprehensive searches were conducted across Google Scholar, PubMed, and SciElO databases. Articles meeting the criteria were limited to those published within the last decade in Spanish, Portuguese, or English. Rigorous exclusion criteria focused on articles unrelated to the diabetes-obesity association or treatment with glucagon-like peptide-1 analogues. A total of 78 articles were scrutinized, with 41 deemed relevant for citation.
Conclusions:
The adjunct use of semaglutide, coupled with a meticulously tailored diet and physical activity regimen for individuals with diabetes, elicits manifold benefits. These encompass optimized glycemic control, weight reduction, and amelioration of comorbidities, particularly cardiovascular health, culminating in an overall enhancement of this health condition.

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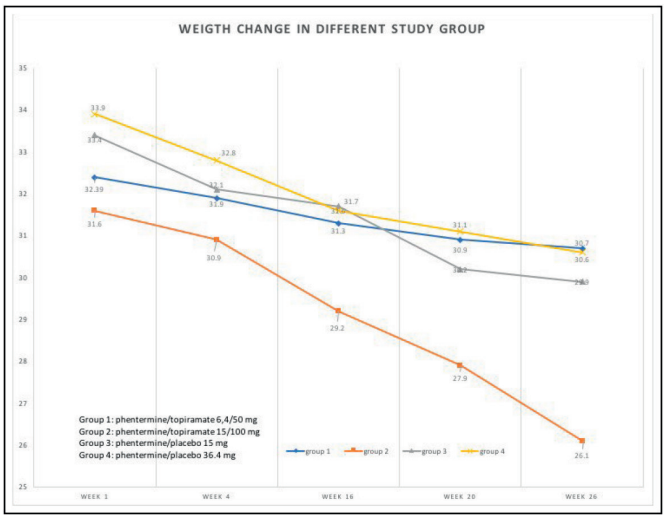
GC4.201

Phentermine-Topiramate Combination in Latin American populations: Clinical Efficacy and Safety in Overweight and Obesity

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Background: The prevalence of obesity in Latin American population underscores the critical need for innovative interventions, given the consequential health implications associated with this public health challenge.
Objective: This study rigorously examines the efficacy and safety profile of the combined administration of phentermine and topiramate among individuals contending with overweight or obesity. A primary emphasis is placed on evaluating the impact of this combination on pertinent risk factors and safety parameters.
Methodology: Over a meticulous 26-week period, a prospective, comparative, randomized, double-blind, parallel-group study was executed, involving discerningly selected men and women aged 18-55 years diagnosed with overweight or obesity. Participants were systematically allocated into distinct treatment cohorts: Phentermine (6,4mg) and topiramate (50 mg), Phentermine (15 mg) and topiramate (100 mg), and the administration of phentermine (15 mg) with a placebo, juxtaposed with phentermine (36.4mg) with a placebo.
To foster compliance, bespoke diet plans were meticulously crafted by a qualified nutritionist, bespoke to individual dietary preferences.
Results: The amalgamation of phentermine (15 mg) and topiramate (100 mg) yielded the most pronounced reductions in body weight, BMI, waist and hip circumference, accompanied by significant enhancements in metabolic variables encompassing lipids and glucose. The cohort receiving phentermine (36.4mg) exhibited commendable reductions, albeit relatively more modest than the phentermine + topiramate group.
Prominent adverse events, notably paresthesia and dry mouth, were documented, with a discernible attenuation in both frequency and intensity throughout the study's duration.
Conclusions: This comprehensive investigation posits that the combination of phentermine and topiramate not only demonstrates a commendable safety profile but also substantiates its efficacy in mitigating body weight and associated metabolic variables. This dual therapeutic paradigm holds promise as a noteworthy alternative in the therapeutic armamentarium against overweight and obesity



Group 1: phentermine/topiramate 6,4/50 mg Group 2: phentermine/topiramate 15/100 mg Group 3: phentermine/placebo 15 mg Group 4: phentermine/placebo 36.4 mg.

Fig. 1. Weigth change in different study groups.

GC4.202

Weight and body composition changes in patients living with severe obesity treated with GLP-1 agonists liraglutide

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Introduction: More than 40% of adults in the USA are affected by obesity; lifestyle modification alone is often ineffective. Liraglutide, a GLP-1RA, has proved to bring about cardiometabolic benefits and a reduction in high-risk fat deposits in patients with T2D and without DBT
Objective: To evaluate the changes in the distribution of total and visceral body fat in patients with severe obesity with high BMI, as a tool to lose weight prior to bariatric surgery and in order to prevent cardiometabolic complications.
Method: The body composition of 32 patients was determined by impedanciometry; furthermore, total body fat, visceral fat, and weight loss percentages, along with BMI have been compared with patients with severe obesity (19 women and 13 men). They were evaluated, both, at the beginning of treatment, and after six months. They were treated with progressive doses of Liraglutide up to 3 mg.
Results: As regards body composition, the initial average total body fat was 54.77%, and later on, it decreased up to 47.18%. The average initial visceral fat was 16.7% and, 6 months later, 14.5%. In addition, post surgery, the total fat decreased up to 36.9% while visceral fat diminished up to 9.5%.
Let´s point out that the initial body weight average was 140 kg; then it dropped up to 123.9 kg.
Regarding BMI average, I should say that it was 57.9 kg/m^2 at the beginning, and it decreased up to 43,2% 6 months later.
Conclusions: It has been observed that reductions in visceral fat, by means of Liraglutide, could be a mechanism underlying the benefit in cardiovascular disease risk; this applies not only to patients with type 2 diabetes, but also, to people with metabolic syndrome and with obesity (without diabetes). I must highlight that it lowers cardiovascular disease risk, while it is useful for weight loss before bariatric surgery.

GC4.203

Korean Medicine Registry of Herbal Medicine for Weight Loss:prospective observational multi-center study

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The purpose of this study was to investigate the clinical characteristics and current status of patients receiving herbal medicine (HM) treatment for weight loss in Korean medicine (KM) by constructing a multi-institutional prospective registry. Also, this study was to monitor the changes in symptoms and safety in people with obesity who have been treated with herbal medicine, including Ephedrae Herba
This was a prospective, observational, multi-center registry, including patients visiting the KM clinics in South Korea for weight loss. This study will collaborate with 15 KM clinics and recruit patients into the registry between October 2021 and October 2022.
A total of 1043 patients were enrolled. The average daily dose of ephedra is 12.66g, and the average period of taking herbal medicine is 46.07 days. After taking herbal medicine, body weight and body mass index significantly decreased by 6.11% and 6.20%, respectively ($p<0.0001$). Among patients who completed taking herbal medicine, there was no serious adverse reaction, including death, risk to life, hospitalization, serious disability, myocardial infarction, or other cardiovascular diseases.
Although a carefully planned and performed prospective observational studies, it do not guarantee an outcome showing a definitive relationship between therapeutic intervention and efficacy and safety, there are clearly limits to the research design itself for generalization of the results. This study can however, make a great contribution in fitting the pieces of evidence for safety of herbal medicine, including Ephedrae Herba, for people with obesity.

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GC4.204

A randomized, double-blind sham-controlled trial to evaluate the efficacy of electrical vestibular nerve stimulation, as a means of reducing excess body weight and body fat

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Introduction: The global prevalence of people living with obesity has reached pandemic proportions. The WHO estimates about two billion people are living with being overweight, with approximately one third of these individuals living with obesity. It is known that the hypothalamus plays a crucial role in the regulation of metabolism and body composition. Activation of the vestibular system has been shown to positively influence the areas of the hypothalamus that are involved in energy regulation and fat storage, particularly visceral adipose tissue (VAT). The aim of this study was to evaluate the efficacy and safety of electrical vestibular nerve stimulation (VeNS) combined with a lifestyle modification program, compared to a sham control and a lifestyle modification program as a means of reducing excess body weight and body fat.

Methods: A randomised, double-blind, sham-controlled trial conducted from August 2019 to April 2022. The trial recruited participants aged 22 to 80 years inclusive, with a body mass index (BMI) ≥ 27 kg/m^2. Participants were provided with a lifestyle modification program and randomly assigned (in a 1:1 ratio) to receive the investigational (VeNS) or sham device. All participants were instructed to use their allocated device daily for 60 minutes for 6 months and were assessed at baseline and 6 months. Key assessments were bodyweight (primary outcome), whole-body composition DXA scanning and occurrence of adverse events (AEs).

Results: 241 participants were randomly assigned to receive either the VeNS (n=117) or sham (n=124) device. At 6 months, the Intention-to-Treat (ITT) analysis showed that change in bodyweight between VeNS (-2.91kg) and sham (-2.30kg) groups was not significant (p=0.39). However, a significant difference was observed in the percentage reduction in VAT between the VeNS and sham groups (ITT: -12.63% vs. -4.67%, p=0.03). Furthermore, significantly more participants in the VeNS group compared to sham group lost ≥10% of VAT (ITT: 49% vs. 39%, p=0.04) and ≥5% of total body fat (ITT: 44% vs. 30%, p=0.03). There was no significant difference between the VeNS and sham groups in the number of reported causally related AEs (VeNS group 42% vs. sham group 39%; p=0.7). There were no causally related SAEs reported. A formal blinding analysis at 6 months for both participants and researchers demonstrated adequate blinding was achieved.

Conclusion: Although this study did not show a significant difference in bodyweight between the treatment groups at 6 months, there was a significant reduction in VAT observed in the VeNS group. Additionally, the number of participants achieving 10% or greater reduction in VAT was significantly greater in the VeNS group. These findings suggest that VeNS appears to have a positive and specific influence on fat storage, in particular the regulation of VAT, and thus could contribute to clinically meaningful outcomes when used as part of a standard weight management intervention.

Conflict of interest: Please see conflict of interest statement

Funding: Please see funding statement

GC4.205

Severe obesity and type 2 diabetes: a promising multi-target therapy

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Introduction: Obesity seems to be associated with higher emotional dysregulation compared to normal weight condition and this relationship could represent a risk factor for the worsening of problems related to excessive body weight. Behavioural coping mechanisms, such as unhealthy eating, mediate disturbed glucose homeostasis, and neuroinflammation in type 2 diabetes (T2D).

Emotional eating (EmE) scores are associated with both obesity and weight regain, correlates with alterations in reward processing areas and less sensitivity to the central effects of GLP-1 receptor.

GLP-1 receptor agonists (GLP-1RAs) reduce body weight, suppress appetite and increase satiety, although considerable variation in individual responses were observed.

Naltrexone-bupropion sustained release (NBSR) combination results on weight loss by stimulation of hypothalamic pro-opiomelanocortin neurons (bupropion-related) and a blockade consumption (naltrexone-related). The aim of this study was to evaluate efficacy and safety of adjunctive NBSR in obese T2D patients.

Methods: 28 (M/F 12/16; mean age: 52.5) patients with obesity-resistant to weigh loss (BMI 37.3 ± 3.6) and T2D (HbA1c 7.2 ± 0.8) on GLP-1RAs (semaglutide, sc) were selected. The Dutch Behaviour and Eating Questionnaire (DBEQ), the Food Craving Questionnaire-State (FCQS) and body composition (BIVA) were obtained before and after 12 and 24 weeks of semaglutide(once weekly sc, 1mg)/NBSR (os, 8/90 tablets) dual therapy. Primary outcome was changes from baseline in percentage of weight loss and secondary outcome were changes in baseline emotional (EmE), external (ExE) and restrained (RE) eating.

Results: Of 28 patients, 86% completing treatment and adverse events have been found in 6 [dizziness (4), nausea (6), dry mouth (3) and vomiting (4)] and were primarily mild to moderate in severity. Mild hypoglycemia was reported in 3,6%. At 24-week, the percentage of patients who attained ≥ 10% weight loss was 75% and therefore weight-loss and EmE/RE were significantly related to dual therapy (semaglutide/NBSR).

Conclusion: The association of EmE with depression and poor emotion regulation skills suggests that the treatment of people with T2D and severe obesity (with high EE) should focus on emotion regulation skills (not calorie-restricted diet). Adjunctive NBSR treatment, in addition to a GLP1RA (semaglutide), seems an effective and well-tolerated useful choice to improve pathological eating behaviour and accordingly losing weight in patients with GLP1RA weight-resistant obesity and T2D diabetes in conjunction with lifestyle modification.

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GC4.206

Effect of tirzeptide on weight and metabolic parameter in adults with and without type 2 diabetes mellitus

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Tirzepatide, a novel GLP-1 receptor agonist, shows promise in treating type 2 diabetes and inducing weight loss. This study evaluates its effects on weight and metabolic parameters in patients with or without type 2 diabetes, including HbA1c reduction, waist circumference, and lipid parameters

Introduction: Tirzepatide, a dual-action molecule on GIP and GLP-1 receptors, enhances insulin secretion and reduces glucose concentrations. Despite its efficacy in adults with type 2 diabetes, its broader impact on metabolic parameters in both adults with diabetes and adults with no diabetes is underexplored.
Objective: The primary goal is to assess tirzepatide's effects on weight loss and metabolic parameters in patients with or without type 2 diabetes over 1, 3, and/or 6 months. Secondary objectives include evaluating HbA1c reduction, waist circumference, lipid parameters, and liver enzymes.
Methods: Patients visiting 5 different medical centers across united arab of emirates, were selected if they have completed at least 3 consecutive months of Tirzeptide treatment. Multiple parameters such as height,-weight, waisit circumference, vital signs, metabolic panel and hba1c at initiation of treatment and after 1,3 and 6 months
Results: The cross-sectional retrospective study included 426 patients prescribed tirzepatide for at least 3 months. Significant weight reductions occurred at 1 month (2% decrease), 3 months (4% decrease), and 6 months (5% decrease), with an overall 11% decrease in weight (10 kg average loss in 6 months). Notably, patients with type 2 diabetes experienced a significant reduction in AST and ALT levels compared to patients without type 2 diabetes.
Conclusion: This study provides comprehensive insights into tirzepatide's effectiveness and safety in diverse populations, highlighting its potential in managing metabolic parameters and promoting weight loss in both individuals with and without type 2 diabetes.

GC4.207

Skin Temperature Changes in Patient with Obesity Undergoing multiple Whole-Body Cryostimulation sessions

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Introduction: Whole-body cryostimulation (WBC) involves exposing the entire body to cryogenic temperatures (below -100°C) for a short period (1-3 minutes) in order to elicit physiological responses to cold. The cold stimulus used in WBC directly affects the endocrine and nervous systems, mainly through a lowering of skin temperature. Achieving a critical level of skin temperature below 12°C is essential for eliciting an analgesic response in healthy patients of normal weight. Despite continued exploration of the impact of WBC on skin temperature, data on skin temperature changes in patients with obesity undergoing multiple sessions of WBC are lacking.
Methods: We considered 140 adult patients with obesity (18-65 years old). Among them, 119 (104F/15M, mean BMI 40.77±5.67 Kg/m^2) underwent 10 sessions at −110°C for 2 minutes in a cryochamber (Arctic, CryoScience, Italy). A sham-control group of patients (N=21, 13F/8M, mean BMI 42.37±5.5 Kg/m^2) experienced 10 sessions at -55°C in the same cryochamber. Trained operators supervised all sessions. Patients were instructed to remove glasses, contact lenses, jewelry, and thoroughly dry their bodies before entering. Patients were encouraged to move inside the cryochamber, and constant visual and vocal contact was maintained. Skin temperature was measured before and after each session at four landmarks (Nape, Quadriceps, Calf, Popliteal Cavity) using an infrared manual thermometer. Data were expressed as mean (±standard deviation), with normality assessed by the Shapiro–Wilk test. Multiple comparison tests (ANOVA) and Wilcoxon's nonparametric paired post hoc test were applied, considering a p-value <0.05 as statistically significant.
Results: The WBC group showed a significantly different decrease in skin temperature than the sham group for both men and women (p<0.0001). In the sham group, skin temperature changes in N, Q, C and PC were not significantly different between the first and tenth sessions. In the WBC group, significant changes were observed in body sites PC (-15.8°±4.79°), C (-14.75°±5.48°) and Q (-12.35°±4.01°). Skin N had a change of -5.91°±3.08° in the WBC group and -3.47°±2.05° in the sham group. In the female WBC group, PC, C and Q skin temperatures were significantly lower than in men and sham, being significant from the third to the seventh cryotherapy session. Changes in skin temperature were correlated with BMI, body surface area, % fat mass, waist, age and negatively with % muscle mass in the female group.
Conclusion: 10 sessions of WBC at -110°C in an individual cryochamber were well tolerated and resulted in a significant change in skin temperature, particularly at body sites Q, C, and PC in the women's group. These results provide the first evidence to establish a protocol to evaluate the efficacy of WBC in patients with obesity. Further investigation is needed to explore time/temperature changes to improve skin temperature decrease in men with obesity.

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GC4.208

Exploring the therapeutic use of Whole-Body Cryostimulation as an add-on treatment in Multidisciplinary Rehabilitation for Severe Obesity

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Introduction: Whole-body cryostimulation (WBC) is a controlled exposure of the whole body to cold temperatures to achieve health benefits. In recent years, data have emerged on the potential applications of WBC in

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various clinical settings, but no data are available on the beneficial effects in patients with severe obesity during a multidisciplinary rehabilitation program, as the effects of WBC in the treatment of metabolic disorders have yet to be determined. Therefore, the purpose of this study was to investigate the anthropometric and metabolic effects of WBC during weight loss in a group of patients with obesity.

Methods: A total of 205 (167F/38M) adult (18-65 years old) inpatients with BMI>30 kg/m^2 for a multidisciplinary rehabilitation program were considered and non-randomly assigned to a group that received 10 sessions of WBC (once daily at -110°C/2 min) (WBC group, N= 115) or a Sham group (-55°C, N=24) or the control group (RT-CTR, N= 66). The multidisciplinary rehabilitation program was the same in all groups considered. Changes in anthropometric, inflammatory and clinical variables between PRE and POST treatment were analyzed and paired data were analyzed.

Results: Significant weight loss, both in terms of Kg and BMI, was observed exclusively in the WBC group (p-value=0.04). Waist measurements were significantly lower in the WBC and RT-CTR groups, while no significant difference was observed in the Sham group. Anthropometric parameters, including fat mass, fat-free mass and muscle mass, improved in all groups considered. Irisin levels showed significant improvement only in the WBC group, particularly among women (PRE 19.48±2.2 and POST 23.5±1.71, p<0.05). Circulating levels of epinephrine, serotonin and dopamine showed no significant changes, except for dopamine levels in the WBC patient group (p=0.047). Erythrocyte sedimentation rate (ESR), neutrophil-to-lymphocyte ratio (NLR), systemic immuno-inflammation index (SII) and aggregate systemic inflammation index (AISI) showed significant improvement only in the WBC group (P<0.05). Glucose, total cholesterol, triglyceride and LDL levels improved in all groups, but the changes were particularly significant in the WBC group.

Conclusions: Our results revealed that ten sessions at cryogenic temperature (-110°C) in the WBC group exerted more pronounced effects in patients with obesity undergoing a multidisciplinary rehabilitation program, particularly in modulating inflammation and muscle metabolism. The observed improvements offer preliminary support for considering WBC as an adjuvant treatment for patients with obesity

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GC4.209

The Impact of Whole-Body Cryostimulation on the Quality of Life (QoL) in Individuals with Severe Obesity

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Introduction: Obesity is frequently associated with different degrees of disability and alterations in psychological profile, factors that produce a reduction in the quality of life (QoL). The aim of the rehabilitation programs is, not only the weight loss, but also the improvement of disability and the relief of fatigue through physical activity. Recently, cryotherapy, combined with rehabilitation, has been suggested for its positive effects on well-being and physical activity, as demonstrated in other chronic diseases.

Methods: As part of 4-week multidisciplinary weight loss program, encompassing a low-calorie diet (75% of basal metabolism with a Mediterranean nutrient distribution) and aerobic physical activity (15 minutes, 3 times/day for 5 days/week), patients with obesity (BMI>30 kg/m^2) underwent ten sessions of whole-body cryostimulation (WBC) over 2 weeks. Each treatment lasted 2 minutes and took place in extremely cold, dry air at -110°C in a single cryochamber (Arctic, CryoScience, Rome, Italy) located at the San Giuseppe Hospital, Istituto Auxologico Italiano, in Piancavallo, Italy. The sessions were supervised and occurred daily (5 a week) at 8:15 am before exercise classes and physiotherapy for a total of 10 sessions. Baseline demographic, anthropometric and clinical characteristics were collected at admission and discharge, including body weight, pain visual analog scale (VAS), 6-minute walk test (6MWT), hand grip strength (HGS), and Psychological General Well-Being Index (PGWBI) score, which measures self-perceived psychological health and general well-being.

Results: We assessed 28 patients (22F) with a mean age of 53.3+13.7 years, mean body weight of 116.0+20.2 kg, and BMI of 43.5+4.5 kg/m^2. Over the observation period, a significant weight loss (-4.84+2.58 kg, 4.09+1.83% of initial body weight, p<0.0001), a substantial reduction in pain VAS (-42.55+45.03% of initial values, p<0.0001), and notable improvements in 6MWT distance (+8.94+11.25% of initial values, p<0.0001) and HGS (+3.44+11.71% right, 9.28+29.22% left of initial values, p<0.0001 and 0.005 respectively) were registered. The total PGWBI score significantly improved in all patients (from 63+17 to 82+15 score points, p<0.0001). The scores for anxiety (15.2+5 vs 20.2+4), depressed mood (11.1+3.4 vs 12.9+2.2), positive well-being (9.21+3.3 vs 13.4+3.8), self-control (9.9+3.0 vs 11.9+2.4) and vitality (9.2+3.8 vs 13.9+4.0) showed significant changes, while self-perception of general health (8.3+2.8 vs 10.2+2.8) had a not significant increase.

Conclusion: In this experimental study, integrating a 10-day WBC session into a multidisciplinary weight loss program demonstrated several beneficial outcomes for patients with obesity. While the precise mechanisms remain unclear, the findings suggest that WBC positively impacts the mental state and well being. Further studies are necessary to validate these results.

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GC4.210

Investigating the long-term effects of WBC in patients with obesity and fibromyalgia: a follow-up survey

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Introduction: Whole-body cryostimulation (WBC) is a treatment where the entire body is exposed to cryogenic temperatures. Exposure to such extreme temperatures is known to reduce pain and inflammation and provide several health benefits. Recent studies suggest that WBC may be beneficial for patients with obesity and fibromyalgia (FM), who have higher pain severity, depressive symptoms, physical impairment, and poorer sleep quality [1], but there is little or no information on its long-term effects.

Methods: 38 women with FM and obesity (age 30-70 years) undergoing a 4-week multidisciplinary rehabilitation program, were non-randomly assigned to either a "rehabilitation + WBC group" (RWBC, n=19), or a "rehabilitation only group" (RG, n=19). The RWBC group underwent 10 sessions of WBC (once daily at -110°C/2 min). At 12 months after

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discharge, a follow-up phone interview with "YES/NO" response was conducted to investigate well-being status, use of pain medications, fatigue, sleep quality, mood and anxiety. If the answer was "YES", we asked the number of months the beneficial effects lasted. The level of pain was scored with a Numerical Rating Scale (NRS, 0-10).

Results: Patients in the RWBC group reported a significantly larger improvement (Fisher's exact test, p=0.0188) in their general well-being status (18/19, 94.74%) compared to the RG group (11/19, 57,89%), lasting 4.11±3.25 months for RWBC and 5.18±2.71 months for RG. More patients reduced or discontinued pain medication in the RWBC group (11/19 patients, 57.89%, for a mean of 5.20±3.01 months), but did not differ significantly from the RG group (8/19 patients, 42.11%, for a mean of 7.00±4.31 months). The majority of patients in both groups (17/19, 89.47% in the RWBC group and 16/19, 84.21% in the RG group) noted increased energy and decreased general fatigue up to 3-4 months after treatment discontinuation. More RWBC patients reported better sleep quality (13/19, 68.42%), with positive effects lasting for 5.00±3.74 months, compared to RG patients (p=0.0025), with only 3 patients (15.79%) reporting improvements that lasted for 2±1.41 months. Patients who showed improvement in mood (12 in RWBC vs. 15 in RG) and anxiety (11 in RWBC vs. 12 in RG) were similar in both groups (p>0.05). Finally, the pain level improved significantly in the RWBC group (Student's t-test, p=0.008).

Conclusion: These preliminary data revealed that WBC exerted stronger positive effects than rehabilitation alone on patients' general well-being, pain, and sleep quality, with an average duration of effects of 4-5 months after discharge, representing a promising tool for mid/long-term management of FM symptoms. Fatigue and psychological aspects were similarly improved in both groups, showing that a multidisciplinary approach was effective in providing benefits in patients' physical and mental health. Future research will aim to implement follow-up interviews to assess the long-term effects of WBC.

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GC4.211

A patient-centred approach to trialling a novel product for weight-loss: acceptability of the product and first in human trial

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Introduction: Sirona is a novel hydrogel, designed as a weight-loss intervention to suppress appetite and food intake. To ensure the final product, and the clinical trials designed to test it, are acceptable to adults living with obesity, a patient-centred approach has been taken to incorporate their views and lived experience throughout the trial design process. This abstract reports how people living with obesity have contributed to the design of, and findings from, the first-in-human trial of Sirona.

Method: Four Patient and Public Involvement (PPI) sessions were held online to capture initial views and concerns about the product itself (two sessions), and to capture opinions on the trial design (two sessions) to ensure the final design was acceptable to those in the target patient group. Trial participants were given an online questionnaire to provide details of their experiences with taking the product and participating in the trial. The bespoke questionnaire asked for ratings of acceptability (from 1-5) of taking the product and different elements of the trial and offered an opportunity to provide more detail. Participants were also asked if they noticed changes in appetite, energy levels, or enjoyment from food during the trial.

Results: Fourteen contributors attended the initial PPI sessions. Contributors liked that they may be eligible to use this product as not eligible for pharmacological treatments but were concerned about swallowing the large pill size. Nine attended the trial design PPI sessions. Contributors recognised participation would be a considerable, but acceptable, commitment and gave valuable feedback on the participant information sheets to make it easier to read and understand the expectations. Trial participants completed the questionnaire (intention to treat analysis, n=10). Participants were satisfied with the number and frequency of Sirona pills they were asked to take (median rating=3.5) and found the pills tolerable to swallow (median rating =3). 9/10 participants noticed their eating patterns, hunger and fullness changed whilst taking Sirona, and all participants reported Sirona fitted within their lifestyle. Participants were satisfied with level of commitment required (median rating=4), citing the excellent organisation (median rating=5) and responsive and helpful team.

Conclusion: People living with obesity are open to this novel product designed to aid weight-management. Those who have experienced the product have found it to be acceptable and have noticed concurrent changes to their appetite and amount consumed. Participants reported the trial was well organised and conducted in a caring fashion. This work has demonstrated the value and importance of listening to the patient voice when developing new weight-loss interventions, and these findings will guide the design of future, larger trials of the product.

GC4.212

A safety, feasibility, and tolerability first-in-human study of an orally administered hydrogel, Sirona, as an intervention for weight loss in adults with a BMI of 30-40

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Introduction: A novel, hydrogel-based product has been developed to address the increasing need for affordable, accessible, and effective interventions to reduce levels of obesity, by suppressing appetite and food intake. This first-in-human trial was designed to assess the safety, feasibility, and tolerability of the Sirona hydrogel in adults with body mass index (BMI) of 30-40.

Methods: Volunteers were screened to ensure their safety by gastroscopy, psychological assessment, and blood tests. Participants attended four in-hospital visits over two dosing cycles of 28 days: at baseline, first dosing with one pill (C1D1), first dosing with two pills (C2D1), and at follow-up, for measurement of safety bloods, vital signs, and ratings of appetite in first two hours after dosing. An adaptive dosing regime was implemented: from one to two pills in cycle one (up to total of seven pills over nine days), and from two to three pills in cycle two (up to total of 11 pills over nine days). Safety was assessed through reporting of adverse (AEs) and serious adverse events (SAEs) and cross-sectional gastric 3T MRI. Feasibility targets for recruitment, adherence to dosing regime, and retention to completion of study measures were assessed. Tolerability was measured through self-reported nausea using the motion sickness severity scale (MSSS; scored from 0-6), and appetite ratings.

Results: The recruitment target of 10 participants was met (female = 7; median age (IQR) = 39.5(7.0); mean BMI (sd)= 35.8(4.2)). 90% of participants adhered to both dosing cycles, and 100% were retained to complete follow-up measures. During the trial, 13 different symptoms were reported as AEs from nine participants (e.g., nausea, abdominal discomfort), with two experiencing SAEs (vomiting, one related to Sirona; one related to gastroenteritis). Follow-up gastroscopy was unremarkable, and MRI identified the hydrogel in the stomach at least two days post-dosing. 90% of participants reported mild nausea at least once in the three

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days following dosing, with 50% reporting higher levels of nausea. 70% of participants complied with the dosing regimen over both dosing cycles. Fullness increased in a dose-dependent manner after dosing (percentage change from baseline to 60 minutes post-dose: C1D1 41.5%; C2D1 58.3%).

Conclusion: Early phase trialling of Sirona demonstrates this hydrogel is safe for adults living with obesity and MRI data confirmed multi-day gastric retention. Feasibility targets were met showing the trial processes are robust. Preliminary appetite data suggests that the hydrogel increases fullness in the acute period following dosing, whereas changes in hunger, desire to eat and prospective portion-size selection were sustained over a longer period (see Elsworth et al). Following these encouraging findings, a double-blind randomised controlled trial of Sirona is underway in approximately 40 participants to further test the safety, feasibility, and tolerability of this novel product.

GC4.213

Exploring the sustained effects of a novel weight loss product on appetite using ecological momentary assessment

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Introduction: Sirona is a novel hydrogel pill that expands once in the stomach, occupying space and potentially increasing satiety. A first-in-human trial was conducted to assess the safety, feasibility, and tolerability of Sirona. Ecological momentary assessment (EMA) is a technique to obtain repeated measurements of experiences in real-time and in people's natural environments. To explore and try to understand the sustained effects of Sirona in people's everyday lives, we used EMA to measure appetite throughout the day.

Methods: Ten participants took part in the 8-week trial, which comprised of two 28-day dosing cycles. In cycle one, participants consumed a maximum of seven pills (days 1, 3, 7 and 9 of weeks 1 and 2, with none in washout weeks 3 & 4) and in cycle two this increased to a maximum of eleven pills (days 1, 3, 7 and 9 of weeks 5 and 6, washout weeks 7 & 8). Participants completed ten days of EMA in total (2 days baseline and then one day per week throughout the trial). During each day, participants were sent seven text message prompts to their mobile phone at 2-hour intervals within an individually tailored 12-hour window. Each online EMA asked participants to rate their hunger, fullness, and desire to eat four different foods. Participants also used a virtual portion-size selection task to select "How much would you like to eat right now?" (i.e. prospective portion-size). Rather than considering each timepoint in isolation, we calculated a daily time-averaged area under the curve (AUC). We calculated percentage change from baseline to weeks 1, 2, 5 and 6.

Results: Preliminary intention to treat analysis showed that compared to baseline, hunger was reduced in weeks 5 (-35.6%) and 6 (-29.3%). A similar pattern was observed when assessing changes in prospective portion-size selection, with the amount of food (kcal) that participants selected being lower in week 5 compared to baseline (-44.9%). Desire to eat was reduced in weeks 1 (-27.5%), and 5 (-52.4%), when compared to baseline. There was weaker evidence for change in fullness between baseline and dosing weeks (e.g., 5.3% at week 6).

Conclusion: Preliminary EMA data suggest that Sirona may be effective in reducing hunger, desire to eat, and prospective portion-size selection in people's everyday lives, highlighting its potential to act as an 'appetite suppressant'. Whilst it appears a large change in fullness was not experienced throughout the day, this physiological effect may vary more strongly acutely after dosing (see Byrne et al). The findings also suggest the product demonstrates appetitive benefits with consistent application over time. Future research in a larger sample of patients will further our understanding of these appetitive effects of Sirona and how they may affect food intake and subsequent weight loss.

GC4.214

Combined very low-calorie ketogenic diet and liraglutide for the treatment of severe obesity in adults

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Introduction: The goal of obesity treatment is in most instances to achieve sustained weight loss greater than 10% of body weight, which may improve many of the complications associated with obesity as well as quality of life. Very low-calorie ketogenic diets (VLCKD) and liraglutide are increasingly emerging as successful treatments to manage obesity due to rapid weight loss, preservation of fat free mass, and improved glucose and lipid metabolism. VLCKD is characterized by a marked restriction of daily carbohydrate intake, usually lower than 30 g/day (≃13% of total energy intake) along with a relative increase in the proportions of fat (≃44%) and protein (≃43%) and a total daily energy intake < 800 kcal [1]. After the ketogenic phases (8-12 weeks) the patients should progressively reintroduce carbohydrates starting from foods with the lowest glycemic index (fruit, dairy products), followed by foods with moderate and higher glycemic index. Carbohydrate reintroduction phase corresponds to the time when the patient reports increased hunger and subsequent difficulty with dietary compliance and weight recovery. Here, for the first time, we present preliminary data of the combined use of VLCKD and Liraglutide in people living with severe obesity followed at IRCCS Auxologico. Specifically, the use of Liraglutide in patients treated with VLCKD, during the carbohydrate reintroduction phase, was evaluated.

Method: Since September 2023, we proposed therapy with liraglutide during the carbohydrate reintroduction phase of VLCKD treatment to all patients with severe obesity

Results: Therapy with Liraglutide during the carbohydrate reintroduction phase was proposed to 16 participants (13 women, age 51,1±10,4 yrs, BMI 39,9±59,2 kg/m^2), 11 of whom decided to start (VLCKD+L group) and 5 refused (R group) the pharmacological treatment. There were no differences between VLCKD+L group and R group in BMI (39,9±4,3 vs 42,6±17,2 kg/m^2, ns), age (49,6±12,1 vs 54.2 vs 5.0 yrs, ns) and percentage of weight loss after the ketosis phase of VLCKD (-15,3±4,8% vs -16,5±9,9, ns). All participants concluded the reintroduction phase. The mean relative weight loss was -19,4±5,6% in the VLCKD+L group and -15,6±5,6% in the R group ($p<0.05$). The participants in VLCKD+L group are presently in maintenance phase of dietary program and they are continuing liraglutide treatment.

Conclusion: Along with VLCKD, liraglutide medication appears to promote therapeutic goal attainment, has been accepted in more than 65% of patients following VLCKD and was well tolerated. Combined VLCKD and liraglutide should be a good strategy in patients with severe obesity requiring a long-term multimodal approach. Further studies are needed to take into account each individual's treatment goals and the benefits and risks of different therapies combined.

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GC4.215

Effects of glucose-lowering therapies on body weight loss in older adults with Type 2 Diabetes and overweight/obesity

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Introduction: Type 2 Diabetes Mellitus (T2DM) is a highly prevalent health condition in the aging population. Compared to younger adults, older individuals with T2DM usually face more challenges in T2DM care, due to the overlap with age-related diseases, which must be considered when choosing the most suitable therapy. The response to medications for T2DM may also be different in this population.
Methods: This retrospective study was aimed to compare the effects of Dipeptidyl peptidase-4 inhibitors (DPP-4is), sodium-glucose co-transporters inhibitors (SGLTis) and GLP-1 receptor agonists (GLP1-RAs) on body weight loss and HbA1c improvement, in older patients with T2DM and overweight/obesity. Patients with T2DM aged ≥ 70 and with BMI ≥ 27, treated with DPP-4is, SGLT2i and GLP1-RA were considered for the study. Data were analyzed at baseline (T0) and after 6 (T1) and 12 (T2) months, from the start of treatment.
Results: Out of 76 total patients, 15 patients (11 F/4 M, 81.3±5.1 yrs, BMI 30.0±3.7 Kg/m^2) treated with DPP-4is, 23 patients (8 F/15 M, 76.9±3.8 yrs, BMI 31.9±9.5 Kg/m^2) treated with SGLT2is, 38 patients (11 F/27 M, 77.2±4.7 yrs, BMI 32.9±4.6 Kg/m^2) treated with GLP-RAs were considered for the retrospective analysis. BMI variation between T0-T2 was significantly higher in SGTL2is group (-1.67±0.22 Kg/m^2) and in GLP1-RAs (-1.34±0.28 Kg/m^2) compared to DPP-4is group (-0.27±0.29 Kg/m^2; respectively, p=0.002 and p=0.034). No significant difference was found in ΔBMI between SGTL2is and GLP1-RAs groups. By analyzing the data according to the sex, no significant differences between the 3 medications in BMI variations arose in the female subgroup. Within the GLP1-RA group, unlike dulaglutide, semaglutide was more effective in promoting body weight loss compared to DPP-4is (ΔBMI: semaglutide -1.74±0.49 vs -0.27±0.29 Kg/m^2, p=0.046). GLP1-RAs category revealed more efficacious than both DPP-4is (ΔHbA1c: GLP1-RA -9.92±2.1 vs +1.69±1.68 mmol/mol, p=0.0003) and SGTL2is4is (ΔHbA1c: GLP1-RA -9.92±2.1 vs 2.02±1.89 mmol/mol, p=0.021) in significantly reducing HbA1c. Both in male and female subgroups of GLP1-RAs, HbA1c decrease tended to be more significant than in the DPP-4is subgroups (respectively, p=0.057 and p=0.063).
Conclusion: GLP1-RAs and SGLT2 inhibitors have demonstrated favorable effects on body weight in older adults (≥65 years) with T2DM compared to DPP-4is, representing a valid and tailored therapeutic option in patients with associated overweight/obesity. However, sex-related differences as well as differences in types of molecules must be taken into account when choosing the most suitable drug. There is a compelling need for trials more representative of the heterogeneity of older adults.

GC4.216

Audit of variation of Saxenda efficacy in responders in a Tier 3 WMS in Leeds, UK

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Introduction: In the UK, 63.8% 2 of the population are suffering with being overweight and in Leeds it is estimated that over 205,000 people are living with Obesity. To adress this need, Liraglutide in the form of Saxenda was funded and a treatment pathway established in the Leeds Tier 3 Weight Management Service.
The aim of this audit was to review a random sample of patients who responded (i.e. achieved more than 5% weight loss at 16 weeks) to Saxenda to judge if there was variation in the amount of weight lost and to explore factors that may help explain the variation.
Method: A retrospective audit of 20 patients who had completed Saxenda were chosen at random and their demographics such as age, sex, initial weight, final weight, total weight loss, percentage (%) weight loss, starting BMI, weight at 16 weeks, weight loss at 16 weeks, % weight loss at 16 weeks and the actual number of Saxenda pens supplied were all collated. In addition, blood tests before Saxenda was initiated were also collected, including initial HbA1c, EGFR, creatinine, ALT, TSH, total cholesterol, HDL cholesterol, triglycerides, LDL cholesterol. Lastly, we also calculated their DUBASCO score and used an anxiety depression scale at baseline before starting Saxenda.
Stata 13 was used to determine the descriptive characteristics of each variable, to judge the distribution of each variable and perform univariate analysis to judge the correlation between the variables and total % weight loss at the end of Saxenda treatment. Lastly, any variable with a statistically significant correlation was used to produce a linear regression equation.
Results: There were 18 females and 2 males in the data set. The mean age was 51.9 years (+/- SD of 10.1 yrs; age range 36 - 72 years). The average starting weight was 126.1 Kg (+/- SD of 24.6 Kg; range 94 - 180.8 Kg). This was reflected by the initial BMI figures with the mean BMI of 46.5 Kg/m^2 (+/- SD of 6.8 Kg/m^2; BMI range 35- 59.7 Kg/m^2). The average final weight after the Saxenda course was 107 Kg (+/- SD of 20.6 Kg; range 74.8 - 144.9 Kg). This meant that the average % weight loss was 14.9% (+/- SD of 5.9%; range 6.7 - 23.4%).
Spearman rank correlation was used to test each variable against the total % weight loss at the end of Saxenda treatment. It was found that only % weight loss at 16 weeks reached significance (p-value < 0.05) with Spearman rho of 0.74 and a p-value of 0.0002. Thus the linear regression equation formed was % weight loss at the completion of therapy = 0.92 x % weight loss at 16 weeks + 4.61.
Conclusion: Saxenda efficacy was excellent at 14.9% weight loss. Of all the variables analysed only % weight loss at 16 weeks was correlated with the total % weight loss at the end of treatment with Saxenda. Our findings agree with Webster et al 3 and signal that % weight loss at 16 weeks can be used as a guide to determine final % weight loss.

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GC4.217

Economic evaluations of obesity interventions: A systematic review of methods, outcomes and challenges reported in long-term obesity modelling studies

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Introduction: Health economic modelling is useful to investigate the complexity and long-term outcomes of obesity, and to evaluate obesity interventions and policies. However, no gold standard exists that defines obesity-specific modelling methods and outcomes. This study aimed to identify methods and outcomes used for long-term modelling of obesity, and implications for economic evaluations of obesity interventions.
Methods: Following PRISMA guidelines, we conducted a systematic review of studies that model obesity-related outcomes of interventions long-term. We systematically searched seven databases (PubMed/Ovid Medline, Cochrane Library, Web of Science, NHS Economic Evaluation Database, EconLit, International Health Technology Assessment Database,

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Global Health) from date of first indexing until 9th November 2022. Two researchers independently conducted title/abstract screening and full-text review in Rayyan software and a third reviewer resolved conflicts. Studies were included that model continuous or categorical measures of body weight, body composition or fat mass over ≥ 20 years; editorials, purely cross-sectional studies and reviews were excluded. Single reviewers extracted data and assessed study quality using an excel template that was developed and piloted in the group. Quality assessment followed the NHS Centre for Reviews and Dissemination checklist (https://www.york.ac.uk/crd/guidance/).

Results: After deduplication, 744 titles/abstracts were screened, 185 full-text articles reviewed and 80 articles retained in the review. Studies from Australia (29%), the USA (26%) and the UK (20%) dominated. Data sources varied, including cohort data, cross-sectional studies, randomized controlled and multicentre trials, meta-analyses, patient registries, patient records, census data and expert opinion. Most studies employed Markov (73%) and/or microsimulation models (21%), analysed cost-effectiveness (75%) and applied a health system (60%) and/or societal perspective (48%), over a lifetime (85%). Interventions targeted various settings (e.g. bariatric surgery in healthcare; school; community), individual lifestyle, or regulatory elements (e.g. taxation); 39% were complex interventions and 33% included children.

Frequent outcome measures include body mass index (BMI; 94%), healthcare costs (79%), quality-adjusted life years (63%) and risk and outcomes of various diseases. Some studies assessed indirect (15%) or societal costs (15%), disease markers (Hb1Ac: 5%), participatory outcomes (labour productivity: 15%; school productivity: 3%) and lifestyle changes.

Modellers reported methodological challenges in relation to data availability (e.g. follow-up periods), model translation, and the study design, measurement, evaluation and extrapolation of underlying data sources.

Conclusion: Modelling guidelines are required that set methodological standards and address the identified challenges. To improve data quality, economic evaluations of obesity interventions and policies should incorporate outcome measures beyond BMI. A Core Outcomes Set would be beneficial. Capacity may be needed to provide training in obesity modelling in most countries.

GC4.218

Multidisciplinary Team Collaboration: Enhancing Outcomes in Breast Cancer Patients

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Breast cancer management has significantly evolved, with a paradigm shift towards multidisciplinary team (MDT) collaboration. This abstract explores the impact of MDT approaches on the diagnosis, treatment, and overall care of breast cancer patients. It discusses the importance of a multidisciplinary approach, integrating healthcare care professionals such as lifestyle medicine experts, oncologists, surgeons, nutritionists, psychologists, and sports therapists, in decision-making processes. The abstract showcases the benefits of real-time information sharing, consensus building, and personalised treatment planning, leading to improved patient outcomes, reduced treatment-related complications, and enhanced quality of life. Additionally, it examines the challenges faced by MDTs, such as communication barriers and resource allocation, proposing innovative solutions to optimize teamwork and streamline patient care. By highlighting successful MDT models and case studies, this abstract emphasises the pivotal role of collaborative, patient-centered care in the holistic management of breast cancer patients.

GC4.219

Semaglutide 2.4 mg long-term clinical outcomes in patients with obesity or overweight: a real-world retrospective cohort study in the United States (SCOPE: long-term clinical outcomes)

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Introduction: Semaglutide is a glucagon-like peptide-1 receptor agonist (GLP-1 RA), indicated for chronic weight management, as an adjunct to lifestyle changes, in adults with obesity, or overweight and a weight-related comorbidity. Due to its relatively recent approval, there is limited real-world evidence to support its long-term effectiveness. This real-world study aimed to address this gap.

Methods: This retrospective, US-based, non-interventional cohort study utilized electronic medical records and claims data from the Komodo Health database and included patients aged ≥18 years at index (semaglutide start date, June 1, 2021 to June 30, 2022) with BMI ≥30 kg/m^2, or BMI 27–29.9 kg/m^2 and ≥1 weight-related comorbid condition. Eligible patients had available data for the baseline period (6 months prior to and on the index date) and for ≥52 weeks after index and included patients who had escalated to and maintained treatment with semaglutide 2.4 mg. Study outcomes included change from baseline at week 52 in body weight (kg, %) and BMI. Outcomes were summarized descriptively and stratified by obesity class.

Results: Of the total 973 patients who met the inclusion criteria, 74.7% were female and mean (standard deviation [SD]) age was 47.2 (9.6) years. Mean (SD) baseline weight and BMI were 109.5 (20.7) kg and 36.5 (4.4) kg/m^2, respectively. Mean changes in body weight (n=106) and BMI (n=241) from baseline at week 52 were −16.7 kg and −4.4 kg/m^2, respectively. Overall, percentage change in body weight (n=106) from baseline at week 52 was −15.1%. By obesity class, mean changes in body weight (%) from baseline at week 52 were −17.6% in patients with class 1 obesity (BMI 30.0–34.9 kg/m^2) (n=24), −16.5% in those with class 2 obesity (BMI 35.0–39.9 kg/m^2) (n=28) and −13.1% in those with class 3 obesity (BMI ≥40 kg/m^2) (n=49).

Conclusion: In this real-world study, continuous treatment with semaglutide 2.4 mg for 52 weeks was associated with a clinically relevant reduction in body weight. The magnitude of the reduction seen in this observational study is consistent with that observed at similar time points in controlled clinical trials.

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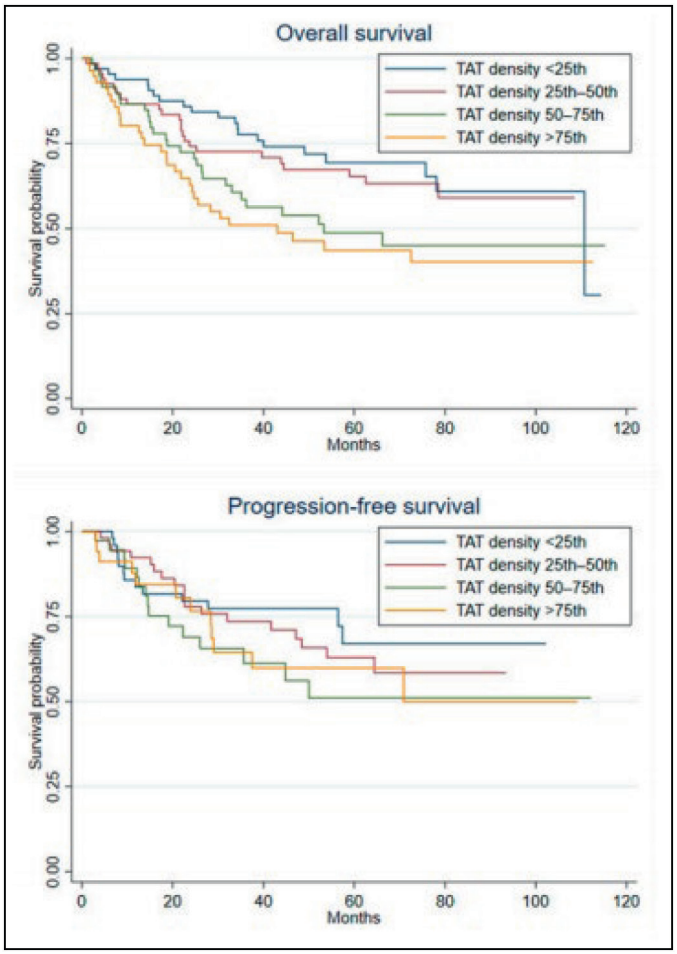
GC4.220

Abdominal Fat Characteristics and Mortality in Rectal Cancer

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Introduction: The impact of body composition compartments on oncological outcomes foremost mortality has recently gained interest in clinical research settings. The aim of the current study was to evaluate the relationship between abdominal fat density and cancer-specific survival (CCS) in recently diagnosed patients with rectal cancer.
Methods: Patients with stage II–IV rectal cancer, who completed an abdominal computed tomography (CT) at the time of diagnosis were included in the study. Total (TAT), subcutaneous (SAT), and visceral (VAT) adipose tissue density were conducted at the level of third lumbar vertebra (L3), and their relationship between with CCS was performed through competitive risk models adjusted by age, gender and stage of cancer.
Results: Among a total of 274 patients, over a median of 72 months of follow-up, 116 cancer-specific deaths were reported. The increasing abdominal fat density was found to be associated with poorer survival rate in all analyses, with a stronger effect of TAT (SHR = 1.033, 95% CI = 1.012–1.054, p = 0.002) and SAT (SHR = 1.03, 95% CI = 1.01–1.05, p = 0.002) density on CSS.
Conclusion: We provide evidence that indicates that an increased radio-density of abdominal body fat compartments at the time of diagnosis is associated with a higher risk of mortality in adult patients with rectal cancer. Undoubtedly, this finding is new and should raise awareness regard the importance of the body composition measurement in this population, however it still need to be further investigated in order to understand its underlying mechanisms and, eventually, to assess its usefulness in clinical practice.



Kaplan–Meier survival curves for overall survival (n = 274) and progression-free survival (n = 197) by quartiles of total adipose tissue density (TAT density).

Fig. 1.

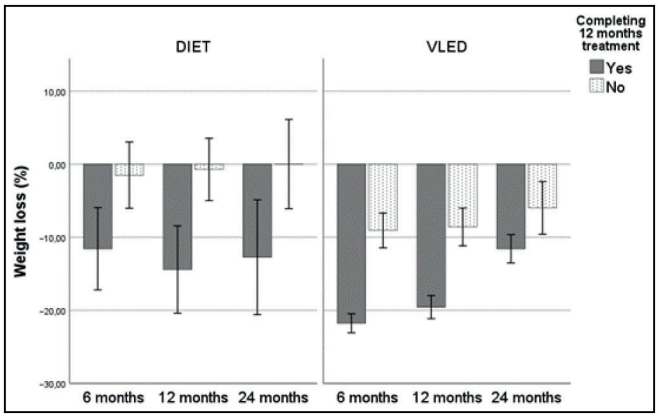
GC4.221

Impact of eating behavior on 24-months weight change after bariatric surgery and medical weight loss treatment - a clinical prospective study

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Introduction: Maintaining weight loss is challenging and eating behaviors might affect maintenance of dietary- and lifestyle changes for sustained weight loss. There is limited knowledge in groups of patients with severe



Total weight loss (%) and standard deviation (sd). P-value<0.001 at 12- and 24 months.

Fig. 1. Weight loss change (%) after medical treatment with dietary treatment (DIET) or Very Low Energy Diet (VLED) in patients (men and women combined) completing 12-month medical treatment (Yes) or discontinued treatment before 12 months (No).

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Tab. 1. Effect of baseline eating behaviors, according to difference in weight loss shown as kilogram (kg) (B-coefficient, effect on weight loss) at 6-, 12- and 24 months in patients receiving bariatric surgery (RYGB or SG) or medical treatment (VLED or.

	6 months			12 months			24 months		
	B (effect, kg)	95% CI	P	B (effect, kg)	95% CI	P	B (effect, kg)	95% CI	P
Binge-eating disorder a)	0.46	(-2.3 – 3.2)	0.74	0.47	(-3.0 - 3.9)	0.79	2.6	(-1,2 – 6.3)	0.18
Nocturnal eating b) at least once per month	1.3	(-1.1 – 3.8)	0.29	2.0	(-0.9 – 5.0)	0.17	3.5	(0.02 – 6.9)	0.04
Uncontrolled eating	0.15	(-0.50 – 0.81)	0.64	0.76	(-0.04 – 1.56)	0.06	0.91	(-0.03 – 1.85)	0.057
Cognitive restraint	0.73	(0.07 – 1.38)	0.03	0.53	(-0.26 – 1.32)	0.19	0.17	(-0.78 – 1.12)	0.72
Emotional eating	0.55	(-0.12 – 1.22)	0.10	1.16	(0.37 – 1.95)	0.004	0.84	(-0.11 – 1.78)	0.08

a) According to the Diagnostic and Statistical Manual of mental disorders - fifth edition (DSM-5). b) Wake up from sleep during night to eat.

obesity regarding eating behaviors and long-term effect on weight loss maintenance after bariatric surgery and medical weight loss treatment.
Aim: To evaluate the association between self-reported eating behaviors and weight loss over 24 months, in patients with severe obesity, receiving bariatric surgery or medical weight loss treatment.
Methods: The BASUN- (Bariatric surgery Substitution and Nutrition) study, a prospective, non-randomized cohort study on surgical and 12-months medical treatment program (intensive lifestyle treatment with or without an initial period of Very Low Energy Diet), including patients referred to obesity treatment in Region Västra Götaland in Sweden 2015–2017. A total of 971 adults (75% women), mean BMI 42.0±4.9 kg/m^2, were included in the study. Self-reported eating behaviors before start of treatment intervention, using Questionnaire of Eating and Weight Patterns-Revised (QEWP-R) and Three Factor Eating Questionnaire (TFEQ-r21), were analyzed in relation to weight loss at 6-, 12- and 24 months. Evaluated eating behaviors were Binge Eating Disorder (BED), Nocturnal Eating (NE), uncontrolled eating, cognitive restraint, and emotional eating.
Results: Prevalence of BED was 7% and NE 17.8% (range 2.3%–25% and 4.4%–30% respectively, depending on treatment). Analyses were adjusted for treatment, sex, age, baseline weight and BMI. BED did not affect weight loss at any timepoint. Those with NE lost less weight, +3.5 kg, (95% CI 0.02 – 6.9), p<0.05 at 24 months compared to those without NE. Cognitive restraint was associated with less weight loss at 6 months, +0.73 kg per Z-score (95% CI 0.07 – 1.38), p <0.05. No effect on weight loss was found at either 12- or 24 months. Emotional eating was associated with less weight loss at 12 months, +1.16 kg per Z-score (95% CI 0.37 – 1.95), p<0.05, but not at 24 months, p=0.08. The association of eating behavior with weight loss were seen independent of treatment. Patients who dropped out from medical treatment (44%) reported more emotional and uncontrolled eating at baseline, both p<0.001, compared to completers of the 12-months treatment. Individuals lost to follow up at 24 months (n=304, 31%) compared to completers, were younger. No difference in eating behaviors were reported at baseline between completers and those lost to follow-up.
Conclusion: Several eating behaviors, except for binge eating disorder, were associated with less weight loss both at 12- and 24 months, and not completing medical weight loss treatment. Eating behaviors should be addressed before treatment for adults with severe obesity to improve long term weight loss outcome.

GC4.222

Maternal body fat distribution 10 years following metabolic complications in pregnancy – a secondary analysis of the ROLO longitudinal cohort study

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Introduction: Pregnancy, a physiological "stress test" for women's health, may reveal mal-adaptations linked to later-life chronic disease. We hypothesize metabolic complications during pregnancy are associated with enduring changes in maternal body fat distribution 10-years postpartum.
Methods: 304 women aged 42.7±3.9 years were examined 10 years postpartum from the longitudinal ROLO (Randomized controlled trial of low GI diet in pregnancy) cohort study. Participants underwent anthropometric measurements and total dual-energy X-ray absorptiometry scan. Recorded pregnancy complications (pregnancy induced hypertension, impaired glucose tolerance or gestational diabetes) categorized the cohort into metabolic complications and uncomplicated pregnancies. Between group differences were assessed via independent t-test or Mann-Whitney U-test.
Results: Body fat distribution 10 years postpartum. Please see table in attached file.
Conclusion: We noted higher BMI and increased visceral adipose tissue following pregnancy-related metabolic complications, which may predispose to later life cardiometabolic disease.

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Tab. 1. Body fat distribution 10 years postpartum.

	Metabolic Complication in Pregnancy (n=91)	*Uncomplicated Pregnancy (n=213)*		
	Mean(SD)/Median[IQR]	*Mean(SD)/Median[IQR]*	*p-value*	*Adjusted p-value*[a]
Weight(kg)	74.2 [66.3,87.5]	69.8 [64.4,79.3]	0.011*	0.726
BMI	27.5 [24.3,32.3]	25.3 [23.4,28.2]	<0.001*	0.015*
Waist circumference(cm)	92 [82.5,104]	87.5 [81.7,94.9]	0.003*	0.231
Hip circumference(cm)	105.9 [99.5,115]	103.4 [98.6,109.2]	0.019*	0.348
Waist/Hip Ratio	0.88 [0.82,0.92]	0.85 [0.80,0.90]	0.008*	0.718
Total Fat Mass(kg)	28.8 [21.5,36.2]	24.2 [20.0,31.3]	0.006*	0.264
Body Fat Percentage(%)	39.4 (7.8)	36.3 (7.0)	<0.001*	0.070
VAT volume(cm^3)	699 [309,1102]	385 [223.8,707.5]	<0.001*	0.011*
VAT mass(kg)	0.66 [0.29,1.04]	0.35 [0.21,0.67]	<0.001*	0.011*
SAT volume(cm^3)	1900 [1240,2735.3]	1519 [1131,2177]	0.012*	0.327
SAT mass(kg)	1.79 [1.17,2.58]	1.43 [1.07,2.05]	0.012*	0.329

[a] Early-pregnancy BMI was significantly different between groups at baseline, therefore was controlled for in adjusted p-value.

Table representing significant differences in body fat distribution between women who experienced metabolic complications compared to uncomplicated pregnancies. Between group differences were assess with independent t-test or Mann-Whitney U-test. Early-pregnancy BMI was significantly different between the groups at baseline, therefore was controlled for in adjusted p-value.

GC4.223

Patient characteristics and healthcare costs for individuals waiting different lengths of time for bariatric surgery in England

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Introduction: According to the National Institute for Health and Care Excellence (NICE), people with a body mass index (BMI) of ≥ 40 kg/m², or 35–39.9 kg/m² with an obesity-related complication (ORC), are eligible for bariatric surgery (BaS).[1] However, less than 1% of those eligible undergo BaS.[2] Here, we assess the characteristics and healthcare costs of eligible individuals by time to BaS.

Methods: This was a retrospective, open cohort study using Discover, a real-world database of linked primary and secondary electronic health records covering 2.7 million people in North-West London. Individuals aged ≥ 18 years were included if they were eligible for BaS per NICE criteria (BMI ≥ 40 kg/m², or 35–39.9 kg/m² and a diagnosis of an ORC). Index date was the date all eligibility criteria were met during the study period (1 Jan 2010 to 31 Dec 2019). Individuals with BaS pre-index were excluded. Individuals transitioned from the BaS-eligible group into the BaS-treated group if they had a diagnosis or procedure code indicating BaS post-index. Healthcare costs (primary and secondary care interactions, and prescriptions) were assessed at 1-year intervals throughout follow-up. Follow-up continued until death, the individual left the database or the study period ended, whichever occurred first. Baseline characteristics and costs were assessed by time to BaS (< 2 years, 2–3.9 years or ≥ 4 years).

Results: In total, 137,184 individuals in the database were eligible for BaS, of whom 3241 received BaS. Among individuals who received BaS, 35.9% waited < 2 years, 27.4% waited 2–3.9 years and 36.7% waited ≥ 4 years for surgery from the time they became eligible (Table 1). Sex and age were similar across waiting time groups; approximately three-quarters were women and mean age was 41 years. The mean BMI ranged between 41.7 and 44.2 kg/m² and decreased with waiting time. The proportion of Asian and Black individuals increased with increasing waiting time, whereas the proportion of White individuals decreased. Annual healthcare costs decreased or were relatively stable over time for individuals waiting < 2 years and 2–3.9 years for BaS, respectively (Figure 1). For individuals waiting ≥ 4 years, healthcare costs increased over time, primarily driven by increasing outpatient care and prescription costs.

Conclusion: In a UK real-world population, members of ethnic minority groups and those with a comparatively lower baseline BMI often waited ≥ 4 years for BaS. Overall, more than one-third of individuals waited ≥ 4 years before receiving BaS; this group incurred increasing healthcare costs over time. Our study highlights the need to address inequalities in provision of care as well as the importance of earlier intervention to avoid growing costs in this population.

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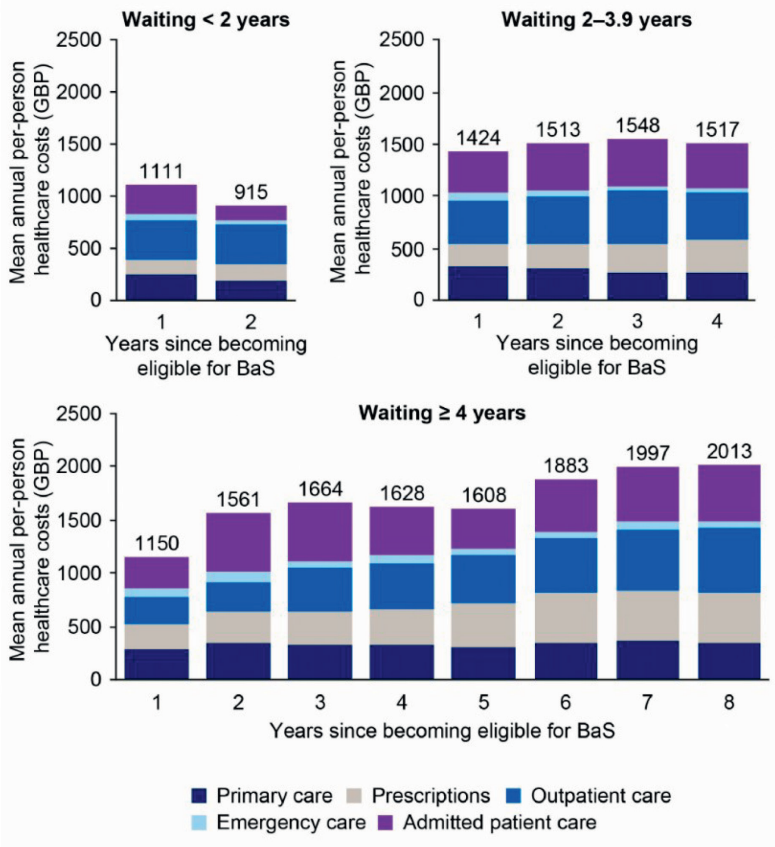
Tab. 1.

Table 1. Baseline characteristics of individuals treated with BaS stratified by time to BaS.

	BaS-treated population		
Time to BaS	**< 2 years**	**2–3.9 years**	**≥ 4 years**
Individuals, n	1163	889	1189
Women, n (%)	882 (75.8)	687 (77.3)	895 (75.3)
BMI, mean (SD), kg/m^2	44.2 (6.6)	43.2 (6.3)	41.7 (5.6)
Age, mean (SD), years	41.2 (11.2)	41.3 (11.8)	41.3 (11.0)
Age category, n (%)			
< 55 years	1016 (87.4)	780 (87.7)	1051 (88.4)
55–75 years	146 (12.6)	108 (12.1)	137 (11.5)
> 75 years	< 5 (< 1.0)	< 5 (< 1.0)	< 5 (< 1.0)
Race/ethnicity, n (%)			
Asian	152 (13.1)	148 (16.6)	280 (23.5)
Black	172 (14.8)	120 (13.5)	198 (16.7)
Mixed	56 (4.8)	43 (4.8)	47 (4.0)
Other	134 (11.5)	87 (9.8)	128 (10.8)
White	637 (54.8)	489 (55.0)	535 (45.0)
Not stated	12 (1.0)	< 5 (< 1.0)	< 5 (< 1.0)

BaS, bariatric surgery; BMI, body mass index; SD, standard deviation.

Figure 1. Mean annual per-person healthcare costs by time waiting for BaS.



BaS, bariatric surgery; GBP, Great British Pound.

Fig. 1.

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GC4.224

Early retirement pensioners diagnosed with obesity or other hyperalimentation in Germany - characterization and utilization of medical rehabilitation

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Introduction: In order to avoid early retirement (ER) the German statutory pension insurance fund covers the cost of rehabilitation for employees whose working capacity is endangered due to health problems. However, the granting of medical rehabilitation must adhere to the principles of economic efficiency and frugality (§ 13 (1) SGB VI, Federal Ministry of Justice 2022).

We aimed to describe the use of medical rehabilitation among insured persons received a disability pension due to obesity or other hyperalimentation (ICD E65-E68) with special consideration of sociodemographic determinants.

Methods: Analysis based on 20% random samples of administrative pension records from the Research Data Centre of the German Federal Pension Insurance, which include all new cases of early retirement (ER) from 2001 to 2020 (DRV FDZ 2022).

We estimated risk of non-utilization of medical rehabilitation using logistic regression models. Age, gender, marital status, nationality, place of residence, education, level of employment, annual income as well as pension payment amount were considered as potential risk factors.

Results: The data set contains 681,189 insured persons aged up to 64 years who were granted an EM pension for the first time between 2001 and 2020. After exclusion of persons who received occupational rehabilitation, 661,227 persons are left, of whom 371,180 (56.5%) did not receive medical rehabilitation in the five years before the granting of ER pension.

Among them, 3,233 (0.5 %) persons received a ER pension due to obesity or other hyperalimenation. 1,958 out of these 3,233 (60.6%) did not receive medical rehabilitation. Among 658 (20.4%) cases their application for rehabilitation was revaluated as an application for a ER pension. 257 (8.0%) persons had an revaluated rehabilitation application and did not receive medical rehabilitation.

Risk factors for not receiving medical rehabilitation are male gender, foreign nationality, low or unknown education, low or unknown job requirement profile, low income as well as low pension payment amount. For example, adjusted risk (Odds Ratio [95%-CI]) among persons with low income (1st quartile vs. 4th quartile), was 3.4 [2.6;4.4]. Using pension payment amount instead of income in multiple logistic regression model showed similar pattern.

Conclusion: One reason for the social inequality in the implementation of the principle "rehabilitation before pension" could be the difficulty of complying with the economic efficiency and frugality requirement when granting medical rehabilitation measures for economic disadvantaged persons.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.225

Association between Obesity and Chronic Kidney Disease: Time-Varying Cox Regression Analysis with Propensity Score Matching

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Introduction: The incidence of Chronic Kidney Disease(CKD), associated with life-threatening diseases such as cardiovascular diseases or end-stage renal disease, is steeply increasing and obesity has been regarded as an important risk factor of it. BMI can change over time, however, the time varying effect of BMI for CKD has not been studied well. In this study, we observed the effect of BMI on CKD by reducing selection bias through Propensity Score Matching(PSM) and immortal time bias through time-varying Cox regression.

Methods: We were provided two nationwide health screening records, divided into men and women, of participants who aged from 40 to 80 and undertook health screening over three times between 2009 and 2019 from National Health Insurance Sharing Service, Korea. Out of a total of 4,366,425 men and 4,565,256 women participants, 1,702,876 men and 2,174,612 women participants whose BMI was lower than 25kg/m² and without CKD between 2009 and 2012 were selected as a study population in order to mitigate a bias stemming from the duration of obesity prior to enrollment. People with obesity were defined as participants whose BMI was over 25kg/m² between 2013 and 2015. CKD, outcome of interests, was defined as estimated glomerular filtration rate (eGFR) less than 60 mL/min per 1.73 m² or proteinuria 1+ or higher by dipstick test between 2016 and 2019. PSM in a ratio 1:1 was conducted based on defined people with obesity. Final participants consisted of 164,692 men and 194,152 women after PSM. The time varying effect of BMI and CKD was estimated by time-varying Cox regression model adjusted by age, systolic blood pressure, diastolic blood pressure, fasting blood sugar, low density lipoprotein, smoking status, drinking status, physical activity, type 2 diabetes, hypertension, heart diseases and stroke. Subgroup analysis was conducted with above covariates. For comparison, conventional Cox analysis was also conducted.

Results: With adjusted conventional model, the hazard ratio(HR) of obesity was 1.62(95% CIs: 1.56-1.67, p-value: <.0001) for men and 1.40(1.36-1.45, <.0001) for women. With adjusted time-varying model, the HR of obesity was 1.72(1.66-1.78, <.0001) for men and 1.50(1.46-1.55, <.0001) for women. In all subgroup analyses, the HRs of obesity were between 1.43 and 1.80 for men and between 1.31 and 1.55 for women with statistical significance. In subgroup analyses, no significant differences between subgroups were found.

Conclusion: The effect of obesity on CKD was hazardous and higher with time-varying than conventional. Reducing immortal time bias through the application of time-varying Cox analysis likely contributed to the precision of the measurements. The effect of obesity on CKD was higher in men than women. It is suggested that future studies should include an analysis of sex interaction.

Ethics Statement: The protocol of this study was approved by the Institutional Review Board of Seoul National University Hospital at Seoul (men; IRB No. E-2211-070-1377, women; IRB No. E-2211-071-1377).

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GC4.226

4-year setmelanotide weight outcomes of patients with POMC and LEPR deficiency obesity

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Background: Patients with proopiomelanocortin (POMC; including variants in POMC or PCSK1) or leptin receptor (LEPR) deficiency due to biallelic gene variants have impaired melanocortin-4 receptor signaling that leads to hyperphagia and early-onset, severe obesity. Setmelanotide treatment in this population improved weight-related measures and hunger severity and was well tolerated. Reported here are long-term extension (LTE) outcomes after 4 years of setmelanotide treatment.
Methods: Patients with POMC or LEPR deficiency who achieved clinical benefit and acceptable safety in a prior trial of setmelanotide could enroll in the LTE (NTC03651765) and continue setmelanotide for ≥5 years or transition to a commercial product or other clinical trials. This analysis reports weight outcomes and adverse events at 4 years of setmelanotide treatment for patients who achieved a clinically meaningful, age-appropriate, 1-year index trial weight response defined as either ≥10% weight reduction (age ≥18 years at baseline) or reduction of ≥5 percentage points in percent of the 95th percentile for BMI (%BMI95; age <18 years at baseline).
Results: A total of 24 patients entered the LTE with clinically meaningful weight response; 12 patients had 4 years of measurements and were included in this analysis. Of the 12 patients excluded, 3 pediatric patients transitioned to adulthood between the index trial and this analysis, 5 transitioned to commercial therapy, and 4 discontinued treatment. Compared with index trial baseline, the mean (SD) change in body weight was −32.6 kg (36.7) for patients aged ≥18 years (n=8) and −42.7 (22.44) percentage points in %BMI95 for patients aged <18 years (n=4). No new safety signals were observed between the index trial and the LTE.
Conclusions: Continuous setmelanotide treatment in patients with POMC or LEPR deficiency is supported by sustained meaningful benefit in weight-related measures with no new safety signals at 4 years of treatment in this population.

GC4.227

Establishing a Population-Based Obesity Registry for Effective Obesity Management in General Practice

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Background: The high prevalence obesity and its complexity necessitates the use of innovative technologies (IT) to support of management, especially in primary care. The establishment of a population-based obesity registry is essential for the development such IT tools. The registry provides comprehensive data, enables evidence-based decision making, facilitates personalized care, allows for monitoring and follow-up, promotes research and quality improvement, and fosters collaboration among healthcare providers. By leveraging these capabilities, the IT tools can effectively address the complex challenges associated with obesity and improve patient outcomes.
Methods: To address this growing health concern, Leumit Health Services (LHS), a large nationwide Israeli Health Maintenance Organization (HMO) in Israel, serving 725,000 members, has developed the first population-based obesity registry. The development of the registry was based on a retrospective review of electronic medical records (EMR) data from a large sample of LHS enrollees, including demographic information, anthropometric measurements, and medical comorbidities. This data was used to identify adult individuals with obesity, defined as a body mass index (BMI) of 30 or above, and to classify them according to the WHO classification system.
Results: A total of 114,028 individuals were identified. Mean age was 51.1 and 56.1% were females. About 25.1% of individuals in the registry were belonged to the low socio-economic status (SES). Contrastingly, only 9.4% fall into the high SES category. Almost 40% of individuals in the registry reported a lack of any type of physical activity. The prevalence of physical inactivity increases proportionally with with obesity staging. The prevalence of chronic somatic and psychiatric comorbidities (diabetes mellitus, cardiovascular disorders, ADHD and depression) were significantly higher than in general population (27.4%, 8.1 %, 6.1% and 5.9% respectively) highlighting the need for targeted interventions to manage these conditions. A low rate of GLP1 RA use was observed in the population with obesity. Almost 70% of obese individuals have never visited a registered dietitian. Almost 50% of those who visited a dietitian did so only once. The rate of telemedicine utilization among dietitians has been relatively low and had a positive association with obesity staging.
Conclusions: The LHS obesity registry is a valuable resource for developing the IT tools to identify and target high-risk populations for intervention and prevention efforts. These tools support comprehensive assessments, provide decision support, deliver behavioral and nutritional interventions, enable remote monitoring, facilitate telemedicine, and ensure data integration and interoperability. This is essential in developing effective strategies and IT tools to address the obesity management in general practice. Tailored strategies can positively impact both weight management and overall health.

GC4.228

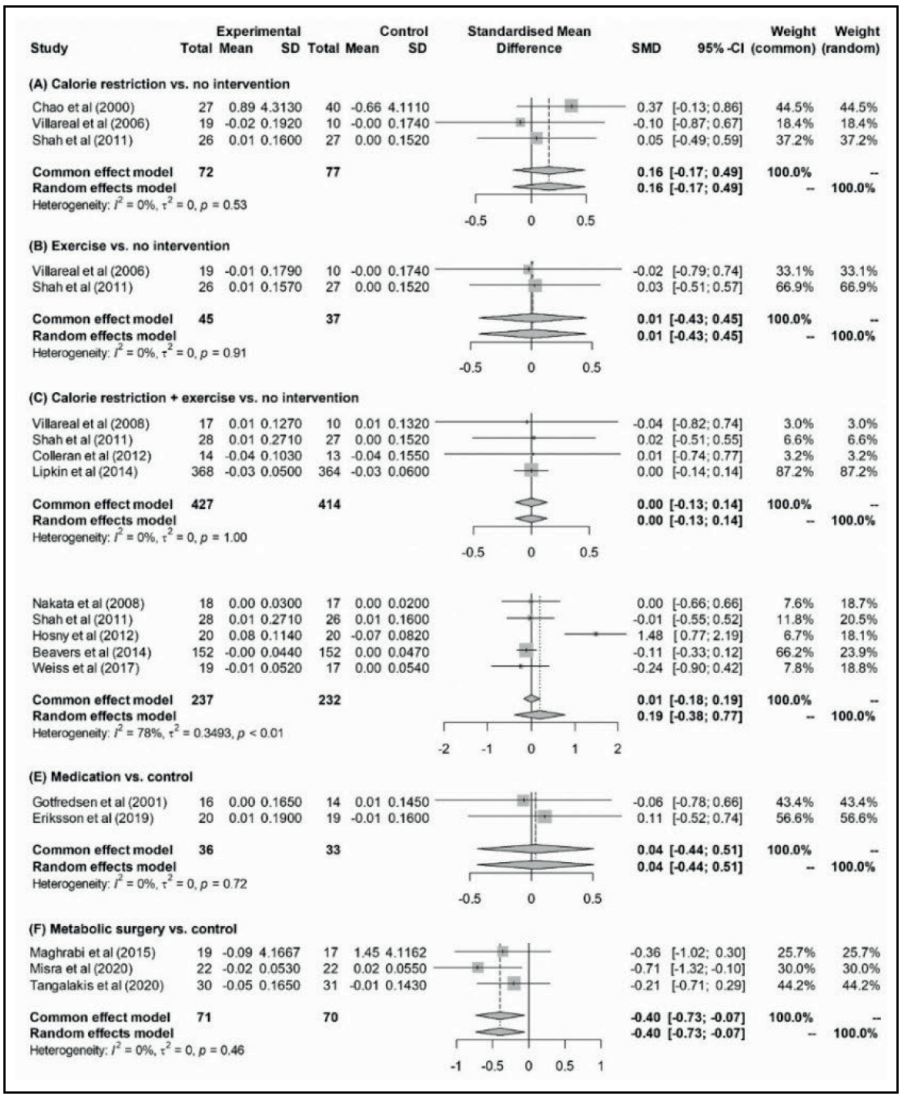
Effects of Anti-Obesity Strategies on Bone Mineral Density: A Systematic Review and Meta-Analysis

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Introduction: Although an appropriate weight management strategy is essential for patients with obesity, weight loss may have adverse effects on bone mineral density (BMD). We conducted a systematic review of randomized controlled trials to evaluate the changes in BMD after implementing various weight loss strategies.
Methods: The PubMed, Embase, Web of Science, and Cochrane Library databases were searched to find articles published from database inception until June 2023. Randomized controlled trials conducted in patients with obesity treated with various approaches and reported changes in BMD were selected. The primary outcome was BMD of the whole body, lumbar spine, and total hip, measured using dual X-ray absorptiometry.
Results: Eighteen randomized controlled trials involving 2,510 participants with obesity were included in the analysis. At follow-up examination, the BMD of the lumbar spine decreased significantly after metabolic

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The diamonds represent the pooled estimates, while the horizontal straight lines represent the 95% confidence intervals.

Fig. 1. Forest plots of the BMD changes in the lumbar spine after implementing each weight loss strategy.

surgery (MD = –0.40 g/cm2, 95% confidence interval [CI]: –0.73 to –0.07; I2 = 0%); other lifestyle and pharmacological interventions did not result in a significant decrease in BMD of any location. Metabolic surgery also exhibited the most substantial difference with an MD of –3.14 (95% CI: –3.82 to –2.47).

Conclusion: This meta-analysis is the first to examine the impact of all categories of anti-obesity strategies, including the use of anti-obesity medications, on BMD. Bariatric metabolic surgery may have adverse effects on BMD. Moreover, medications can be used as an alternative treatment for weight loss without compromising bone quality.

GC4.229

Short term effects of semaglutide among patients with obesity and food addiction

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Introduction: Food addiction (FA) shares behaviors typically present among substance use disorders, such as consumption despite negative effects, tolerance, and withdrawal symptoms. FA is highly prevalent among people with obesity (PwO) and may constitute a key factor in weight loss failure or weight regain. GLP1 analogues have been shown to act on the mesolimbic system, which is related to hedonic overeating and substance abuse.

Objectives: To study the effects of low doses of semaglutide on FA symptoms. To evaluate whether the presence of FA have a negative impact on weight loss despite treatment with semaglutide.

Methods: 115 PwO were evaluated baseline and after 4 months of treatment with semaglutide. PwO were evaluated for the presence of FA by completing The Spanish version of the Yale Food Addiction Scale 2.0 questionnaire (YFAS 2.0).

Results: Baseline BMI and %fat mass were greater among PwO with FA (35.9±6.5 vs 33 ±5.9kg/m^2 and 44.3±6.6 vs 40.2±7.8%; p=0.01). After 4 months of treatment with semaglutide, FA diminished from 57.4% to 4.3% (p<0.0001). Both the percentage of weight loss (6.9±12.9 vs 5.3±4.7%; p=0.4) and the proportion of fat mass (2±9.2 vs 1.7±3.2%; p=0.8) were comparable between PwO with and without FA. No differences regarding side effects and treatment discontinuations were seen between the two groups.

Discussion: Semaglutide is an effective tool for the amelioration of FA symptomatology among PwO. Despite Pwo and FA had a greater BMI and

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fat mass at baseline, treatment with semaglutide showed similar results compared to PwO without FA in terms of weight and fat loss at short term.

GC4.231

Obesity, Mental Health, and Eating Behaviours: A Case Study from Iran

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Introduction: Mental health and obesity are two of the most prevalent global public health issues for a significant portion of people. Dietary behaviors have been reported to have a significant effect on both mental health and obesity. The purpose of this study was to determine the association of eating behaviours, and obesity with mental health in adults living in Tehran.
Methods: We conducted a cross-sectional study on healthy Iranian adults using a convenience sampling technique. The short form of the Depression Anxiety and Stress Scale (DASS-21) was used to measure mental health outcomes. Anthropometric data were collected BMI ≥ 30 kgm-2 was considered obese. Data on dietary intake were gathered using a validated food frequency questionnaire and a three-day 24-hour dietary recall on non-consecutive days. Principal component analysis (PCA) and latent class analysis (LCA) were deployed to derive the dietary patterns. Daily mealtime distribution of macronutrients was determined using the coefficient of variation (CV). The relationships between dietary patterns, macronutrient CV, and obesity with mental health were investigated using a Two-Way ANOVA. The dose-response relationship was evaluated using restricted cubic splines with three knots to find the association between obesity and mental health.
Results: In all, 54.6%, 53.9%, and 56.6% of 434 participants were classified as having anxiety, depression, and stress, respectively. We identified three meal-based dietary patterns: "Flexitarian", "Protein" and "Western" patterns, based on the PCA, and "Picky" "Prudent", and "Modern Iranian" patterns, based on the LCA. Higher adherence to the "Flexitarian" and "Western" patterns was inversely associated with stress levels. Meanwhile, the "Protein" pattern was significantly associated with a lower risk of anxiety. Compared with the "Picky" pattern, the "Modern Iranian" pattern but not the "Prudent" pattern was significantly associated with a lower risk of anxiety in this study population. The CV scores for carbohydrates were relatively evenly distributed across all meal times, with a mean of 0.38, 0.38, and 0.39 for breakfast, lunch, and dinner, respectively. A more skewed distribution of protein intake (i.e., a higher protein CV value) was positively associated with anxiety (OR: 1.69; CI: 1.02-2.78) and stress (OR: 1.93; CI: 1.17-3.16). We also observed a significant association between fat distribution and depression, with subjects in tertile 2 having higher odds of depression compared to tertile 1 (OR: 1.63; CI: 1.00–63). However, we observed a nonlinear dose-response relationship between anthropometric indexes and the risk of anxiety. The lowest risk for anxiety was observed at approximately 28% BAI and 0.079 ABSI.
Conclusion: For individuals experiencing mental disorders, adopting a healthy dietary pattern and adjusting the distribution of macronutrient intake during mealtime may be beneficial. Further research is recommended to validate these findings and gain a better understanding of the underlying mechanisms.

Conflict of Interest: None

Funding: No funding to report

GC4.232

Food addiction and depressive symptoms in adults with overweight and obesity trying to lose weight

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Introduction: The World Obesity Federation predicts that by 2030, one billion people worldwide, including one in five women and one in seven men, will be living with obesity [1]. Obesity is a serious health risk, increasing the risk of premature death and significantly affecting mental health and quality of life [2]. The increasing availability of processed foods, the unhealthy lifestyle and limited physical activity are exacerbating the problem [3]. The scientific community is focusing on a variety of biological, psychological, and behavioural factors associated with this phenomenon [4]. One of these factors is food addiction (FA) [5]. The purpose of the study is to explore the many links between physical and mental health and lifestyle.
Methods: The study was carried out in a private Polish centre that organises weight-loss holidays for adults. The questionnaires used were: Food Frequency Questionnaire-6, Global Physical Activity Questionnaire, Three Factor Eating Questionnaire-R18, Yale Food Addiction Scale 2.0, Zung Depression Self-Assessment Scale. Body composition, anthropometric measurements, fasting glucose, lipid profile, and blood pressure were measured.
Results: The study included 172 people with overweight and obesity (82% female) aged 23 to 85 years. The mean age of all participants was M=59.97 years (SD=11.93), the mean BMI was M=32.05 kg/m² (SD=4.84), and the mean body fat was M=39.12% (SD=6.48). Symptoms of FA symptoms and depressive symptoms were found in 18.6% and 22.7% of people with overweight and obesity, respectively. FA was statistically significantly more common in people under 50 years of age. BMI and body fat mass were

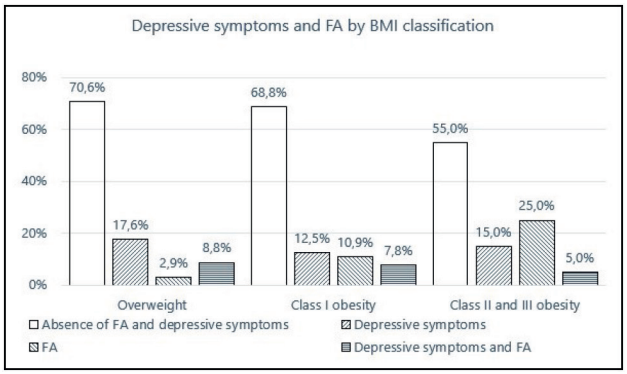


Fig. 1. Depressive symptoms and FA by BMI.

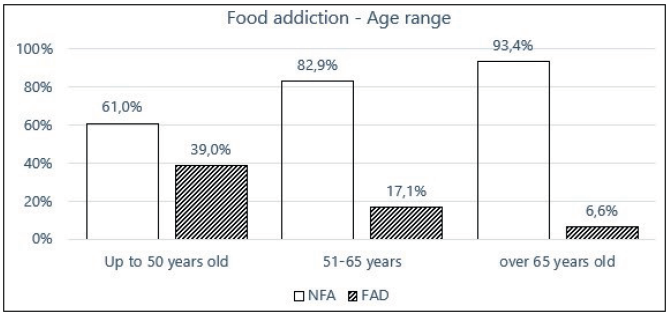


Fig. 2. Food addiction - Age range.

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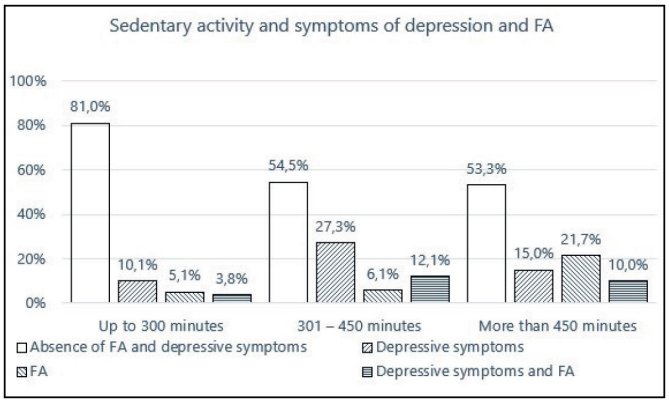


Fig. 3. Sedentary activity.

statistically significantly higher in people with symptoms of FA. People who were sedentary for 301-450 minutes a day were significantly more likely to have symptoms of depression, while people who were sedentary for more than 450 minutes a day were at increased risk for symptoms of FA.
Conclusions: Identifying aspects of mental health in people with excess body weight may be crucial for effective interventions, including physical and behavioural aspects. In particular, emphasising regular physical activity and reducing sedentary behaviour is essential not only for weight control but also for mental well-being.

Conflict of interest: no conflicts of interest declared.

Funding: no report of funding.

GC4.233

MoreLife UK Emotional eating group intervention pilot: Three Case Studies

SIRIN AYVA, A. B.; Edwards, S.; Heywood, N.; Gately, P.
MoreLife UK

Introduction: Emotional eating is a common behaviour, often linked to mental health issues in those living with obe-sity1. MoreLife UK provides weight management services across the UK and provide therapeutic support as part of their specialist interventions. Evidence-based psychotherapeutic approaches to ad-dress emotional eating and weight management are limited, and MoreLife clients shared their difficulties in accessing those services.
Method: A significant proportion of clients struggle with emotional eating, which is a barrier to their weight loss. MoreLife clinicians (Counselling Psychologist, Dietitian) and therapists co-created with clients a group-based programme to help clients with their emotional eating and improve their relationship with food. The programme consisted of 8 weekly, 90 minute sessions with 6-8 participants. The programme was offered to clients who were struggling with emotional eating and had symptoms of depression and/or anxiety.
The participants of this pilot programme were invited to give feedback on their experiences of the programme via weekly feedback forms. They also provided written responses to our comprehensive Case Example questions.
Results: This pilot had five cohorts and 20 completers in total. Three clients volunteered to be a case studies. All the other participants shared their feedback via client feedback form.

Case Study A
Female, 53 years old.
'I realised that I was binging due to a trauma that happened 45 years ago and realised it with the help of this programme and group. I have other ways to indulge myself and take my mind off from emotional eating.'

Case Study B
Female, 38 years old.
'I am not measuring my weight as I can see the difference, my body toning up. I haven't binged for four months. I regularly flick through my notes from the programme and do my regular wellness check in as I learned from the programme.'

Case Study C
Male, 58 years old.
'I don't use food as an emotional crutch anymore. I see it as an enjoyable experience, a necessity to survive but not something to turn to in times of stress as I did previously. I learned coping mechanisms on the course and how to use mindfulness that is far more helpful than a full packet of biscuits and the results are more sustained.'
Conclusion: This qualitative feedback adds to the limited literature on effectively treating emotional eating as part of a weigh management programme These case study examples emphasise the effectiveness of evidence-based psychotherapeutic approaches to address emotional eating and weight loss.
The overall feedback highlights that this pilot programme effectively reduces emotional eating and improves the participants' emotion regulation skills. The feedback points to enhanced self-awareness, acceptance, self-monitoring, and mindfulness. Future research is needed to evaluate the long-term impacts of this programme.

Reference

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GC4.234

Service evaluation of an emotional eating group intervention pilot for adult weight management programme in the UK

Sırın Ayva, A. B.; Edwards, S.; Heywood, N.; Gately, P.
MoreLife UK

Emotional eating is a prevalent concept which is also related to some other mental health issues among people living with obesity1. MoreLife UK provides weight management services across the UK and supports clients with individual therapy sessions to help them with their weight management journey. Group intervention is a valuable supportive environment for participants with the benefits of learning new skills, gaining new perspectives and ano-nymity2. MoreLife provides a specialist programme to people living with complex obesity with a BMI>35. Health professionals refer clients into this programme.
Method: MoreLife clinicians (Psychologists, Dietitian) and therapists created the Emotional Eating Pilot Programme consisting of 8 weekly sessions with 6-8 participants based on Acceptance and Commitment Therapy and Mindfulness. The duration of each session is 90 minutes to enable group discussion. The programme is offered to clients who are struggling with emotional eating and scoring high on PHQ and GAD-7 and is facilitated by a therapist.
Measurements
The questionnaires below are used to see the changes in emotional appetite, emotion regulation, depression and anxiety in participants.
The Emotional Appetite Questionnaire (EMAQ) has 22 items and focuses on positive and negative emotions. The EMAQ was shown to have construct validity, and emotional eating was significantly correlated with BMI3.
Difficulties in Emotion Regulation Scale (DERS 18)
Short form of DERS questionnaire to understand emotion-related constructs and treatment progress4.
Generalised Anxiety Disorder Assessment (GAD-7)
A self-reported questionnaire to screen the severity of generalised anxiety disorder includes seven items5.
Patient Health Questionnaire (PHQ-9)

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A self-reported instrument to monitor the severity of depression and response to treatment6.
Results: This pilot had five cohorts and 21 completers in total. Analysis showed that the programme helped participants significantly reduce their positive (Z=-2.094, p<0.5) and negative (Z=-2.200, p<0.5) emotional appetite, reducing depression (Z=-2.658, p.0.5) and anxiety (Z=-2.360, p<0.5), emotion dysregulation scores (Z=-2.278, p<0.5). Clients were not required to be weighted but those who reported their weights lose %3.7 of their body weight and an average of 9.15kg at the end of the programme.
Conclusion: This pilot programme outcomes shows that the Emotional Eating Group programme is an efficient tool to help clients reduce their emotional eating significantly where, improving depression, anxiety and emotion regulation. The weight loss data is limited as the main intention was to focus on the psychological impacts of this programme. However, the current weight loss results of the study indicates that weight loss is a bi-product of this intervention.

GC4.235

Phenotyping obesity treatment: are there predictors of Naltrexone/Bupropion treatment adherence and effectiveness in real life? Insights from a clinical audit

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Introduction: Prolonged-release naltrexone 8 mg/ bupropion 90 mg (N+B) is a combination out-of-pocket medication approved in Europe for weight management in persons with obesity (PwO).
We aimed to investigate whether baseline characteristics including psychiatric symptoms (i.e., depression, anxiety, binge eating) can predict adherence to therapy and treatment failure/success in a real-life setting.
Method: A retrospective audit was carried out on 117 adult PwO (87 F, mean age 53.5 ± 10.94, mean BMI 37.8 ± 6.7) treated with NB at our institution. One-third of patients were on antidepressant and/or antianxiety and/or antipsychotic treatment. Psychometric tests at baseline were available in 67. We analyzed the relation between sex, age, body mass index, assumption of psychoactive medications, psychiatric symptoms evaluated through the State-Trait Anxiety Inventory (STAI-Y1), the Beck Depression Inventory (BDI), the Binge Eating Scale (BES); and (1) adherence to therapy by assessing the maximum dosage (MD) and treatment duration (TD) and (2) NB discontinuation rate; (3) weight loss at 16 wks.
Results: In the whole cohort (intention-to-treat), the average weight loss was 2.8% (±SD = 3.7) at 16 weeks and 3.6% (±SD = 6.9) at 52 weeks. About half of patients discontinued therapy due to side effects, cost, lack of compliance or poor effectiveness. Treatment discontinuation due to perceived ineffectiveness occurred more frequently in males (40%) vs females (17%) (p=0.011).
One-third of patients reached a % weight loss ≥ 5% at 16 wks, with no sex- or age-related differences. A positive relation was found between BMI and BES score (R=0.265, p=0,030), but not between BMI and treatment adherence/efficacy.
No significant correlation was found between STAI-Y1, BDI, BES scores and weight loss. Scores in psychometric tests did not predict adherence to treatment either. 100% patients on serotonin–norepinephrine reuptake inhibitors (SNRIs) and 76% of patients on selective serotonin reuptake inhibitors (SSRIs) failed to reach a MD > 2 caps/day vs 52% of patients not on psychiatric medications (p=0.04). However, use of psychotropic treatment - as a whole- did not affect N+D efficacy on weight loss.
Conclusion: in a real-life audit, male sex was associated with a higher rate of N+B discontinuation for perceived poor effectiveness. This study does not confirm that psychiatric symptoms at baseline can predict the effect of naltrexone/bupropion on weight loss or adherence to treatment. Co-treatment with SNRIs and SSRIs seems to influence the maximum dosage but not effectiveness of N+B in weight loss. These findings suggest that persons with obesity (PWO) and impaired mental health can fully benefit from treatment with N+B.

GC4.236

Association between pre-operative psychological distress and weight loss in people with obesity after bariatric surgery

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Introduction: Bariatric surgery has been proven to be the most effective treatment for obesity. However, bariatric surgery affects patients' life for years, which pre-operative mental health assessments are required to estimate patients' capacity to deal with major changes in their life, physiological functions, psychological processes, lifestyle habits, and social interactions. Consequently, these changes may affect the effectiveness of weight loss. This study, therefore, aimed to assess psychological distress symptoms before surgery and weight loss outcome after bariatric surgery in people with obesity.
Methods: A retrospective study was conducted, using data from the electronic health records of Songklanagarind Hospital. Patients with obesity who registered for bariatric surgery during 2020-2021 were recruited, with a complete baseline psychological assessment and 6-month and 12-month postoperative weight recorded. Percentage of body weight loss was our primary outcome. Psychological distress was measured preoperatively by using the General Health Questionnaire - 28 (GHQ-28) via participant self-report on somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. A total GHQ score of 7 or above indicated high psychological distress, which was defined using a median of the study population as a cut-off value. Differences between groups were compared by using student T-test analysis. This study was approved by the Human Research Ethics Committee of the Faculty of Medicine, Prince of Songkla University, Thailand.
Results: A total of 84 patients was recruited, 76% female (n=64), mean age 37 years (SD 9.5). Baseline preoperative body weight was 121 kg (SD 26.6) with mean body mass index (BMI) of 45.1 (SD 8.3). Laparoscopic sleeve gastrectomy was performed in 69% of patients (n=58), followed by laparoscopic Roux-en-Y gastric bypass procedure (18%, n=15). Percentage of weight loss at 6 months after surgery was 25% (SD 6.2), and 12 months was 30% (SD 7.9).
A median of total GHQ score was 6 (IQR of 2-13). Nearly half of patients (45%, n=38) reported high psychological distress symptoms with most of the scores were from somatic symptoms, anxiety and insomnia, and social dysfunction. Between groups, there were no differences in age, sex, baseline body weight, and baseline BMI. Patients with high psychological distress showed greater percentage weight loss than those with low psychological distress at 6 months (26.6%, SD 7.3 vs. 23.7%, SD 4.9; p-value 0.04), and 12 months follow-up (32.1%, SD 9.1 vs. 28.1%, SD 6.0; p-value 0.024).
Conclusion: Our study showed that patients undergoing bariatric surgery who had high baseline psychological distress exhibited greater weight loss up to 1 year after surgery than those with low psychological distress.

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GC4.237

Relations between triglyceride-glucose index, atherogenic index of plasma and depression: A cross-sectional study based on 7th and 8th Korea National Health and Nutrition Examination Survey

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Background: Depression has been reported to have a bidirectional relationship with several metabolic diseases. This study aims to investigate the relationship between two metabolic indices, the Triglyceride-glucose index (TyG index) and the Atherogenic index of plasma (AIP), and the prevalence of depression in Korean adults.
Methods: Data were used from 2016, 2018, and 2020 of the Korean National Health and Nutrition Examination Survey when the PHQ-9 depression screening test was conducted. A total of 17,028 over the age of 19 were subjected. The relationship between TyG index, AIP and depression prevalence was analyzed using a complex sample weighted analysis. A P-value of <0.05 was considered statistically significant.
Results: In women, the mean TyG index and AIP were higher in the depression group (P=0.004 and 0.014, respectively) but not in men. Furthermore, the logistic regression analysis indicated that higher TyG index and AIP were related to depression in women (Model 1; TyG OR=1.27, P=0.003, AIP OR=1.53, P=0.012, Model 2; TyG OR=1.33, P=0.001, AIP OR=1.66, P=0.004). In men, only the higher TyG index was related to depression (Model 1 TyG OR=1.23, P=0.041, Model 2 TyG OR=1.29, P=0.009). However, there was no relationship in the model 3.
Conclusion: TyG index and AIP showed statistically significantly higher values in women with depression but not in men. When sex and age were adjusted as variables (Model 2), TyG index and AIP was related with depression in women but only TyG index was related with depression in men.

GC4.238

Metabolic and renal outcomes of empagliflozin in patients with type 2 diabetes mellitus attending Armed Forces Hospital in Saudi Arabia

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Objectives: To explore the effects of empagliflozin (25 mg) on metabolic and renal parameters in patients with type 2 diabetes mellitus (T2DM).
Methods: This retrospective observational comparative study was conducted at a military hospital in southern Saudi Arabia. All adults (aged >18 years) with T2DM who attended clinics for persons with diabetes between October 2021 to March 2022 (6 months), with or without insulin treatment, were eligible for inclusion in the study.
Results: Following the initiation of empagliflozin treatment, statistically significant reductions in patient weight (kg) were observed at 1, 3-5, and 6 months. In addition, low-density lipoprotein levels significantly decreased 3-5 months post-treatment initiation (p=0.011). However,

Tab.1. Age and gender distribution of the participants (N=308).

Variables	Variables
Gender, n (%)	
Male	198.(64.3)
Female	110(35.7)
Age(years)	23-89
Range, mean±SD	58.0±10.6

Age and gender distribution of the participants (N=308).

Tab. 2. Comparison of metabolic and renal outcomes of empagliflozin in patients with T2DM at different follow-up periods.

	Before starting empagliflozin Mean ± SD	3 weeks to 1 month after starting empagliflozin Mean ± SD (p-value)	3-5 months after starting empagliflozin Mean ± SD (p-value)	>6 months after starting empagliflozin Mean ± SD (p-value)
Weight (Kg)	83.3 ±15.9(n=45) 84.9 ±15.1(n=152) 83.4 ±13.9 (n=117)	80.4 ±15.5 (0.010)	82.0±15.7 (<0.001)	79.4 ±12.8 (<0.001)
LDL	2.31±0.58 (n=19) 2.53±0.91 (n=166) 2.55±0.77 (n=73)	2.23±0.63 (0.618)	2.36±0.84 (0.011)	2.60±0.87 (0.584)
TG	2.11±1.20 (n=33) 1.79±0.96 (n=236) 1.87±0.99 (n=126)	1.88±1.18 (0.115)	1.77±1.08 (0.766)	1.77±0.80 (0.223)
Creatinine	83.79±30.14 (n=31) 77.55±25.18 (n=227) 76.04±23.46 (n=147)	87.45±31.78 (0.105)	79.62±28.60 (0.059)	78.39±27.43 (0.033)
UACR	52.39±92.85 (n=21) 123.86±348.6 (n=181) 133.41±391.8 (n=106)	32.87±44.34 (0.208)	91.87±226.3 (0.043)	71.92±169.3 (0.022)
HbA1c	8.93±1.50 (n=34) 9.01±1.72 (n=260) 8.85±1.55 (n=166)	8.73±1.43 (0.411)	8.51±1.43 (<0.001)	8.34±1.35 (<0.001)
SBP	130.45±14.87 (n=22) 129.35±13.77 (n=115) 129.52±13.06 (n=83)	129.59±11.63 (0.777)	129.05±12.71 (0.821)	126.04±12.33 (0.045)
DBP	75.09±8.62(n=22) 74.26±8.32 (n=115) 75.19±7.92 (n=83)	72.41±7.79 (0.066)	73.20±7.35 (0.221)	71.61±8.95 (0.002)

Comparison of metabolic and renal outcomes of empagliflozin in patients with T2DM at different follow-up periods.

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serum creatinine level decreased gradually with time during the treatment with empagliflozin, from 87.45±31.78 (0.105) to 78.39±27.43 (0.033). Furthermore, after empagliflozin treatment, the urinary albumin-to-creatinine ratio significantly decreased at 3-5 and 6 months. Moreover, HbA1c levels exhibited statistically significant decreases at 3-5 months ($p<0.001$) and at 6 months ($p<0.001$) following the initiation of empagliflozin treatment. Notably, systolic and diastolic blood pressure significantly reduced 6 months after empagliflozin treatment.

Conclusion: In the current study, empagliflozin has demonstrated efficacy in controlling blood pressure and body weight, and improving renal function, short-term dyslipidemia, and glycemic control in patients with T2DM.

GC4.239

Real world results of SGLT2i and GLP1RA combination therapy

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Introduction: Two drug classes, sodium-glucose co-transporter-2 inhibitors (SGLT2is) and glucagon-like peptide-1 receptor agonists (GLP-1 RAs), have recently attracted significant attention of the medical research community in studies focused on weight loss, glycemic control, and cardiovascular and renal system protection. This combined therapy also has the potential to cause further reductions in major cardiovascular events and renal decompensation than those achieved with either drug used as monotherapy or in combination with other hypoglycemic agents.

Methods: This is real world clinical data analysis in one center, Daejeon Eulji University Hospital from May 2018 to August 2021. From 129 patients who prescribed combined therapy of SGLT2i and GLP1RA, 109 patients were analyzed with over 6 months follow up data. We reviewed clinical data of HbA1c, FBS, Weight, AST, ALT, eGFR, ACR, insulin after 3 months and 6 months of combined therapy.

Results: 89 patients were treated with sequential treatment of dulaglutide and SGLT2 inhibitors resulted in significant and clinically relevant improvements in body weight reduction (2.20 ± 5.13kg $p=0.001$) and glycemic control (0.96 ± 1.33, $p<0.001$), with acceptable tolerability. 19 patients were treated with simultaneous treatment of dulaglutide and SGLT2 inhibitors and presented greater weight reduction (3.94 ± 3.99 kg, $p=0.001$) and glycemic control ($1.29 \pm 0.99\%$, $p<0.001$) in type 2 diabetes with tolerability.

Conclusion: Combined treatment of SGLT2i and GLP1RA showed additive glucose lowering and weight reduction efficacy with well tolerable safety in real world clinical situation.

GC4.240

Association between type 2 diabetes and depressive symptoms after a 1-year follow-up in an older adult Mediterranean population with metabolic syndrome

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Background: Type 2 diabetes (T2D) and mood disturbances are highly comorbid conditions with shared underlying factors and mutual influence on their clinical course and management, including adherence to diet and physical activity or monitoring of diabetes-related complications, leading to increased morbidity and mortality and reduced quality of life. This fact is particularly important for middle-aged and older adults, who constitute a vulnerable group due to the combination of metabolic and mood disorders. Our aim was to investigate the cross-sectional relationship between depressive symptoms at baseline and the presence of T2D, alongside exploring its association with glycated hemoglobin (HbA1c) and other metabolic variables. Furthermore, we aimed to examine the prospective relationship between depressive symptoms and HbA1c after a year of follow-up. Using path analysis, we evaluated the predictive capacity of baseline depressive symptoms on HbA1c at 1-year follow-up, and the potential mediating role of different features such as T2D duration (at baseline), physical activity, adherence to MedDiet, and BMI (at 1-year follow-up).
Methods: The sample included n=6224 older adults with overweight/obesity and metabolic syndrome (MetS) from the PREDIMED-Plus study (48% females, mean age 64.9 ± 4.9 years). Baseline depressive symptoms were assessed using the Beck Depression Inventory-II. HbA1c was used as a measure of metabolic control and was evaluated at baseline and at 1-year of follow-up. Longitudinal associations were analyzed with logistic regression models. Path analysis was implemented through structural equation modeling to assess the predictive capacity of baseline levels of depressive symptomatology on HbA1c at 1 year of follow-up.
Results: At baseline, the presence of T2D increased the likelihood of higher levels of depressive symptoms (X^2=15.84, p=0.001). Polynomial contrast revealed a positive linear relationship (X^2=13.49, p=0.001), the higher the depressive symptoms levels, the higher the prevalence of T2D. Longitudinal analyses showed that the higher baseline depressive symptoms levels, the higher the likelihood of being within the HbA1c ≥7% at 1-year follow-up (Wald-$X^2$2=24.06, df=3, p<.001, for the full adjusted model). Additionally, higher levels of depressive symptoms at baseline and duration of T2D predicted higher HbA1c and BMI, lower level of energy expenditure in leisure-time physical activity and lower likelihood of adherence to MedDiet at 1-year of follow-up.
Conclusions: This study supports an association between T2D and the severity of depressive symptoms in older adults with obesity and MetS, and suggests worse metabolic control from mild severity levels in the short-medium term, influenced by BMI and lifestyle habits related to diabetes care. Therefore, screening for depressive symptoms, and a more holistic and multidisciplinary integrative therapeutic approach in patients with T2D should be ensured to encompass both metabolic management and depressive symptoms in individuals with T2D, as the improvement of one will influence the other.

GC4.241

Liraglutid and insuline resistance at heart failure patient with severe obesity and diabetes mellitus

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Cardiologists play a key role in the identification and subsequent management of patients with cardiovascular disease and comorbid obesity. In addition to the overall cardiovascular risk profile one must also consider the residual cardiovascular risk in patients in whom, despite properly treated comorbidities, dyslipidemia and hypertension), in connection with ongoing obesity, the chronic inflammatory process of the vascular wall continues, and myocardial fibrosis and the HFpEF phenotype develop. Since last year, it has also been able to indicate modern pharmacotherapy such as GLP-1 receptor agonists (RA) and SGLT2 inhibitors for indications other than DM2T. GLP-1 receptor agonists, specifically liraglutide, regulates appetite by increasing the feeling of satiety while simultaneously reducing the feeling of hunger and the desire to consume more food. This leads to significant weight loss and subsequent reduction in the risk of hypertension, arrhythmias (including atrial fibrillation), ischemic heart disease and heart failure. It can be expected that this type of treatment for patients with the HFpEF phenotype and obesity will gain significant traction in the near future. In this case liraglutid application led to signiffcant weight reduction. This enabled reduction in the extent of pharmacotherapy especially extreme reduction of daily insulin burden dosage together with dramatic decrease blood glucose levels near to normal values. The most probable explanation for this impressive improvement is the insulin resistance reduction together with weight reduction. This was accompanied with improvement of the patient's quality of life, especially of effort dyspnoe reduction and with the renal function improvement too.

GC4.242

Effects of oral ingestion of *Bifidobacterium breve* B-3 on body fat and lipids in adults with overweight or obesity: a randomized, double-blind, placebo-controlled trial

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Introduction: Evidence suggests an association between changes in microbial diversity and composition and the development of obesity, raising the possibility of targeting gut microbiota for new anti-obesity therapies. A previous clinical study involving Japanese adults with a tendency toward overweight found that *Bifidobacterium breve* B-3 has anti-obesity effects by improving intestinal barrier function, which results in a suppressed systemic inflammatory reaction and controlled body fat. However, *Bifidobacterium animalis* subsp. *lactis* GCL2505 had no effect on body fat or weight loss in Japanese adults. In this study, we investigated the efficacy and tolerability of *Bifidobacterium breve* B-3 for improving body composition and lipid profiles in Korean adults with overweight or obesity.

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Methods: A randomized controlled trial was conducted on one hundred adults with obesity (34% men) aged 43.7 ± 11.7 years, with a mean body mass index (BMI) of 29.1 ± 4.1 kg/m^2. A total of 100 participants were assigned to either the intervention group (IG), which received 160 mg of *Bifidobacterium breve* B-3 per day, or the control group, which was given a placebo for 12 weeks. Of these, 96 (96%) participants completed the study. We confirmed that the *Bifidobacterium breve* B-3 capsules contained approximately 1.6 × 1010 colony-forming units per capsule by microbial colony count, using reinforced clostridial agar (Oxoid), before the clinical trial. Changes in body fat were evaluated using dual-energy X-ray absorptiometry as the primary efficacy endpoint. Lipid profiles were measured as a secondary efficacy endpoint, and reports of adverse events were collected throughout the study. ClinicalTrials.gov Identifier: NCT03774381.
Results: After 12 weeks of the trial, no differences in total body weight, percentage of body fat, body fat mass (kg), free fatty acid levels, and adiponectin levels were observed between the two groups in both the ITT and PP analyses. However, the level of low-density lipoprotein-cholesterol (LDL-C) in the IG was found to be significantly improved compared to that in the CG (-6.5% vs. 7.1%, p=0.008). The application of *Bifidobacterium breve* B-3 was well tolerated, and no notable adverse effects were reported from either group.
Conclusion: These results suggest the beneficial potential of *Bifidobacterium breve* B-3 in reducing LDL cholesterol in adults with overweight or obesity, although it had no effect on reducing body fat. However, there was no effect on reducing body fat. Further studies are required to determine the optimal dosage and duration of *Bifidobacterium breve* B-3 supplementation to confirm these initial findings for clinical application.

GC4.243

Effects of oral ingestion of drinking water using a far-infrared-emitting tumbler on lipid profile and insulin resistance in adults: a pilot randomized double-blind sham-controlled trial

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Introduction: Far infrared (FIR) radiation is a subdivision of the electromagnetic spectrum. FIR rays are emitted by sun rays, the human body, metals, and minerals, including heated saunas. Apart from drugs like statins, various alternatives, such as natural medicines, functional foods, and electromagnetic waves, have been investigated for lipid control. FIR is also available for health promotion or primary prevention of cardiovascular disease. However, as of now, no studies have observed changes in lipid profiles using FIR-emitting water.
Methods: For the preclinical study, lipid profiles and biomarkers were measured in rats that consumed FIR-emitting water. For the clinical study, in a randomized, sham-controlled, double-blinded controlled trial, twenty participants (men, 5%, mean age 37.1 years) were divided into two groups: the intervention group (IG), which drank water from an FIR-emitting tumbler, and the sham control group (SHAM), which drank water from a sham tumbler. They all consumed water, which had been in the tumbler for 30 minutes or more, 8 times daily (after waking up, before and after meals, and before bed) and 200 ml of each time for a total of 8 weeks. The concentrations of lipid profile, HbA1c, fasting glucose, insulin, HOMA-IR, and apolipoprotein B were measured to assess the primary and secondary outcomes. Reports of adverse events were collected throughout the study. ClinicalTrials.gov Identifier: NCT03920436
Results: In the preclinical study, oral ingestion of water exposed to the FIR emitter in rats led to a reduction in total cholesterols (TC), triglycerides (TG), and calculated low-density lipoprotein cholesterols (LDL-C). In the clinical study, the concentration of TG for 8 weeks was significantly reduced by 26.5 mg/dL in the IG (P = 0.036), and the IG showed a significant difference in the change of TG concentration compared to the SHAM (P = 0.017). However, no differences were observed between the two groups regarding changes in other lipid profiles and secondary outcomes. The application of an FIR-emitting tumbler showed no notable adverse effects.
Conclusion: Oral drinking water ingestion using an FIR-emitting tumbler may reduce TG concentration without adverse effects in healthy adults. Further studies are required to explore the mechanisms and to reconfirm the findings with a broader range of people.

GC4.244

Impact and management of comorbidities in people with obesity: a multinational survey

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Introduction: To describe the presence of comorbidities in people with obesity (PwO), and associated concomitant treatments, weight management and hospitalisations in PwO with ≥1 comorbidities (PwOC).
Methods: This is a descriptive analysis of data from Adelphi Obesity Disease Specific Programme, a cross-sectional survey of physicians, and PwO they manage, in Brazil, Canada, China, Japan, Saudi Arabia and United Arab Emirates between April-December 2022. Physicians completed an attitudinal survey and reported patient demographics, clinical characteristics and management for the PwO who were on a weight management programme or using AOMs.
Results: Of 2,839 PwO, 83% had ≥1 comorbidities (mean 2.1). Of PwOC (n=2,351), mean age 44.3 years, 45% male, 40% receiving AOM. Mean BMI at diagnosis 35.2, current at time of survey 33.2. Most common comorbidities were hypertension (40%), dyslipidaemia (39%), and type 2 diabetes (T2D, 24%). Mean number of concomitant medications was 2.3, most commonly for dyslipidemia (51%), diabetes(44%) and cardiovascular issues (43%). Overall, PwOC hospitalised in last 12 months for obesity 3%, for obesity-related comorbidities 4%. Among PwOC, most common reasons for first consulting physician were for discussion and/or treatment of obesity/weight (57%) or weight-related comorbidities (50%). Among PwOC who consulted for weight-related comorbidities, most common were hypertension (47%) and T2D (41%). Most common reasons for starting current weight-loss attempt were presence of comorbidities that were worsening or risking health (64%), mainly hypertension (47%) and dyslipidemia (39%).
Among 431 physicians managing PwO, most common reason for initiating weight discussion was risk or presence of obesity-related comorbidities (86% and 82% respectively).
Conclusion: Results indicate high obesity-related comorbidity presence in PwO in the study which was one of the most common reasons for both physicians and patients initiating weight management discussions and seeking treatment. Preventing the occurrence of or controlling for the severity of comorbidities in PwO could help reduce overall impact and management.

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GC4.245

Residual cardiovascular risk rises with obesity in individuals receiving pharmacological treatment for hypertension and dyslipidemia: a prospective study in primary prevention

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Introduction: The 2021 ESC guidelines (1) recommend using the SCORE-2 algorithm (2) to assess the 10-year risk of cardiovascular disease (CVD). However, SCORE-2 does not take overweight and obesity into account. Obesity is known to be strongly associated with CVD (3). The aim of this prospective interventional study was to evaluate factors able to modify the global CV risk after pharmacological treatment of hypertension and dyslipidemia.
Materials-Methods: 143 patients (mean age 60.2±10.9 years, 49% male) were consecutively enrolled in our Center from 2018 to 2022. Patients having systolic blood pressure (SBP) and/or diastolic blood pressure (DBP) values ≥140/90 mmHg or taking arterial hypertension treatment (HTT) were defined as patients with hypertension (PwH). Patients with non-HDL cholesterol values ≥130 mg/dL or taking lipid lowering treatment (LLT) were defined as patients with dyslipidemia (PwD). CV risk was calculated at baseline and at 1-year of follow-up with SCORE2 and SCORE2-OP (4), after receiving blood-pressure lowering therapy in the morning and lipid-lowering therapy after lunch, as a single-pill combination. Statistical analysis was performed using the SPSS Version 29 package. Categorical variables were compared using the Chi-Square test. Differences between continuous variables were evaluated by the ANOVA. The prevalence of independent predictors of modifications in the CVD risk measured with SCORE2 was assessed by the Poisson regression analysis.
Results: SCORE-2 improved in 69.9% of cases and adherence to treatment was 94%. Change of HTT, LTT and the adherence to treatment, independently predicted the improvement in SCORE-2, but obesity and mild chronic kidney disease (CKD) were associated with a worsening in SCORE-2. (Figure)
Conclusions: The early use of both HTT and LLT in fixed combination seems to improve global CV medium-term risk. However, despite PwH and PwD receiving optimal pharmacologic treatments, they continue to have a higher CV risk due to obesity. It would be appropriate to consider obesity as having a similar burden as hypertension and dyslipidemia in global CVD risk estimation algorithms.

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GC4.246

Associations between the postprandial glucose and insulin response and anthropometric changes after an 8-week low-calorie formula diet - results from the LION study

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Introduction: Current research suggests that postprandial metabolism is linked to weight regulation; however, whether and to what extent the individual postprandial response is associated with the success of weight management interventions is poorly understood. This work examines the postprandial glucose and insulin response to an OGTT as predictors for changes in anthropometric parameters after a standardized weight loss intervention.
Methods: Adults (18-65 years) with a body mass index (BMI) between 30.0 and 39.9 kg/m² were recruited for the Lifestyle Intervention (LION) study (NCT04023942). Blood samples were taken at baseline during an OGTT, from which several parameters describing the postprandial glucose and insulin response (e.g., area under the curve, peak concentration, Matsuda index) were derived. Anthropometric parameters (body weight, fat mass, fat-free mass) were collected before and after an 8-week low-calorie formula diet. Finally, regression analyses were fitted, and a random forest model was applied to identify predictive parameters for anthropometric outcomes after intervention.

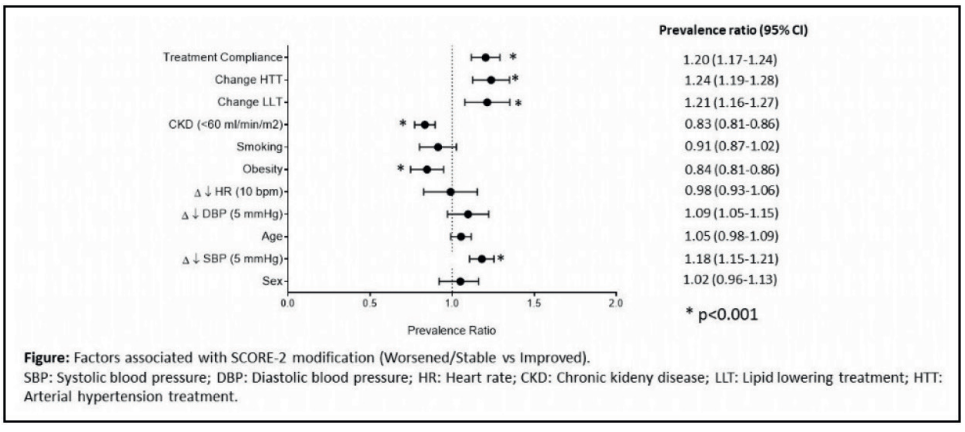


Figure: Factors associated with SCORE-2 modification (Worsened/Stable vs Improved).
SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; CKD: Chronic kideny disease; LLT: Lipid lowering treatment; HTT: Arterial hypertension treatment.

Fig. 1.

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Results: Data from a total of 158 participants (mean age 45 ± 12 years, BMI 34.5 ± 2.9 kg/m², 63.3% women) were included in this analysis. The formula diet resulted in an average weight loss of 11.8 ± 3.8 kg body weight and 8.2 ± 2.6 kg fat mass. Postprandial parameters describing the glucose or insulin response showed no significant associations with changes in anthropometric parameters. Baseline fat-free mass (FFM) and sex were identified as primary predictors for Δ FFM [kg].
Conclusion: The parameters of postprandial glucose or insulin response to a glucose load examined here do not predict short-term weight loss success after an 8-week low-calorie formula diet.

GC4.247

Effects of cardiorespiratory fitness on CVD risk factors and telomere length by age and obesity in women

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Background: This study aims to investigate the differences in telomere length among South Korean women with obesity, alongside cardiovascular disease (CVD) risk factors and fitness levels, categorized by age.
Methods: The study included female participants aged between 10 and 50 years (N = 177). We measured obesity indices, CVD risk factors, leukocyte telomere length (LTL), and cardiorespiratory fitness (CRF). Correlation and regression analyses were conducted to examine the data.
Results: As a result of measuring obesity indices, CVD risk factors, and maximum oxygen intake, and analyzing their correlations with LTL, we found that both LTL and CRF decreased with age and in individuals with obesity (p <.001). LTL showed variations based on the presence of obesity and CRF levels (p <.001). After adjusting for all variables influencing LTL, it was observed that LTL shortened with an increase in age and LDL-C levels, and lengthened with an increase in VO2max levels. Adjusting for age, LTL was found to shorten with an increase in obesity levels, CFR, and CVD risk factors (p <.01), and to lengthen with an increase in VO2max (p <.01).
Conclusion: Our findings indicate that obesity impacts LTL by elevating CVD risk factors and diminishing CRF. However, maintaining a high level of CRF can mitigate the effects of obesity and CVD risk factors on LTL, promoting its elongation across different ages.

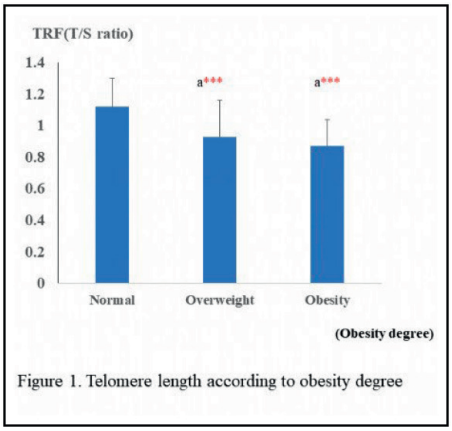
GC4.248

Impact of obesity on health-related quality of life, sleep, and work – a multinational survey

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Introduction: To describe the impact of obesity on health-related quality of life (HRQoL), sleep and work delineated by BMI and the presence of comorbidities.
Methods: Data were drawn from the Adelphi Obesity Disease Specific Programme™, a cross-sectional survey of physicians and the people with obesity (PwO) whom they manage on a weight management programme or using anti-obesity medications, conducted in Brazil, Canada, China, Japan, Saudi Arabia and the United Arab Emirates from April–December 2022. Physicians reported demographics and clinical characteristics for their consecutive 3 to 8 qualifying PwO. PwO were then invited to complete a questionnaire containing SF-36v2.0 Health Survey (scores range from 0 - 100, with higher scores indicating better HRQoL), Jenkins Sleep Evaluation Questionnaire (JSEQ; where 0 indicated no sleep problems to 20 indicating most sleep problems) and Work Productivity and Activity Impairment Questionnaire (higher scores indicating greater impairment and less productivity). PwO who completed all 3 patient-reported outcome measures were then grouped by current BMI (kg/m²) i) <30/<28 in China/<25 in Japan [B0] and ii) ≥30/≥28 in China/≥25 in Japan [B1], and by presence of comorbidities i) none [C0] and ii) ≥1 [C1]. Analyses were descriptive.
Results: Of a total 1,434 PwO (n/%: 243/17% were B0 and 1191/83% B1; 262/18% were C0 and 1172/82% C1), mean±SD age was 40.5±12.5 years, 57% female, 71% employed. Mean±SD BMI at diagnosis was 34.2±8.4, current 32.2±7.6. Mean±SD SF-36v2.0 component summary scores: physical, 50.0±7.9 (B0), 46.8±8.4 (B1); 50.3±7.3 (C0), 46.7±8.5 (C1); mental, 44.9±9.1 (B0), 44.4±10.1 (B1); 46.4±8.7 (C0), 44.1±10.1 (C1). Mean±SD JSEQ scores: 4.9±4.3 (B0), 5.0±4.1 (B1); 4.3±3.9 (C0), 5.2±4.2 (C1)). Mean±SD overall work impairment scores: 61.5%±11.1 (B0), 65.7%±12.2 (B1); 61.7%±11.4 (C0), 65.8%±12.2 (C1).
Conclusion: Our results suggest obesity and comorbidity presence have an impact on HRQoL and work. Future awareness of this when managing PwO could help optimise outcomes.



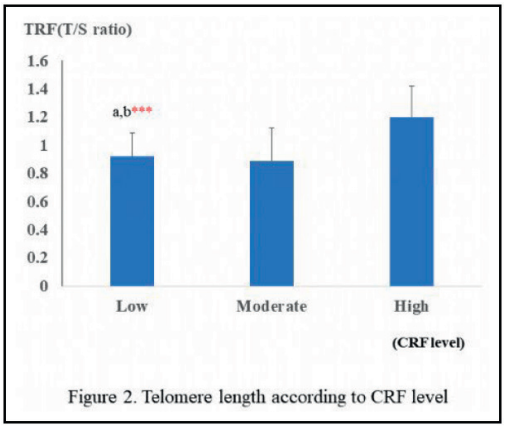


Fig. 1. TRF & Obesity.

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GC4.249

Clinical, economic, and patient-reported impact of obesity in selected European countries: A systematic review

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Introduction: To describe the clinical, economic, and patient-reported impact of obesity in selected European countries.
Methods: Using PRISMA guidelines, a multi-region systematic literature review (SLR) review was performed to report the clinical, economic, and patient-reported impact of obesity in selected European and Asia-Pacific countries, and Canada from 2018 to 2023. Here we report results for Europe from multi-country and country-specific studies (France, Germany, UK, Italy, Spain). Obesity was defined using the WHO body mass index (BMI); BMI ≥30 was used for all countries. Original articles, conference abstracts, and grey literature, published in English or local languages, were eligible for inclusion.
Results: From 221 publications in the global SLR, 107 publications reporting on 93 studies were identified for Europe (Germany, n=30; UK, n=38; Italy, n=26; Spain, n=34; France, n=19; Europe, n=2; non-mutually exclusive). The prevalence of obesity ranged from 7.5-35.7% with the highest estimates seen in Spain (35.7%) and the UK (26.0%). Diabetes, hypertension, heart-related complications, depression, and dyslipidaemia were the most frequently reported comorbidities. Studies illustrated health-related quality of life, depression, eating behaviors, anxiety, and body image as the most reported patient- reported outcomes. Total direct and indirect patient-specific costs were high, with the main patient-specific costs including healthcare professional visits, hospitalization, prescription medication, out-of-pocket costs, and productivity loss caused by presenteeism and absenteeism.
Conclusion: Obesity is prevalent in European countries and accompanied by weight-related metabolic, cardiovascular, and psychological comorbidities. Obesity significantly affects the psychosocial sphere and HRQoL in people with obesity and is associated with significant use of resources.

GC4.250

Clinical, economic, and patient-reported impact of obesity in the Asia-Pacific region: A systematic review

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Introduction: To describe the clinical, economic, and patient-reported impact of obesity in the Asia-Pacific region.
Methods: Using PRISMA guidelines, a multi-region systematic literature review (SLR) was performed to report the epidemiological, clinical, humanistic, and economic burden of obesity in selected Asia-Pacific and European countries, and Canada from 2018 to 2023. Here we report results for Asia Pacific from multi-country and country-specific studies (Japan, Australia, Korea, China, Taiwan, and Hong Kong). Obesity was defined using body mass index (BMI); Australia, BMI ≥30; China, BMI ≥28; Taiwan, BMI ≥27 and Japan, Korea, Hong Kong, BMI ≥25. Original articles, conference abstracts, and grey literature, published in English or local languages, were eligible for inclusion.
Results: From 221 publications in the global SLR, 91 publications reporting on 85 studies were identified for Asia-Pacific (Japan, n=12; Australia, n=30; Korea, n=22; China, n=34; Taiwan, n=3; Hong Kong, n=1; non-mutually exclusive). The prevalence of obesity ranged from 6.1-36.2%, with the highest estimates seen in Korea (36.2%), and Australia (29.9%). Diabetes, hypertension, depression/anxiety, dyslipidaemia, and cardiovascular disease were the most frequently reported comorbidities. The SF-36 (0-100; higher score indicating less disability) was the most used health-related quality of life measure, with scores ranging from 29.4-36.1 for the physical component score and 34.0-47.2 for the mental component. Other patient-reported measures included: self-reported depression, self-esteem, personal experience of obesity, and binge eating. Total direct and indirect patient-specific costs were high, with the main patient-specific costs including healthcare professional visits, hospitalization, prescription medication, out-of-pocket costs, and productivity loss caused by absenteeism.
Conclusion: Obesity is prevalent in the Asia-Pacific region with notable presence of weight-related metabolic, cardiovascular, and psychological comorbidities. Obesity notably impacted the psychosocial sphere, physical functioning, and HRQoL of people with obesity, leading to the elevated use of health resources.

GC4.251

Epidemiology landscape and impact of obesity: Multi-country results from the IMPACT-O study

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Introduction: Few large-scale studies document rates and impact of overweight/obesity across selected countries in Europe and Asia-Pacific.
Methods: The EpIdeMiology Landscape and PAtient Care paThways of Obesity (IMPACT-O) study was a multi-country retrospective cohort study that utilised electronic medical records and claims databases standardised to the Observed Medical Outcomes Partnership Common Data Model from Australia, China, France, Germany, Italy, Spain, the UK and Japan. The level of recording and the number of adults with overweight/obesity (based on diagnostic codes and/or body mass index [BMI]) between 2018-2022 were estimated. BMI thresholds and categories (according to the World Health Organisation/Japan Society for the Study of Obesity), and presence of comorbidities were described for adults with ≥1 BMI record of ≥25.0kg/m²–overweight (Australia, Europe)/obesity (Japan)–and ≥12 months observation before the index date (highest BMI record) in the prevalent cohort. This analysis (April 2023 data cut) did not include data from China and Spain.
Results: BMI was recorded for 4.8-38.9% of active patients across the databases. The number of adults identified with overweight or obesity (Japan) based on BMI and/or diagnostic codes was: Australia 41,533; France 880,815; Germany 1,194,272; Italy 248,256; UK 1,110,830; Japan 656,336. Of these, diagnostic codes were present in 2.9-49.7% of cases. The prevalent cohort consisted of 2,515,860 individuals (Australia 25,625; France 430,089; Germany 429,422; Italy 170,119; UK 893,246; Japan 567,359). The percentage of individuals by BMI threshold (non-Japan/Japan) was 74.8-81.4%/55.9% (≥27.0kg/m²); 44.1-54.8%/22.1% (≥30.0kg/m²); 15.8-24.4%/4.7% (≥35.0kg/m²); 5.0-10.1%/1.0% (≥40.0kg/m²). At least 1 weight-related comorbidity was reported in 59.6-85.0% of patients (≥25.0kg/m²), and 35.9-65.8% had multimorbidity (≥2); the proportion of patients with comorbidities generally increased with increasing BMI category. The main comorbidities for ≥25.0kg/m² were hypertension (28.9-62.3%), dyslipidaemia (20.4-40.2%) and depression (4.1-27.5%).
Conclusion: A small proportion of people with overweight/obesity are formally diagnosed in healthcare databases. Generally, comorbidity burden increased with BMI.

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GC4.252

A follow-up study in rural Tanzania assessing mother and child health six years after a pregnancy diagnosed with gestational diabetes

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Introduction: Great potential lies in detecting and treating gestational diabetes (GDM) to reduce the risk of pregnancy complications as well as prevent or delay the onset of type 2 diabetes (T2D) in both mothers and offspring later in life. Thus, screening, and precise diagnosis of GDM are highly relevant and can be viewed as a window of opportunity to prevent later cardio-metabolic disease. The International Diabetes Federation (IDF) emphasizes in a recent report the urgent need to fill data gaps of the burden of GDM and T2D in low- and middle-income countries (LMIC), which will contribute to raise awareness and help governments to implement policies to reduce risk factors for diabetes. Indeed, little is known about the long-term consequences of GDM in LMIC settings since the few studies performed are mostly cross-sectional.
The overall aim of the present study was to estimate the prevalence of prediabetes and T2D among women and the cardio-metabolic health of both women and children affected by GDM, six years post-pregnancy in a rural Tanzanian area.
Methods: Using a prospective cohort study of women (n=197) from rural Northeastern Tanzania with or without a previous GDM diagnosis, and their children (n=251), we assessed prevalence of prediabetes and T2D using diagnostic criteria of the World Health Organization (WHO) and the American Diabetes Association (ADA) based on fasting plasma glucose (FPG) and HbA1c and examined differences in maternal and offspring cardio-metabolic parameters six years post-pregnancy.
Results: No differences in prevalence of prediabetes or T2D based on either fasting plasma glucose (FPG) levels or HbA1c were observed between women with- and without previous GDM. These results were supported by similar cardio-metabolic risk markers (including BMI and body composition – except for a higher fat% among women with previous GDM) among mothers with and without previous GDM as well as among their children. The overall prevalence based on FPG levels, was 47.7% (WHO) and 67.5% (ADA) for prediabetes and of 17.8% (WHO and ADA) for T2D and when diagnosis was based on HbA1C levels the overall prevalence was 15.1% for prediabetes and of 0.5% for T2D. Additionally, no differences in other cardio-metabolic risk markers, including blood pressure, lipids, and adiposity were observed in participants diagnosed with prediabetes/T2D compared to participants with normal glucose tolerance 6 years post-pregnancy.
Conclusion: Northeastern Tanzanian women with previous GDM did not have an increased risk of prediabetes or T2D, six years post pregnancy. Furthermore, no major differences in cardio-metabolic health parameters between mothers and children affected by GDM compared to non-GDM exposed individuals was observed. A very high prevalence of pre-diabetes and T2D was found, both among women with and without previous GDM. FPG and HbA1C may be poor markers for T2D in this population and further studies are warranted to clarify whether the WHO 2013 criteria are an appropriate method to diagnose GDM and whether HbA1C and fasting glucose are suitable for diagnosing T2D in sub-Saharan Africa.

GC4.253

Independent association of thigh muscle fat density with vascular events in Korean adults

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Background: We aimed to explore the associations between thigh muscle fat density and vascular events.
Methods: A total of 3,595 adults (mean age, 57.2 years; women, 1,715 [47.7%]) without baseline cardiovascular events from the Korean Atherosclerosis Study-2 were included. Muscle and fat area at the mid-thigh level were measured by computed tomography (CT) using the following Hounsfield Unit range: 0–30 for low density muscle (LDM); 31–100 for normal density muscle (NDM); and –250 to –50 for fat.
Results: During a median follow-up period of 11.8 (4.3–13.9) years, vascular events occurred in 11.6% of men and 5.9% of women. Individuals with vascular events had a larger LDM area (men: 48.8 ± 15.5 cm2 vs. 44.6 ± 14.5 cm2; women: 39.4 ± 13.2 cm2 vs. 35.0 ± 11.8 cm2, both $P < 0.001$) compared with those who did not have vascular events during the follow-up of at least 5 years. The LDM/NDM ratio was also independently associated with vascular events after adjusting for cardiometabolic risk factors. Moreover, the LDM/NDM ratio improved the prognostic value for vascular events when added to conventional risk factors.
Conclusions: The current study suggests that a higher thigh muscle fat infiltration is associated with an increased risk of developing vascular events among Korean adults.

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GC4.254

Identification of phenotypic profiles with different cardiometabolic risks for given levels of body mass index: an IMI SOPHIA study

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Introduction: Obesity and cardiovascular disease often coincide, but this link is highly heterogeneous, complicating prevention and clinical care in obesity. There are established inconsistencies in the relationship between BMI, often used as a metric for obesity, and cardio-metabolic disease. Common signs of metabolic dysfunction such as insulin resistance and hypertension are absent in around 7% of individuals over the BMI threshold for obesity. Next to this, about 20% of individuals carry multiple cardiometabolic risk factors despite being within the normal range of BMI. This suggest the existence of subgroups at disproportionately higher or lower risk of cardiometabolic disease at any given BMI.
Methods: Leveraging data from 4 large-scale European population-based cohorts (N ~ 173K), we applied graph-based clustering to detect subgroups of individuals who display levels of routinely collected cardio-metabolic risk biomarkers that are either as expected (concordant) or lower or higher than expected (discordant) for their BMI. We then characterized the cross-cohort replicated discordant profiles for prevalence and future risk of major adverse cardiovascular events (MACE) and Type 2 Diabetes.
Results: While ~80% of people have a predominantly concordant phenotypic profile, we identified five additional discordant profiles with phenotypic patterns that deviate from the expected given the BMI. Approximately 8% of women displayed a discordant hypertensive profile and around 5% of women and 7% of men showed a discordant adverse lipid profile. Discordant liver transaminases and discordant inflammatory state profile were each observed in 4 to 5% of individuals in both sexes. Lastly, about 2.5% of individuals had a discordant hyperglycaemic profile (DHG). Despite having comparable BMIs, these discordant profiles differed from the concordant in prevalence and future risk of MACE and diabetes. Subtle discordances with BMI had implications on risk, such as a 10% higher probability of having a discordant lipid profile for BMI being associated with a 5% higher risk of MACE. Incorporating discordant profile information enhanced the predictive ability of MACE and diabetes progression models beyond traditional multivariable prediction (likelihood ratio test $P < 0.001$). This enhancement represents an additional net benefit of 4 to 15 additional individuals correctly intervened in and 37 to 135 additional unnecessary interventions correctly avoided for every 10,000 individuals tested when discordant profile information is considered.
Conclusion: We identified five distinct phenotypic profiles exhibiting diverse relationships between BMI and risk biomarkers and varying degrees of CVD and diabetes risks, reflecting substantial heterogeneity in the link between BMI and risk. Conceptualising these as different subtypes of obesity requires further validation, but incorporating phenotypic discordance with BMI enhances the prediction of MACE and diabetes progression in the general population.

Tab.1. Final authors.

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There was not enough space for all the co-authors, so I would like to add the final three authors here.

GC4.255

Risk Factors of Metabolic Syndrome among Polish Nurses

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Background: The metabolic syndrome, also known as syndrome X or the insulin resistance, is characterized by abdominal obesity, insulin resistance, hypertension, and hyperlipidemia, as defined by the World Health Organization. Both globally and in Poland, there is a shortage of nurses; however, the majority of those employed are in the pre-retirement age. The demands of the nursing profession and the imperative for high-quality patient care persist, irrespective of the compromised health or age of working nurses. It crucial to address the health status of this professional group, underscoring the significance of adopting a proactive approach towards health through practices such as regular weight monitoring, adherence to dietary recommendations, routine physical activity, and participation in preventive examinations. This study aims to assess the prevalence of metabolic syndrome, its individual components, and the factors influencing its development among Polish nurses.
Methods: The research involved DXA (Dual Energy X-ray Absorptiometry) measurements, glucose concentration assessment, lipid profile, blood pressure, and a questionnaire survey administered to the participating nurses.
Results: Almost half of the surveyed nurses have metabolic syndrome (MS), which significantly increases the risk of developing cardiovascular diseases or diabetes. After multivariate analysis, it was found that being overweight and obesity were significant factors influenced the MS occurrence among Polish nurses. Being overweight increases the chances of MS occurrence 8.58 times in relation to BMI (Body Mass Index) <25,

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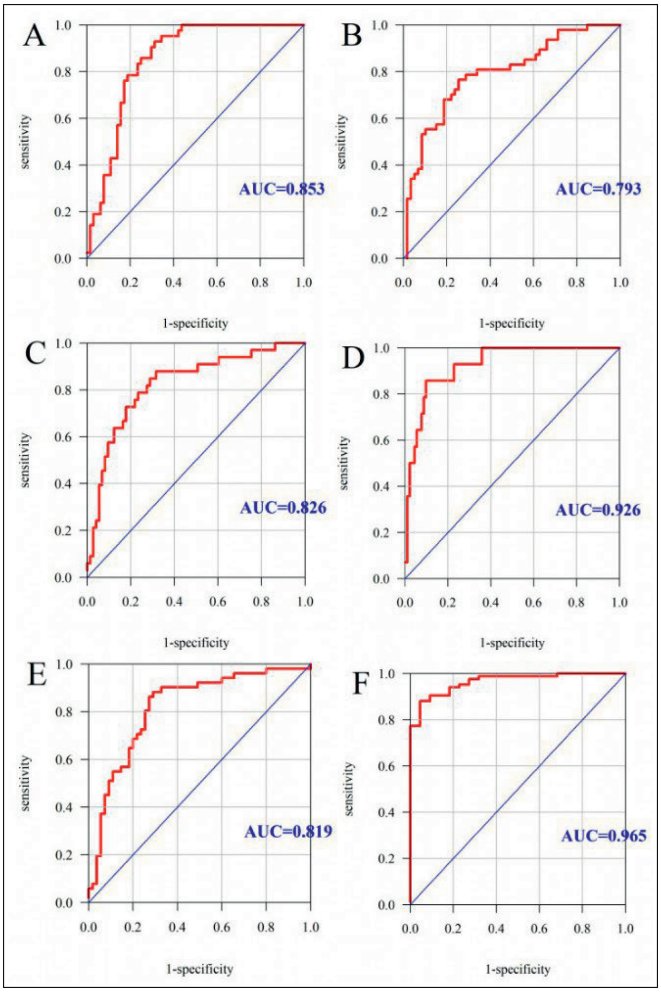


Fig. 1. ROC curve and AUC value: MS (A), triglycerides > 150 mg/L (B), HDL < 50 mg/dL (C), glucose ≥ 100 mg/dL (D), blood pressure > 130/85 mmHg (E), abdominal obesity (F). AUC—Area Under the Curve (measure of diagnostic accuracy).

obesity increases the chances of MS occurrence 8.085 times in relation to BMI <25, and obesity class II/III increases the chances of MS occurrence 16.505 times in relation to BMI <25.

Conclusions: The findings underscore the necessity for preventive and supportive measures for tailored to the unique health challenges faced this professional group.

Conflict of interest: Non-disclosed

Funding: No funding to report

GC4.256

The emerging role of skeletal muscle as a modulator of HDL-cholesterol in Metabolic Healthy young adults

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Introduction: The physiological role of skeletal muscle (SM) is not limited to movement and posture but involves also energy metabolism control. The role of MS in glucose and protein metabolism is well known, while its involvement in lipid homeostasis has been less well determined. SM is a privileged site for the oxidative metabolism of lipids, which it use as a major energy source.

The purpose of the study was to evaluate the role of SM on plasma lipids in Metabolic Healthy young adults.

Methods: Retrospective observational monocentric study. Data on plasma lipids and SM of patients attending our institution from 1999 to 2014 were analyzed. Inclusion criteria were age 18-45 years and apparently good health. SM was evaluated by bioelectrical impedance analysis (BIA) using the equation proposed by Janssen and skeletal muscle index (SMI) was obtained throughout SM/height2. The associations between SMI and plasma lipids levels were examined using a crude and adjusted linear regression model including age, sex, BMI and waist circumference as additional covariates.

The study population consisted of 450 patients (273 females) subsequently stratified by BMI classes (12.2% with normal bodyweight, 33.1% overweight, and 54.7% with obesity), without Metabolic-Syndrome.

Results: As expected, SMI, total-cholesterol, LDL-cholesterol, Triglycerides and TG/HDL ratio increased, while a decreased HDL-cholesterol was observed in partecipants living with overweight or obesity. Interestingly, SMI was inversely associated with HDL-Cholesterol in partecipants with obesity only ($p<0.05$).

Conclusions: This study showed that SM can be considered a modulator of plasma HDL-cholesterol levels in people with metabolically healthy obesity, possibly even speculating that changes in these levels are an early marker of intramuscular fat deposition.

GC4.257

Effect of Oral Semaglutide on Weight Reduction in Non-Diabetic Adults with Obesity in Kuwait

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Introduction: Obesity, especially central obesity, manifested by excessive visceral fat is associated with comorbidities such as metabolic syndrome, diabetes and cardiovascular diseases which can lead to high morbidity and mortality rate. (1, 2) Thus, reducing weight for overweight/obese non-diabetics people is highly important to delay or prevent type 2 diabetes.(3) The injectable glucagon-like peptide-1 (GLP-1) agonists was approved as a treatment of obesity in non-diabetic adults with body mass index (BMI) ≥30. Although the effect of oral Semaglutide is well-established in weight reduction in people with type 2 diabetes, this effect among non-diabetic adults with obesity is still not fully investigated. (4)

Objective: The study aims to evaluate the effect of "off label" use oral Semaglutide at "Glycemia Clinic-Kuwait" in reducing body weight, including visceral fat reduction in non-diabetic adults with obesity.

Methods: Ninety-one adults 71 females and 20 meals mean age 43 years with BMI ≥ 27 received oral Semaglutide over 12 weeks, they have also received a diet plan consultation as an 1800-2000 kcal diet for men and 1500-1800 kcal diet for women. Additionally, they were advised to practice moderate aerobic activity such as walking 30 minutes daily and simple muscles toning exercise (2-3 times/week) as using rubber-band and light weights.

The body mass composition test using (InBody 770 body composition analyzer) was done at baseline and at week 12. The data was analyzed using IBM statistics SPSS 25.

Results: The mean body weight of the participants at baseline was 86.35±19.60 kg, compared to 82.55 ±19.36 kg at week 12. That indicate 4.4% weight loss among the study participants which is highly statistically significant with ($p<0.001$). In subordination, the study showed around 3.1% reduction in BMI confirming a statistically high significant difference with ($p<0.001$), as the mean BMI was 32.53±6.5 at baseline, compared to 31.50±5.6 at week12.

Furthermore, the result showed a high statistically significant reduction in the mean body fat mass and mean visceral fat as well by (7.2%, 6.7%) respectively.

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On the other hand, both the lean mass and skeletal muscle mass decreased in our study participants by (4.2-2.3%) respectively. This reduction was expected in both parameters because of total body weight loss.
Conclusion: The results of the study provide strong evidence for the effectiveness of the weight loss intervention in reducing overall body weight including visceral fat.
The efficacy of oral Semaglutide in weight reduction in non-diabetic adults with obesity is promising.
Study limitation
The number of participants was quite small.
The study duration was quite short.

GC4.258

Renin-aldosterone ratio and 24-hour blood pressure control in visceral overweight-obese essential hypertensives treated with a combination of RAASi, thiazide diuretic and calcium-channel blocker

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Background: A combination treatment including renin-angiotensin-aldosterone system inhibitors (RAASi), calcium-channel blocker (CCB) and thiazide diuretics (TZD) is often needed in patients with obesity (PwO) and essential hypertension. In addition to the inappropriate RAAS activation in obesity, a variation in plasma renin concentrations (PRC) and plasma aldosterone concentrations (PAC) is expected based on the effect of each drug on the RAAS. We evaluated the potential clinical utility of the renin-aldosterone ratio (RAR), the inversion of the one used to screen for primary aldosteronism, in predicting 24-hour BP control in patients with visceral overweight/obesity and essential hypertension treated with a combination of RAASi, thiazide diuretic (TZD) and/or a calcium channel blocker (CCB).
Methods: We conducted a cross-sectional study on 67 consecutive outpatients with visceral overweight or obesity based on body mass index (BMI) and waist circumference (WC). All patients had essential hypertension with available PRC (mU/L), PAC (ng/dL) and 24-hour ambulatory BP monitoring (ABPM) under stable pharmacological therapy with a combination of RAASi (ACEi or ARB) and TZD and/or CCB. Patients were divided into groups according to the pharmacological treatment: RASi + TZD, RASi + CCB, and RASi + TZD + CCB. A treatment intensity score (TIS) was calculated to compare the different anti-hypertension drugs and their dosages. ROCs were used to test RAR's ability to predict 24-hour BP control in all three groups.
Results: Mean age 55 ± 11 years, 59% were males. The mean BMI was 33 ± 5 Kg/m^2, and the mean WC was 110 ± 11 cm. Thirty-four per cent of the patients were treated with a RAASi + CCB combination, 36% with a RAASi + TZD combination, and the remaining 30% with a RAASi + CCB + TZD combination. No meaningful differences regarding demographics, anthropometrics, and clinical and laboratory data emerged between the three treatment groups. Rates of 24-hour, daytime and night-time BP control were not different between treatment groups. PRC and RAR, but not PAC, showed a significant inverse correlation with all ABPs. No correlation was found between RAAS parameters and TIS. The best overall RAR performance in predicting ABP control was seen in the RAASi + TZD group, particularly concerning night-time BP control. In this latter setting, the area under the curve (AUC) was 0.80, with the best performing RAR cutpoint of 8.03, corresponding to a 72% sensitivity (SE) and 85% specificity (SP), with a positive (PPV) and negative (NPV) prediction value of 48% and 52%, respectively.
Conclusions: RAR could be regarded as a potentially accurate, simple and low-cost tool in clinical practice to assess drug adherence and night-time BP control in patients with overweight/obesity and essential hypertension treated with first-line guideline-recommended pharmacological combination treatment, especially with RAASi and TZD.

GC4.259

Effect of a Year-Long Lifestyle Intervention Program on Metabolic Health in Individuals with Obesity in India

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Background: Approximately 30-65% of urban Indian adults are living with either overweight or obesity, which is a significant contributor to metabolic abnormalities.
Aim: To investigate the efficacy of a year-long lifestyle intervention program to enhance metabolic health, focusing on weight loss, insulin resistance, and lipid profile among individuals with obesity.
Methods: Data on anthropometry, biochemical parameters, and medical history were collected from a cohort of 398 individuals with obesity (aged >18 years, BMI >25 kg/m^2) attending a one-year online lifestyle intervention program conducted at the Freedom from Diabetes Clinic, India. The intervention comprised a plant-based diet along with juice and water fasting, strength-stamina-flexibility exercises, psychological support through various behavioral therapies, and medical management. Homeostatic assessment models for insulin resistance (HOMA-IR) and beta cell function (HOMA2-B) were calculated.
Results: The study included a cohort with a mean age of 44 years and BMI of 31.4 kg/m^2. Of these, 27% had hypertension, 39% had dyslipidemia, and 43.4% had insulin resistance. Despite being on medication, 48.3% had elevated triglyceride levels at baseline and 42% had normalized post-intervention ($p<0.05$). Among the 221 participants initially with obesity level 2, 28% transitioned to obesity level 1 and 1.5% shifted to overweight BMI. Among the 177 participants with initial obesity level 1, 29% transitioned to overweight BMI and 5% had a normal BMI (<23 kg/m^2). The participants achieved an average weight loss of 8%, with statistically significant improvements in weight, BMI, HOMA-IR, and serum lipid levels ($p<0.05$).
Conclusion: The lifestyle intervention with diet, exercise, mental health, and medical care showed promising outcomes in weight, BMI, insulin resistance, and serum lipid levels among individuals with obesity. This study demonstrated the effectiveness of comprehensive interventions for enhancing metabolic and overall health in these populations.

GC4.260

Impact of obesity and overweight on PCSK9-inhibitors efficacy in patients with familial hypercholesterolemia and in patients in secondary cardiovascular prevention: a real-world retrospective analysis

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Introduction: Proprotein convertase subtilisin/kexin type 9 inhibitors (PCSK9-I) are monoclonal antibodies (Alirocumab and Evolocumab) able to bind PCSK9 protein, blocking its interaction with the low-density lipoprotein receptor (LDL-R) increasing its expression on hepatocytes. The Italian Medicines Agency consider PCSK9-I administration to patients with certain diagnosis of Heterozygous Familial Hypercholesterolemia (He-FH) in primary prevention when low-density lipoprotein cholesterol (LDL-C)>130 mg/dl and in all patients in secondary prevention when

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LDL-C>70 mg/dl. However, despite the effective improvement in CV risk, a significant percentage of patients still did not reach the recommended LDL-C target. The presence of overweight and obesity could complicate cardiovascular health and lipid management. Given their increasing global incidence, it is pivotal to understand their impact on the efficacy of PCSK9-I therapy. Thus, we aim to verify whether overweight influences the achievement of LDL-C targets in patients receiving PCSK9-I therapy.
Methods: This retrospective single-center study included patients with different types of dyslipidemias treated with PCSK9-I between January 2018 and September 2023. Demographical characteristics, medical history, weight, and body mass index (BMI) were collected at baseline while lipid profile was assessed at baseline and after 6, 12, 24 and 36 months. The recommended targets of LDL-C were defined according to the international guidelines for the management of dyslipidemia (i.e., 55 mg/dL and 70 mg/dL in patients with very-high and high CV risk, respectively).
Results: A total of 180 patients with a median age of 67 (IQR 58-73) years and equally divided between male and female were included. Among them, 101 (56.1%) were with He-FH and 105 had a history of atherosclerotic CV disease. The median BMI was 26.7 (IQR 24-30) kg/m^2, meaning that 75 patients (41.7%) presented a BMI between 25 and 29.9 and 45 patients (25.0%) a BMI above 30. The recommended LDL-C target at 12 (p=0.021), 24 (p=0.024), and 36 months (p=0.024) was achieved more frequently in patients with normal weight (54.5%, 62.5% and 65.4%, respectively) as compared to those with overweight (47.8%, 50.0% and 44.0%, respectively) or with obesity (25.6%, 29.4% and 28.6%, respectively). These differences persisted when patients were categorized according to the diagnosis of He-FH.
Conclusion: Patients with dyslipidemia treated with PCSK9-I and with overweight and obesity are significantly less likely to reach LDL-C targets compared to patients with normal weight. This highlights the need for tailored lipid management strategies in patients with obesity or with overweight, to optimize treatment outcomes.

GC4.261

Pharmacogenetic markers for personalized treatment in patients with type 2 diabetes mellitus and obesity

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Introduction: Type 2 diabetes mellitus (T2DM) and obesity are chronic metabolic diseases. The aim of our study was to assess the association of OCT1, MATE1, MATE2 and GLP1R genes and the effect of Metformin and Semaglutide in patients living with T2DM and obesity.
Materials-Methods: This three-month trial included 27 participants aged 18 to 65 with T2D and overweight/obesity (body mass index (BMI) > 25 kg/m^2). At the beginning fasting glucose, insulin, HOMA index, glycated hemoglobin, lipid profile, body weight, height, body mass index (BMI) were measured for all the participants. They were randomly divided into two groups. The first group (n=17) was treated with Metformin extended-release therapy at the maximum dose (Glucophage XR, 2000 mg) for a period of three months. For the second group (n=10), a therapy with Semaglutide (Rybelsus, 14mg) was started for the same period. During the treatment, the patients were advised to follow diet number 9. At the end of the third month, the same initially tested biochemical markers and the anthropometric parameters were measured for all the patients. The genetic polymorphisms of the receptors for metformin (MATE1, MATE2, OCT1) in liver and kidney and GLP-1 agonist (GLP1RA) receptors were examined.
Results: The analyses showed no correlation between the cofactor variants and the therapy with metformin and semaglutide regarding the reduction of fasting glucose, fasting insulin, HbA1C and HOMA index. The reasons might be the weak functional effect of the individual variants, the lack of longer follow-up of the studied clinical markers, the smaller number of patients in the study and the presence of other genetic variants. The secondary analyses of the results for rs2252281 showed a reduction in BMI and LDL cholesterol, important markers for the development and progression of diabetes.
Conclusion: The precision medicine for type 2 diabetes mellitus is of great importance, due to the higher efficiency of therapy and the prevention of late diabetic complications. A longer follow-up on the effect of Metformin and Semaglutide therapy in a larger group of patients is needed in the future.

GC4.262

Association Between Fat-to-Muscle ratio and Metabolic Syndrome in Elderly Population

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Introduction: Aging leads to significant alterations in body composition in elderly people. Previous studies have indicated that fat-to-muscle ratio (FMR) could be used as a potential predictor of metabolic syndrome. This study aims to investigate the correlation between fat-to-muscle ratio and metabolic syndrome in elderly population.
Methods: A total of 1285 participants aged older than 65 years old were enrolled in this study. Individuals diagnosed of metabolic syndrome in our study required meeting at least three of the following condition: (1) systolic blood pressure (BP) ≥ 130 mmHg, diastolic BP ≥ 85 mmHg or current use of antihypertensive agents; (2) fasting blood sugar ≥ 100 mg/dL or current use of antihyperglycemic agents; (3) triglyceride level ≥ 150 mg/dL; (4) high density lipoprotein cholesterol (HDL-C) < 40 mg/dL for men or < 50 mg/dL for women; (5) waist circumference > 90 cm in men or > 80 cm in women, according to metabolic syndrome diagnostic criteria for Taiwanese. FMR is calculated as fat mass (kg) divided by lean mass (kg), measured by the whole-body dual-energy X-ray absorptiometry (DXA). Different sites of FMR were calculated, including arms, legs, trunk, and whole body. The FMR in participants with and without metabolic syndrome was compared and analyzed by different sites. Also, receiver operating characteristic (ROC) curve and areas under ROC curve (AURs) were performed to examine the diagnostic accuracy of FMR. The independent association between FMR and metabolic syndrome was assessed by logistic regression test.
Results: In total, 1285 participants were enrolled in this study, and the prevalence of metabolic syndrome of this study population is 42.6% (38.9% in males and 46.8% in females). The FMR of whole body, arms, legs, and trunk were significantly higher in individuals with metabolic syndrome than without metabolic syndrome (0.590 ± 0.182 vs. 0.471 ± 0.188 in FMR of whole body; 0.484 ± 0.230 vs. 0.401 ± 0.220 in FMR of arms; 0.468 ± 0.195 vs. 0.411 ± 0.184 in FMR of legs; 0.697 ± 0.187 vs. 0.530 ± 0.209 in FMR of trunk; all p<0.001). The areas under ROC curve (AUCs) of FMR were calculated for the diagnostic accuracy of metabolic syndrome, and showed statistically significant in FMR of whole body, arms, legs, and trunk (0.681, 0.605, 0.589, 0.733 respectively; p<0.001). Furthermore, logistic regression test revealed that the FMR of whole body is independently associated with metabolic syndrome after adjustment for age and BMI (odds ratio 3.09; 95% confidence interval [CI] 1.42-6.75; p=0.005).
Conclusion: This study revealed that higher FMR of whole body is significantly associated with increased risk of metabolic syndrome in elderly population. FMR could be used as a screening method for metabolic syndrome in individual aged over 65 years old.

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Tab.1. Comparison of FMR in different sites between individuals with and without metabolic syndrome.

	Metabolic Syndrome (n=548)	Non-Metabolic Syndrome (n=737)		
	Mean ± SD	Mean ± SD	P-value	95% CI
FMR of Whole Body	0.590 ± 0.182	0.471 ± 0.188	<0.001	−0.140, −0.100
FMR of Arms	0.484 ± 0.230	0.401 ± 0.220	<0.001	−0.109, −0.059
FMR of Legs	0.468 ± 0.195	0.411 ± 0.184	<0.001	−0.783, −0.037
FMR of Trunk	0.697 ± 0.187	0.530 ± 0.209	<0.001	−0.190, −0.146

Abbreviation: FMR, Fat-to-Muscle Ratio; SD, standard deviation; CI, confidence interval

Tab. 2. ROC curve and AUCs of FMR in different sites.

Sites of FMR	AUC	95% CI	P-value	Optimal FMR cutoff point	Sensitivity	Specificity
Whole Body	0.681	0.652, 0.710	<0.001	0.448	76.5%	50.2%
Arms	0.605	0.574, 0.636	<0.001	0.273	82.1%	32.8%
Legs	0.589	0.558, 0.620	<0.001	0.292	84.3%	31.8%
Trunk	0.733	0.705, 0.760	<0.001	0.528	82.8%	52.5%

1. Abbreviation: FMR, Fat-to-Muscle Ratio; AUC: area under curve; SD, standard deviation; CI, confidence interval. 2. Optimal FMR cutoff point is determined by Youden index.

GC4.263

Body composition changes during the swallowable, non-endoscopic gastric balloon program: prioritizing lean mass preservation for sustainable, healthy weight loss

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Introduction: One of the management goals for patients with obesity is improvement in body weight and composition. Preservation of lean body mass during significant weight loss promotes health and initial and sustained weight loss outcomes, reducing risks of weight regain. Ideal therapies should be designed to ensure lean mass conservation. Strategies to preserve skeletal muscle and improve physical function, through structured exercise and higher protein intakes should be integrated. However, many obesity interventions including diets, surgeries, and medications, fail to deliver on the crucial aspect of preservation of lean body mass. This study evaluates body composition changes during the SIGBP (Swallowable Intragastric Balloon Program), shedding light on its distinctiveness in fostering sustainable, healthy weight loss; delivering 'quality weight loss'.
Methods: Data from 6 obesity centers in 6 countries which record body composition parameters were gathered on patients with obesity and overweight who underwent the SIGBP between Nov 2016 and April 2023. Patients had the 4-month SIGB (Allurion Balloon) and were followed up at least monthly for at least 6 months by a multidisciplinary team and digital remote monitoring and had lean body mass preservation coaching. Body composition was measured at baseline and 4 months using consistent bioelectrical impedance analysis methods (Tanita® and InBody®). Results for Weight loss (WL), %Total Body Weight Loss (%TBWL), Body Mass Index decrease (BMIL), Fat Mass (FM), Muscle Mass (MM), Fat Free Mass (FFM) were collected.
Results: Data of 698 patients (M236-F462) were analyzed. Initial mean weight, BMI were 99.1±24.3Kg and 34.8±6.8kg/m^2. After 4 months of the Allurion program WL and TBWL were 14±6.5Kg and 13.3±5.8%. Initial FM, MM and FFM were 39.7±14.2Kg, 44 ± 19.6Kg and 58.1 ± 13.4Kg respectively. At 4 months these values significantly ($p < .005$) reduced from baseline by: 9.5±6.5Kg, 2.5±5.7Kg and 4±7.8Kg respectively (-24%, -5.7% and -6.9% from baseline respectively). Participants experienced a notable reduction in total body weight. Importantly, the analysis highlighted a significant emphasis on delivering predominantly fat mass losses (68%) and thus preserving lean mass. These positive body composition changes showcase the program's approach to supporting metabolic and functional health and supporting term weight maintenance.
Conclusion: In a landscape crowded with obesity interventions, this large international study demonstrates that the SIGBP distinguishes itself by not only facilitating significant weight loss, but also delivering on the preservation of lean mass with primarily fat mass losses. This emphasis not only contributes to sustainable weight loss but also supports health. These findings advocate for a paradigm shift in weight management strategies, emphasizing the importance of interventions that prioritize the preservation of lean body mass for a healthier and more enduring impact. Long-term outcomes will be important to monitor.

GC4.264

Heart rate variability and the Risk of Metabolic Syndrome

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Objective: Obesity is the starting point of most metabolic diseases, such as diabetes, hypertension, and metabolic syndrome. Although autonomic imbalance is associated with an increased risk of metabolic disease, its effects on metabolic syndrome (MetS) remains unclear. Heart rate variability (HRV) is a noninvasive marker of autonomic imbalance and vagal activity. The objective of this study was to examine whether altered heart rate variability (HRV) could predict the risk of MetS.
Research Design and Methods: A cohort study was conducted in 32,237 adults without metabolic syndrome who underwent three-minute HRV measurement during health check-ups between 2011 and 2014 at Kangbuk Samsung Hospital. We analyzed the time domain [standard deviation of the normal-to-normal interval(SDNN) and root mean square difference(RMSSD)] and the frequency domain [total(TP), normalized low-frequency(LF), and normalized high-frequency(HF) power, and LF/HF ratio]. We compared the risk of diabetes until 2018 according to tertiles of heart rate and HRV variables, with tertile 1 serving as the reference group. Metabolic syndrome was defined based on both the NCEP-ATP III criteria.
Results: Both time and frequency domain variables were lower in MetS group, except LF norm and LF/HF ratio. In cox analysis, as SDNN, RMSSD, TP, HF and HF norm tertiles increased, the risk of MetS decreased, whereas the risk of MetS increased in case of LF norm and LF/HF ratio. These tendencies observed in HF norm, LF norm, and LF/HF ratio were maintained after adjustment for age, sex, body mass index, current smoking, drinking, systolic blood pressure, serum low-density lipoprotein-cholesterol, high sensitivity c-reactive protein, and glucose levels as confounders. The hazard ratios (95% confidence intervals) of tertile 3 of were 0.57 (0.53-0.62) for HF norm, 1.72 (1.59-1.87) for LF norm, and 1.78 (1.63-1.37) for LF/HF ratio.
Conclusions: Alterations in HRV measurements are related to increased risk of MetS. Abnormal HRV, especially decreased vagal activity and deviation in sympatho-vagal imbalance to sympathetic activity, might precede incident MetS.

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GC4.265

Is there a difference between phenotypically similar but metabolically different patients with Metabolically Healthy Obesity and with Metabolically Unhealthy Obesity on weight loss?

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Introduction: Metabolically Healthy Obesity (MHO) refers to individuals without evident cardiometabolic abnormalities associated with adiposity. However, over time, many of them transition into a state of Metabolically Unhealthy Obesity (MUO). Our inquiry revolves around identifying which group exhibits a more favorable response to weight loss at the commencement of treatment.
Methods: Patients with BMI>30kg/m^2 and aged 18 years or older were admitted at the Division of Endocrinology, Croatian Obesity Treatment Referral Center, University Hospital Centre Zagreb. They were advised to change their lifestyles according to nutrition and endocrinology recommendations. Patients were stratified into two groups based on using Angulinar-Salin criteria for MHO and MUO. Descriptive statistics were employed, utilizing the Mann-Whitney U test and X^2 for analysis.
Results: Overall, we included 48 patients with obesity. Among the 24 patients with MUO (79.2% female; median age 41.5 (22-82) yr.) and 24 patients with MHO (79.2% female; median age 38 (20-60) yr.), there were no significant differences in age and gender distribution. At baseline, patients with MUO and MHO had BMI of 39.1 (31.2-56.5) kg/m^2 vs 37.1 (31.5-66.1) kg/m^2 (p=0.885), respectively. There were no significant differences in the frequencies of current smokers, past smokers nor patients who never smoked cigarettes: 33.3% vs 20.8% (p=0.335), 62.5% vs 75% (p=0.355), and 4.2% vs 4.2% (p=1.000). Additionally, patients with MUO showed a slightly higher presence of type 2 diabetes compared to MHO, but the statistical significance was not reached (12.5% vs 0%, X^2=3.133, p=0.077). Following 3-6 months, patients with MUO demonstrated significantly better improvements in terms of weight loss and BMI reductions compared to patients with MHO ($\triangle$BW: -6,5 kg vs -1.55 kg, p=0.027; $\triangle$BMI: -2.4 kg/m^2 vs -0.55 kg/m^2, p=0.025).
Conclusions: Although patients with MUO were slightly older and exhibited higher baseline weights, with a higher percentage of current and past smokers, these differences were not statistically significant. Despite all patients receiving education on lifestyle changes, those with MUO achieved statistically better weight loss results after 3-6 months. Notably, individuals with MUO displayed heightened motivation for weight loss. In contrast, people with MHO may experience additional benefits when undergoing pharmacological treatment for obesity. Further research with a larger sample size is needed to draw final conclusions.

GC4.266

Real-world data of post-bariatric hypoglycaemia at a tertiary centre

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Background: Post-bariatric surgery hypoglycaemia (PBH) refers to hypoglycaemia that occurs following metabolic/bariatric surgery attributed to alteration in the anatomy which affects the transition time of food, and consequently, gastrointestinal physiology. It is a severe and increasingly recognized complication. Long-term follow up shows that PBH does not always resolve. We report real world data of patients with established PBH from a tertiary centre.
Methods: We collected data from patients with suspected PBH and identified 8 cases of PBH through Mixed Meal tests (MMT)and free style libre (FSL1) monitoring 1. All of them were post Roux-en-Y gastric bypass (RYGB). Anthropometric and clinical data were collected retrospectively.
Results: The mean age (standard deviation (SD) was 54.4 (±8.41) years. The mean body mass index at the time of surgery was 48.9 (±6.1) kg/m^2. Most common symptoms included sweating, shakiness, dizziness and blurred vision. 2 patients were diagnosed with seizures prior to being diagnosed with PBH. On the mixed meal test 3 had documented hypoglycaemia (<3mmol/L) however, FSL1 did pick more episode of PBH. MMT (hypo vs non-hypo group)was done. All saw the dietician. Treatment included trial of acarbose and octreotide which was stopped due to side effects in 100% and 60% of patients it was started on respectively. Other treatments include verapamil, Liraglutide and gastric band insertions. RYGB reversal was discussed in 2 but not performed. For 2 participants who did not tolerate medical management, long-term CGM is effectively used to control PBH.
Conclusions: A high index of suspicion is required for PBH with low threshold for diagnosis and testing is required especially for people with non-specific symptoms. Management can be difficult and has to be tailored to patient preference and response. The use of CGM to monitor and manage PBH should be encouraged.

GC4.267

Mexico, the experience of the critical state: In search of mutual aid group goverment mexican strategies for the benefit of patients living with obesity

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Introduction: In Mexico, overweight and obesity affect more than 75% of adults, and 35.6% of the child population. Figures that place us first in the world in childhood obesity, and second in adults, surpassed only by the United States.
In the Benito Juárez Health Jurisdiction of the Ministry of Health of Mexico City, the strategy called "Mutual Aid Groups for Chronic Diseases" was initiated with the unique objective of achieving control goals in patients living with obesity through a multidisciplinary team that will provide empowerment, education, and physical activation.
Methods: I will present the group's success story with excellence. The group of specialists was made up of specialists in general medicine, nutrition, dentists, optometrists, nursing staff and physical activators.
We worked with 1 group of 15 members, all of these patients with obesity and some other chronic degenerative disorder for 1 and a half years. Activities began in March 2022 with an average weight of 70.17 kg and an average waist of 102 cm. ending the process in August 2023 with an average reduction of 7.18 kg in total weight and a reduction of 6.67 cm in waist.

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Measurements were carried out on all members once a month, carrying out 4 physical activation sessions of 1 hour of moderate intensity per month as well as 4 sessions with the main educational needs per patient.
The information was captured on a government platform throughout the country where the progress of the group members can be monitored on a monthly basis.
Conclusion: Concluding that through strategies of accompaniment, promotion, multidisciplinary support and health education, every patient who lives with obesity (and some chronic-degenerative disease) can achieve a healthier life and greater well-being.
Providing the patient with the necessary tools to self-manage their disease without depending 100% on a health specialist and the multipharmacy.
We managed to obtain the goals requested by the Government of Mexico to be one of the 15 groups accredited with excellence in the country, as well as a member of the group was certified as a "community health leader."

GC4.268

Effectiveness of low doses of semaglutide on weight loss and body composition among women in their menopause

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Background and Aims: Menopause is a complex period in women's life, when weight gain and predisposition to obesity are frequent. Moreover, even during menopause transition, women begin to lose lean mass up to 0.5% and, therefore, an increase in the percentage of fat mass with central distribution and an increased risk of metabolic syndrome. Despite lifestyle habits remain the cornerstone in this period, their long-term effectiveness is a challenge. In this sense, GLP-1 analogues have shown their efficacy in improving weight loss and other cardiovascular risk factors.
Methods: To assess the effectiveness of low doses of semaglutide on body weight and composition for 4 months during menopause compared to premenopausal women.
Results: Baseline weight and BMI were significantly greater among menopausal women (95±23.4 vs 86.4 ±12.8kg and 35.9±7.3 vs 32.9±4.7kg/m^2; p=0.02 and p=0.03, respectively). Fat mass was higher among postmenopausal women (45.2±17.1 vs 38.2±9.8kg; p=0.03). The percentage of fat mass and lean mass were comparable between the two groups (43.2±8.1 vs 40.9 ±7.1% and 29.6±5.5 vs 32.4 ±8.4kg; p=0.2 and p=0.08, respectively). After four months of semaglutide 1mg, either weight loss (5.9±5.2 vs 4.5±3.5 kg; p=0.1), or percentage of weight loss (5.8±4.7 vs 5.1±3.2%; p=0.4 were comparable. Furthermore, both fat mass loss in kilos (4.1±4.5 vs 3.1±3.7kg; p=0.3) and lean mass loss (-0.4±1.7 vs -1.1±3.7kg; p=0.1) were similar between the two groups.
Conclusions: Despite a greater initial weight and fat mass among women in their menopause, after four months of treatment with semaglutide 1mg, either fat mass loss or weight loss were similar to premenopausal women, by preserving lean mass.

GC4.270

Effects of group cognitive behavioral therapy for obesity in women

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Introduction: To determine the effectiveness of multydisciplinary approach, including group cognitive-behavioral therapy (CBT) and individual consultation of dietitian for body weight correction in women with obesity.
Methods: There were 13 women in study. The mean age of participant was 41.3±9.89 years old, the mean body mass index - 34.7±4.07 kg/m^2. The psychologist gave 8 CBT meeting for long 2.5 hours during 2 months. We estimated markers initial and through 2 months: body weight, eating behavior (EB) with scales: the Dutch Eating Behavior Questionnaire (DEBQ) and Three Factor Eating Questionnaire (TFEQ), tests of anxiety and depression, Test of Self-Conscious Affect (TOSCA), Toronto Alexithymia Scale (TAS-20).
Results: The mean change in body weight from baseline to 2 months observation was 2.5 kg (p=0.005). We found decrease emotional EB (p=0.002) and external EB (p<0.001) according DEBQ. We didn't note statistically significant changes with restrictive EB (p = 0.1). Also we got the same results according TFEQ: factor 2 (disinhibition) and 3 (hunger) decreased after intervention. The patients didn't show pronounced signs of anxiety, but signs of depression were detected in 2 (15.4%). After CBT there weren't statistically significant changes in anxiety questionnaires (p = 0.07) and depression (p=0.19). Analyze of the dynamics TAS-20 scale indicators, the accuracy of identifying feelings (p = 0.12), describing feelings (p = 0.11) and externally-oriented thinking (p = 0.218) did not show significant differences. There was a significant decrease in total scores characterizing feelings of guilt as a result of the intervention (p<0.001), and also a decrease in the feeling of shame after therapy (p<0.001).
Conclusion: To effectively reduce body weight and correct EB in women with obesity joint nutritional and psychotherapeutic work is necessary to better effectiveness of therapy.

Conflict of Interest: None Disclosed

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GC4.271

Tapering semaglutide to the most effective dose: real-world evidence from a digital weight management programme (TAILGATE)

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Introduction: Digital weight management programmes have become widely available as purpose-built mobile applications provide scalable and flexible solutions for providers and patients.
The objective of this investigation was to explore the impact of dose tapering of semaglutide for patients with obesity as a clinically relevant weight loss is achieved.
Methods: This study is a real-world, new-user cohort including individuals signing up for the weight management programme no later than the 31st of December 2023. The programme consisted of dedicated lifestyle intervention in combination with personalized dosages of semaglutide.
Results: A total of 1.944 participants were included in the cohort. Of this cohort, 108 participants initiated a dose tapering of semaglutide in agreement with their treating healthcare professional.
The median duration of the planned tapering was 20 weeks (95%CI, 12 to 33), and the average change in body weight during this period was -0.6% (95%CI, -1.3 to -0.2).
A total of 54 participants tapered semaglutide to zero and did so on average 9.9 weeks (95%CI, 7.6 to 12.2) after the dose tapering was planned and initiated. The average change in body weight was -0.5% (95%CI, -1.7 to 0.6 %) from cessation to last available data point (31st of December 2023).
A total of 8 participants re-initiated dosing of semaglutide. 10 weeks post-cessation there was a 19.5% (95%CI, 5.6% to 31.3) probability of restarting semaglutide.
Conclusion: Tapering of semaglutide did not result in body weight regain within the first 20 weeks. Neither did discontinuation of semaglutide seem to result in an increase in body weight.
In conclusion, following a clinically relevant weight loss dose tapering of semaglutide could be completed without body weight regain through a digital multi-disciplinary obesity management programme.

GC4.272

Protocol for a randomised controlled trial of young adults with childhood-onset obesity treated with semaglutide 2.4 mg/week – The RESETTLE trial

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Introduction: Childhood-onset obesity poses significant health risks, including early-onset type 2 diabetes, cardiovascular disease, and reduced quality of life. Hospital-based behavioural treatment is associated with reduced degree of obesity. However, approximately 25% of children do not respond with adiposity reduction upon hospital-based behavioural treatment. Therefore, the purpose of this study is to investigate the effect of the GLP-1 receptor agonist, semaglutide, as an add-on to hospital-based behavioural treatment, in youth who still have obesity following hospital-based behavioural treatment during childhood. Furthermore, biomedical and psychosocial factors associated with treatment response in youth with childhood-onset obesity will be investigated.
Methods: This is an investigator-initiated randomised, placebo-controlled trial. We will enrol expectedly 170 young adults (aged 18-28 years) based on previous response to a hospital-based obesity treatment during childhood and current body mass index (BMI) (kg/m^2). Participants are categorised into three groups: Low treatment response (BMI standard deviation score (SDS) reduction <0.10; BMI≥30 kg/m^2); medium treatment response (BMI SDS reduction >0.25; BMI>30 kg/m^2); and high treatment response (BMI SDS reduction >0.50; BMI<30 kg/m^2). Participants with BMI≥30 are randomised 2:1 to semaglutide 2.4 mg/week or placebo, as an add-on to hospital-based behavioural treatment, for 68 weeks. The primary outcome is the change in BMI from randomisation to the end of treatment with semaglutide compared to placebo. Secondary endpoint is change in weight and body composition.
Conclusion: This is the first randomised-controlled trial to investigate the effect of semaglutide 2.4 mg/week, as an add-on to hospital-based behavioural treatment, on body mass index and health in youth with childhood-onset obesity and documented low responsiveness to hospital-based behavioural obesity treatment. By utilising state-of-the-art methodology, to identify novel targets related to brain, liver, fat, appetite, and behaviour, the results of this study have the potential to reveal the underlying factors of treatment response and help create personalised and more effective treatment strategies for obesity in youth.

GC4.273

Barriers and facilitators to use of pharmacological intervention- Saxenda (Liraglutide), for weight management in a specialist service

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Introduction: NICE guidance (CG189, TA664) recommend use of Saxenda as an adjunct to reduced calorie diet and increased physical activity for managing weight in adults living with obesity. MoreLife's specialist weight management service provides a comprehensive consultant led Saxenda pathway alongside evidence-based behavior change intervention for sustained engagement with healthy eating and active lifestyle.
Methods: The patients enrolled at our Greater Manchester Tier 3 adult weight management service (March 2022 - July 2023) were screened for Saxenda as per eligibility criteria defined by NICE. Those who did not achieve 5% weight loss at 4 monthly review or maintain the weight at a later review were discharged. Retrospective audit of data was carried out to examine and report the outcomes for this service evaluation.
Results: A total of 112 patients were screened as eligible for Saxenda, though 75.9% (n,85) started on this pathway. A significant 17.9% could not start due to GLP-1RA shortage announced by National Patient Safety Alert, DHSC July 2023. A small number of patients (2.7%) were deemed non-eligible at medical assessment, of these 1.8% due to achieving normoglycemia and the rest (n,1) due to contraindication to safe use of the medication. Another 3.8% declined the pathway primarily due to concerns related to side effects that may exacerbate their gastro-intestinal symptoms related to existing health condition. Attendance for 4-month reviews indicated that 75.3% (n,64) of the patients attended their appointment. A significant 15% (n,13) of the 4-month reviews were rescheduled due to stock shortages and patients were supported to re-start their pathway. Another 4.7% did not attend this review as they discontinued Saxenda and sought to be discharged from pathway due to uncertainty around medication stock. Only 3.7% of clients discontinued due to side effects, though others reported to manage it well with guidance from the team. The weight loss at 4 monthly reviews highlighted a substantial change in weight (Mean -9Kg, SD 5.2,) and reportedly 85% achieved their 5% weight loss target and year 1 outcomes demonstrated cumulative weight loss (Mean -16.2Kg, SD 9.3). During the stock shortages our service offered bespoke support as additional one to one session with specialist dietitian, support from psychologist, support for dose management or re-titration advice, peer support session, FAQ session and co-ordination with GP. Other factors such as flexibility around time, delivery (telephone/ zoom), information on managing potential side effects, mandatory attendance for behavior change intervention, transparent and timely communications and compassionate approach has been instrumental for client engagement and effectiveness on this pathway.

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Conclusion: Interruption in medication supply chain can abruptly interfere the medication pathways in specialist weight management service and can have a considerable impact on the patient's motivation and well-being. Supplementary support and engagement with core behavior change programme are relevant considerations to manage the barriers and for effective weight loss.

GC4.274

The impact of Integrative Neuromuscular Training on body composition, muscular strength, postural control and quality of life in outpatients with obesity: preliminary results

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Introduction: The prevalence of obesity is a worldwide challenge affecting more than 650 million adults (1) and physical exercise is one the health component. In this regard, Concurrent Training is a mode that improves both body composition and cardiorespiratory fitness (2). Notably, also the Integrative Neuromuscular Training is an effective training protocol that ameliorates physical fitness in individuals with obesity (3). The aim is to examine the dose-response effect of a 10-week Integrative Neuromuscular Training intervention on body composition, physical fitness and quality of life in outpatients with obesity.
Methods: Thirty-one (52.3 ± 7.0 years) individuals (39.4 ± 7.1 kg/m^2, 80% female) were recruited at IRCSS Istituto Auxologico Italiano and randomly assigned into Traditional Concurrent Training (conc-T, n=16) or Concurrent Integrative Neuromuscular Training (conc-INT, n=15). Conc-T is a protocol based on traditional concurrent training formed by strength exercises (20 minutes) followed by endurance training (brisk walking at moderate intensity for 30 minutes; 6 out of 10 a.u. RPE scale). Conc-INT is a circuit-based procedure that combines an aerobic stimuli (brisk walking for 30 minutes at 6 out of 10 a.u. RPE scale) with neuromuscular exercises targeted on multi-joint strength, balance and flexibility (20 minutes, 3 sets) for 3 times/week. Body Mass Index (BMI), Fat Mass% (FM%), Fat Free Mass% (FFM%), physical activity level (IPAQ), upper-body strength (HST), lower-body strength (five repetition sit-to-stand), postural control (M-BESS) and quality of life (EQ-5D VAS) were assessed at baseline (T0) and after 10 weeks (T10).
Results: At T10 repeated-measures ANOVA revealed significant time x group interactions in postural control (P<0.01, part η2 = 0.414), upper and lower-body strength (P<0.05, part η2 = 0.316; P<0.05, part η2 = 0.141), and Fat Free Mass % (P<0.05, part η2 = 0.143). Moreover, a main effect of time was also significant for BMI (conc-T -6.2%, conc-INT -7.1%), FM% (conc-T -5.3%, conc-INT -8.2%), FFM% (conc-T +4.7%, conc-INT +7.6%), HST (conc-T +7%, conc-INT +14%), five repetition sit-to-stand (conc-T +18.6%, conc-INT +28.9%), M-BESS (conc-T +34.8%, conc-INT +70.5%), IPAQ (conc-T +68.3%, conc-INT +69.6%) and EQ-5D VAS (conc-T +27.8%, conc-INT +27.4%) highlighting improvements after both interventions.
Conclusion: These findings support the feasibility of conc-INT to obtain positively responses in body composition, postural control, physical fitness and perceived health throughout 10 weeks. This specific training mode that encompasses cardiorespiratory fitness with neuromuscular training could be an option to use when prescribing physical exercise to deal with obesity.

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GC4.275

Data Visualisation in weight loss studies: current practice and recommendations

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Introduction: Visualisations are an effective way to present weight differences in randomized groups in weight loss trials, however the visualisation must be appropriate for the data being presented. Bar charts should be used to represent percentages or proportions and boxplots or error bar plots for quantitative weight or body composition data. The aim of this research was to outline current practice in data visualisation in weight loss trials and provide recommendations on the appropriate use of visualisations.
Methods: Open access weight loss trials published over a 12 month period commencing July 2022 were searched for data visualisations of weight loss data. To be included, the paper had to report weight or BMI as an outcome. Ninety-two papers were included in the analysis. In order to demonstrate the visualisations, data from a two group (control and intervention) randomized controlled trial of weight loss, with a pre-post design, was simulated based on previous research using the rnorm_multi function in RStudio. Pre and Post weights were generated for each group and a categorical variable indicating whether or not the weight loss was less than or greater than or equal to 5% was created. SPSS and RStudio were used to visualise the data.
Results: Fifty-three (57.6%) of the papers included a visualization of weight loss outcomes. Twenty- four (26%) papers presented bar charts, fifteen (16%) of them incorrectly using a bar chart to represent mean weights, 10 (11%) correctly used bar charts to show percentages or proportions (eg percent in each group meeting a weight loss criteria of greater than or equal to 5%). Simulated data was used to show the correct use of bar charts for percentage data (Figure 1) and the incorrect use of bar charts (Figure 2a) and correct use of CI plots (figure 2b) and boxplots (Figure 2c) for continuous weight data in the control and intervention groups. The boxplots also contain points to indicate the individual patient weights to give further information about the distribution of the data.
Conclusions: Data visualisation of weight loss outcomes is common in weight loss research and can be an effective way to present data when used correctly.

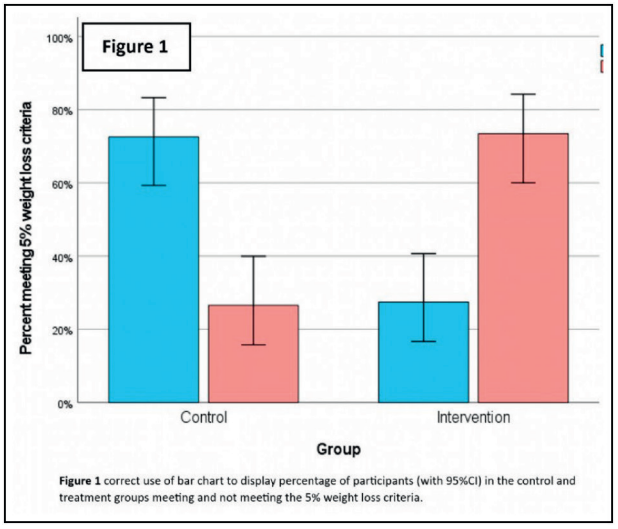


Fig. 1. correct use of bar chart to display percentage of participants (with 95%CI) in the control and treatment groups meeting and not meeting the 5% weight loss criteria.

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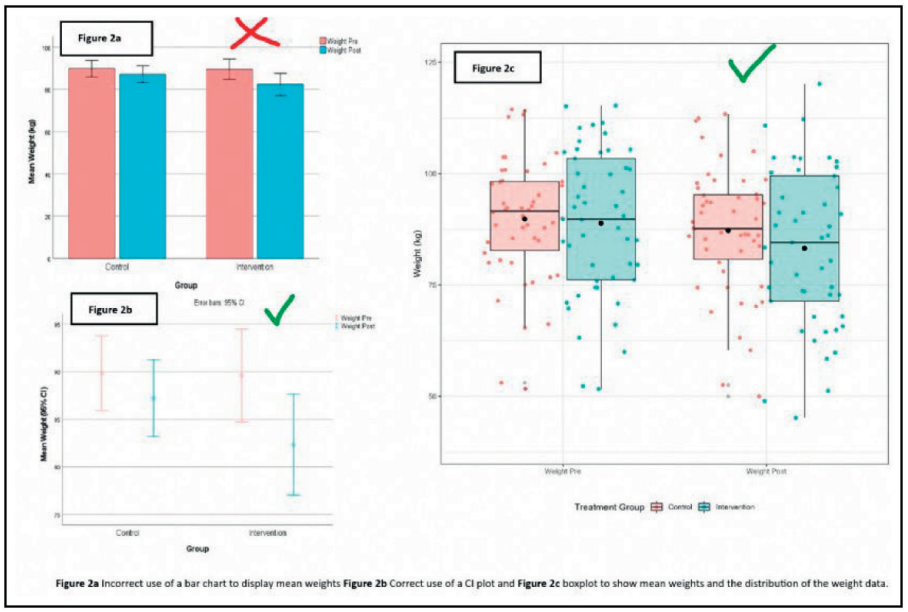


Fig. 2. Figure 2a Incorrect use of a bar chart to display mean weights Figure 2b Correct use of a CI plot and Figure 2c boxplot to show mean weights and the distribution of the weight data.

GC4.276

Weight Loss in Hashimoto Thyroiditis induced by Photobiomodulation Therapy: A Clinical Feasibility Parallel Trial with 6-Months Follow-Up

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Introduction: Hashimoto thyroiditis (HT) is thyroid-specific autoimmune disorder, and the most common cause of hypothyroidism in a population with an adequate dietary intake. Easy weight gaining and persistent symptoms even in the euthyroid state, it seams that remain the main problem caused by thyroid autoimmunity despite the conventional treatment, focused on the permanent replacement of levothyroxine (LT4) deficiency. Photobiomodulation (PBM) showed to be an effective additional therapy in treatment of autoimmune diseases, but with limited evidence.

Methods: This single center, experimental open label non-randomized interventional clinical trial was conducted to evaluate PBM efficacy therapy as additional therapy to conventional, in weight management in patients with HT compared with conventional treatment alone. Seventy-four female participants with HT aged between 20 and 50 years old were recruited and divided equally into two groups: PBM plus conventional treatment (group 1); and conventional treatment alone (group 2). The PBM dosimetry and treatment protocols were as follows: wavelength, 820 nm; power output, 200 mW; continuous emission mode; irradiating time, 20 s per point; fluence, 32 J/cm2 per point; treatment frequency, twice a week (excluding weekends); and treatment duration, three consecutive weeks. Both groups had the conventional treatment protocol, as follows: An appropriate dose of LT4 determined before their enrolment, participants with a serum level of vitamin D3 <40 ng/dL, received replacement according to their serum levels, and all the participants had a daily intake of 100 μg of oral selenium. Anthropometric measurements (BMI, hip and waist circumference, waist/hip ratio) were evaluated before, after three-months and after six-months follow-up, as well as the biochemical (FT3, FT4, antiTPO and antiTG) parameters.

Results: Our findings showed significant improvement in group 1 parameters (PBM plus conventional treatment) compared with group 2 (conventional treatment only) in terms of weight loss and reduction in the following parameters: BMI, hip and waist circumference, waist/hip ratio ($p < 0.05$).

Conclusion: An increasing amount of clinical evidence suggests the beneficial effect of PBM in restoring thyroid gland homeostasis in persons with HT. Our results, for the first time, demonstrated efficacy of PBM in reducing excessive weight that persists in persons with HT even in the euthyroid state, delivered at a lower fluence. Hence, extensive studies with a longer follow-up period are warranted.

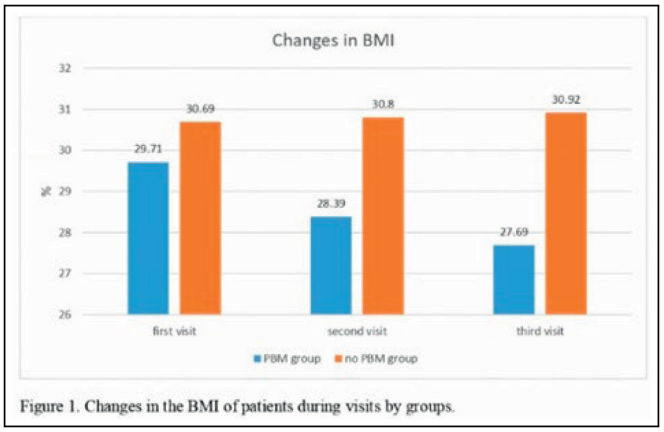


Fig. 1. Changes in the BMI of patients during visits by groups.

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Tab. 1. Baseline comparison of some anthropometric between PBM group and no PBM group.

	PBM group (n=18) Mean±SD or Median(IQR)	no PBM group (n=20) Mean±SD or Median(IQR)	
AGE (years)	39.78±4.40	37.30±5.91	t=1.452, p=0.155
H (cm)	1.64±0.05	1.65±0.05	t=0.588, p=0.560
W (kg)	80.00±9.63	83.57±9.61	t=1.142, p=0.261
BMI (kg/m^2)	29.71±3.36	30.69±3.13	t=0.991, p=0.357
Weist (cm)	100.39±9.54	105.45±9.84	t=0.999, p=0.117
Hip (cm)	112.22±7.82	116.55±6.71	t=0.780, p=0.075
Weist/Hip	0.90±0.06	0.90±0.06	t=0.681, p=1.000

At baseline there where no significant differences between parameters in two groups.

GC4.277

Association between Obesity and Adult Attention-Deficit/ Hyperactivity Disorder in Mexican Adults

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This retrospective cohort study, conducted at the Metabolic Medicine Clinic, aims to investigate the association between obesity and Attention-Deficit/Hyperactivity Disorder (ADHD) in Mexican adults. The research will rely on patient data collected from previous clinic records, with the goal of conducting a comprehensive analysis of the interrelationships between obesity and ADHD over time.

A retrospective methodology will be employed to address the temporal evolution of both conditions, providing a unique and detailed insight into the relationship between obesity and ADHD in adults. The study population will consist of patients from the Metabolic Medicine Clinic, allowing for a specific analysis within a clinical and metabolic context.

Evaluations will include measures of body composition, along with key biochemical parameters such as glucose, triglycerides, cholesterol, liver enzymes, insulin, and HOMA index. These indicators will offer a comprehensive understanding of participants metabolic health and its relation to ADHD. In the context of the comprehensive assessment of participants, a detailed analysis of dietary habits will be carried out as a fundamental part of this study. Specialized questionnaires and interviews will be used to gather accurate information about participants' dietary intake, addressing aspects such as meal frequency, consumption of specific food groups, eating patterns, and food preferences. Nutritional assessment will include both a qualitative and quantitative analysis of the diet, allowing the identification of potential dietary patterns associated with both obesity and ADHD. Special attention will be given to the relationship between ADHD symptoms and possible eating behaviors, such as binge eating, impulsive snacking, or the choice of specific foods. Determining the prevalence of ADHD will be carried out using established diagnostic criteria, and differences in these measures between persons living with obesity and persons not living with obesity will be explored. Additionally, subgroup analysis will be conducted to assess potential variations in the association based on sociodemographic factors such as age, gender, and others.

Statistical methods will be used to model and quantify the association between obesity and ADHD, adjusting for confounding variables and stratifying by relevant characteristics. A literature review will be conducted to contextualize findings within the existing body of knowledge on the relationship between obesity and ADHD. This study will provide crucial insights into understanding the natural history of the coexistence of obesity and ADHD in adults, identifying potential patterns of development and outcomes. The retrospective perspective will allow the observation of temporal trends and exploration of events that may have contributed to the relationship between these conditions.

GC4.278

Effectiveness of Anti-Obesity Medications from a multidisciplinary weight management program-A real-world experience

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Aim: The aim of the study was to evaluate the effectiveness of FDA approved anti-obesity medications from a multidisciplinary weight management program in a real-world setting

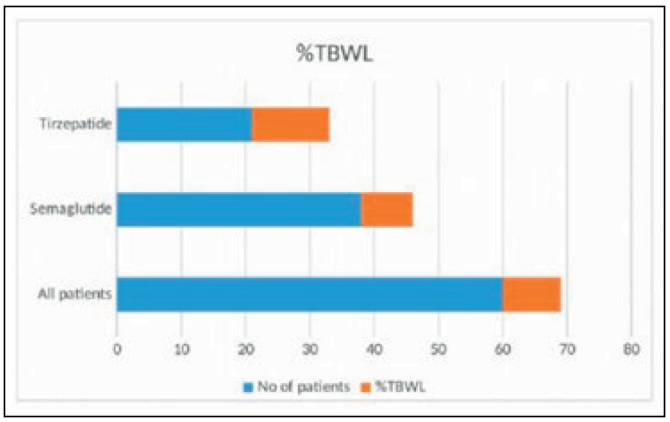
Methods: This is a cross-sectional study conducted at Genesis Healthcare Centre in Dubai, UAE. 60/183 patients have been evaluated at 6 months from November 2022 until Dec 2023 as part of a multi-disciplinary weight management program. Key demographics, anthropometrics, and clinical data was analyzed using Statistical Package for Social Sciences software version 25 (SPSS Inc., Chicago, IL).

Results: 183 patients included and 60 patients evaluated as had completed data at 6 months.45 (75%) females and 15 (25%) males. The mean age was 41.75 years (±7.62) with a mean BMI of 33.2 (±5.6) and 33.70 (±5.83) for females and males respectively. Mean waist circumference was 101 cm (±10.6) and 102.1 cm (±10.8), fat percent was 42.63% (±7.5) and 42.46 (±7.8), fat mass was 40.9kg (±12.5) and 41.91 (±13.04), and visceral fat was at level 17.5 (±2.9) and 17.65 (±2.8), for females and males respectively.

The following co-morbidities were documented: 31.6% (n=19) prediabetes, 3.3% (n=2) type 2 diabetes. 6.7% (n=4) hypertension, 6.7% (n=4) obstructive sleep apnea, 78.3% (n=47) dyslipidemia, 16.7% (n=10) and fatty liver, 9.2% (n=12).

In this cohort, Semaglutide was prescribed in 38 (63.3%) patients, followed by Tirzepatide in 21(35%) of patients and 1 patient was on Liraglutide. At 6 months %TBWL was 9% (±6%) in the whole cohort, 8% (±5%) in Semaglutide group and 12% (±6%) in Tirzepatide group. One patient on Liraglutide lost 10% at 6 months. 83% of the entire cohort achieved at least 5% TBWL.

In Tirzepatide group, at baseline 8 patients were identified with prediabetes and 2 patients with type 2 diabetes with mean HbA1c of 5.7% (±0.5). At 6 months HbA1c had normalized at 5.14% (±0.25). In Semaglutide group, at baseline 10 patients were identified with prediabetes with mean HbA1c of 5.39% (±0.42). At 6 months HbA1c had normalized at 5.07% (±0.3). Common side effects were nausea and none of the patients discontinued the medication because of side effects.



It shows %TBWL of all patients and as per antiobesity medication.

Fig. 1. %TBWL by different anti-obesity Medications.

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Tab. 1. Baseline Characteristics by Aanti-Obesity Medications.

	All patients	Semaglutide	Tirzepatide	Liraglutide
N(%)	60	38 (63.3%)	21(35%)	1
Mean Age (SD)	41.75 years (±7.62)	41.9 years (±7.49)	41.4 years (±8.2)	41 years
Mean BMI (SD)	33.4(±5.72)	31.3 (±4.89)	36.8 (±5.3)	41
HbA1c%	5.53(±0.47)	5.39(±0.42)	5.7 (±0.48)	6.3%
Total cholesterol mg/dl	220.5 (±44.5)	215.48 (±49.8)	228.15 (±33.3)	252
Triglycerides mg/dl	152.56 (±82.3)	129.35 (±68.9)	193.64 (±91.8)	167
LDL mg/dl	138.5 (±38.7)	133.27 (±41.93)	146.27 (±31.83)	171.9
HDL mg/dl	53.4 (±14.89)	57.69 (±16.58)	46.12 (±7.39)	46.7

Conclusion: In conclusion, anti-obesity medications resulted in significant weight loss comparable to shown in randomized clinical trials. Long-term follow up is needed to look at efficacy and tolerance of these medications.

GC4.279

Impact of an exercise program and eating habits in patients with cardiovascular disease. (RECARDIET Project)

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Introduction: Due to the high prevalence and morbidity and mortality of cardiovascular diseases (CVD), there is a need to create intervention programmes for high-risk patients. In this case, we are talking about secondary prevention in patients who have suffered a severe cardiovascular event, who will undergo a multidisciplinary programme of Cardiac Rehabilitation (RHC), composed of psychologists, nutritionists, doctors of different specialties and rehabilitators.
Objective: To describe and phenotype the study population, as well as to evaluate the clinical, morphological, habit and functional changes after receiving an exercise and diet intervention programme by a multidisciplinary team.
Materials-Methods: A RHC programme lasting 3 months, which focuses on promoting adherence to the Mediterranean diet, an exercise programme adapted for these patients, nutritional education and emotional support.
Results: of the sample of 76 patients, 80.2% were male, the sample had a mean age of 56.7 years, a BMI of 28.6kg, most were normal weight and 82% had some associated comorbidity, good cell mass and increased preperitoneal fat. The changes obtained were decrease in waist circumference (WC) (102cm vs. 96.65cm), increase in quadriceps muscle area (4.74cm vs. 5.38cm), Y-axis (1.52cm vs. 1.68cm) and improved contractile capacity (1.98cm vs. 2.26cm). 2.26cm), decreased preperitoneal fat (0.86cm Vs. 0.72cm), increased strength in dynamometry tests (33.06kg Vs. 36.32kg in hand dynamometry, 42.12kg Vs. 50.68kg in biceps dynamometry and 52.9kg Vs. 62.99kg in quadriceps dynamometry) ($p<0.05$). Similarly, they improved adherence to the Mediterranean diet, increased physical activity and both total cholesterol (135.07mg/dl Vs.121.38mg/dl) and LDL (67.65mg/dl vs. 55.76mg/dl) in their blood tests decreased.
Conclusion: with the intervention of the RHC programme, a clear improvement is observed in both anthropometric and functional parameters, although it is not reflected in weight or BMI, they increase adherence to the Mediterranean diet, increase physical activity and reduce LDL levels, which is a preventive measure against the risk of CVD.

GC4.280

Correlation between morphofunctional assessment techniques in a cardiac rehabilitation program. (RECARDIET Project)

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Unidad de Endocrinología y Nutrición, Hospital Virgen de la Victoria de Málaga, España

Introduction: Due to the fact that cardiovascular diseases (CVD) are the second cause of mortality in our country, there is a need to create multidisciplinary preventive intervention programmes as they are high-risk patients.
Objective: The present investigation designs a methodology to correlate and agree parameters obtained with different tools, in order to evaluate clinical, morphological, habit, functional and quality of life changes.
Materials-Methods: Retrospective study of 76 patients, mean age 56.7 years. Characteristics were described with a morphofunctional assessment, including classical and more advanced parameters (body composition, vector bioimpedance, nutritional ultrasound and functionality test). Statistical analysis correlates the different variables and tools.
Results: Analysing the parameters that measure fat, we could see that there is a correlation between FM of the BIVA with classic parameters such as BMI ($r=0.81$) and CC ($r=0.76$) with a $p<0.05$. As for the functional dynamometry tests, comparing data from the start and end of the programme, there were improvements in all of them (hand, biceps and quadriceps dynamometry) with a $p=0.001$.
Conclusion: The different diagnostic methods and morphofunctional tools are complementary.

GC4.281

Current opportunities of genetic testing in patients with obesity and metabolic disorders - a personalized approach

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Introduction: Over the past 25 years, a large body of data has been published showing genetic factors associated with metabolic disorders and obesity. The purpose of this study is to demonstrate a personalized, genetic-based approach to normalizing patients' weight, eating habits, and metabolic disorders.
Methods: Forty patients were enrolled in the study aged 19-62. A set of 36 single nucleotide polymorphism (SNPs) related to lipid metabolism, absorption, insulin sensitivity, regulation of postprandial glucose level, sweet tooth, eating preferences, energy homeostasis, methylation, inflammation, detoxification and oxidative stress were tested: APOA2 (rs5082), ADIPOQ, (rs17300539), FTO (rs9939609), KCTD10 (rs10850219), LIPC (rs1800588), MMAB (rs2241201), PPARG (rs1801282), ANKK1/DRD2 (rs1800497), TAS2R38 (rs1726866), LEPR (rs2025804), SLC2A2 (rs5400), UCP1 (-3826A>G), UCP2 (-866G>A), UCP3 (55C>T), MTHFR (677C>T and 1298A>C), MTR (2756A>G), MTRR (66A>G), CBS (699C>T), COMT (472G>A), IL-6 (-174G>C), TNFA (-308G>A), IL-1A (4845G>T and -889C/T), IL-1B (3954C>T and -511A>G), IL-1RN (2018C>T), CYP1A1 (Msp1T>C and Ile462ValA>G), GSTM1 (Ins/Del), GSTP1 (313A>G), GSTT1 (Ins/Del), NQ01 (C>T), eNOS (894G>T), MnSOD/SOD2 (47T>C), CAT (-262C>T) and GPX1 (C>T).
All participants completed a specially designed questionnaire to assess epidemiological risk factors and family history.
Based on the genetic results, the specific diet for each patient was determined: balanced, Mediterranean, low-fat and low-carbohydrate, as well as personalized vitamin and antioxidant intake. Following the analysis of the results, detailed consultations and recommendations for diet and lifestyle modification were provided by clinical geneticists and a nutritionist.

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Results: The BMI of the studied patients ranged from 25.15 to 50.12 kg/m^2. The obtained results show that the diet of the patients so far differs from the genetically determined one. Most of the patients were predisposed to certain unhealthy eating habits. 80% of the study participants carried a high cumulative risk for chronic inflammation of genes related to IL-1, IL-6 and TNFα. 87.5% (n=35) carried an adverse variant in the ADIPOQ gene (GG); 17.5% (n=7) were predisposed to low leptin levels - AA (FTO), 45% (n=18) to AT (FTO) to reduced and 37.5% (n=15) to TT (FTO) to normal leptin levels. With respect to genetic risks associated with insulin resistance and type 2 diabetes, the following distribution was found: 38% were low risk carriers and 62% were moderately increased risk carriers. Regarding the metabolism of PUFAs, 65% (n=26) of the study sample were found to carry GG (FADS1) variants associated with active conversion of omega-6 PUFAs to arachidonic acid, and only 5% (n=2) to TT (FADS1) had standard metabolism.
Conclusion: This study demonstrates a well-established personalized approach of integrating adverse genetic variants with epidemiological risk factors. It may be used to improve stratification of individuals and lead to more effective prevention and clinical interventions of metabolic disorders, obesity and related conditions.

GC4.282

Online Group Tier-3 Obesity Assessment Clinic - a Pilot Study

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Introduction: Traditionally, people attending the obesity clinic are seen in 1:1 consultations. With increasing demand for obesity interventions, limited clinical resources, and Covid-19 pandemic affecting people's movement, there is a growing need to explore alternative ways of care delivery.
Methods: The pilot group clinic ran between 27/10/2022 to 03/02/2023. Three people with obesity (PWO) were invited to each group online video-consultation, on Zoom. A consultant clinician and a dietitian jointly facilitated each group clinic, duration 1 - 1.5 hours. At the start of the clinic, all participants consented to be part of the group clinic and to confidentiality. Following the consultation, participants feedback was collected via an anonymous online survey. Data presented as numbers (percentages) or means and standard deviations.
Results: A total of 20 PWO were invited and 17 (85%) attended the clinics, 12 (70%) females. Average age 45.8 ±15.1 years, weight 130.1 ±21.6 kg, and body mass index (BMI) 45.7 ±7.0 kg/m^2. Six (35%) PWO were interested in bariatric surgery. Clinics outcomes included: 12 (70%) referrals to group lifestyle intervention (Mood and Food programme); 6 (35%) referrals to 1:1 psychology assessment; 4 (23%) referrals for individual diet intervention; 5 (29%) referrals to NHS digital weight management programme; 5 (29%) referrals for sleep studies; 3 (17%) referrals to primary care provider to adjust diabetes medications.
11 (61%) PWO completed the anonymous survey. Average score on participants satisfaction with clinic experience was 9 out of 10 (with higher scores reflecting higher satisfaction). All participants (100%) felt that they were listened to; had enough opportunity to speak; and that they would recommend the group clinic to others. The feedback also highlighted the importance of peer support, and the option to have a 1:1 break out room with a clinician.
Challenges included: the group clinic requires good facilitation skills from the healthcare professionals (HCP). The group clinic may not be suitable for people with very complex medical needs/learning difficulties/or need an interpreter; or where the patient is from outside the region and the HCP is unable to access their electronic medical records.
Conclusions: The online group clinic provides better use of resources and high participants satisfaction. The clinic may not be suitable for every PWO attending the weight management service, and it requires a different set of skills by the HCP. Appropriate triaging and PWO choice are essential for its success.

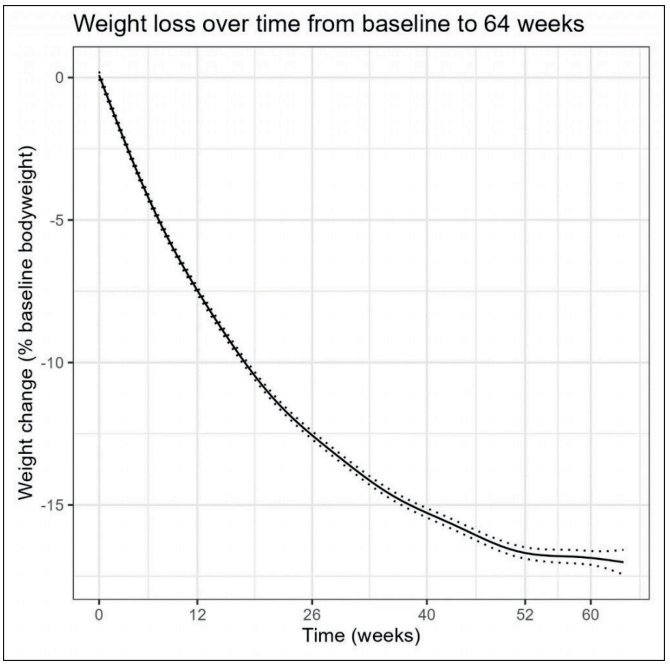
GC4.283

Treat to target in obesity management: real-world evidence from an internet-based weight management programme (TRIM)

Seier, S.[1]*; Pedersen, J.*[1]*; Lymperis, K.*[2]*; Balck, J.*[1]*; Gudbergsen, H.*[1]

[1]Embla ApS
[2]Omicron ApS

Introduction: Digital weight management programmes have become widely available as purpose-built mobile applications provide scalable and flexible solutions for providers and patients.
The primary objective of this investigation was to explore the impact of a digital multi-disciplinary obesity management program during a 64-week follow-up period (52 weeks is the primary follow-up) with respect to change in body weight and use of semaglutide.
Methods: This study is a real-world, new-user cohort including individuals signing up for the weight management program no later than the 31st of December 2023. The program consisted of dedicated lifestyle intervention in combination with personalized dosages of semaglutide. Weight change was modelled using a mixed model with spline of time and a random intercept term.
Results: A total of 1.997 participants were enrolled in the programme, and after 26, 52 and 64 weeks, respectively, 1.132, 361 and 179 participants were still included.
The programme produced an average weight loss of 16.7 % (95%CI, 16.5 % to 16.9 %) at week 52 (figure 1) with an average weight loss of 17.0 % at week 64 (95%CI, 16.6 % to 17.4 %).
During the programme the participants used between 36.9 and 40.3 % of the suggested cumulative dose at week 52 and 26, respectively. In addition, 97.3 % of the participants lost > 5% of their body weight and 89.0 % lost > 10% of their body weight at week 52. Analyses of participants' baseline BMI and cumulative dose of semaglutide revealed no difference between the different BMI groups in terms of their achieved weight loss.
Conclusion: In conclusion, regardless of the participants' BMI upon enrolment and the cumulative dose of semaglutide they achieve clinically relevant weight loss through a digital multi-disciplinary obesity management programme including lifestyle intervention and semaglutide.



Weight loss over time since initiation of the programme

Fig. 1.

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GC4.284

Transforming Obesity Education: Integration of the The Canadian Obesity Education Competencies into curriculum

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Background/Purpose: With ongoing gaps in obesity education delivery globally, a transformative shift is needed to address and mitigate weight bias and stigma, and foster evidence-based approaches to obesity assessment and care in the clinical setting. Obesity Canada has created evidence-based obesity competencies for medical education that can guide curriculum development, assessment and evaluation. We aim to implement these competencies into the curriculum of the first-in-kind European Masters programme in obesity management (EMINENT).
Methods: The Obesity Canada Education Action Team has seventeen members in health professions education and research along with students and patient experts. Through an iterative group consensus process using four guiding principles, key and enabling obesity competencies were created using the 2015 CanMEDS competency framework as its foundation. These principles included the representation of all CanMEDS Roles throughout the competencies, minimizing duplication with the original CanMEDS competencies, ensuring obesity focused content was informed by the 2020 Adult Obesity Clinical Practice Guidelines and the 2019 U.S. Obesity Medication Education Collaborative Competencies, and emphasizing patient-focused language throughout. Through a partnership between Obesity Canada and EMINENT, we are working towards developing a comprehensive evidence-based curriculum which integrates clinical practice guidelines, competencies and real world experiences.
Results: A total of thirteen key competencies and thirty-seven enabling competencies make up the Canadian Obesity Education Competencies. This is a pilot project and global partnership which is just starting, so no results specific to the curriculum are ready yet. However many of these lessons learned and tools will be able to be used for many different types of training not specific to a formal educational institution.
Discussion: There is a significant gap in the skills and capacities of the global graduate workforce to help public administrations/agencies, civil society, and companies address the challenges of obesity and its effects on public health and communities. The lack of expert personnel is a key obstacle to the implementation of national and multinational plans to support people living with obesity. This is exacerbated by the multi-disciplinary nature of obesity treatments; effective obesity practitioners must be knowledgeable across behavioural, psychological, pharmacological and surgical domains. EMINENT will deliver a comprehensive design of a two-year European Masters programme in Obesity Management that will train its graduates across all the key obesity-related disciplines. It will design a standardised training pathway for Healthcare Professionals.

GC4.285

Evaluation of the impact of a low-energy ketogenic diet versus a low-energy non-ketogenic diet on metabolic dysfunction-associated steatotic liver disease in patients with obesity

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Introduction: The global prevalence of metabolic dysfunction-associated steatotic liver disease (MASLD) in adults is estimated to be 32%, and in persons with obesity, it can be as high as 90%. Weight loss is recommended for persons with obesity for the treatment of this hepatic disease. Ketogenic diets have also been shown to be effective in reducing hepatic steatosis (HS), at least over a short period.
Aim: To evaluate and compare the effectiveness of the low-energy ketogenic diet (LEKD) with the low-calorie non-ketogenic diet (LENKD) in reducing non-alcoholic HS in patients with severe obesity.
Methods: Female patients with MASLD, who were candidates for bariatric surgery, were recruited. Sociodemographic and biochemical data were initially collected, and anthropometric and body composition assessments were conducted. HS was assessed using two non-invasive tests: abdominal ultrasound using the Ultrasonographic Fatty Liver Indicator (US-FLI) and transient liver elastography using the Controlled Attenuation Parameter (CAP). Each participant was randomly assigned to follow either a LENKD or a LEKD for two weeks. During this period, the participants were contacted by telephone every week.
After the end of the dietary intervention, biochemical, anthropometric and body composition data were collected again, and HS was re-assessed. Each participant was asked to assess the difficulty they encountered in adhering to the diet plan (Likert scale) and to report any symptoms they had experienced during the intervention.
Results: Among the 21 participants, there was a weight loss of 4.3% (-4.8 ± 1.35 kg in the LENKD group and -5.3 ± 1.46 kg in the LEKD group, p=0,423). Participants in the LEKD group reported a higher level of difficulty in adhering to the diet (p=0.008). There was a decrease in adjusted CAP of 11.0 % in the LEKD group (from 295.4 ± 25.5 dB/m to 261.7 ± 38.6 dB/m) and 9.6% in the LENKD group (from 279.8 ± 31.3 dB/m to 252.8 ± 53.3 dB/m). LENKD significantly reduced the US-FLI score. According to the CAP values, 62% of the total sample showed a reduction in HS severity (70% in the LEKD group and 55% in the LENKD group). There were no differences between the two interventions in anthropometric and body composition parameters or their impact on HS.
Conclusion: A low-energy diet, with or without carbohydrate restriction, effectively reduces HS when implemented for two weeks.

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GC4.286

Does probiotics supplementation improve cardio-metabolic outcomes in women after menopause with MALDF?

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Introduction: Metabolic-associated fatty liver disease (MAFLD) is an independent risk factor of cardiovascular diseases, and its prevalence correlates with female menopausal status. A decrease in estrogen may also hasten the progression of liver fibrosis. One of the most interesting and widely studied pathogenetic factors influencing fatty liver and metabolic deregulation is gut microbiota dysbiosis, but the impact of probiotics on MAFLD in women after menopause is still inconsistent. Therefore, we investigated the clinical efficacy of multi-strain probiotic supplementation on selected cardio-metabolic outcomes of women after menopause with MALDF.
Methods: 40 women after menupause (mean age: 55,26±4,92 years) with MALFD participated in this double-blind, placebo-controlled pilot trial. They were randomly divided into two groups that received probiotics ($1x10^9$ colony forming units/day) (PR) or placebo (PL) for 12 weeks. The probiotic contained the following strains: 50% *Lactococcus lactis Rosell®* – 1058, 25% *Lactobacillus casei Rosell®* – 215, 12,5% *Lactobacillus helveticus Rosell®* – 52, 12,5% *Bifidobacterium bifidum Rosell®* – 71. At baseline and after supplementation, each woman underwent anthropometric measurements (weight, height, waist circumference (WC), hip circumference (HC), waist-to-hip ratio (WHR)), and body composition analysis (electrical bioimpedance). Biochemical parameters as total cholesterol (TC), high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides (TG), lipid accumulation product (LAP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), γ-glutamyl transferase (GGT), fasting glucose (FG), fasting insulin (FI), homeostatic model assessment of insulin resistance (HOMA-IR), systolic (SBP) and diastolic blood pressure (DBP) was also examined. The fatty liver index (FLI) was also calculated.
Results: In both groups, there were no significant changes (p>0,05) at the end of the study in terms of anthropometric parameters and biochemical parameters. However, in probiotics group the tendency to more preferable changes in body mass (PR: -0.75 kg, p=0,076 vs. PL: -0,08, p=0,890), BMI (PR: -0,28 kg/m², p=0,074 vs. PL: -0,02 kg/m², p=0,906), FG (PR: -1,83, p=0,265 vs. PL: +2,47, p=0,214), FI (PR: +0,30, p=0,735 vs. PL: +1,10, p=0,078), LAP (PR: -3,86, p=0,409 vs. PL: +7,92, p=0,425), and FLI (PR: -4,35, p=0,066 vs. PL: +0,32, p=0,905) were observed. Probiotics supplementation also leads to positive changes in SBP (PR: -4,31, p=0,032 vs. PL: -+0,71, p=0,772) and DBP (PR: 2,75, p=0,239 vs. PL: +0,47, p=0,82), but statistical significant was only reduction in SBP.
Conclusion: In this pilot study, the probiotics administration in women after menopause with MALFD did not affect any significant improvement in anthropometric and biochemical parameters but led to a significant reduction in SBP. Probiotics supplementation also caused more positive changes in body mass, glucose and fatty liver, therefore may be considered as a adjuvant therapy in MALFD.

Conflict of Interest: None Disclosed

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GC4.287

Lean Non-alcoholic Fatty Liver Disease in Taiwan

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Background: The prevalence of lean non-alcoholic fatty liver disease (NAFLD) is on the rise, contributing to a growing proportion of liver diseases. However, the phenotypic and genetic characteristics of lean NAFLD in Asian populations have yet to be fully understood.
Aims: Our study aims to investigate the correlation between serum levels of fetuin-A and the AL ratio in lean and non-lean individuals, considering their NAFLD status and adjusting for central obesity and insulin resistance. Furthermore, we intend to assess the relationship between different metabolic factors and body composition and lean NAFLD, as well as varying risks of lean NAFLD in the presence or absence of PNPLA3 and SAMM50 variants, comparing them to lean individuals without NAFLD.
Methods: The first set of studies included community-based adults residing in Northern Taiwan. The participants were categorized into different groups based on their BMI and ultrasonographic indicators of fatty liver, including lean controls, lean NAFLD, non-lean individuals, and non-lean NAFLD. The second set of studies examined the relationship between each metabolic factor, body compositions, and single nucleotide polymorphisms and lean NAFLD, it was a cohort study conducted in the HAVO Health Exam Clinic from 2022 in Taiwan. Adults with a body mass index less than 24 kg/m^2 were enrolled. Fatty liver was defined by ultrasonography. The candidate gene approach employed in the study relied on the NHGRI-EBI website's library for selecting relevant genes. To analyze single nucleotide polymorphisms, the Global Screening Array-24 v1.0 Bead Chip was utilized for the selection process. Multiple logistic regression models and ROC curves were employed in these studies.
Results: In the first cohort, out of the 575 participants included in the study, 200 participants (34.8%) were diagnosed with non-lean NAFLD, and 105 participants (18.3%) had lean NAFLD. The odds ratio (OR) for having NAFLD in the highest tertile compared to the lowest tertile of fetuin-A was 2.62 (95% CI: 1.72-3.98; P for trend < 0.001). Compared with the lean controls, the odds of having lean NAFLD for the highest versus the lowest tertile of AL ratio was 0.28(95%CI: 0.12-0.69) after adjustment. In the second cohort, a total of 1,652 lean controls and 602 lean NAFLD patients were enrolled in HAVO database. Each metabolic factor, body fat, waist circumferences and waist to hip ratio was independently associated with lean NAFLD regardless the body mass index. After adjustment, individuals with GG genotypes of PNPLA3 rs12483959 had a higher risk of fatty liver with an odds ratio (OR) of 3.06 (95% CI: 2.15-4.37). Similarly, those with GG genotypes of SAMM50 rs3761472 also had an increased risk of fatty liver with an OR of 2.90 (95% CI: 2.04-4.14) (95% CI: 0.841, 0.877) for PNPLA3 rs738409 and 0.860 (95% CI: 0.843, 0.877) for SAMM50 rs3761472.
Conclusions: These results indicate the need for further investigation and research in this area to better understand the implications and potential clinical applications of these biomarkers and gene variants in lean NAFLD.

GC4.288

Effect of liraglutide on liver stiffness and steatosis in patients with obesity: a new serendipity for glucagon-like peptide-1 receptor agonists (GLP1-RA)?

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Introduction: Obesity has a strong correlation to metabolic dysfunction-associated steatotic liver disease (MASLD), one of the most common causes of chronic liver disease (1). Transient Elastography (TE) is a non-invasive, relatively easy-to-perform exam for measuring liver stiffness (LS) and controlled attenuation parameter (CAP) to evaluate liver steatosis and fibrosis. Pharmacotherapy with GLP1-RA is an effective option for the treatment of obesity (2) and liraglutide is still the only approved GLP1-RA to treat obesity in Italy. This retrospective observational real-life study aims to evaluate whether Liraglutide has an effect on MASLD alone, and which factors independently predict an improvement of MASLD.

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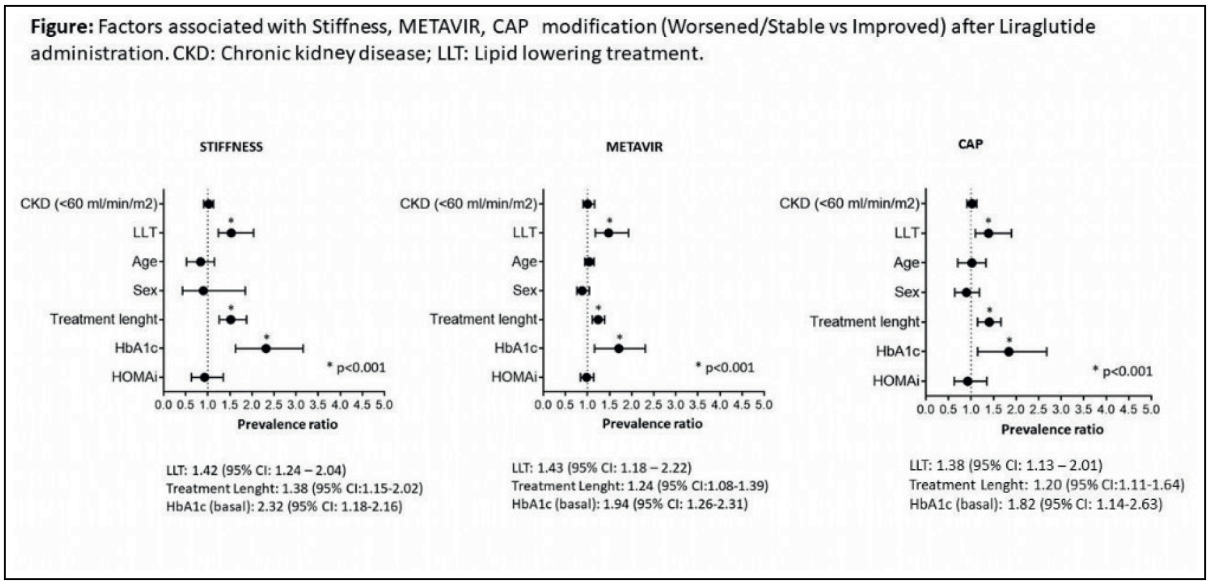


Fig. 1.

Materials-Methods: The present study takes into consideration 50 patients with obesity (PwO) (mean age 52.8±10.4 years, 35 female), who received treatment with Liraglutide 3.0 mg and followed a low-calorie diet. Patients with non-HDL cholesterol values ≥130 mg/dL received lipid-lowering treatment (LLT) on top. MASLD was evaluated at baseline and after 18.1±6.3 weeks using TE performed with FibroScan® compact 530 (Echosens, Paris, France) with M or XL probe. Blood tests including liver enzymes, HbA1c, lipid profile and renal function were carried out. Categorical variables were compared using the Chi-Square test. Differences between continuous variables were evaluated by the ANOVA. The prevalence of independent predictors of modifications in Stiffness, Metavir and CAP was assessed by the Poisson regression analysis.
Results: A significant reduction of BMI values was found from baseline to the follow-up (36.1±6.3 vs 33.3±6.1 kg/m^2, p<0.001). LS, Metavir score and CAP improved in 68.0%, 34.0% and 62.0% of cases, respectively. Length of treatment with liraglutide, lipid-lowering therapy and basal HbA1c independently predicted the improvement in LS, Metavir score and CAP (Figure).
Conclusions: Liraglutide treatment seems to improve LS and CAP in the short-term with a linear relationship with treatment duration. Moreover, a higher impact on TE measures was observed in patients with a greater dysmetabolism at baseline (i.e. high HbA1c and the need of LLT), thus suggesting a direct effect of liraglutide on MASLD, independent from weight loss, as BMI was always rejected from the Poisson analysis. These results need to be confirmed in other clinical studies involving a larger number of patients.

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GC4.289

Impaired mitochondrial bioenergetics in peripheral blood mononuclear cells as a novel NAFLD biomarker: impact of a Mediterranean-oriented dietary intervention

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Non-alcoholic fatty liver disease (NAFLD) is a health emergency worldwide due to its high prevalence and the lack of specific therapies. Lifestyle-based interventions are the only approaches recommended to treat NAFLD up to now. Liver mitochondrial dysfunction is known to be a central NAFLD pathomechanism that changes throughout disease progression. Blood-cell bioenergetics reflecting mitochondrial organ dysfunction is emerging for its potential applications in diagnostics. We took part in a 12-month clinical trial aimed to improve the patient's adherence to the Mediterranean Diet and investigate the contribution of blood-cell bioenergetics in the diagnosing and monitoring of NAFLD.
We measured real-time mitochondrial respirometry in peripheral blood mononuclear cells (PBMCs), anthropometric parameters, routine blood analytes, and circulating cytokines from a cohort of patients with NAFLD (N=19) and controls without NAFLD (N=18) at the baseline (T0). PBMC basal respiration, ATP-linked respiration, maximal respiration, and spare respiratory capacity were significantly reduced in patients with NAFLD compared to control cases. Compared to controls, individuals with NAFLD exhibited significantly elevated values of BMI, waist circumference, fasting glucose, fasting insulin, HOMA-index, total and LDL cholesterol, triglycerides, high-sensitivity C-reactive protein (hs-CRP), interleukin 6 (IL-6), and increased Fatty Liver Index, and significantly lower levels of HDL cholesterol. Correlation plots were applied to visualize relationships between known or potential NAFLD-related biomarkers. A subset of the recruited participants completed the longitudinal study. Participants with NAFLD (N=15) received a 16-page booklet and dietary counselling by an expert dietician, with regular follow-ups every three months. A Mediterranean Diet adherence score (Medscore) was collected at each appointment. Control participants (N=17) received general advice based on current Italian food-based dietary guidelines and were evaluated only at baseline and at the end of the twelve months. Anthropometric, biochemical, and respirometry parameters were assessed at the study onset (T0) and after twelve months (T12). Notably, the significant differences observed at T0 between patients and controls in terms of total cholesterol,

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HDL and LDL cholesterol, hs-CRP, IL-6, and mitochondrial respiration (including basal respiration, ATP production, maximal respiration, and spare respiratory capacity) were no longer evident at T12.
In conclusion, a semi-personalized Mediterranean dietary advice positively influenced known NAFLD biochemical markers and the mitochondrial respiration of PBMCs, implying that improvements in liver health have a positive impact on bioenergetics at the peripheral level. Therefore, we propose including blood cell respirometry in panels of NAFLD diagnostic biomarkers to monitor disease progression and response to current and novel therapies, including mitochondrial-targeted ones.
Ethic Committee approval n. NP2587.

GC4.290

Evaluating the impact of a moderately Low-Calorie Ketogenic Diet on MAFLD in patients with obesity: the role of magnetic resonance imaging

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Introduction: Metabolically associated fatty liver disease (MAFLD), prevalent in the Western world and a leading cause of liver transplantation among U.S. women, ranges from intra-hepatocyte lipid accumulation to cirrhosis. Fibrosis severity is crucial for prognosis, correlating with risks of advanced cirrhosis, portal hypertension, and hepatocellular carcinoma. 5-10% weight loss is associated with improvement of liver steatosis, but achieving >10% weight loss is usually necessary to improve NASH. Ketogenic diets, regardless of calorie intake, seem effective in treating steatosis, but there is very little evidence on their impact on liver fibrosis. The objective of this study is to evaluate the effect of a moderately low calorie, high-fat ketogenic diet (HFKD) on liver health in patients with MAFLD.
Methods: This prospective, pilot study involved patients with a confirmed MAFLD diagnosis through Magnetic Resonance Imaging (MRE) and Proton Density Fat Fraction (PDFF). Inclusion criteria included age over 18, and BMI ≥ 30 kg/m^2, while exclusion criteria included decompensated liver failure, pregnancy/lactation, type 1 diabetes mellitus, chronic renal disease, alcoholism, hepatotropic viral infection.
The primary outcome was reduction of liver steatosis, while secondary outcomes focused on safety, improvements in liver fibrosis, metabolic profile, and body composition. The patients underwent a moderately hypocaloric (-300 kcal of calculated Total Energy Expenditure) HFKD for 90 days and Magnetic Resonance Imaging (MRE) was employed to evaluate steatosis (PDFF %) and stiffness (kPa). Baseline and post-intervention assessments included anthropometric measurements, biochemical analysis, and body composition evaluation via DEXA.
Results: Seven patients with MAFLD (3 females, mean age 61.3±8.14 years and mean BMI 38.84±6.62 kg/m^2) were included. Following the dietary intervention, weight loss (-8.14 kg, p=0.03) and a decrease in mean BMI (-2.92 kg/m^2, p=0.02) and fat mass percentage (-3.57%, p=0.02) were reported. As expected given the small calorie deficit, none had >10% weight loss, allowing for better evaluation of the impact of macronutrient composition beyond calorie deficit/weight loss per se. MRE revealed a significant reduction in steatosis (PDFF -6.16%, p=0.03). Although no statistical reduction in liver fibrosis was observed overall likely due to the small sample size, three out of seven patients exhibited clinically relevant stiffness decrease. Notably, two patients achieved complete resolution of NASH, while another, despite remaining cirrhotic, demonstrated significant improvement. Safety parameters were unchanged.
Conclusion: Despite modest weight loss, preliminary data indicate a role for HFKD in managing MAFLD, not only in mitigating steatosis but potentially in more advanced stages characterized by liver fibrosis. MRE emerges as a sensitive tool for assessing MAFLD changes over time.

GC4.291

Non-Alcoholic Fatty Liver and Metabolic Abnormalities Are Determined by Age and Serum Des-acyl Ghrelin among Apparently Healthy Female Taiwanese

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Introduction: Non-alcoholic fatty liver disease (NAFLD) is a prevalent liver condition associated with metabolic disturbances, and its incidence notably increases in Asian regions. In these areas, many patients with NAFLD, particularly females, are neither obese nor of average weight. Although gastroenteropancreatic hormones are pivotal in metabolic regulation, existing research has primarily focused on only a few of these hormones. This study aims to comprehensively investigate key factors influencing NAFLD and related metabolic abnormalities in Asian females with detailed assessment of gastroenteropancreatic hormones.
Methods: A total of 139 adult female volunteers underwent thorough health evaluations. We identified the variables strongly associated with NAFLD and other metabolic abnormalities through correlational, forward regression, and pathway analyses. To ensure analytical accuracy, we conducted model fit tests, followed by developing and validating prediction models based on these pivotal factors.
Results: Our research underscored the significant roles of age and serum des-acyl ghrelin in metabolic abnormalities and NAFLD. Body mass index and waist circumference emerged as notable mediators. The predictive potential of age and serum des-acyl ghrelin for NAFLD was also detected.
Conclusion: This study identified significant correlations among age, serum des-acyl ghrelin, and metabolic complications, including NAFLD, in adult Asian females. Monitoring serum des-acyl ghrelin levels might offer predictive insights into metabolic risks in preventive medicine and drug development.

GC4.292

Which weight management strategies are more effective for patients with obesity-associated steatotic liver disease? A retrospective analysis

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Introduction: Steatotic Liver Disease (SLD) is a newly defined spectrum condition that refers to the presence of hepatic steatosis and includes the Metabolic dysfunction-associated steatotic liver disease (MASLD) when steatosis presents at least one of five cardiometabolic risk factors; MASLD and increased alcohol intake (MetALD) when alcohol intake ≥20g/daily and Alcohol Liver Disease (ALD) when the alcohol intake≥60g/daily. It has become an emerging public health issue and affects around 32.4% of the world's population. People who are living with MASLD are recommended to achieve a weight loss target of ≥ 7-10%, which is considered the most effective therapy to improve liver disease. We aimed to assess the effectiveness of different weight-loss strategies in obesity-associated SLD and their impact on fibrosis and steatosis using non-invasive methods.

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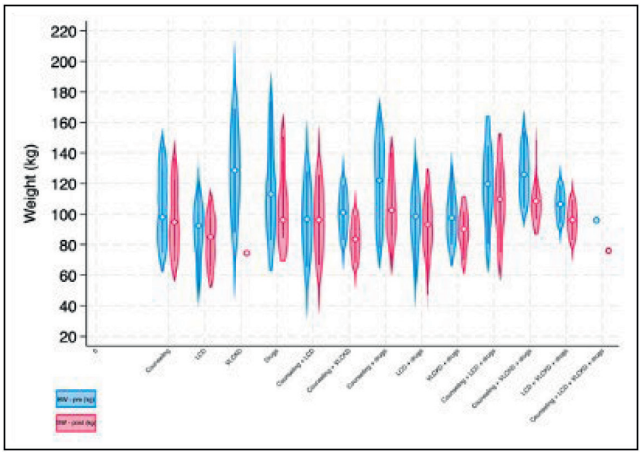


Fig. 1. Weight variations before and after interventions.

Methods: In this retrospective cross-sectional study, we analyzed the medical records of patients who were diagnosed with MASLD and were referred to the Clinical Nutrition and Metabolism Unit of IRCCS Policlinico S.Orsola, Bologna, Italy. All patients were over 18 years old and underwent a thorough nutritional assessment that included anthropometric measurements, basal metabolic rate assessment, evaluation of clinical history, blood tests and liver stiffness measurement (LSM) and controlled attenuated parameter (CAP) by transient elastography (FibroScan). Additionally, each patient was provided with a personalized therapy plan to achieve weight loss.

Results: We evaluated 104 patients (M/F: 69/35; age 57.5 (51.0-63.0) years; BMI: 36.8 (32.0-44.1) kg/m^2), 64/30/10 individuals were affected by MASLD/MetALD/ALD. Patients treated with cognitive behavioural therapy (CBT) and nutritional counselling achieved weight loss (WL) of -5.6% (-13.9--1.9), -5.6% (-11.4--2.6) with a low-calorie diet (LCD), -12.4% (-17.9--7.3) with a very-low-calorie ketogenic diet (VLCKD), -6.2% (-12.8--2.6) with metformin, -7.4% (-19.2--2.1) with glucagon-like peptide 1 receptor agonists (GLP1-ra) and -0.7% (-5.2 - -0.4) with naltrexone/bupropion. Furthermore, we observed that weight loss was related to improved steatosis by CAP and fibrosis by LSM. Moreover, patients with SLD treated with LCD obtained a weight loss –5.6% associated with a reduction of AST levels 29 (26.0-40.0), LSM 5.2 kPa (4.1 -6.2) and CAP

Tab.1. Comparison of different nutritional interventions for obesity in patients with chronic liver disease.

OVERALL - INTERVENTI (SHORT)	Population n=104 (100%)	Counseling n=23 (22.1%)	LCD n=16 (15.4%)	VLCKD n=2 (1.9%)	Drugs n=8 (7.7%)	Two interventions n=46 (44.2%)	Three or more interventions n=13 (12.5%)	p-value
Duration of intervention	23.0 (13.0-37.0)	13.0 (11.0-20.0)	12.5 (10.0-24.0)	27.0 (27.0-27.0)	16.0 (13.0-20.0)	28.5 (18.0-44.0)	39.0 (18.0-52.0)	<0.001
ANTHROPOMETRY - PRE								
Body Weight (BW) (kg)	103.3 (88.2-128.3)	98.0 (88.0-128.6)	92.4 (68.7-100.6)	128.5 (88.0-169.0)	113.0 (92.5-150.3)	105.8 (87.0-128.6)	119.0 (103.6-134.5)	0.022
BMI (kg/m^2)	36.8 (32.0-44.1)	34.9 (31.3-41.3)	32.0 (25.9-34.7)	48.8 (37.1-60.6)	40.3 (32.6-50.9)	39.0 (31.6-46.7)	39.4 (36.7-44.2)	0.007
Normal weight	5 (4.8%)	0 (0.0%)	3 (18.8%)	0 (0.0%)	0 (0.0%)	2 (4.3%)	0 (0.0%)	0.083
Overweight	11 (10.6%)	3 (15.9%)	3 (18.8%)	0 (0.0%)	1 (12.5%)	4 (8.7%)	0 (0.0%)	0.083
Obesity Class 1	24 (23.1%)	4 (21%)	6 (37.5%)	0 (0.0%)	1 (12.5%)	11 (23.9%)	2 (15.4%)	0.083
Obesity Class 2	27 (26.0%)	12 (52.1%)	2 (12.5%)	1 (50.0%)	2 (25.0%)	9 (19.6%)	5 (38.5%)	0.083
Obesity Class 3	37 (35.6%)	4 (21%)	2 (12.5%)	1 (50.0%)	4 (50.0%)	20 (43.5%)	6 (46.2%)	0.083
ANTHROPOMETRY - POST								
Body Weight (BW) (kg)	96.2 (79.8-110.5)	94.8 (79.0-122.8)	85.0 (66.2-97.6)	74.5 (74.5-74.5)	96.2 (89.3-134.4)	97.5 (82.5-108.5)	104.0 (93.5-117.9)	0.041
BMI (kg/m^2)	32.7 (29.4-40.6)	30.7 (28.4-40.6)	28.4 (26.4-32.6)	31.4 (31.4-31.4)	34.6 (31.4-43.3)	34.0 (29.9-41.8)	33.8 (31.2-40.9)	0.060
Normal weight	8 (7.7%)	2 (13.3%)	3 (18.8%)	0 (0.0%)	0 (0.0%)	3 (6.5%)	0 (0.0%)	0.083
Overweight	19 (18.3%)	4 (26.7%)	6 (37.5%)	0 (0.0%)	0 (0.0%)	9 (19.6%)	0 (0.0%)	0.083
Obesity Class 1	36 (34.6%)	2 (13.3%)	6 (37.5%)	1 (50.0%)	5 (62.5%)	14 (30.4%)	8 (61.5%)	0.083
Obesity Class 2	9 (8.7%)	2 (13.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (13.0%)	1 (7.7%)	0.083
Obesity Class 3	32 (30.8%)	9 (39.1%)	1 (6.2%)	1 (50.0%)	3 (37.5%)	14 (30.4%)	4 (30.8%)	0.083
Δweight - BW (%)	-8.1 (-14.7--3.0)	-6.6 (-10.2--1.7)	-4.9 (-12.4-0.5)	-15.3 (-15.3--15.3)	-4.9 (-24.5-1.6)	-10.2 (-15.6--4.1)	-8.9 (-11.7--7.2)	0,003
OUTCOME - WEIGHT (kg)								
Weight gain	14 (14.7%)	3 (23.1%)	5 (31.2%)	0 (0.0%)	1 (14.3%)	5 (11.1%)	0 (0.0%)	0.327
Weight loss <5%	18 (18.9%)	2 (15.4%)	3 (18.8%)	0 (0.0%)	3 (42.9%)	9 (20.0%)	1 (7.7%)	0.327
Weight loss 5-10%	22 (23.2%)	4 (30.8%)	4 (25.0%)	0 (0.0%)	1 (14.3%)	7 (15.6%)	6 (46.2%)	0.327
Weight loss ≥10%	28 (29.5%)	3 (23.1%)	3 (18.8%)	1 (100.0%)	0 (0.0%)	17 (37.8%)	4 (30.8%)	0.327
Weight loss ≥20%	13 (13.7%)	1 (7.7%)	1 (6.2%)	0 (0.0%)	2 (28.6%)	7 (15.6%)	2 (15.4%)	0.327
OUTCOME - BMI (kg/m^2)								
No BMI changes	44 (48.9%)	6 (50.0%)	5 (38.5%)	0 (0.0%)	6 (75.0%)	22 (51.2%)	5 (38.5%)	0.570
Improvement 1 BMI class	33 (36.7%)	3 (25.0%)	6 (46.2%)	1 (100.0%)	1 (12.5%)	16 (37.2%)	6 (46.2%)	0.570
Improvement 2 BMI class	12 (13.3%)	3 (25.0%)	1 (7.7%)	0 (0.0%)	1 (12.5%)	5 (11.6%)	2 (15.4%)	0.570
Worsening BMI class	1 (1.1%)	0 (0.0%)	1 (7.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.570

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265.0 dB/sec (259.0-361). The combination of two or more interventions resulted in weight loss of at least 5% and 10% in over 60% and 43% of patients, respectively.
Conclusion: CBT is an effective treatment for patients with obesity-associated SLD spectrum, especially when used in association with nutritional counselling and pharmacological therapy. VLCKD is the most effective therapy in the short-term but is associated with weight regain during follow-up. Weight loss is the primary therapy for obesity and SLD, as demonstrated by the reduction of liver steatosis and fibrosis.

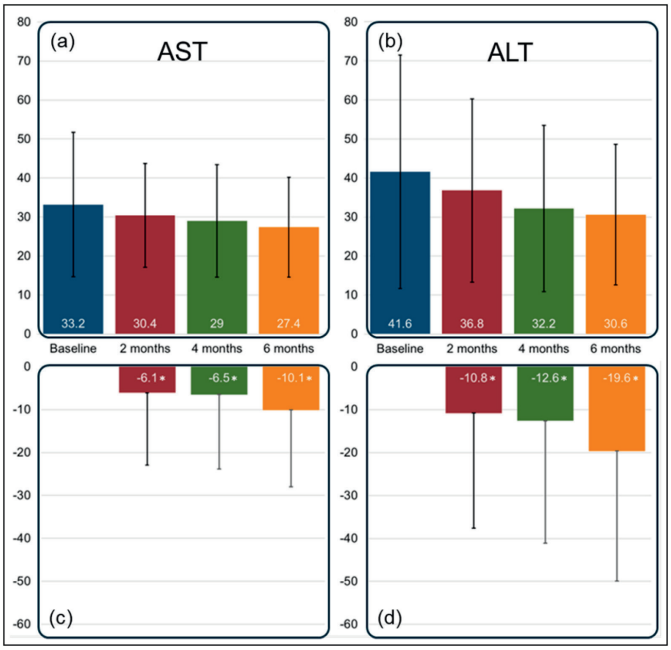
GC4.293

The effect of liraglutide 3.0mg on non-alcoholic fatty liver disease in Korean obesity adult: Multicenter real-world cohort study

Kim, J.[1]; *Park, J.*[2]; *Lim, S.*[3]

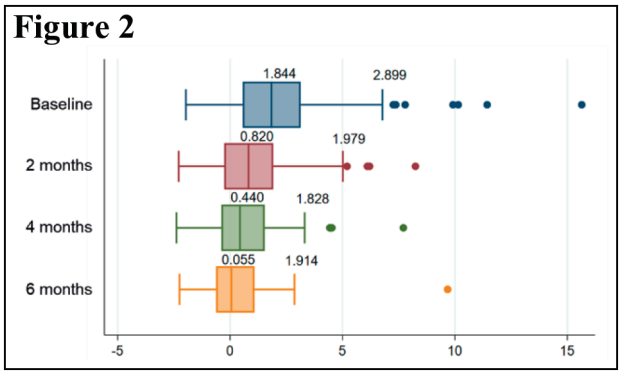
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Background & Aims: Non-alcoholic fatty liver disease (NAFLD) is widespread disease, which can lead to type 2 diabetes and cardiovascular disorders as well as liver cirrhosis, and hepatocellular carcinoma. We investigated the effect of liraglutide 3.0 mg on improving NAFLD in patients undergoing obesity treatment in real-world settings.
Methods: The cohort study was conducted in ten departments in nine hospitals in South Korea. People who were18 years of age or older, BMI of 27 kg/m^2 or more, and had obesity-related diseases were recruited in 10 tertiary hospitals in South Korea from November 2018 to March 2020. A total of 503 participants were included at baseline, and 244, 190, 101 participants were included at 2 months, 4 months, and 6 months, respectively. We collected anthropometric and biochemical data at the same time periods, focusing on NAFLD-related parameters.
Results: In this cohort, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels decreased continuously, with a more pronounced decrease observed with longer use of liraglutide 3.0 mg: AST: 33.2 ± 18.5 IU/l at baseline, 30.4 ± 13.3 IU/l at 2 months, 29.0 ± 14.4 IU/l at 4 months, and 27.4 ± 12.8 at 6 months; ALT: 41.6 ± 29.9 IU/l at baseline, 36.8 ± 23.5 IU/l at 2 months, 32.2 ± 21.3 IU/l at 4 months, 30.6 ± 18.0 IU/l at 6 months, respectively. Hepatic Steatosis Index and NAFLD liver fat score decreased significantly and steadily during the same time periods.
Conclusions: For people with obesity, liraglutide 3.0 mg might be a good choice for treating NAFLD as well as obesity.



Changes of AST and ALT levels from baseline after 2-, 4-, and 6-months treatment of liraglutide 3.0 mg.

Fig. 1.



Changes of NAFLD liver fat score from the baseline after 2-, 4-, and 6-months treatment of liraglutide 3.0 mg. The line in the box means median value of NAFLD liver fat score.

Fig. 2.

GC4.294

Cirrhosis Among People with Metabolic-Dysfunction Associated Steatohepatitis (MASH) is a Key Driver of Clinical and Economic Burden Independent of Metabolic Syndrome – an Observational Study

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Introduction: MASH, formerly known as nonalcoholic steatohepatitis (NASH), affects 3-6% of adults in the US.[1] The prevalence is higher among those with metabolic syndrome (MetS; 8.8%), obesity (8.7%), or type 2 diabetes mellitus (T2DM; 22.5%).[2] This study aimed to characterize the clinical and economic burden among those with MASH and MetS; overall; and among those with baseline cirrhosis or progression to cirrhosis over follow-up.
Methods: Optum de-identified Clinformatics® Data Mart Database (2015-2022) was used to identify adults with NASH. Presence of MetS (defined by a diagnosis for MetS or ≥3 of: obesity, hyperlipidemia, hypertensive disease, or T2DM) was assessed at baseline (6 months before and 1 month after index NASH diagnosis), and those with vs. without MetS were matched 1:1 on age, sex, and diabetes complications severity index. Prevalence of a composite clinical outcome (mortality, liver transplant, or significant hepatic event) and mean total costs per patient per year (PPPY) were estimated, stratified by baseline or progression to cirrhosis. Generalized linear models (GLM), adjusted for patient/disease characteristics, were used to determine the predicted additional total cost PPPY of having MetS in addition to NASH.
Results: Over a mean follow-up of approximately 3 years, more patients with NASH and MetS (n=10,580) experienced composite outcomes than those with NASH and without MetS (n=10,580; 49% vs 40%). Mean (SD) costs PPPY were higher among those with NASH and MetS ($60k[$149k]) vs. those without MetS ($41k[$112k]). Adjusted GLM estimates showed having MetS, in addition to NASH, increased costs by approximately $16k PPPY. At baseline, 35% of those with NASH and MetS and 27% of those with NASH without MetS had cirrhosis. Among all with NASH (with and without MetS), a diagnosis of cirrhosis at baseline was associated with

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higher prevalence of the composite outcome (88-89%) than among those without (22-26%). Costs for those with baseline cirrhosis were also higher ($85k-$106k) than for those without ($24k-$34k). For those without baseline cirrhosis, costs were higher for those who progressed to cirrhosis ($51k-$65k) vs no progression ($17k-$25k), regardless of MetS status.
Conclusion: While the presence of MetS was associated with worsening liver disease and higher economic burden, those with either baseline cirrhosis or progression to cirrhosis had substantially worse clinical and economic outcomes independent of MetS status. Therapies that slow progression to cirrhosis and end-stage liver disease may alleviate clinical and economic burden of MASH.

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GC4.295

Healthcare Resource Utilization and Incremental Costs Among Patients with Nonalcoholic Steatohepatitis and/or Metabolic Syndrome

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Introduction: Nonalcoholic steatohepatitis (NASH), also known as MASH, and metabolic syndrome (MetS) are associated with considerable morbidity and healthcare costs. However, little is known about the incremental cost of each condition to the other. The aim of this study is to quantify the incremental costs of patients with NASH and MetS.
Methods: Adults 18+ years at index with ≥1 diagnosis code for NASH, and/or ≥3 of 4 possible MetS conditions (T2D, Hypertension, Obesity, Hyperlipidemia/Hypercholesterolemia) within 1 year of each other, were identified in the Veradigm Integrated Dataset using electronic health records or claims, between 7/1/2018 and 8/31/2022. Patients with viral hepatitis, alcohol-use disorder or alcoholic liver disease, opioid disorders, cirrhosis, type 1 diabetes, gestational diabetes, or bariatric surgery were excluded. Patients had to have ≥12 months of continuous claims enrollment before (baseline) and after (follow-up) the index date. The index date was the latest NASH diagnosis or date when the 3rd MetS criteria was met. Patients were stratified into 3 cohorts: NASH-only, MetS-only, and NASH+MetS. Baseline patient characteristics and healthcare costs were described. We fit a generalized linear model using follow-up costs by excluding outliers (costs in top 1%), then controlling for disease cohort, age, sex, a modified Charlson comorbidity index (mCCI), and flag for index year of 2022, to estimate the per year all-cause healthcare costs and incremental cost of adding MetS to a NASH diagnosis (or vice versa). Incremental costs were estimated by changing from NASH-only or MetS-only to NASH+MetS and observing the change in cost.
Results: We identified 37,850 patients with NASH-only, 1,783,918 patients with MetS-only, and 18,906 patients with NASH+MetS. Mean (SD) age was 52.2 (14.7), 61.2 (13.5), and 57.8 (12.3) years for the NASH-only, MetS-only, and NASH+MetS cohorts, respectively. During the baseline, the NASH+MetS cohort had a higher mean (SD) mCCI score of 0.8 (1.3) compared to 0.5 (1.0) for NASH-only and 0.7 (1.2) for MetS-only. 9.0% of the NASH-only cohort had an inpatient admission during follow-up, with mean inpatient costs of $3,533, compared to 14.3% of the MetS-only cohort ($5,845) and 12.0% of the NASH+MetS cohort ($5,773). 25.7%, 27.3%, and 30.7% of the NASH-only, MetS-only, and NASH+MetS cohorts respectively had an emergency department visit during follow-up. The model-predicted mean total cost during follow-up was $12,563 for patients with NASH-only, $14,673 for patients with MetS-only, and $17,818 for patients with NASH+MetS. The incremental increase in costs of adding MetS to NASH was 10.1% (+$1,275). The incremental increase in costs of adding NASH to MetS was 15.1% (+$2,210).
Conclusion: Both NASH and MetS contribute to the high healthcare costs among patients with a dual diagnosis of NASH+MetS. Results from our analysis imply that NASH comprises a higher portion of total healthcare costs among patients with NASH and MetS.

GC4.296

The Efficacy of Lactobacillus on Body Fat Reduction: A Randomized, Double-Blind, Preclinical Trial

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Background: Recently, interest in dietary Lactobacillus with good potential for obesity treatment and prevention has been increasing. A randomized double-blind preclinical trial was undertaken to assess potential impacts on reducing body fat following 8 weeks of treatment.
Method: This study is 8 week parallel, randomized, double-blind, placebo controlled clinical trial designed to evaluate the anti-obesity property and safety of Lactobacillus in 45 overweight adults whose BMI were within 23kg/m^(2) to 30kg/m^(2). 45 subjects have been randomized in a 1:1:1 fashion to placebo, low dose (1 billion CFU/day) Lactobacillus treatment and high dose (10 billion CFU/day) Lactobacillus treatment group. During the test, they visited four times including screening. Body fat mass, body fat rate, anthropometric dimensions at waist and hip, waist-hip ratio(WHR), total cholesterol, triglyceride, low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C), free fatty acid(FFA), Leptin, Adiponectin were measured. Participants were assessed at baseline, 4 weeks and 8 weeks (end of therapy).
Results: At week 8, there were no significant differences in Body fat mass, BMI, Body weight, WHR among placebo, low dose and high dose groups, nor significant differences in triglyceride, total cholesterol, HDL, LDL, FFA, leptin, adiponectin. Body fat rate in low dose group was significant higher than high dose and placebo group after week 8 ($p = 0.008$).
Conclusion: Lactobacillus has shown the tendencies to reduce Body fat rate after 8-week treatment. Lactobacillus showed similar safety profile with placebo. I expect to confirm the significant anti-obesity property of Lactobacillus with long term clinical trials with bigger number of subjects based on these results in the future.

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Tab. 1. Comparison between and within each groups.

Table 1. Comparison between and within each groups (PP population)

Variable	Observed value				Change from baseline						
	placebo (n=15)	low dose (n=12)	high dose (n=14)	p value**	placebo	p value*	low dose	p value*	high dose	p value*	p value**
Body fat mass(%)											
visit 2	32.58±7.46	34.74±5.52	33.04±6.43	0.683[1)]							
visit 4	32.24±7.03	31.94±5.24	32.23±6.21	0.991[1)]	−0.34±1.34[a]	0.341[2)]	−2.80±2.13[a]	**0.001**[2)]	−0.91±1.44[a]	0.056[2)]	**0.008**[a]
BMI(kg/m²)											
visit 2	25.63±2.08	25.83±2.16	25.84±1.94	0.831[2)]							
visit 3	25.45±2.19	25.29±1.95	25.53±1.74	0.782[2)]	−0.19±0.56	0.220[2)]	−0.54±0.48	**0.005**[b]	−0.31±0.39	**0.018**[b]	0.176[1)]
visit 4	25.43±2.18	25.23±1.96	25.59±1.77	0.641[2)]	−0.20±0.65	**0.040**[b]	−0.61±0.70	**0.012**[b]	−0.24±0.40	0.050[2)]	0.267[2)]
Weight(kg)											
visit 2	67.85±10.28	69.76±6.88	72.11±11.93	0.684[2)]							
visit 3	67.44±10.64	68.40±6.26	71.28±11.38	0.796[2)]	−0.41±1.42	0.287[2)]	−1.36±1.38	**0.006**[b]	−0.84±1.06	**0.010**[b]	0.180[1)]
visit 4	67.35±10.72	68.28±6.54	71.41±11.46	0.722[2)]	−0.50±1.83	0.307[2)]	−1.48±1.74	**0.013**[b]	−0.70±1.17	**0.041**[b]	0.353[2)]
WHR											
visit 2	0.88±0.05	0.84±0.08	0.86±0.07	0.266[1)]							
visit 3	0.86±0.05	0.83±0.07	0.85±0.06	0.603[1)]	−0.02±0.05	0.086[2)]	0.00±0.05	0.780[2)]	−0.01±0.03	0.284[2)]	0.538[1)]
visit 4	0.86±0.05	0.82±0.07	0.84±0.08	0.375[1)]	−0.02±0.04	**0.026**[b]	−0.02±0.03	0.127[2)]	−0.02±0.04	0.091[2)]	0.993[2)]
Leptin											
visit 2	12317±8669	9801±6334	11177±8047	0.712[1)]							
visit 4	10708±7210	7963±3729	10665±6364	0.435[1)]	−1609±3998	0.141[2)]	−1839±4403	0.176[2)]	−513±4922	0.703[2)]	0.711[1)]
Adiponectin											
visit 2	4843±2573	5072±2922	5561±2315	0.753[1)]							
visit 4	5193±2492	5501±2945	5240±2410	0.940[1)]	350±780	0.104[2)]	429±1079	0.196[2)]	−322±2165	0.588[2)]	0.584[2)]

Shapiro-Wilk's test was employed for test of normality assumption.
[1)] P values were derived from compared within each group.
[2)] P values were derived from compared between groups.
[a] ANOVA (Post hoc : Bonferroni test)
[b] Welch ANOVA (Post hoc : Dunnett's T3 test)
* Kruskal Wallis test
** paired t test.

GC4.297

Swedish translation and cultural adaptation process of the Satter Eating Competence Inventory 2.0TM

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Introduction: The 16-item Satter Eating Competence Inventory 2.0TM (ecSI 2.0TM) indicates level of eating competence, a construct focus on eating attitudes, contextual eating skills, acceptance of food, and internal regulation of food intake (1). Survey use is restricted to approved applications to the Ellyn Satter Institute. The study aimed to translate from English and adapt the ecSI 2.0TM into a culturally sensitive Swedish version.

Methods: The ecSI 2.0™ was translated using a systematic multistep approach prescribed by the Ellyn Satter Institute. Two Swedish-speaking healthcare professionals and researchers unfamiliar with ecSI 2.0™ translated each item from English into Swedish with the aim of retaining its contextual, cultural, and semantic meaning, rather than translating verbatim. Translated items were reviewed together with a Swedish-speaking adjudicator (dietitian/researcher) familiar with ecSI 2.0™. Next, the proposal was pretested by six Swedish-speaking healthcare professionals with experience in treating patients with obesity, diabetes or conducting research. Based on the pretest results, the translators and adjudicator reviewed the statements, made suggested changes, and agreed to a preliminary version. This version was back-translated into English by a Swedish-speaking nutritionist and researcher unfamiliar with the ecSI.20TM. Subsequently, the back-translated subscale was submitted to the Ellyn Satter Institute for a review of the literal and subjective meanings of the items. Based on this feedback, a new round of the translation process was initiated for items not acceptably translated. The process was repeated until a final agreement was reached.

Results: The process of translating and culturally adapting the Swedish version of the ecSI 2.0TM instrument was initiated in May 2023 and concluded in November 2023. Pretesting identified suggestions and ideas for items regarding culturally and contextually adapted wording that are suitable for patients in clinical practice. However, there were linguistic discrepancies and nuances that required consideration, such as definition of food variety and attitudes towards eating enough. Of the 16 items, eight required only one round of translation; three needed two rounds, and four items required up to four rounds. One item related to the contextual skills of the plan for feeding oneself required six rounds before a final agreement was reached.

Conclusion: Adequate time and personnel were required to achieve an acceptable translation of the ecSI 2.0TM. A culturally and linguistically appropriate translation in Swedish is now available upon request from the Ellyn Satter Institute (2). Continued research to affirm face validity and additional psychometric analyses is suggested.

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GC4.298

Changes in appetite ratings and gastrointestinal hormones after ketogenic vs non-ketogenic low-energy diets in females with lipedema – a randomized controlled trial

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Introduction: Diet-induced weight loss is usually followed by increased concentrations of the hunger hormone ghrelin and subjective hunger ratings. Ketogenic diets have been shown to suppress this response, which could increase compliance with energy-restricted diets. However, most studies have been done with very-low energy diets.
Objectives: The primary objective of this study was to compare change in basal plasma concentrations of acylated ghrelin after a ketogenic versus non-ketogenic low-energy diet (LED) in females with lipedema. Secondary objectives were to determine potential differences between diets in the changes in plasma concentrations of total peptide YY (PYY), cholecystokinin (CCK), and glucagon-like peptide 1 (GLP-1) as well as subjective ratings of appetite over time.
Methods: Females with obesity and lipedema were randomized (1:1, stratified for BMI categories) to either ketogenic or non-ketogenic isocaloric LED (1200 kcal/day for both; 75 vs. 180 g carbohydrates/day) for 8 weeks. Basal and postprandial (incremental area under the curve (iAUC)) plasma concentrations of acylated ghrelin, PYY, CCK, and GLP-1, together with subjective ratings of appetite (hunger, fullness, desire to eat (DTE) and prospective food consumption (PFC)), were assessed at baseline and after the intervention. Intention-to-treat analysis was performed using linear-mixed effect models.
Results: A total of 70 females (35 in each group, age 47 ± 11 years, BMI 37 ± 5 kg/m^2) were included in the analysis. The keto group experienced a greater weight loss compared to the non-keto group (-2.8 kg, 95 % CI: -4.1 to -1.0, P < 0.001). No change in basal plasma concentrations of acylated ghrelin was seen in either the keto or non-keto groups (-1.4 pg/mL, 95% CI -38.7 to 36.0, P = 0.942 and 5.0 pg/mL, 95% CI: -34.0 to 44.0, P = 0.803, respectively), with no difference in change between groups (-6.3 pg/mL, 95% CI: -55.4 to 42.7, P = 0.800). Both groups experienced a reduction in postprandial CCK concentrations. No changes, or differences between groups, were found for postprandial acylated ghrelin, PYY or GLP-1. An increase in subjective ratings of hunger in the fasting state, and a reduction in postprandial PFC, was seen in the non-keto group only, despite both groups reporting an increase in postprandial fullness ratings.
Conclusion: Despite no change in basal concentrations of acylated ghrelin in either group over time, a ketogenic LED can suppress the increase in subjective ratings of hunger otherwise seen with weight loss. This might have contributed to the larger weight loss observed in the keto group.

GC4.299

Changes in glucose and insulin metabolism following ketogenic vs. non-ketogenic low-energy diets in females with lipedema

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Introduction: Ketogenic diets have been suggested as a potential treatment option for females with lipedema, possibly through a reduction in insulin plasma concentrations and insulin resistance. Randomized controlled trials investigating the effect of ketogenic diets on glucose and insulin metabolism in females with lipedema are lacking.
Objectives: The primary objective of this study was to compare changes in basal concentrations of glucose and insulin, in serum and plasma, respectively, after a ketogenic versus non-ketogenic low-energy diet (LED) in females with lipedema. Secondary objectives were to determine potential differences between diets in the changes in HOMA-IR, an index of insulin resistance, and basal and postprandial plasma concentrations of glucose-dependent insulinotropic polypeptide (GIP) and c-peptide.
Methods: Females with obesity and lipedema were randomized (1:1, stratified for BMI categories) to either ketogenic or non-ketogenic isocaloric LEDs (1200 kcal/day for both; 75 vs. 180 g carbohydrates/day) for 8 weeks. Basal and postprandial (incremental area under the curve (iAUC)) plasma concentrations of glucose, insulin, GIP, and c-peptide were measured before and after the intervention. HOMA-IR was calculated using the formula: basal insulin (µU/L) x basal glucose (mmol/L)/22.5. Intention-to-treat analysis was performed using linear-mixed effect models.
Results: A total of 70 females (35 in each group, age 47 ± 11 years, BMI 37 ± 5 kg/m^2) were included in the analysis. The keto group experienced a greater weight loss compared to the non-keto group (-2.8 kg, 95 % CI: -4.1 to -1.0, P < 0.001). Both keto and non-keto groups had a reduction in basal glucose concentrations (-0.46 mmol/l, 95% CI -0.64 to -0.3, P<0.001, and -0.2 mmol/L, 95% CI: -0.4 to -0.0, P=0.022, respectively), despite larger in the keto group (P=0.031), c-peptide (-0.2 nmol/L, 95 % CI: -0.3 to -0.1, P<0.001, and -0.1 nmol/L, 95% CI: -0.2 to -0.0, P=0.007, respectively), and insulin (-196.3 pg/mL, 95% CI: -300.0 to -92.7, P<0.001 and -159.9 pg/mL, 95% CI: -269.2 to -50.6, P=0.004, respectively), with no difference in change between groups (P=0.232 and P=0.625, respectively) A significant increase in postprandial glucose (103.1 mmol/L*min, 95% CI: 69.7 to 136.4, P<0.001), c-peptide (37.9 nmol/L*min, 95 % CI: 8.6 to 67.2, P=0.011) and GIP (1552 pM*min, 95% CI: 532.2 to 2573.4, P=0.003) were observed in the keto group only. No change or difference between groups were found for basal or postprandial concentrations of GLP-1.

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Conclusion: Both LEDs led to improvements in glucose/insulin metabolism, however, the keto group was associated with additional benefits. This probably contributed to the superiority of the keto diet in terms of weight loss and lipedema management.

GC4.300

Effect of sweeteners and sweetness enhancers on weight loss maintenance in adults and children with overweight or obesity – results from the SWEET multicentre, randomised, controlled, trial

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Introduction: The role of sweeteners and sweetness enhancers (S&SEs) in appetite and body weight regulation is still heavily debated. The aim of this randomised controlled trial (RCT) was to investigate if prolonged consumption of S&SEs within a healthy sugar-reduced diet could improve weight loss maintenance after rapid weight loss, as well as benefit risk markers for type-2-diabetes (T2D) and cardiovascular diseases (CVD) compared to no S&SE consumption.
Method: SWEET (Sweeteners and sweetness enhancers: Prolonged effects on health, obesity and safety) was a 1-year multicentre RCT including 341 adults with overweight or obesity (18-65 years, body mass index (BMI) ≥25 kg/m^2) and 38 children with overweight (6-12 years, BMI-for-age>85th percentile) recruited at centres in Denmark, Spain, Greece, and The Netherlands (clinicaltrials.gov NCT04226911). In an initial 2-month period, adults consumed a low-energy diet with the aim to achieve ≥5% weight loss. In the following 10-month period, participants were randomised to a healthy ad libitum diet with <10 energy-% added sugar and with (S&SE group) or without (Sugar group) S&SE products. Clinical investigation days were performed at baseline and after 2, 6, and 12 months. The primary outcome was change in body weight in adults after 1 year. Secondary outcomes included changes in BMI-for-age z-score in children, anthropometry, risk markers for T2D and CVD, subjective appetite sensations and appetite hormones (Kjølbæk et al 2022).
Results: As planned, intake of sugar-rich products decreased in both groups, but significantly more in the S&SE than in the Sugar group (p=0.002). In addition, intake of S&SE products increased in the S&SE group and decreased in the Sugar group (p<0.0001). The intention-to-treat analyses in adults (n=277) showed a slightly better weight loss maintenance after 1 year in the S&SE compared with the Sugar group (1.6±0.7 kg, p=0.029). Risk markers for T2D and CVD were not different between groups (completers analyses, n=203). Subjective appetite sensations and appetite hormones in a sub-group (n=104) did also not differ. Childrens' BMI-for-age z-score and other outcomes were not influenced by the interventions (completers analyses, n=22).
Conclusion: These results suggest that including S&SE products in a healthy ad libitum sugar-reduced diet can improve weight loss maintenance in adults compared with no S&SE products without influencing risk markers for T2D and CVD. No differences were observed in children, possibly due to the limited number of participants.

Reference

Kjølbæk L et al. Protocol for a multicentre, parallel, randomised, controlled trial on the effect of sweeteners and sweetness enhancers on health, obesity and safety in overweight adults and children: the SWEET project. BMJ Open 2022 Oct 12;12(10):e061075. doi: 10.1136/bmjopen-2022-061075.

GC4.301

Weigh more, lose less bone

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Background: Several reports indicated that intentional weight loss can result in reduction in bone mineral density (BMD), particularly in post-menopausal women, and older individuals. This is a post-hoc analysis of a prospective multidisciplinary weight loss trial, in search of predictors of bone loss in the Metabolic Syndrome (MS).
Methods: 73 MS subjects (ATPIII criteria; F/M=34/39) participated in a 1-year intensive multidisciplinary treatment, based on personalized physical training and a low calorie/high protein Mediterranean diet. Baseline (±SD): age 53.3±11.2 years; weight 98.6 kg ± 16.8; BMI 34.4 ±3.8 kg/m^2; lean body mass (LBM) 55.48Kg±11.66Kg; Spine BMD 1.21± 016 g/cm^2, femur neck BMD 0.99±0.13 g/cm^2.
Results: By the end of 1-year BMI declined by 9.1% (p<0.001); LBM declined by 2.68% (p<0.001). There were no significant overall changes in spine or femur BMD; no difference in the change in BMD between participants under the age of 50 years or above 51 years, and between male and female subjects. Despite the lack of overall change in BMD during weight loss, when individual changes in spinal BMD were analyzed, participants who clustered above the median post-treatment vs. pre-treatment BMD level, showed a higher initial BMI compared to participants whose change in spinal BMD was below the median level (BMI 35.6±3.6 vs. 32.5±3.52 kg/m^2, respectively (p<0.0001).
Conclusion: In subjects with MS undergoing intensive and closely supervised multidisciplinary intentional 1 year weight loss program, higher initial weight is associated with lesser spine bone loss.

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GC4.302

Effect of different types of yerba mate on energy expenditure and substrate utilization in healthy adults

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Introduction: Yerba Mate (Ilex paraguariensis) is a prominent plant. Its consumption dates back many centuries, but its health benefits and effects have only recently been studied. Yerba Mate (YM) is a traditional South American brew. It is a common drink in Argentina, Paraguay, Uruguay, Brazil, Syria, and Lebanon. Its consumption has the potential to increase energy expenditure (EE). It has many positive effects on the body. Its leaves have high antioxidant activity associated with numerous biologically active components, such as polyphenols, antioxidants, xanthine alkaloids, and flavonoids. Its consumption helps decrease blood cholesterol levels and protect the liver. Furthermore, it may protect against cardiovascular disease and obesity. In addition, yerba mate extract showed antimicrobial properties against specific bacteria. The aim of this study is to explore the impact of different types of YM consumption on EE, exercise efficiency (DE), and fat oxidation of healthy active adults in low to moderate intensity physical activity corresponding to everyday life.
Methods: 18 healthy active adults (50% women, age 22.4 ± 4.3 years, BMI 25.7 ± 5.8 kg/m^2) were recruited. Each participant performed the test on four separate occasions. In each session, participants came to the laboratory after 12 h of fasting, had their basal metabolic rate measured for 30 min, and then were randomly assigned to receive one of the following four treatments: water, roasted yerba mate drink (RYM), green yerba mate drink (GYM), or caffeinated water (WC). After 60 min, EE and substrate oxidation were measured for 30 min by face-mask indirect calorimetry. They then started pedaling on the ergocycle for 5 minutes at each of the following intensities (20, 40, 60, and 80 W). The determination of the total phenolic content of YM will be done through the utilization of the Folin-Ciocalteu reagent in conjunction with chlorogenic acid as a reference standard. Theobromine, caffeine, rutin, and quercetin will be quantified using high-performance liquid chromatography (HPLC).
Results: This study is still ongoing. Preliminary analysis (n=18) shows that DE was significantly higher after drinking GYM (26.4%) than after drinking RYM (23.4%) and WC (24.1%) with no EE differences among treatments. In addition, the rates of fat oxidation, assessed by the respiratory quotient, were significantly lower after drinking water than other drinks (P<0.05). Results comparing participants with normal weight and those with overweight will be presented at the congress.
Conclusion: In terms of substrate oxidation, all caffeinated drinks showed better results than water alone. GYM seems to be associated with improved DE, possibly due to the higher levels of stimulants or other beneficial compounds. This drink could positively contribute to endurance training and overall exercise performance in healthy individuals.

GC4.303

Chrono-Nutritional Patterns, Medical Comorbidities, and Psychological Status in Patients with Severe Obesity

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Chrono-nutrition studies dietary habits and their role in the onset of metabolic diseases. The aim of this study is to describe chrono-nutritional patterns based on the analysis of the eating habits of patients with severe obesity during the 24-h cycle and investigate a possible relationship between these profiles, the comorbidities, and the psychological status. From the overall evaluation of the chrono-nutritional profiles of 173 patients with severe obesity, four predominant eating patterns were obtained with a refined statistical model. A regression analysis was performed to determine the relationship between chrono-nutritional patterns, medical comorbidities, and psychological status. Profile 1 was the most frequent (46.2%) and characterised by the regular presence of the three main meals. The distribution of the chrono-nutritional profiles did not vary with BMI. Chrono-nutritional profiles affected predominantly psychological variables, with lower performances among chrono- nutritional profiles 3 (to eat during all the 24-h, with nibbling and snacking also during the night) and 4 (like the fourth but without night-eating). This finding could be useful in the assessment and treatment of patients with obesity, allowing the identification of patients with a higher probability of suffering from a psychopathological condition simply by knowing the patients' dietary profiles.

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GC4.304

Management of obesity in a patient with X-linked spondyloepiphyseal dysplasia Tarda: what's our strategy?

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Introduction: Spondyloepiphyseal dysplasia tarda (SEDT; SEDL) is a rare hereditary skeletal disorder caused by mutations in a gene on the short arm of the X chromosome. Inherited as an X-linked recessive disorder, typically only males will develop SEDT. This report outlines key nutrition issues and management strategies that must be considered during the optimal care of patients living with Spondyloepiphyseal Dysplasia Tarda.
Case: A thirty-nine-year-old male patient presented for an appointment at the diabetes and nutrition department of our clinic on November 10, 2023, complaining of weight gain, fatigue, insomnia, mood swings, pain, and stiffness at both knees. The patient is a known case of Spondyloepiphyseal Dysplasia Tarda with a family history of cardiovascular disease and Hashimoto's Thyroiditis. He is a smoker, denies consuming alcohol, and makes daily dietary choices involving large quantities of carbohydrates and saturated fats. Experiencing joint pain and muscle fatigue has led him to abandon the idea of engaging in any form of physical activity. Clinical examination revealed disproportionate short stature -154 cm, an arm span significantly greater than height, an upper-to-lower body segment ratio of

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0.85, a weight of 86 kg with a BMI of 36.3 kg/m^2, and increased deposition of abdominal fat. Abdominal ultrasound showed a suggestive aspect for fatty liver disease. The lipid profile revealed increased levels of total cholesterol -250 mg/dl, LDL-cholesterol -150 mg/dl, and triglycerides 250 mg/dl. Fasting blood glucose and glycated hemoglobin were normal, and the HOMA index was 3.5. The levels of thyroid and cortisol hormones were normal in the general laboratory examination. The orthopedic doctor diagnosed osteoarthritis in both knees and recommended delaying joint replacement as much as possible.
Management: In contrast to the majority of the population, which can rely on physical exercise as an affordable option for reducing weight and cardiovascular risk, the main strategy in people diagnosed with SEDL consists of a proper nutrition plan. In this particular case, we prescribed a low-carb diet of approximately 1500 calories, focusing on vegetables, lean proteins, unsaturated fats and whole grains. Furthermore, we recommended our patient to quit smoking and referred him for psychological counseling. Treatment with a low dose of a statin rosuvastatin 10 mg and oral vitamin D supplementation to correct the deficiency was initiated. The 3-month follow-up showed modest to moderate weight loss, leading us to prescribe once-daily liraglutide injection in addition to the nutrition plan and mental health support. The 6-month reevaluation of the patient shows significant progress in weight status (current weight of 76 kg), sleep quality, a considerable reduction in knee pain, and active involvement in social life.
Conclusion: This case highlights the need for a holistic approach in the nutrition management of patients living with Spondyloepiphyseal Dysplasia. Advances in skeletal dysplasia nutrition knowledge are still needed to optimize broader health outcomes.

Conflict of Interest: None Disclosed

Funding: No funding to report

GC4.305

The effectiveness of different dietary interventions for long-term weight loss maintenance following bariatric surgery: a systematic review

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Introduction: Weight regain (WR) is common following bariatric surgery (BS) and contributes to suboptimal health outcomes. Following BS, some people access additional support from community-based weight management programmes. An important factor for avoiding WR is post-operative dietary adherence. However, effective dietary interventions for promoting long-term weight loss maintenance (WLM) are unclear, particularly >12 months post-surgery. Optimal dietary interventions must also ensure nutritional adequacy considering the malabsorptive procedures involved. The primary aim of this paper was to systematically review the literature for studies investigating effective dietary interventions to support long-term WLM following BS. This aim was met through two objectives, (1) to synthesise all published primary research on dietary interventions for WLM following BS, and (2) to identify the most effective dietary interventions for long-term WLM following BS.
Methods: Embase, PubMed and Scopus were searched for studies involving adults aged ≥18 years that assessed associations between any dietary intervention and weight outcomes >12 months post-BS. Risk of bias was assessed using Cochrane RoB 2 and ROBINS-I. Findings were presented for individual studies and synthesised according to dietary intervention.
Results: 7284 articles were identified after deduplication, 70 were sought for full text screening, and six were eligible for inclusion (one randomised controlled, one randomised, one controlled pilot, one non-randomised controlled, one pre-post intervention and two observational studies). Sample sizes ranged from 11-40, totalling 153 participants. Intervention length ranged from two to six months. One study was considered low risk of bias, three were moderate/of some concern, and two were serious. All studies reported significant weight loss following dietary intervention. A single, high-quality study provides evidence for the efficacy of a low-carbohydrate, high-protein dietary intervention for long-term WLM following BS, whilst supporting optimal post-operative macronutrient intake. Weight loss was accounted for entirely by fat mass loss (p=.021) and accompanied a slight, non-significant, increase in fat-free mass (p=.188). The efficacy for other dietary approaches is uncertain due to considerable heterogeneity and methodological flaws.
Conclusion: For long-term WLM following BS, the strongest evidence supports a low-carbohydrate, high-protein diet possibly due to beneficial effects on body composition (decreasing fat mass whilst maintaining fat-free mass). Findings to support other interventions are preliminary. Methodological heterogeneity reduces the power of reported findings and highlights the need for high-quality future research. Given the importance of overall nutritional adequacy, further research in this area is needed. The role of community-based weight management programmes in supporting people post BS is yet to be explored and is an area of future interest.

GC4.306

Low muscle mass and sarcopenic obesity and their relation to comorbidities in a population with class II/III obesity: a study on the diagnostic criteria of the EASO/ESPEN consensus guidelines

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Introduction: In sarcopenic obesity (SO), sarcopenia (low muscle mass and function) coincides with obesity, leading to a distinct condition. SO has been associated with an increased risk of comorbidities such as type 2 diabetes and hypertension. Recently, a ESPEN/EASO consensus on SO has been published.[1] This study aimed to assess the prevalence of low muscle mass and SO in relation to comorbidities using these diagnostic criteria.
Methods: This prospective cross-sectional study included participants with a BMI above 35 kg/m² and an age between 18 and 65 years. Study measurements included handgrip strength (HGS) and a dual-energy X-ray absorptiometry (DXA) scan to define SO. The prevalence is studied as well as differences in participants with or without low muscle mass, and with and without SO-related comorbidities.
Results: Using the diagnostic consensus criteria, the prevalence of SO was 0 – 1.2%, depending on cut-off levels for HGS. Using only DXA-derived estimates of SO, the prevalence of low muscle mass was 54.8%. Participants with low muscle mass were older (49 vs. 43 years), had a higher HbA1c (40.5 vs. 36 mmol/mol), a higher fat percentage (45 vs. 41%) and a lower hand grip strength (42 vs. 32 kg) compared to those with normal-to-high muscle mass. Participants with SO-related comorbidities (i.e. diabetes and/or hypertension) were older (52 vs. 44 years), had a higher HbA1c (42 vs. 37 mmol/mol), a larger waist circumference (127 vs. 119 cm), a lower fat percentage (41 vs. 45%), a higher estimated visceral adipose tissue (VAT; 931 vs. 797 grams) and more sleep apnoea (29 vs. 5%).
Conclusion: The diagnostic ESPEN/EASO criteria failed to identify SO, while a low muscle mass was highly prevalent in this population. Moreover, the presence or absence of SO-related comorbidities did not identify low muscle mass but rather visceral adiposity as the driving force in hypertension and/or diabetes in patients with class II/III obesity.

Reference

1. Donini LM, et al. Definition and diagnostic criteria for sarcopenic obesity: ESPEN and EASO consensus statement. Clin Nutr (2022) 41:990–1000. doi: 10.1016/j.clnu.2021.11.014

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GC4.307

Gender-related differences in weight loss induced by a Very Low Calorie Ketogenic Diet protocol

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Background: Sex-related biological factors and sociocultural gender aspects influence weight loss. However, most dietary intervention studies never explored gender-related outcomes. Investigating whether very low calorie ketogenic diet (VLCKD) outcomes differ between men and women is important for developing gender-specific programs of precision nutrition. Differences in outcomes after weight loss have been reported previously, with men commonly losing more body weight and adipose tissue than women.
Aim: We aimed to compare anthropometric and metabolic effects of a VLCKD nutritional program for six weeks in a cohort of men and women.
Materials-Methods: 72 patients with obesity and insulin resistance [22 males and 50 females, HOMA index ≥ 2.5, age 55.6±6.7 years, BMI 35.23±4.1 kg/m^2] were consecutively selected among those referring to our nutrition center, followed a VLCKD for 6 weeks (≤800 kcal/day). Anthropometric indexes, blood and urine chemistry, including parameters of renal, hepatic, glucose and lipid metabolism were evaluated.
Results: At baseline, as expected, male patients showed a higher weight (104.5±13.5 kg) than female patients (94.4±11.7 kg, p=0.002), as well as a higher waist circumference (112.5±7.3 cm vs 102.5±8.7, p=0.001). At baseline, 45.5% of men and only 8% of women suffered from type 2 diabetes mellitus (p=0.001). Male patients showed higher fasting insulin (17.75 μU/mL) and HOMA index (4.7) values than female patients (p=0.007 and p=0.022, respectively). Body weight (-8.6±2.6, p<0.001), BMI (-3.2±1.0, p<0.001), waist circumference (-7.3±3.2, p<0.001), total and low-density lipoprotein cholesterol (-38.1±22.6, p<0.001; -30.3±24.1, p<0.001 respectively] and triglycerides (-38.3±37.9, p<0.001) markedly decreased in female participants during the VLCKD. Also, a significant reduction in body weight (-10.2±3.0, p<0.001), BMI (-3.3±09, p<0.001), waist circumference (-7.1±2.7, p<0.001), total and lowdensity lipoprotein cholesterol (-49.6±37.7, p<0.001; -34.5±21.9, p<0.001, respectively) and triglycerides (-56.5±104.3, p<0.001) was observed in male participants. When comparing groups, it was found that males lost 1.65±0.72 kg more than females (CI 95% [0.21;3.1],p=0.025). There was also a greater reduction in systolic and diastolic blood pressure in the male group (-7,2±3,4 mmHg, p=0,044; -7,3±2,8 mmHg, p=0,016 respectively). Finally, a greater reduction in fasting insulin (-8,3±3,4 μU/mL, p=0,023) and HOMA index (-2,9±1,3, p=0,046) was observed in the male group at the end of VLCKD.
Conclusions: Six weeks of VLCKD were accompanied by significant improvements in anthropometry, blood pressure, and metabolic profile in women and men with obesity and insulin resistance. Men lost significantly more body weight than women and showed a higher reduction in HOMA index, fasting insulin, and blood pressure. This is the first study showing significant gender-related differences in the effects of a VLCKD.

GC4.308

Are hypocaloric, Mediterranean diets prescribed for weight loss interventions also sustainable according to the EAT-IT reference diet?

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Introduction: Growing evidence underline the need to promote healthy diets and that, at the same time, have a low environmental impact. The EAT-IT reference diet (Tucci M et al, 2022) has been proposed as a Mediterranean dietary pattern in line with the EAT-Lancet Commission adapted to the Italian food habits; however, it is not yet known how to adapt such a model to hypocaloric dietary interventions. Aim of this study is to investigate how patients' characteristics seeking a weight-loss intervention could influence the adherence to the EAT-IT and to analyze at the food-groups level historical diets prescribed at the ICANS center in Milan.
Methods: We included a total of 4032 patients (72% females, aged 49 (39,57) years, BMI 29 (26, 33) kg/m^2). All the 4032 prescribed diets were hypocaloric (total energy prescribed / basal metabolic ratio = 1.04) and based on Mediterranean dietary pattern (51% carbohydrates, 31% lipids, 0.9 g/kg body weight of proteins, 17 g/1000 kcal of fibers), according to the Italian dietary guidelines (SIO-ADI 2016-2017).
Results: Linear regression model shows how diets prescribed to male were less adherent the EAT-IT than the females ones (-2.6% (CI:-3.3,-2.0); p<0.001). A small but significant effect of BMI on % of adherent food groups on overall food groups was detected in the linear model (0.4% (CI: 0.1, 0.7); p=0.005). The calculated EAT-IT adherence score show as only 44% of food groups included in the prescribed diets were adherent to EAT-IT: 20% of food groups prescribed are not included in the EAT-IT (eg.canned fish), and the most frequent group that resulted outside the EAT-IT diet limits were protein source (legumes 26%, fish 13%, red meat 13%), followed by vegetable oil (12%), and fresh fruits (11%). In particular, legumes were included in all analyzed diet (99%), but respected the amount expected in the EAT-IT diet in <0.1% cases, with other protein sources following a similar pattern. Vegetable oil and fresh fruits were adherent in a few more cases (11% and 17%, respectively). Complex carbohydrate sources (25% overall: 13% bread, and 12% pasta and cereals) and vegetables (21% overall: 11% leaf salad, and 10% fresh vegetables) were the most frequent food groups that resulted adherent to the EAT-IT diet.
Conclusion: The type of non-adherent foods underline the critical issue of protein sources in an hypocaloric diet, where protein density can be an issue. The need to reduce calorie is reflected in sex differences and in BMI effect, besides lower amount of vegetable oil and the high adherence by cereals. The aim of increasing micronutrients intake while consuming less food resulted in low adherence of fruits and high adherence of vegetables. These results show how hypocaloric diets currently prescribed struggle to meet the sustainability requirements described in the EAT-IT diet, and work is needed to reconcile the two models in order to prescribe both sustainable and hypocaloric dietary interventions.

Reference

Tucci M, et al. The Environmental Impact of an Italian-Mediterranean Dietary Pattern Based on the EAT-Lancet Reference Diet (EAT-IT). Foods. 2022 Oct 25;11(21):3352. doi: 10.3390/foods11213352.

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GC4.309

Impact of ketogenic diet treatment on taste thresholds and anthropometric parameters of people with severe obesity: a pilot study

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Introduction: We know how obesity correlates with several metabolic disorders that exacerbate the condition, including a decreased ability to perceive taste stimuli such as sweet the salty. Several dietary models have been applied for the management of ponderal decline with different results. The Mediterranean diet has been shown to be an approach that can improve all metabolic parameters, anthropometric and improve the gustatory perception of salty after 4 weeks of treatment. In recent years, in addition to the Mediterranean approach, the very low calorie ketogenic diet, an approach that aims to mimic a fasting state with the production of ketone bodies, is increasingly being used. Studies show that VLCKD is able to bring about greater weight loss in the patient with obesity than the Mediterranean diet. For anthropometric and metabolic parameters, diet-induced ketosis has also been seen to bring about improvements. Given the increasing use of this dietary approach, the impact that VLCKD may have on the altered taste perception of people with obesity remains little explored. The aim of this pilot study is to evaluate how the impact of 4 weeks of nutritional rehabilitation with VLCKD on both the hematochemical and anthropometric parameters and the gustatory aspects of sweet and savoury.
Method: In this study, 14 people with severe obesity who underwent a 4-week residential nutritional rehabilitation were evaluated. The effect of the active phase of a VLCKD was evaluated. An ISO13301:2018 (E) methodology, i.e., 3-Alternative-Forced-Choice (3-AFC), was used to determine the taste thresholds of the sample.
Result: On the small number of people recruited to date, we recorded no significant change in taste thresholds (sweet and savoury) after 4 weeks of treatment with VLCKD. Instead, we confirmed the ameliorative effect of Mediterranean diet on salt thresholds. Instead, we were able to observe an improvement in anthropometric and hematochemical parameters, as expected, in people on the ketogenic diet.
Conclusion: The lack of change in taste thresholds following ketogenic treatment may be related to the nature of the replacement meals used during diet therapy. In fact, the content of flavouring, flavour enhancers may interfere with the modulation of the taste transduction mechanism jump. Certainly, future studies, on a larger population, will need to explore more the role of the ketogenic diet, carried out not only with formulated foods but also with natural meals, on the taste thresholds of people with obesity.

GC4.310

Sunflower seed extract supplementation reduces body fat in adults with obesity: A double-blind, randomized, placebo-controlled trial

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Introduction: Obesity is an important public health problem and socio-economic burden. We hypothesized that an intake of sunflower seed extract (SUN-CA) would decrease body fat and then investigated the effects and safety of SUN-CA intake on body fat in adults with obesity as an option for obesity treatment.
Methods: In this double-blind, randomized, placebo-controlled study, 100 adults with body mass indices of 25 to 31.9 kg/m² were assigned to groups that received SUN-CA (n = 50) or a placebo (n = 50) and received 1 tablet/day containing 500 mg of SUN-CA or the placebo over a 12-week period. The primary endpoint was the change in mass and percentage of body fat.
Results: The group that received SUN-CA daily showed decreases in body fat mass greater than those in the placebo group (−0.9 ± 1.8 kg vs. −0.1 ± 1.4 kg, P =.043). In addition, body weight, body mass index, and hip circumference improved after the intake of SUN-CA relative to the changes

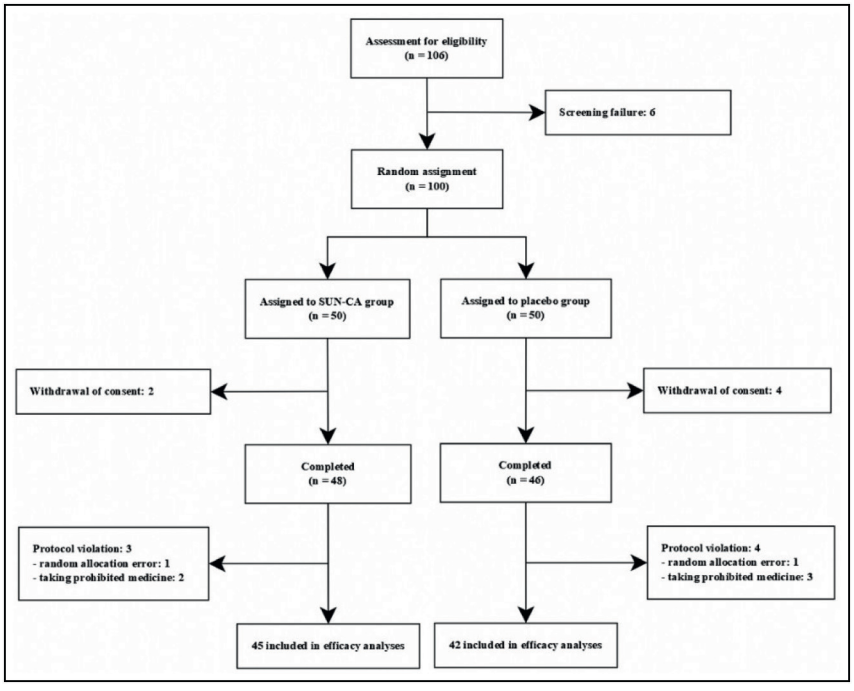


Fig. 1. Flow chart of the study participants.

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Tab. 1. Changes in anthropometric outcomes at baseline and the 12-week follow-up exam in adults with obesity.

Table - Changes in anthropometric outcomes at baseline and the 12-week follow-up exam in adults with obesity.

		SUN-CA (n = 45)	Placebo (n = 42)	*P* between groups
Fat mass (kg)	Baseline	27.0 ± 4.9	25.2 ± 4.7	0.085
	12-week	26.1 ± 5.3	25.1 ± 4.6	0.370
	Change from baseline	−0.9 ± 1.8	−0.1 ± 1.4	**0.043**
	P compared with baseline	**<0.001**	0.595	
Fat percentage (%)	Baseline	38.1 ± 7.3	36.0 ± 6.6	0.176
	12-week	37.4 ± 8.0	36.1 ± 6.5	0.392
	Change from baseline	−0.6 ± 1.8	0.1 ± 1.3	0.074
	P compared with baseline	**0.024**	0.669	
Body weight (kg)	Baseline	75.2 ± 8.6	74.1 ± 10.1	0.368
	12-week	73.2 ± 7.9	73.4 ± 10.3	0.696
	Change from baseline	−2.0 ± 2.2	−0.7 ± 1.9	**0.012**
	P compared with baseline	**<0.001**	**0.022**	
Body mass index (kg/m²)	Baseline	27.6 ± 1.8	27.1 ± 1.7	0.129
	12-week	26.9 ± 1.8	26.8 ± 1.7	0.628
	Change from baseline	−0.70 ± 0.8	−0.27 ± 0.7	**0.016**
	P compared with baseline	**<0.001**	**0.017**	
WC (cm)	Baseline	90.4 ± 6.2	89.8 ± 7.0	0.706
	12-week	87.5 ± 5.3	88.0 ± 7.2	0.721
	Change from baseline	−2.8 ± 3.8	−1.8 ± 3.5	0.126
	P compared with baseline	**<0.001**	**0.002**	
HC (cm)	Baseline	101.0 ± 3.8	99.5 ± 4.6	0.113
	12-week	98.8 ± 3.9	98.9 ± 4.6	0.918
	Change from baseline	−2.2 ± 2.3	−0.7 ± 2.6	**0.043**
	P compared with baseline	**<0.001**	0.107	
WC/HC ratio	Baseline	0.89 ± 0.05	0.90 ± 0.05	0.775
	12-week	0.89 ± 0.04	0.89 ± 0.06	0.750
	Change from baseline	−0.01 ± 0.03	−0.01 ± 0.03	0.839
	P compared with baseline	0.078	**0.006**	
Lean body mass (kg)	Baseline	44.6 ± 8.8	45.4 ± 9.2	0.763
	12-week	44.2 ± 8.8	45.1 ± 9.2	0.802
	Change from baseline	−0.5 ± 1.0	−0.3 ± 0.9	0.658
	P compared with baseline	**0.003**	**0.032**	
Abdomen, total fat (cm²)	Baseline	394.1 ± 75.2	367.5 ± 57.8	0.070
	12-week	381.2 ± 80.6	364.3 ± 60.7	0.275
	Change from baseline	−12.9 ± 31.8	−3.3 ± 29.9	0.372
	P compared with baseline	**0.009**	0.483	
Abdomen, VF (cm²)	Baseline	128.6 ± 41.4	131.4 ± 37.3	0.560
	12-week	122.9 ± 42.1	122.7 ± 36.0	0.693
	Change from baseline	−5.8 ± 22.9	−8.7 ± 21.1	0.838
	P compared with baseline	0.098	**0.010**	
Abdomen, SF (cm²)	Baseline	265.4 ± 65.5	236.1 ± 54.7	**0.026**
	12-week	258.3 ± 72.1	241.5 ± 55.2	0.229
	Change from baseline	−7.1 ± 23.5	5.4 ± 35.5	0.193
	P compared with baseline	**0.047**	0.326	
Abdomen, VF/SF ratio	Baseline	0.52 ± 0.22	0.60 ± 0.26	0.180
	12-week	0.53 ± 0.31	0.54 ± 0.23	0.407
	Change from baseline	0.01 ± 0.18	−0.06 ± 0.15	0.274
	P compared with baseline	0.773	**0.019**	

A generalized linear model was used to analyze changes in outcomes from baseline to the end of the intervention between the 2 groups after adjusting for covariates, including sex, age, alcohol consumption, smoking, physical activity, and baseline values of endpoints. Values are expressed as the mean ± standard deviation. Results in bold indicate statistical significance at the .05 level.

Abbreviations: SUN-CA, sunflower seed extract; HC, hip circumference; SF, subcutaneous fat; VF, visceral fat; WC, waist circumference.

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in the placebo group. There was no intergroup difference in the prevalence of adverse events.
Conclusion: The accumulation of excess body fat improved through the intake of 500 mg/day of SUN-CA containing 100 mg of chlorogenic acids for 12 weeks in adults with obesity without causing serious adverse side effects. SUN-CA could be an effective and safe management option for obesity.

GC4.311

Impact of Glucomannan, Inulin, and Psyllium Supplementation on Weight Loss in Adults with FTO, LEP, LEPR, and MC4R Polymorphisms: A Randomized, Double-blind, Placebo-controlled Trial

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Background: The global challenge of obesity calls for innovative strategies, including investigating the role of dietary fibers in managing weight for people with obesity who have specific obesity-related genetic polymorphisms.
Objective: To assess the impact of supplementation with glucomannan, inulin, and psyllium on body weight and composition in people with obesity and specific genetic polymorphisms, within the framework of a randomized, double-blind, placebo-controlled trial.
Methods: In this double-blind, placebo-controlled trial, 112 adults living with obesity, each carrying at least one minor allele in the FTO, LEP, LEPR, or MC4R polymorphisms, were randomized to receive either a fiber supplement (glucomannan, inulin, and psyllium) or a placebo for 180 days. The primary outcomes were changes in body weight and BMI.
Results: Participants who received the fiber supplement experienced significant reductions in body weight (treatment difference: -4.9%; 95% CI: -6.9% to -2.9%; $p < 0.01$) and BMI (treatment difference: -1.4 kg/m^2; 95% CI: -1.7 to -1.2; $p < 0.01$) compared to the placebo group. There were also notable decreases in fat mass (treatment difference: -13.0%; 95% CI: -14.4 to -11.7; $p < 0.01$) and visceral fat rating (treatment difference: -1.3; 95% CI: -1.6 to -1.0; $p < 0.01$). Participants with homozygous minor alleles saw greater reductions in body weight (treatment difference: -3.2%; 95% CI: -4.9% to -1.5%; $p < 0.01$) and BMI (treatment difference: -1.2 kg/m^2; 95% CI: -2.0 to -0.4; $p < 0.01$) compared to those with heterozygous alleles. This group also experienced a more significant reduction in fat mass (treatment difference: -9.8%; 95% CI: -10.6 to -9.1; $p < 0.01$) and visceral fat rating (treatment difference: -0.9; 95% CI: -1.3 to -0.5; $p < 0.01$). The fiber supplement group reported a high incidence of gastrointestinal events (74.6%), in contrast to the placebo group, which reported no side effects.
Conclusion: Dietary supplementation with glucomannan, inulin, and psyllium is effective in promoting weight loss and improving body composition in adults living with obesity, especially those with specific genetic polymorphisms.

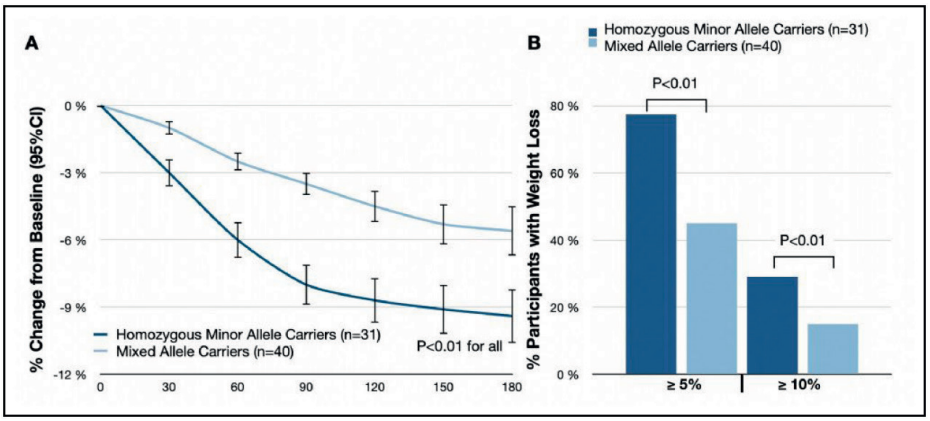


Fig. 1. (A) Mean percentage change from baseline in body weight; (B) Percentages of participants who had body-weight reductions of at least 5%, and 10% from baseline to day 180.

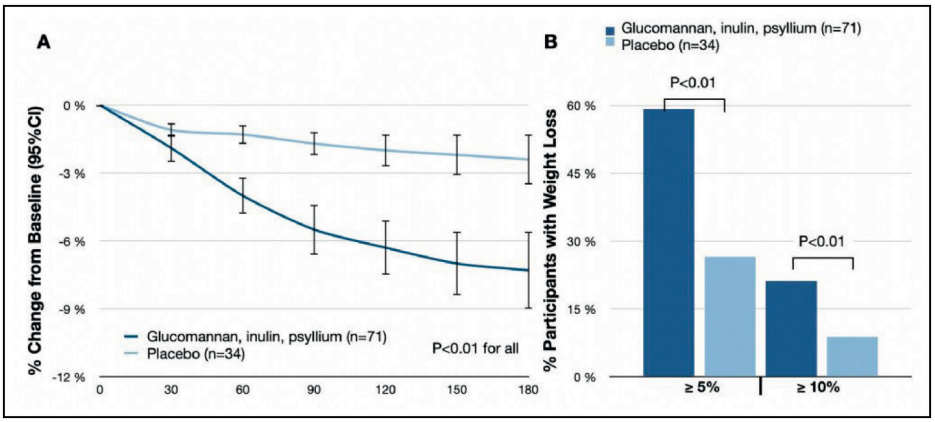


Fig. 2. (A) Mean percentage change from baseline in body weight; (B) Percentages of participants who had body-weight reductions of at least 5%, and 10% from baseline to day 180.

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GC4.312

A ketogenic diet as feasible treatment for post bariatric weight regain

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Introduction: Metabolic surgery is the most effective long-term treatment for patients living with obesity. However, studies reveal that up to 40% of patients who underwent bariatric surgery, experience long-term weight regain (WR), particularly those who discontinue surgical and nutritional follow-ups.
In contrast, the ketogenic diet emerges as a pivotal therapy for people living with obesity, showing convincing evidence in weight loss and improvement of weight-related complications.
PURPOSE: This study aims to evaluate the safety and efficacy of a very-low calorie ketogenic diet (VLCKD) in the treatment of post-bariatric WR.
Materials-Methods: This prospective, single-center pilot study involved patients with previous metabolic surgery (RYGB or Sleeve gastrectomy) who had clinically significant WR after successful initial weight loss. Inclusion criteria included age between 18 and 65 years, a BMI ≥30 kg/m², while exclusion criteria included pregnancy/lactation, type 1 diabetes mellitus, renal and hepatic disease, alcoholism, and major psychiatric disorders. The primary outcome was weight loss, while secondary outcomes focused on safety, improvements in metabolic profile, and body composition. All participants followed an 8-week nutritional intervention with VLCKD, limiting their carbohydrate intake to less than 50 g/day and with adequate protein intake at 1.2-1.5 g/kg of ideal body weight. Dietary counseling was provided every 4 weeks by an experienced dietitian, and compliance was assessed by dietary recalls and beta hydroxybutyrate measurements. Patients underwent biochemical and body composition assessment by DXA scan at baseline and after dietary intervention.

Tab. 1. Participants characteristics at baseline (T0), and after 8-weeks of very low-calorie ketogenic diet (VLCKD) (T1)

	T0 (N =15)	T1 (N=13)	"p"
Weight kg	111.608 ± 23.88	103.85 ± 21.82	<0.000
BMI kg/m²	41.11 ± 6.54	38.30 ± 6.59	0.000
Waist circumference cm	120.77 ± 18.66	110.54 ± 15.37	0.000
Hip circumference cm	128.46 ± 10.11	122.92 ± 9.82	0.007
Body Fat %	41.24 ± 5.71	38.63 ± 6.58	0.005
Lean mass %	58.7 ± 5.71	61.36 ± 6.58	0.005
Fat mass kg	46 ± 12	39 ± 10	0.001
Lean mass kg	65 ± 15	63 ± 16	0.038
Fat/lean ratio	0.71 ± 0.16	0.64 ± 0.17	0.003
HOMA-IR	3.01 ± 1.65	2.01 ± 1.41	0.052
AST UI/mL	18.36 ± 3.171	21.85 ± 6.30	0.049
ALT UI/mL	18. 9 ± 6.78	19.54 ± 5.78	0.838
Uric acid mg/dL	6.011 ± 1.71	5.6 ± 1.6	0.302
Total cholesterol mg/dL	181.15 ± 40.29	158 ± 36	0.010
HDL cholesterol mg/dL	58.31 ± 14.109	52 ± 12	0.007
Triglycerides mg/dL	93.69 ± 36.22	72 ± 14	0.027
LDL cholesterol mg/dL	104.10 ± 35.17	91. 75 ± 32.30	0.030

Results: Fifteen patients were enrolled (10 females, 5 males) with a mean age of 49±11 years and a mean BMI of 40.27±6.59 kg/m². After 8 weeks, patients showed an average weight loss of 7.2%, a significant reduction in waist circumference (p<0.001), hip circumference (p=0.007) and improvement in body composition indices: reduction in fat mass (p<0.001) and lean mass to fat mass ratio (p=0.03). Favorable changes in glyco-metabolic balance were reported with a significant reduction in LDL cholesterol levels (p=0.03). Safety parameters (renal function, uric acid, electrolytes) remained stable; the only adverse event reported was mild constipation.
Conclusions: This study emphasizes the efficacy of the VLCKD in the management of post-bariatric WR, demonstrating satisfactory weight loss and improved body composition without safety concerns. However, long-term weight loss maintenance remains uncertain without significant changes in lifestyle or pharmacotherapy. Further studies should explore the efficacy of dieting, including different weight loss scenarios and emphasizing maintenance strategies.

GC4.313

Effects of chrononutrition on menopausal-related symptoms

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Objective: Menopause negatively affects health, contributing to central obesity and increasing the risk of cardiovascular disorders in women. Diet influences both menopausal symptoms and cardiovascular health, but the impact of chrononutrition, namely the food timing, is not well understood. This study investigated whether the timing of food intake affected menopausal symptoms in postmenopausal women with overweight or obesity.
Methods: This cross-sectional observational study involved 103 postmenopausal women with overweight or obesity. Anthropometric, clinical parameters, and lifestyle habits were assessed. Menopausal symptoms were evaluated using the Menopause Rating Scale (MRS). Nutritional assessment utilized 7-day food records, classifying meals into breakfast, morning snacks, lunch, afternoon snacks, dinner, and evening snacks. A distinction was made between morning intake (covering meals from breakfast to lunch) and evening intake (encompassing snacks from the afternoon to the evening). Women were subsequently divided based on the median values of morning and evening intakes for both total energy and lipids.
Results: A total of 103 postmenopausal women (BMI 36.0 ± 7.2 kg/m², mean age 57.7 ± 6.6 years) were included in the analyses. The mean MRS score was 22.7 ± 7.8, showing a high prevalence of symptoms in the study population. Postmenopausal women under the median of morning energy intake showed a significantly higher score for heart discomfort (p = 0.045), while those under the median of morning intake of lipids showed significantly higher scores for heart discomfort and lower scores for bladder problems (p = 0.013 and p = 0.040, respectively). Postmenopausal women above the median of evening intake of lipids showed a significantly higher score for heart discomfort (p = 0.007). The heart discomfort score correlated negatively and positively with the morning (p = 0.034) and evening (p = 0.034) intakes of lipids, respectively. The correlations were maintained even after correction for confounding factors (p = 0.028 for both).
Conclusion: Consuming most of the energy and lipids later in the day was linked to higher prevalence of menopausal symptoms in postmenopausal women with overweight or obesity. This pattern may negatively

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Tab. 1. Menopausal symptoms (scores) and MRS scores in postmenopausal women broken down by the medians (%) of evening energy and lipids intakes.

		Evening energy intake			Evening intake of lipids	
Scores	Under the median (47.4%)	Above the median (47.4%)	p-value	Under the median (52.8%)	Above the median (52.8%)	p-value
Somatic symptoms	8.7 ± 3.8	8.6 ± 3.8	0.951	8.4 ± 3.8	8.9 ± 3.7	0.472
Hot flashes and sweating	2.2 ± 1.6	2.5 ± 1.6	0.338	2.3 ± 1.6	2.4 ± 1.6	0.648
Heart discomfort	1.0 ± 1.2	1.4 ± 1.3	0.117	0.9 ± 1.2	1.6 ± 1.3	0.007
Sleep problems	2.6 ± 1.4	2.2 ± 1.7	0.265	2.4 ± 1.5	2.4 ± 1.6	0.821
Joint and muscular discomfort	2.9 ± 1.5	2.5 ± 1.5	0.182	2.8 ± 1.5	2.6 ± 1.5	0.500
Psychological symptoms	9.6 ± 4.4	8.9 ± 4.2	0.416	9.2 ± 4.8	9.2 ± 3.8	0.996
Depressive mood	2.4 ± 1.5	2.3 ± 1.5	0.862	2.4 ± 1.5	2.3 ± 1.5	0.760
Irritability	2.4 ± 1.4	1.9 ± 1.5	0.116	2.3 ± 1.5	2.1 ± 1.4	0.519
Anxiety	2.3 ± 1.5	2.3 ± 1.4	0.823	2.2 ± 1.5	2.4 ± 1.4	0.529
Physical and mental exhaustion	2.5 ± 1.4	2.3 ± 1.5	0.398	2.4 ± 1.5	2.5 ± 1.4	0.716
Urogenital symptoms	5.0 ± 3.2	4.7 ± 2.7	0.661	4.9 ± 3.0	4.8 ± 2.9	0.864
Sexual problems	2.0 ± 1.6	2.3 ± 1.6	0.321	2.0 ± 1.7	2.2 ± 1.5	0.534
Bladder problems	1.1 ± 1.4	0.7 ± 1.1	0.082	1.2 ± 1.3	0.7 ± 1.1	0.057
Dryness of the vagina	1.9 ± 1.6	1.7 ± 1.7	0.660	1.7 ± 1.5	1.9 ± 1.7	0.592

Table 1 shows the menopausal symptoms (scores) and MRS scores in postmenopausal women broken down by the medians (%) of evening energy and lipids intakes. Postmenopausal women above the median of evening intake of lipids showed a significantly higher score for heart discomfort (p = 0.007).

impact cardiovascular health. Encouraging earlier intake of energy and lipids through chrononutrition practices could be a beneficial addition to nutritional therapy for these women.

GC4.314

Very Low-Calorie Ketogenic Diet (VLCKD) in Obesity: The Role of the Sex Differences. Results of a Pilot Study

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Introduction: Very low-carbohydrate ketogenic diets (VLCKDs) are emerging as a nutritional treatment for obesity. Despite their increasing popularity, little is known about the impact of sex differences on weight loss, body composition, and inflammatory status improvements induced by following a VLCKD. This study aimed to investigate the effects of sex differences on weight loss in patients with grade I and II obesity without metabolic comorbidities undergoing the active phase of VLCKD for 45 days.
Methods: Twenty-one females and 21 males (aged 32.71 ± 8.78 and 37.76 ± 10.75 years, respectively) meeting inclusion/exclusion criteria were included in the statistical analyses. Anthropometric measurements, body composition (including phase angle, PhA) were assessed (via biompedance analysis), and high-sensitivity C-reactive protein (hs-CRP) levels were determined by nephelometric assay at baseline and after 45 days of VLCKD. Weekly telephone recalls were conducted to assess dietary compliance, physical activity recommendations, and ketosis status.
Results: At baseline, females in our study population exhibited lower weight (p<0.001), waist circumference (WC) (p<0.001), and skeletal muscle mass (SMM) (p<0.001) but higher fat mass (FM) (p<0.001) and fat-free mass (FFM) (p<0.001) compared to males. Additionally, females showed higher resistance (R) (p=0-008) and lower PhA (p=0.002) compared to males at baseline. Regarding hydration and body water spaces, females displayed lower total body water (TBW) (p<0.001), extracellular water (ECW) (p<0.001), and intracellular water (ICW) (p<0.001) but higher ECW (p=0.002) compared to males. Analyzing the percentage changes (Δ%) in study parameters by sex, females exhibited significantly lower decreases in BMI (p<0.001), WC (p=0.001), and FM (p=0.002). Δ% in R varied significantly between females and males (pp=0.002), decreasing in the former and increasing in the latter. Increases in Xc (<0.001) and PhA (p<0.001) were also significantly lower in females than in males. Females had significantly lower decreases in TBW (p=0-049) and ECW (p<0.001), significantly lower increases in ICW (p<0.001), and significantly higher increases in TBW (p<0.001) compared to males. Finally, females showed significantly lower decreases in hs-CRP (p=0.003) than males. In the bivariate odds ratio (OR) model, sex was significantly associated with the Δ% in BMI (p=0.001), WC (p=0.010), R (p=0.011), Xc (p=0.003), PhA (p=0.002), TBW (p=0.001), ECW (p=0.014), ECW (p=0.002), ICW (p=0.004), FM (p=0.006), FM (p=0.022), and hs-CRP levels (p=0.006).
Conclusion: The efficacy of following a VLCKD in obesity was influenced by sex differences, with males experiencing larger benefits than females in terms of weight loss, body composition, and inflammatory status improvements.

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GC4.315

Very Low-Calorie Ketogenic Diet (VLCKD): A Therapeutic Nutritional Tool for Acne? Results of a Pilot Study

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Introduction: Acne, a chronic inflammatory disease impacting the pilosebaceous unit, is influenced significantly by inflammation and oxidative stress, and is commonly associated with obesity. Similarly, obesity is also associated with increased inflammation and oxidation. The role of diet in acne remains inconclusive, but the very low-calorie ketogenic diet (VLCKD), known for weight loss and generating anti-inflammatory ketone bodies, presents promising potential. Despite this, the effects of VLCKD on acne remain underexplored. This pilot study aimed to investigate the efficacy of a 45-day active phase of VLCKD in reducing the clinical severity of acne in young women with treatment-naïve moderate acne and grade I obesity.
Methods: Thirty-one women with treatment-naïve moderate acne, grade I obesity (BMI 30.03 - 34.65 kg/m^2), aged 18 to 30 years, meeting inclusion/exclusion criteria, and consenting to adhere to VLCKD were enrolled. Anthropometric measurements (height, weight, and waist circumference), body composition, along with phase angle (PhA), trimethylamine N-oxide (TMAO) levels, and reactive oxygen metabolite derivatives (dROM) leves as biomarkers of inflammation, dysbiosis and oxidative stress, respectively, were assessed at baseline and after 45 days of active phase of VLCKD. All participants underwent a complete dermatological examination, including the global acne grading system (GAGS) and Dermatology Life Quality Index (DLQI).
Results: VLCKD resulted in general improvements in anthropometric parameters and body composition. Significantly, there were significant reductions in both the GAGS score (Δ%: -31.46 ± 9.53, p<0.001) and the DLQI score (Δ%: -45.44 ± 24.02, p<0.001) after the intervention. These improvements coincided with significant decreases in TMAO (p < 0.001) and dROMs (p < 0.001) levels and a significant increase in PhA (Δ%: 8.60 ± 7.40, p<0.001). Changes in the GAGS score positively correlated with changes in dROMS (p<0.001) and negatively with PhA (p<0.001) even after adjusting for Δ% FM. Changes in the DLQI score positively correlated with changes in dROMS (p<0.001) and negatively with PhA (p<0.001) even after adjustment for Δ% FM.
Conclusion: Given the side effects of drugs used for acne, there is an increasing need for safe, tolerable, and low-cost treatments that can be used for acne disease. The 45-day active phase of VLCKD demonstrated notable improvements in acne severity and these improvements seemed to be attributable to the known antioxidant and anti-inflammatory effects of VLCKD.

GC4.316

A ketogenic diet restores menstrual cycles in women with Polycystic Ovary Syndrome with oligomenorrhea independent of body weight loss: results from a single center, one-arm, pilot study

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Introduction: Polycystic ovary syndrome (PCOS) is a common endocrine disorder of women in fertile age, presenting with anovulatory oligomenorrhea, hyperandrogenism and polycystic ovaries, frequently associated with metabolic syndrome. Causal treatment is not available, with guidelines suggesting lifestyle modification as the first therapeutic approach. The ketogenic diet (KD) is effective in the short-term treatment of several metabolic conditions. Some studies suggest that there may be a role for PCOS, although mostly very low-calorie approaches in obesity were leveraged, and only short-term evaluations are available. We therefore aimed to assess the persistence of the effect of an isocaloric or mildly hypocaloric KD in patients with PCOS and normal or excess weight.
Methods: Eighteen patients with PCOS and either oligomenorrhea or amenorrhea were enrolled. The patient demographics were as follows: 28% with normal weight, 28% with overweight, and 44% with obesity. All participants followed a ketogenic diet (KD) without meal replacements for 45 days. After this period, legumes and fruit were reintroduced as sources of carbohydrates for 45 more days, and thereafter healthy eating indications were given to the patient. Twelve of the enrolled patients completed the study. The patients were assessed before starting the diet and after 6 months. Anthropometric data (weight, BMI, waist circumference), body composition (DEXA), pelvic ultrasound, blood chemistry, hirsutism and menstrual cycles frequency were recorded.
Results: Significant improvements were observed in weight loss, waist and hip circumferences, and body fat percentage after six months of dietary intervention. Menstrual cycles and ovarian volume improved independently of weight or fat loss. Sexual hormones like FSH, LH, and Progesterone showed significant changes that were not dependent on weight or fat loss. However, testosterone levels and hirsutism improvements were influenced by weight and fat mass reduction, suggesting that anthropometric and glucometabolic improvement may be the main drivers of hyperandrogenism amelioration. The study reported good tolerability and no significant adverse events, suggesting that the dietary intervention was both effective and safe for managing PCOS symptoms.
Conclusions: our study showed that KD in PCOS exerts beneficial effects in the medium term, even in women with normal weight. This is mostly independent of body weight loss, suggesting that nutritional ketosis, beyond weight loss per se, improves ovarian function, probably reducing low grade inflammation and ovarian cells apoptosis. Moreover, not leveraging meal replacements represent a cost-effective alternative to commonly used very low-calorie approaches, with comparable results.

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GC4.317

Efficacy of the Mediterranean and ketogenic diet in older people with severe obesity and cardiovascular risk: weight loss data after 4 weeks of treatment

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Introduction: Increasing interest is being directed in the field of nutrition toward precision nutrition. This concept becomes even more central when we talk about the treatment of obesity through nutrition. To date, there is increasing use of dietary therapies that induce effective weight loss for individuals with obesity that can improve the metabolic pattern, which is almost always altered in this population. Among the dietary treatments used, alongside the traditional Mediterranean diet, is the increasingly common use of the very low calories ketogenic diet (VLCKD). This treatment has been shown to induce adequate weight loss between 5 and 10% at 3 months of treatment with positive effects on anthropometric and metabolic parameters. We also know that the degree of comorbidities associated with obesity, such as cardiovascular risk, also increases with increasing age. The purpose of this work is to investigate weight loss in a population with obesity and cardiovascular risk in relation to the age of the sample.
Method: The dietary intervention was carried out at the Auxologico Piancavallo facility within the residential rehabilitation pathway. The 41 subjects (23 male and 18 female) were randomized to the restrictive Mediterranean diet or the VLCK diet carried out with functional foods, after one week run-in. Anthropometric values were assessed at the beginning and after 5 weeks of intervention. Specifically for the ketogenic diet, the results refer to 4 weeks of active phase dietary intervention.
Results: We enrolled 41 patients with severe obesity, with an average weight of 119 kg ± 17.4 sd and a BMI of 43.2 ± 5.7 sd. In addition, our population was characterized by the presence of metabolic syndrome. From the analyses conducted on the enrolled sample, we confirmed that the ketogenic diet induces greater weight loss in terms of kilograms than the restrictive Mediterranean diet ($p < 0.001$). In addition, investigating age differences in the response to the two treatments: the ketogenic diet was associated to higher weight loss across ages when compared to the Mediterranean diet. While in older patients the ketogenic diet was less effective in producing a weight loss when compared to younger patient undergoing the same treatment, it still produced a 8% body weight reduction, resulting in an effective option in this population.
Conclusion: Our preliminary data suggest that the ketogenic diet is effective in inducing weight loss even in the population average age over 60 years. The ketogenic diet may therefore be a useful tool even in the older population with obesity, thus bringing in improvement on a metabolic profile also influenced by age itself.

GC4.318

Total fat intake and its quality in relation to carotid intima-media thickness as a cardiovascular risk factor among young women with obesity

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Introduction: Diet is recognized as a significant determinant of cardiovascular (CV) risk. Some studies suggest that saturated fatty acids (SFA) may increase circulating atherogenic lipoproteins and inflammatory markers concentrations, and may trigger atherosclerotic developmentε through endothelial dysfunction. Therefore, cardiac organizations suggest limiting SFA intake and replacing it with monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). Studies investigating the relationship between SFA intake and carotid intima-media thickness (cIMT) have shown inconsistent results, indicating either increased cIMT values or no association. In this study, we aimed to assess whether the amount and type of fat consumed affects cIMT and has an impact on CV risk among women with obesity.
Methods: We enrolled 55 women under 50 years of age – 37 women with obesity (defined by BMI) as the study group (SG) and 18 women with normal body mass in the control group (CG). Participants were asked to follow their usual diet to asses habitual total fat (TF) intake and quality – SFA, cholesterol, MUFA, and PUFA. Dietary intakes were assessed by 4-day food records. cIMT was assessed by using the GE Vivid S6 Ultrasound Machine with the 2.4-10-MHz Linear Array Probe.
Results: cIMT values did not differ between women with obesity and the control group (0.59±0.07 vs. 0.55±0.07, respectively, p=0.074). No significant differences were observed in the intake of TF (61.61 vs. 60.73 g/day), SFA (21.55 vs. 21.07 g/day), cholesterol (274.1 vs. 262.42 mg/day), MUFA (23.95 vs. 23.63 g/day), and PUFA (10.84 vs. 10.79 g/day) between the SG and CG, respectively.
In the univariate regression model, SG showed an insignificant inverse association between cIMT and TF (SE=0,004348, t=-0.16, p=0.877), cholesterol (SE=0.000781, t=-0.42, p=0.681), MUFA (SE=0.010403, t=-0.19, p=0.848) and PUFA (SE=0.022746, t=-0.41, p=0.683), and a positive between cIMT and SFA intake (SE=0.011168, t=0.42, p=0.677). Therefore, in SG each 10 grams of TF (coef=-0.000678), cholesterol (coef=-0.000324), MUFA (coef=-0.002009), PUFA (coef=-0.009368) insignificantly decreased, and each 10 grams of SFA (coef=0.004691) insignificantly increased cIMT. CG showed an insignificant inverse association between cIMT and TF (SE=0,014425, t=-0.32 p=0.753), SFA (SE=0.031289, t=-1.29, p=0.213), MUFA (SE=0.029489, t=-0.37, p=0.717) and a positive between cIMT and PUFA (SE=0.052639, t=0.78, p=0.448) and cholesterol intake (SE=0.001024, t=0.74, p=0.469). In CG each 10 grams of TF (coef=-0,004609), SFA (coef=-0.040505), MUFA (coef=-0.01086) insignificantly decreased, and each 10 grams of cholesterol (coef=0.000759) and PUFA (coef=0.040925) insignificantly increased cIMT.

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Conclusions: Despite the young age, it appears that the amount of SFA in diet may affect CV risk in women with obesity. There is a need for further research on dietary fat quantity and quality among women with and without obesity, especially in the context of subclinical atherosclerosis.

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GC4.319

Are calcium and vitamin D intakes and their serum concentrations associated with cardiovascular risk determined with carotid intima-media thickness in young women with obesity?

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Introduction: The association between diet and cardiovascular disease (CVD) is complex yet crucial. Diet can directly impact cardiovascular (CV) risk by influencing physiological and molecular changes, such as oxidative stress or inflammation, or indirectly by affecting body mass, glucose, and lipid metabolism. While more epidemiological studies are focusing on overall dietary patterns, there is also an investigation into the importance of single nutrients. Our study aimed to assess the habitual intake of calcium and vitamin D as well as their serum concentrations, and their influence on subclinical atherosclerosis among women with and without obesity.
Methods: A total of 55 women under 50 years of age were recruited, with 37 women with obesity (defined by BMI) in the study group (SG) and 18 women with normal BMI in the control group (CG). Participants were asked to follow their usual diet to assess habitual vitamin D and calcium intake. Dietary intakes were assessed by 4-day food records. Each participant provided a fasting blood sample and serum 25-hydroxyvitamin D (25(OH)D3) and ionized calcium concentrations were assessed. Carotid intima-media thickness (cIMT) was determined as a marker of subclinical atherosclerosis by using the GE Vivid S6 Ultrasound Machine with the 2.4-10-MHz Linear Array Probe.
Results: There was no significant difference in cIMT values between SG and CG (0.59±0.07 vs. 0.55±0.07, respectively). Moreover, there were no significant differences in the intakes of calcium (675.05 vs. 687.97 mg/day) and vitamin D (1.87 vs. 2.77 μg/ml) between SG and CG. Similarly, no significant associations were observed between SG and CG in serum vitamin D (29.07±11.86 vs. 35.29±14.23 ng/ml, respectively) and serum calcium (5.26±0.16 vs. 5.26±0.15 mg/dl, respectively). However, SG showed a significant inverse association between cIMT and vitamin D intake in the univariate regression model (coef=-0.016, SE=0.006, t=-2.42, p=0.021); yet, after adjusting to other variables, vitamin D intake lost its significance. Ca intakes (coef=2.150, SE=0.00003, t=0.01) and Ca (coef=-0.0260, SE=0.107, t=-0.24) and vitamin D (coef=-0.0004, SE=0.001, t=-0.32) concentrations did not significantly influence cIMT in the SG. Similarly, no significant associations with cIMT were observed in CG for intakes of Ca (coef=0.00005, SE=0.0001, t=0.47), and vitamin D (coef=-0.007, SE=0.009, t=-0.457) and serum vitamin D (coef=0.0007, SE=0.001, t=0.47) and calcium concentrations (coef=-0.166, SE=0.135, t=-1.23).
Conclusions: Dietary vitamin D intake seems to be related to CV risk – expressed as cIMT values. However, further research is needed on serum concentrations and intakes of Ca and vitamin D among women with and without obesity, particularly in the context of subclinical atherosclerosis.

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GC4.320

Dietary Inflammatory Index is associated with muscle quality in patients with obesity

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Rationale The role played by dietary factors, especially the pro-inflammatory properties of dietary patterns, in the mechanisms underlying the onset of relevant facets of sarcopenia such as reduced muscle strength and muscle quality, has not been thoroughly clarified, regardless of the well-known players such as insulin resistance and lipotoxicity
The aim of our study was to explore the association between the Dietary Inflammatory Index (DII) and reduced muscle quality
Methods: Participants were recruited among patients admitted to the "Policlinico Umberto I"-the Sapienza University Hospital, Rome, Italy. Inclusion criteria were: age 18-75 years, body mass index (BMI) ≥ 25 kg/m^2. Body composition was assessed by DXA. The Handgrip strength test (HGST) was performed. HGST was normalized to arm lean mass to indicate muscle quality; intramyocellular lipid content (IMCL) was measured by magnetic resonance spectroscopy. 3-day dietary records were administered and analyzed by a registered dietician. The DIIscore (adjusted for energy density) and the HOMA-IR were calculated. High-sensitivity C-reactive protein (hs-CRP) was measured.
Results: 77 subjects (men: 18%) were included (age: 47.7 ± 13.5 years, BMI: 37.1 ± 5.7 kg/m^2). The DII score was negatively associated to muscle quality (beta: -1.474, SE: 0.241, p= 0.03) after adjustment for age and HOMA-IR, with analogous observations with IMCL as covariate.
Conclusion: A pro-inflammatory dietary pattern is associated with reduced muscle quality in patients with obesity.

GC4.321

Preliminary Application of an intermittent (5:2) Low-Carbohydrate Diet in Free-Living Conditions: A Feasibility Study

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Intermittent energy restriction diets, inherently low in carbohydrates, have shown promise in obesity management and metabolic health improvement (Kim et al 2022). Recent studies have suggested a dose-response relationship between carbohydrate content within an energy restricted diet rand the metabolic effects of acute fasting (Antoni et al. 2016). Moreover, our recently submitted investigation replicated acute metabolic effects of fasting via carbohydrate restriction alone (Biyikoglu et al. 2024), proposing a novel dietary approach to mimic long-term intermittent energy restriction (IER) effects. Despite promising acute results, the practicality, and effect of these diets in uncontrolled, real-life settings remain unclear, especially considering dietary adherence and social eating challenges. This study aims to evaluate the feasibility, acceptability, and impact of an episodic carbohydrate

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restriction diet in a real-life setting, focusing on body composition and eating behaviours. Participants were instructed to follow a 4-week dietary intervention, alternating two non-consecutive days of low carbohydrate intake (<50g/day, unrestricted fat and protein) with five days of unrestricted eating. Baseline dietary habits were established via a three-day food diary, with compliance and change in dietary intake were assessed through four 24-hour recalls during low-carbohydrate days, and unrestricted-eating days of the intervention. Baseline and week 4 measurements included anthropometry (total weight, fat mass, fat-free mass, waist and hip circumferences), resting energy expenditure, and fasted respiratory quotient. At week 1 and 4, questionnaires assessed diet acceptability, perception, understanding, adherence, and challenges. An exit interview at week 4 supplemented these findings. Eighteen participants (seven males; weight: 66.3kg±2.7; age: 20.7±5.4; BMI: 22.9±0.7kg/m^2) completed the study. Good feasibility was indicated by a 10% dropout rate and significant carbohydrate intake reduction on low-carb days ($p < 0.0001$). No significant changes were observed in total body weight and composition. However, participants with BMI >24kg/m^2 (n=4) showed numerical weight loss. Weekly total energy and macronutrient intake remained unchanged ($p>0.05$), possibly explaining the stable body weight. Additionally, assessments of total energy, fat, and carbohydrate intakes on unrestricted eating days, as measured by 24-hour recalls, showed no significant differences to baseline habitual intake ($p > 0.05$). Questionnaire results indicated minimal challenges in social eating or restricted food choices ($p > 0.05$), yet there was a significant increase in carbohydrate cravings ($p = 0.014$). Interviews revealed common reports of these cravings, alongside a tendency to consume vegetables more regularly and an overall perception of enhanced health. Half of the participants expressed willingness to continue the diet long-term. We suggest that an episodic carbohydrate restriction diet may be feasible as a long-term dietary approach in healthy adults who are non-obese. Further research is required to explore its metabolic benefits and potential for weight loss.

GC4.322

Particular aspects of eating behaviour in nurses working night shifts

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Introduction: Shift workers face higher risk of developing obesity and metabolic diseases, due to the influence of circadian rhythm disturbances on general health, dietary behavior, and psychological wellbeing. and physical health effects of shift work. More data is required regarding the nutritional particularities of shift workers, in order to tailor interventions for improving lifestyle, including dietary modifications and strategies for better sleep and stress management. This study aimed to compare diet and lifestyle of nurses who works shifts with that of nurses who only work day shifts from the same hospital, in order to find relevant differences that could be used for nutritional interventions.
Material and method. Twenty nurses working night shifts and 10 nurses from the out-patient clinic (working only day shifts) agreed to participate to this study and fulfill detailed nutritional assessment (24-h recalls, journals, questionnaires, anthropometric measurements) at three points: for a day with day shift, for a day after a night shift, and for a day off (for the nurses in the day shift group, two working days were assessed).
Results: Nurses who work night shifts have a statistically significantly higher intake of energy, macronutrients (carbohydrates, protein, total lipids) and micronutrients (calcium, iron and sodium) compared to nurses in the control group who do not work in shifts, as shown by analysis of data from food frequency questionnaires (EPIC FFQ/FETA), but these nurses also have a higher level of physical activity. The statistically significantly higher sodium intake is due to the consumption of processed foods (fast food, pizza, chips, nuts and roasted peanuts) that are easily consumed during working hours as an alternative to fresh foods. Nurses working shifts consume more caffeine at work (but not on days off) compared to control group. Nurses who work shifts have a statistically significantly higher intake of sweets and sweetened non-alcoholic drinks represented by cakes, chocolate and carbonated fruit or caffeinated drinks, replacing a main meal, due to limited free time that does not allow for a break for the table. This was correlated with a significant higher waist circumference in this group (but not BMI).
Conclusions: Our results suggest that nurses who work in shifts require evaluation and nutritional counseling and support to obtain a balanced eating behavior and to adopt the necessary measures to ensure a balance between days with professional activity and days off.

GC4.323

Are we treating more than weight? Effects of liraglutide 3mg for the treatment of obesity among patients with hidradenitis suppurativa

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Background: Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease with a prevalence of 2%. Its negative impact on quality of life has been shown to be one of the highest among dermatological conditions. HS is associated with metabolic syndrome and obesity, and skin lesions seem to worsen when obesity is associated. Besides, patients with HS usually have a suboptimal treatment for the limited evidence-based therapies and the absence of effective and/or curative strategies. Weight loss is frequently reflected in an amelioration in the severity of the lesions. Case reports have suggested that liraglutide might improve not only weight but also skin.
Objectives: Study the effects of liraglutide 3mg in patients with obesity and HS on metabolic, dermatological, and psychological outcomes.
Methods: 14 patients (57.1%♀, 46.1±13.7 years, duration of HS 14.1±9.32 years) started treatment with liraglutide 3mg for 3 months. Severity of the lesions was evaluated using the Hurley Staging System and VAS (visual analogue scale of pain) and quality of life with the DLQI (Dermatology Quality Index). A structured interview was designed to assess the presence of abnormal eating patterns. Depressive syndrome was screened with the Beck Depression Inventory (BDI).
Results: There was a significant reduction in BMI (39.3±6.2 vs 35.6 ±5.8; p=0.002), waist circumference (121.3±19.2 vs 110.6±18.1cm; p=0.01), ultrasensitive C-reactive protein (4.5±2.2 vs 3±2.1mg/L; p=0.04), homocysteine (16.2±2.9 vs 13.3±3µmol/L; p=0.005) and plasma cortisol (15.9±4.8 vs 12.6±4.5µg /dL, p=0.007). Hurley stage (2.6±0.5 vs 1.1±0.3; p=0.002), VAS (5.6±1.5 vs 3.2±1.6; p=0.003) and DLQI (12.3±2.8 vs 9.7±6.9; p=0.04) improved significantly. Depressive symptomatology, measured with the BDI, was significantly ameliorated (22±7.6 vs 16.7±6.8; p=0.007). The frequency of binge eating disorder was significantly reduced among these patients (28.6% vs 14.3%; p=0.008) as well as the presence of emotional eating (64.3% vs 14.3%; p=0.008). In multiple regression analysis, weight loss did not correlate with any inflammatory parameter, Hurley or DLQI.
Conclusions: Liraglutide 3mg is effective and safe among patients with HS and obesity. There could be an anti-inflammatory effect that improves HS lesions regardless of weight loss.

Conflict of Interest: None disclosed.

Funding: No funding to report.

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GC4.325

Preliminary Analyses to Inform the Design of Anti-Obesity Intervention to Prevent Adult Cancer - Consensus on the need for a clinical trial

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Introduction: Obesity is a well-established cause of cancer. With studies showing 4-8% of worldwide cancer being directly attributable to the presence of obesity. However, evidence for the treatment of obesity reducing this risk is not well established. This project aims to elicit the current state of this evidence, establish consensus on further work and provide a study of feasibility of a weight loss intervention to prevent cancer clinical trial.
Methods: We aim to answer this research question in a 3-step process: systematic review and meta-analysis of non-surgical weight loss intervention to prevent cancer, international consensus meetings to elicit priorities and next steps, followed by Bayesian in-silico trials of weight loss intervention to prevent cancer.
Systematic review and meta-analysis has shown a lack of long term trials, with existing evidence being underpowered. However there are trends suggesting non-surgical weight loss intervention may help to reduce cancer risk.
PPIE has been completed, showing preference for lifelong, weekly injections as the most acceptable intervention and strong agreement that cancer risk is important in the context of obesity.
An international expert panel, running on the 12th March 2023 will precede a 2 stage accelerated Delphi consensus between 25-30th March to identify consensus on gaps in evidence, evidence required, acceptable weight loss intervention in the context of obesity-related cancer risk and key aspects of a proposed clinical trial.
Conclusion: Phase two of this study (completed by April 2024) will help to provide clarity on the next steps for evidence generation required for the prevention of obesity-related cancer. Following consensus elicitation, In silico trials will be designed to allow comparison of trial intervention, design and strategy. This will allow for the most efficient use of resources when designing a weight loss intervention to prevent cancer trial, if it is feasible.

GC4.326

Online medical education improves physicians' understanding of the health benefits of sustained weight loss and competence in the practical management of persons living with obesity

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Background and Aims: Obesity is a serious chronic disease associated with multiple complications and significant morbidity and mortality. In 2015, increased body mass index (BMI) led to more than 4 million deaths, of which more than two thirds were due to cardiovascular disease (CVD). Weight loss improves health outcomes and quality of life but sustained weight reduction is difficult to achieve. However, novel incretin-based treatments with pronounced weight loss properties are now enhancing the therapeutic armamentarium to help people living with obesity achieve clinically beneficial weight loss.
The goal of this online educational activity was for cardiologists (CARD) and primary care physicians (PCP) to be better able to recognize obesity as a complex, chronic, progressive, and burdensome disease requiring a long-term management approach, and to achieve sustained weight loss by implementing evidence-based obesity care with the goal to prevent CVD in a cardiology or primary care setting.
Materials-Methods: A 20 minutes online audio summary with synchronized slides highlighted the key aspects of a one hour live symposium with three obesity experts at the European Society of Cardiology (ESC) annual congress 2023. The educational effect was assessed using a repeated-pair design with pre-/post-assessment. 3 multiple choice questions assessed knowledge/competence, 1 question rated on a Likert-type scale assessed confidence. A paired samples t-test was conducted on overall average number of correct responses and for confidence rating, a McNemar's test was conducted at the question level (5% significance level). Cohen's d with correction for paired samples estimated the effect size of the education on number of correct responses. Data collection from October 29, 2023 to November 10, 2023.
Results:

- 48% of CARD (n=50, p<.001, d=0.80) and 50% of PCP (n=171, p<.001, d=0.70) improved their knowledge regarding the clinical evidence for the benefit of substantial and sustained weight loss for obesity-related complications and quality of life, and their competence related to the practical management of appropriate patients with novel anti-obesity drugs for better health outcomes
- 30% of CARD and 53% of PCPs (P<.001 each) increased their confidence in selecting the best pharmacotherapy for patients living with obesity

Conclusion: Participation of CARD and PCP in an online expert summary of a live symposium at ESC improved their understanding of the health benefits of sustained weight loss and their competence in the practical management of persons living with obesity.

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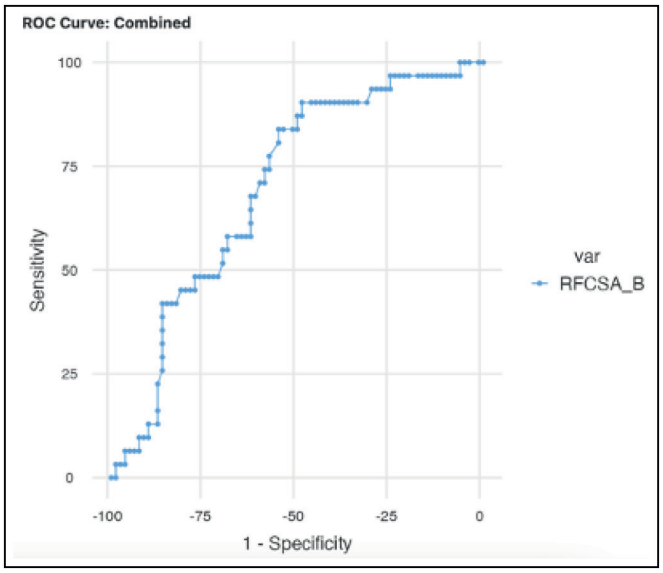
Evaluation of sarcopenia by morphofunctional assessment (nutritional ultrasound, bia and dynamometry) in patients with obesity

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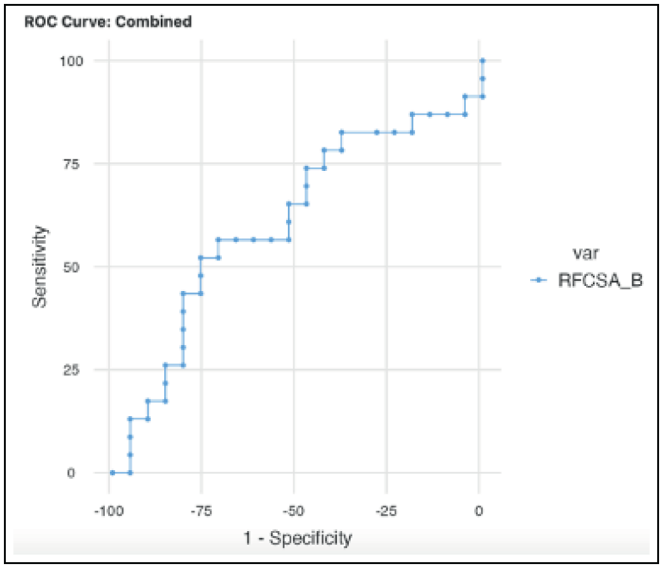
Introduction: Sarcopenic obesity (SO) is a clinical and functional condition characterized by the coexistence of obesity, defined by excess fat mass, and sarcopenia, defined as low skeletal muscle mass and function.
Advanced tools for morphofunctional assessment (BIA, nutritional ultrasound® and handgrip strenght dynamometry) allow us to assess muscle mass and function in patients with obesity more effectively.
Our aim is to evaluate the prevalence of sarcopenia in patients with obesity using the criteria for sarcopenic obesity published by ESPEN/EASO, and to obtain cut-off points of nutritional ultrasound® to define sarcopenia in patients with obesity.
Methods: Prospective study of patients attending the "Obesity Unit" of Hospital Quirónsalud Málaga. Morphofunctional data were evaluated by ultrasound (Mindray® Z60), bioimpedance (BIVA Akern® Nutrilab) and hand dynamometry (Jamar®).
Results: We included 178 patients (124 women and 54 men), with a mean BMI of 36.7±6.20 kg/m^2.
Using the AACE scale, we found 15.7 % of patients had AACE grade 0, 43.8 % of patients had AACE grade 1 and 40.4 % of patients had AACE grade 2.
They had a rectus femoris cross-sectional area (RF-CSA) measured by nutritional ultrasound® of 6.11±1.70 cm2 and 4.421.10 cm2. The fat mass (%FM) measured by BIA was 35.9±6.56 % and 45.4±5.39 %, the body cell mass (BCM) was 42.4±7.76 kg and 27.6±3.57 kg, and the SMM/kg was 37.6±9.08

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ROC curve analysis for Sarcopenic obesity using SMM/kg criteria cut-off point of 4.04cm2 with AUC 0.54 (S 72.4%, E 40%) in women.

Fig. 1. ROC curve 2.



ROC curve analysis for Sarcopenic obesity using SMM/kg criteria cut-off point for RF-CSA of 5.21cm2 with an AUC 0.53 (S 57.2%, E 69.5%) in men.

Fig. 1. ROC curve.

and 31.9±7.09. The handgrip strength (HGS) measured by dynamometry was 39.5±8.68 kg and 20.9±5.20 kg; in men and women respectively.
According to the ESPEN/EASO criteria for sarcopenic obesity, we found that 75.6% of the patients had sarcopenia due to low SMM/kg (measured by BIA) and 9.9% due to low HGS.
Using the ROC curve analysis to determine the cut-off point of sarcopenic obesity by SMM/kg with the muscle ultrasound, we obtain a cut-off point for RF-CSA of 5.21cm2 with an AUC 0.53 (S 57.2%, E 69.5%) in men, and a cut-off point of 4.04cm2 with AUC 0.54 (S 72.4%, E 40%) in women.
Using the ROC curve analysis to determine the cut-off point of sarcopenic obesity by HGS with the muscle ultrasound, we obtain a cut-off point for RF-CSA of 4.82cm2 with AUC 0.87 (S 87.5%, E 93%) in men, and a cut-off point of 4.07cm2 with AUC 0.67 (S 68.5%, E 70%) in women.
Conclusions: Morphofunctional assessment using BIA, nutritional ultrasound® and HGS in patients with obesity is useful in predicting sarcopenia.

Conflict of Interest: None disclosed.

Funding: No funding report.

GC4.328

Association Between Fibrosis–4 Index and Chronic Kidney Disease In Metabolic–Associated Fatty Liver Disease

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Introduction: To our best knowledge, patients with metabolic–associated fatty liver disease (MAFLD) are at a higher risk of developing chronic kidney disease (CKD). The Fibrosis–4 (FIB–4) index is used as an indirect indicator of liver fibrosis. This study aimed to investigate the association between FIB–4 index and chronic kidney disease in patients with MAFLD.
Methods: A total of 745 patients with MAFLD were enrolled in this study. The FIB–4 index was computed based on alanine aminotransferase, aspartate aminotransferase, age, and platelet count. All patients were divided into three groups using cutoffs of 1.45 and 3.25, representing varying degrees of liver fibrosis. Renal function was assessed by estimated glomerular filtration rate (eGFR) and CKD stage. The relationship between the FIB–4 index and renal function was analyzed using Chi–Square test, one–way analysis of variance (ANOVA) and logistic regression models.
Results: In this study of 745 patients diagnosed with MAFLD, we observed a negative correlation between the FIB–4 index and eGFR ($R=-0.423$, $p<0.001$). There was also a significant association between an elevated FIB–4 index, using a cutoff of 1.45 to indicate the absence or presence of liver fibrosis, and the occurrence of CKD stage 3 or above ($p<0.001$). Analysis of variance (ANOVA) revealed significant differences in eGFR and CKD stage across the three groups stratified by FIB–4 index, with higher FIB–4 scores associated with decreased eGFR ($p<0.001$) and advanced CKD stage ($p<0.001$). Notably, significant differences were observed between the groups with FIB–4<1.45 and 1.45<FIB–4<3.25, as well as between the groups with FIB–4<1.45 and FIB–4>3.25. Logistic regression analysis indicated that for each unit increase in the FIB–4 index, the likelihood of having CKD stage 3 or higher were 1.945 times compared to the likelihood of having CKD stage less than 3 ($P<0.001$; OR=1.95; 95% confidence interval, 1.40–2.70).
Conclusion: Our study showed that in patient with MAFLD, a higher FIB–4 index was associated with deterioration of eGFR and advanced CKD stages.

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Table 1. Baseline characteristics of study population.

Variables	Total (n=745)	FIB–4 < 1.45 (n=384)	1.45 ≤ FIB–4 < 3.25 (n=349)	FIB–4 ≥ 3.25 (n=12)	P–value
Age, year	67.1 ± 12.8	60.8 ± 13.5	73.6 ± 7.7	78.3 ± 6.0	<0.001
Sex: male, n (%)	342 (45.9)	162 (42.2)	176 (50.4)	4 (33.3)	0.056
Sex: female, n (%)	403 (54.1)	222 (57.8)	173 (49.6)	8 (66.7)	0.056
Body mass index (BMI), kg/m^2	26.5 ± 3.8	27.1 ± 4.1	25.6 ± 3.3	25.6 ± 3.6	<0.001
Patients with Overweight: 24 ≦ BMI <27, n (%)	247 (33.1)	107 (27.9)	136 (39.0)	4 (33.3)	<0.001
Patients with Obesity: BMI ≥ 27, n (%)	299 (40.1)	179 (46.6)	117 (33.5)	3 (25)	<0.001
Waist, cm	90.5 ± 10.5	92.1 ± 11.4	88.8 ± 9.1	86.9 ± 8.3	<0.001
Patients with Hypertension, n (%)	589 (79.1)	285 (74.2)	294 (84.2)	10 (83.3)	0.004
Patients with Diabetes, n (%)	305 (40.9)	189 (49.2)	111 (31.8)	5 (41.7)	<0.001
Triglycerides, mg/dL	140.9 ± 76.6	147.9 ± 85.9	133.9 ± 64.8	121.1 ± 55.0	0.031
Total Cholesterol, mg/dL	174.5 ± 34.1	175.1 ± 36.6	173.8 ± 31.2	173.1 ± 33.1	0.873
LDL–C, mg/dL	104.0 ± 29.3	105.6 ± 30.8	102.2 ± 27.6	102.5 ± 26.3	0.291
HDL–C, mg/dL	49.3 ± 12.5	49.1 ± 12.8	49.4 ±12.2	50.4 ± 10.9	0.872
ALT, IU/L	25.2 ± 18.6	26.7 ± 20.	23.1 ± 15.7	34.6 ± 34.7	0.007
AST, IU/L	23.8 ± 11.0	22.0 ± 10.0	25.3 ± 10.6	40.1 ± 24.5	<0.001
Albumin, g/dL	4.4 ± 0.3	4.5 ± 0.3	4.3 ± 0.2	4.3 ± 0.3	<0.001
eGFR, ml/min	87.7 ± 17.7	93.9 ± 16.5	81.2 ± 16.6	78.8 ± 15.7	<0.001
eGFR ≥ 90, n (%)	402 (54.0)	265 (69.0)	134 (38.4)	3 (25.0)	
60 ≤ eGFR < 90, n (%)	290 (38.9)	106 (27.6)	176 (50.4)	8 (66.7)	
30 ≤ eGFR < 60, n (%)	46 (6.2)	10 (2.6)	35 (10.0)	1 (8.3)	
15 ≤ eGFR < 30, n (%)	4 (0.5)	2 (0.5)	2 (0.6)	0 (0)	
eGFR < 15, n (%)	3 (0.4)	1 (0.3)	2 (0.6)	0 (0)	
Platelet count, 103/μL	244.5 ± 66.3	283.9 ± 61.5	204.9 ± 39.1	136.7 ± 25.5	<0.001
FIB–4 Index	1.5 ± 0.7	1.0 ± 0.3	1.98 ± 0.43	4.0 ± 1.0	<0.001

Abbreviations: LDL–C, low–density lipoprotein cholesterol; HDL–C, high–density lipoprotein cholesterol; ALT, alanine aminotransferase; AST, aspartate aminotransferase; eGFR, estimated glomerular filtration rate; CKD, chronic kidney disease; FIB–4 index, Fibrosis–4 index

Table 2. Correlation between FIB–4 index and renal function.

	FIB–4 < 1.45 (n=384)	1.45 ≤ FIB–4 < 3.25 (n=349)	FIB–4 ≥ 3.25 (n=12)	P–value
eGFR, ml/min	93.9 ± 16.5	81.2 ± 16.6	78.8 ± 15.7	<0.001
CKD Stage < 3, n (%)	371 (95.6)	310 (88.8)	11 (91.7)	<0.001
CKD Stage ≥ 3, n (%)	13 (3.4)	39 (11.2)	1 (8.3)	<0.001

Abbreviations: FIB–4 index, Fibrosis–4 index; eGFR, estimated glomerular filtration rate; CKD, chronic kidney disease

Table 3. Comparison of renal function between different FIB–4 index levels.

		Mean difference of eGFR ± SD	P-value	95% CI
FIB–4 < 1.45	1.45 ≤ FIB–4 < 3.25	–12.7 ± 1.2	<0.001	9.81–15.68
1.45 ≤ FIB–4 < 3.25	FIB–4 ≥ 3.25	–2.4 ± 4.9	1.000	–14.04–9.25
FIB–4 < 1.45	FIB–4 ≥ 3.25	–15.1 ± 4.8	0.006	3.51–26.76

1. Abbreviations: FIB–4 index, Fibrosis–4 index; eGFR, estimated glomerular filtration rate; SD, standard deviation; CI, confidence interval 2. Adjustment was performed according to Bonferron correction.

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GC4.329

Post-Marketing Authorization Early Access Program (AP2) Findings for Semaglutide 2.4 mg in French Individuals with complicated class III Obesity

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Introduction: The Post-Marketing Authorization Early Access Program (AP2) in France serves as a regulatory avenue enabling the pre-commercial release of drugs, with a focus on addressing severe conditions with unmet medical needs. AP2 approval for semaglutide 2.4 mg was granted by the French National Authority for Health (HAS) for the specified indication: "in addition to a low-calorie diet and increased physical activity for weight control, especially for weight loss and weight maintenance, in adults with an initial body mass index (BMI) ≥ 40 kg/ m2 (Class III obesity) presenting at least one weight-related comorbidity factor: treated hypertension (HBP), treated dyslipidemia, established cardiovascular disease (CVD), treated sleep apnea syndrome (SAS), in the absence of available therapeutic alternatives. This report describes the characteristics of the population included and the pharmacovigilance data.
Method: The HAS implemented a Therapeutic Use and Information Collection Protocol to gather demographic, clinical, and safety information during the AP2, conducted from March 22 to July 21, 2023, semaglutide 2.4 mg exclusively administered and dispensed within hospital settings. An analysis was conducted on data obtained from 205 centers that applied for AP2 participation.
Results: Among 3,532 patients with validated access requests, 3,527 initiated treatment. The population had a mean age of 48.3 years, with 66.3% females, mean weight of 132.2 kg, and mean BMI of 47.0 kg/m^2. Key weight history findings included a median onset of weight gain at 19 years, with 74.7% reporting more than three prior weight loss attempts.
Pharmacovigilance recorded a total of 170 adverse events (AEs) with 52 AEs requiring treatment discontinuation, 119 expected AEs including 9 serious, and 51 unexpected AEs including 12 serious. Importantly, no deaths were reported.
Concerning comorbidities, 54.9% were being treated for high blood pressure (HBP), 64.6% for sleep apnea syndrome (SAS), 32.6% for dyslipidemia, 11.6% had established cardiovascular disease (CVD), and 26.4% had at least two complications.
Conclusion: These findings offer an initial snapshot into individuals receiving semaglutide for the management of complicated class III obesity, underscoring the medical need met by semaglutide 2.4 mg in vulnerable patients. The observed tolerability is consistent with the broader GLP-1 analogue class. A comprehensive final report will synthesize the overall conclusions derived from this AP2.

Reference

Post-Marketing Authorization for Semaglutide 2.4 mg Early Access Program First Intermediate Report - Period from 22nd MARCH 2023 to 21st JULY 2023.

GC4.330

Perioperative and oncological outcomes in patients with BMI ≥ 35 kg/m^2 undergoing robot-assisted radical prostatectomy

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Introduction: The latest anaesthesia National Audit Project, NAP7, highlighted a significant increase in the prevalence and severity of obesity in the surgical population of the United Kingdom since 2013, with the highest proportional rise occurring in the BMI ≥ 35 kg/m^2 category. Robot-Assisted Radical Prostatectomy (RARP) is increasingly being used to treat prostate cancer over other surgical approaches, however is less commonly offered to patients with BMI ≥ 35 kg/m^2 due to surgical and anaesthetic challenges. University College London Hospitals NHS Trust is a centre experienced in RARP in high-risk patients, including those with BMI ≥ 35 kg/m^2, running a dedicated High-Risk Prostatectomy Preoperative Assessment Clinic (PAC) to optimise patients. We conducted a retrospective study to compare outcomes in patients undergoing RARP with BMI ≥ 35 kg/m^2 and BMI < 35 kg/m^2 at this centre.
Methods: Patients undergoing RARP between August 2021 – July 2023 were identified using a data search on our electronic record system, Epic. Unpaired t-tests and Chi-Squared tests were used to compare patient data in the two BMI categories, including: American Association of Anaesthesiologists (ASA) grade, proportion seen in High-Risk PAC, operating time, estimated blood loss (EBL), Post Anaesthesia Care Unit (PACU) admissions, length of stay (LOS), readmissions < 30 days, rates of detectable Prostate Specific Antigen (PSA) at 3 months (defined as PSA > 0.1ug/L), and referrals for salvage treatment (hormonal treatment or radiotherapy). Incidence of complications and their Clavien-Dindo Classifications were also recorded.
Results: All patients (n = 53) with BMI ≥ 35 kg/m^2 found in the Epic search were included in the study, and a random sample (n = 200) of patients with BMI < 35 kg/m^2 was taken for comparison. Patients with BMI ≥ 35 kg/m^2 had significantly higher ASA grades ($p < 0.001$), and a greater proportion were seen in High-Risk PAC ($p < 0.001$). Additionally, patients with BMI ≥ 35 kg/m^2 had a statistically higher EBL ($p = 0.0029$), operating time ($p = 0.020$) and rate of PACU admissions ($p < 0.001$). Despite this, incidence of perioperative complications was low, with no Clavien-Dindo Grade 3+ complications, and there was no significant difference in LOS ($p = 0.12$), readmissions < 30 days ($p = 0.60$), detectable PSA at 3 months ($p = 0.32$), or referrals for salvage treatment ($p = 0.15$). Of note, only two patients had BMI ≥ 40 kg/m^2, as patients in this category are rarely accepted for RARP due to operative difficulty.
Conclusion: Our data supports the safety of RARP in the BMI ≥ 35 kg/m^2 patient group, when conducted at a centre with appropriate expertise in conjunction with dedicated preoperative optimisation. Our future goals include expanding our High-Risk PAC services in collaboration with the Bariatric Medicine department, by formulating a standardised preoperative weight loss programme for patients who are currently above the risk threshold for surgery, including those with BMI ≥ 40 kg/m^2. A future study can be performed after piloting the programme to assess outcomes in patients following weight loss.

GC4.331

Firmicutes and Bacteroidetes ratio in university students with overweight and obesity

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Introduction: The intestinal microbiota is a factor where, in the last decade has been associated with the growth in body fat due to its influence on the control of intestinal permeability, deconjugation of bile salts, intestinal hormones release, and inhibition of adiposity factor induced by fasting are conditions to promote the energetic extraction in the diary diet. Thus, intestinal microbiota its has been a primordial part of the research promoting factors of nutritional change over overweight and obesity treatments. However, current data has not been determinant in dysbiosis and obesity relationship.
Methods and Results: The aim of this research was to define the association of the Firmicutes/Bacteroidetes ratio of the intestinal microbiota with the percentage of fat, glucose, triglycerides, total cholesterol, and HDL-C 70 in university students between 18 and 25 years old by means of an observational, cross-sectional, and comparative study. Participants were selected through a stratified sample and divided into 3 groups: normal weight (29.5%), overweight (27.4%), and obesity (43.2%). Those students carried an appropriate level of glucose (83.91±5.78) and total

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cholesterol (172.71±29.73) in comparison with higher levels of triglycerides (116.35±83.77) a lowest level in HDL-C (57.74±11.56 for women, and 51.38±7.88 in men). The F/B ratio observed the value of 1.05±0.90 for normal weight, 1.17±0.94 for overweight, and for obesity, it was 1.33±0.68.

Conclusion: To conclude, after setting an association through a linear regression model between F/B ratio, metabolic indicators and fat percentage, this association proves statistically non-significant (p>0.05) with a lower strength of association (R<0.5) concluding in factors as type of diet, level of physical activity, and cardiovascular health must be considered to assess meaningful relationships between dysbiosis, body composition and metabolic indicators.

GC4.332

Association Between Sleep Duration and Obesity in Patients with T2D

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Introduction: Recent evidence highlights the impact of insufficient sleep durations on health and mortality. Although sleep duration is linked to obesity in general populations, its relationship remains uncertain among individuals with Type 2 Diabetes (T2D).

Aim: To assess the relationship between sleep duration and adiposity measurements in patients with T2D.

Methods: A longitudinal data of adults enrolled in a SLEEP T2D study. We studied 229 patients with type 2 diabetes recruited from 13 UK-NHS Trusts. Sleep duration was self-reported as a part of the Pittsburgh Sleep Quality Index (PSQI). We defined short sleep duration as ≤ 6 h/ night and long sleep duration as > 9 h/night compared to the normal sleep duration of (>6-9h/night). Adiposity is measured by calculating BMI (kg/m^2), waist, hip, and neck circumference. Main inclusion criteria: 18 years old or more, diagnosed with T2D, and an eGFR ≥15 mL/min/1.73 m2 in the last 12 months.

Results: A sample of 229 individuals diagnosed with Type 2 Diabetes (T2D) included 63.2% males, with an average age of 61.3 ± 11.8 years and 63.9% had a BMI of ≥ 30kg/m^2. Sleep duration was negatively correlated with BMI (r= -0.28, p<0.0001) and waist circumference (r= -0.27, p<0.0001). After adjustment, a multiple-liner regression demonstrated the association between sleep duration and BMI (β= -0.91; p<0.05). After a median (interquartile range) follow-up of 26.4 (22.83 –31.38) months, patients with short sleep duration remained highly associated with BMI increase after adjustment for potential confounders.

Table 1: Longitudinal association between sleep duration and gained at least 5% of BMI over the follow-up period

	Pseudo R2	OR	95% CI	P Value
5% gained in BMI				
Unadjusted	0.070	4.16	1.03 16.85	0.045
	0.332	6.08	0.32 11.84	0.038

Conclusion: In patients with T2D, there is a significant association between short sleep duration and BMI, longitudinally. Understanding and acknowledging this link encourages us to consider insufficient sleep patterns as a factor in risk stratification for obesity-related complications in patients with T2D.

Conflict of Interest: All authors declared no conflict of interest except:

GC4.333

Proposed Treatment Strategy for Reactive Hypoglycaemia

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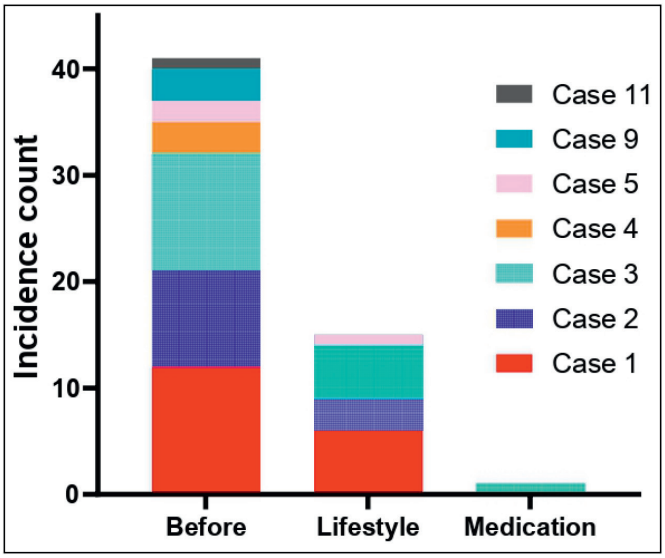
Background-Aim: Managing reactive hypoglycaemia (RH) poses challenges due to limited and often ineffective treatment options. We report a case series and draw on this to propose a stepwise treatment approach consisting of lifestyle modifications, metformin, GLP-1 analogues, and the use of flash glucose monitoring technology.

Method: A retrospective review was conducted to analyse the management of 11 cases presenting with recurrent RH symptoms.

Result: Two patients experienced successful resolution of symptoms through lifestyle modifications. Metformin alone was effective in treating seven out of nine patients who received pharmacological treatment. Two patients with previous upper gastrointestinal surgery showed a partial response to metformin and benefited further from additional long-acting GLP-1 analogue. Pharmacological intervention led to significant reductions in insulin and C-peptide levels during mixed meal tolerance tests (P-values 0.043 for insulin and 0.006 for C-peptide). Finally, flash glucose monitoring technology was useful in early detection and preventing episodes of hypoglycaemia in one of these patients with persistent symptoms.

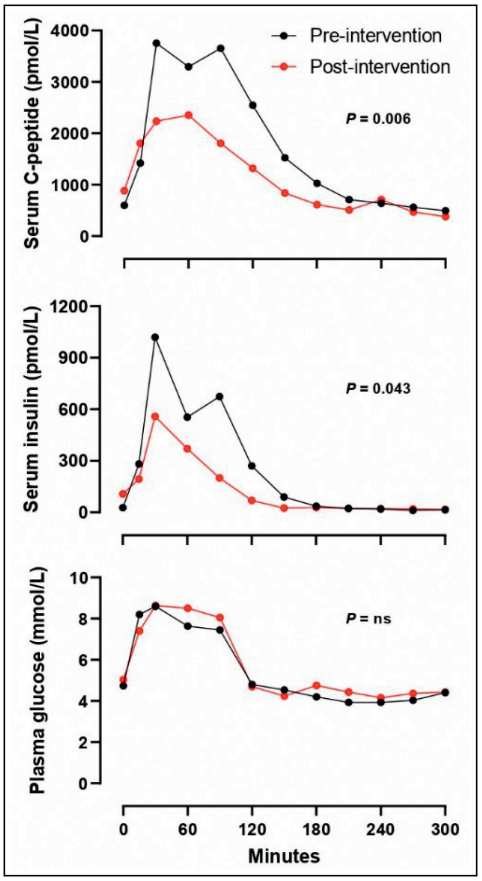
Conclusion: These findings highlight the potential efficacy of escalated treatment strategies for RH, including the use of metformin, GLP-1 analogues, and flash glucose monitoring technology.

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Before intervention, 7/11 patients experienced 41 episodes (32 in cases 1-3 with GI surgery) of severe hypoglycaemia. During lifestyle changes, 4/11 patients had further 15 episodes in a mean follow-up duration of 6.3 (range 3-20) months, and with medications, only 1 episode occurred within 32.4 (16-46) months of follow-up.

Fig. 1.



Mean serum C-peptide, serum insulin and plasma glucose concentrations in response to MMTT (200 ml of Fresubin Energy Fibre) in n = 3 patients with RH before (Black line) and after intervention (red line). Two were treated with lifestyle, metformin and dulaglutide, and one with lifestyle and metformin. Error measures were not included due to n=3.

Fig. 2.

GC4.334

The common *MC4R* rs17782313 association with obesity susceptibility in Israeli female adults is mediated by eating behavior interactions

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Introduction: The escalating incidence of obesity worldwide can be largely ascribed to the interplay between genetic susceptibility and an environment conducive to weight gain. The polymorphism of the Melanocortin- 4 receptor (*MC4R*) rs17782313 is recognized for its association with prevalent obesity, exhibiting diverse effects in various population groups. As a key component in the leptin-melanocortin pathway that regulates weight balance, *MC4R*'s role is pivotal. Our research aim was to study *MC4R* rs17782313 polymorphism and its interaction with eating behaviors on the likelihood of obesity in the Israeli population.
Methods: Israeli adults' (n=5785, ≥ 18 years) genetic, anthropometric, and demographic data were analyzed using logistic regression models, adjusted for age, sex, and diabetes types 1 and 2. Eating behaviors were assessed using an online validated self-reported questionnaire.
Results: The *MC4R* rs17782313 polymorphism was significantly associated with an elevated risk of obesity under the recessive and additive models (OR = 1.38, 95% CI: 1.1–1.72, p = 0.005 and OR = 1.1, 95% CI: 1.01–1.2, p = 0.03, respectively), after adjustment for confounders. Further stratification by sex found that carrying the common *MC4R* rs17782313 variant is significantly associated with increased predisposition to obesity in females only, under the recessive model (OR = 1.41, 95% CI: 1.09–1.82, p = 0.01). This was accompanied by an average BMI increment of 0.85 units compared to those with wild type or one risk allele. The *MC4R* rs17782313 polymorphism demonstrated a significant interaction with various eating habits, amplifying the likelihood of obesity.
Conclusion: Female *MC4R* rs17782313 homozygous carriers show a markedly increased predisposition to obesity, a risk that is further mediated by eating behaviors.

GC4.335

The efficacy and safety of Electromagnetic stimulation on the Cross-sectional area and Density of the abdominal muscles: A Multi-center, Double blind, Prospective, Randomized, Comparative study

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Introduction: Although some studies have reported favorable effect on body contouring following electro-magnetic stimulation (EMS), none have examined changes in abdominal muscle structure quantitatively. We conducted 2-week multi-center, double-blind, prospective, randomized, comparative study investigates the effect of EMS on abdominal muscle cross-sectional area and density using computer tomography scans.
Methods: Forty-six participants aged between 18 and 65 years were enrolled and randomly assigned to either the EMS group (n=23) or the Sham group (n=23). The intervention consisted of four 30-minute EMS treatment sessions over two weeks. Computer tomography scans were obtained to measure the cross-sectional area and density of abdominal muscles before and after the intervention.
Results: Following four sessions of EMS treatment, the EMS group exhibited a statistically significant increase in both the cross-sectional area and density of abdominal muscles compared to the Sham group ($p < 0.01$). Consistent with abdominal muscle hypertrophy, there was a significant reduction in subcutaneous fat thickness at week 12 in the EMS group compared with the control group ($p < 0.05$).
Conclusion: This study provides compelling evidence that short-term electro-magnetic stimulation positively influences abdominal muscle

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cross-sectional area and density. The results of this study suggest that EMS could be an effective treatment option for abdominal muscle strengthening. Further research is needed to evaluate the long-term effects of EMS on abdominal muscle structure and function.

GC4.336

Recording Diagnosis of Overweight and Obesity and its Association with Weight Loss in the Primary Care Setting

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Introduction: Obesity has been widely accepted as a chronic medical condition, which requires timely diagnosis, clinical assessment, intervention and follow up. The primary care provider (PCP) is strategically positioned to inform and offer the patient the appropriate clinical care. Both overweight and obesity (OW/OB) are underdiagnosed. The aim of the study was to investigate whether placing a formal diagnosis of OW/OB for patients with elevated BMI in the primary care setting is associated with weight loss compared to missed diagnosis.
Methods: A retrospective cohort study was conducted using Maccabi Healthcare Services' nationwide database. The study included a sample of 200,000 adult patients with a BMI ≥ 25 kg/m2 recorded during a visit at a primary care clinic between January 2014 to December 2020 (the index event). Patients with prior diagnosis of OW/OB, or obesity-related complications were excluded from the study. The independent binary variable was having a recorded OW/OB diagnosis placed by the PCP at or immediately BMI measurement. The outcome variable was weight loss of 5% or more on a second body weight measurement taken within 9 to 15 months after the index event. The association between OW/OB diagnosis and weight loss was analyzed using a multivariate regression model.
Results: Only 36,033(18%) received a recorded diagnosis of OW/OB. Patients who received a recorded diagnosis of OW/OB were more likely to be female, had a higher BMI and a younger age compared to those who did not receive a diagnosis. People with a recorded diagnosis were more likely to have at least one visit with a nutritionist within 9M after the index event (25% vs 11.6%, respectively). 37,368 people (18.7%) had a second body weight measurement, of which 7,635 (20.4%) lost 5% or more of their body weight at the index event. In univariate analysis, weight loss was associated with OW/OB recorded diagnosis (OR 2.53, 95% CI 2.46-2.60) and having visits with a nutritionist (OR 2.18, 95% CI 2.14-2.21). In multivariate logistic regression model, adjusted for potential confounders, including visits with a nutritionist, recorded diagnosis of OW/OB was still a significant predictor of weight loss (OR 1.32 95% CI 1.28-1.36, p<0.001).
Conclusion: Recording OW/OB diagnosis is an independent predictor of clinically significant weight loss, even while controlling for potential confounders and dietary consultation. Our findings could suggest that diagnosis by the PCP may inform, motivate, and engage patients to lose weight independent of further clinical intervention. Taken together, the high rates of undiagnosed OW/OB present a significant opportunity to promote weight loss in the primary care setting.

GC4.337

Evaluation of the accuracy of the current methods to estimate the resting energy expenditure in patients living with obesity and factors that influence the prefer oxidative substrate

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Introduction: Resting energy expenditure(REE) measurement in clinical practice is useful to avoid or prevent underfeeding and/or overfeeding, but it also crucial to establish reachable goals for dietary and exercise interventions. Currently, the reference method is indirect calorimetry(IC). IC provides data on the preferred oxidative substrate of the analyzed metabolism by the respiratory coefficient(RQ). At present, there is little reliable data on REE in patients living with obesity(PwO). Determining the RQ will allow a more personalized approach in the management of obesity, as well as to evaluate the impact of the metabolic status on the REE and oxidative substrate.
Goals: a)To evaluate the accuracy of REE obtained by BIA and validated mathematical equations in PwO by comparison with IC. b)To explore the factors that influence the accuracy of the REE estimation(gender, presence of Type 2 diabetes (T2D), c)To evaluate if the oxidative substrate measured by RQ is influenced by gender of the presence of T2D.
Methods: Single center, cross-sectional study, including consecutive PwO attended at our center between February2023-December2023. Patients underwent: clinical history, biochemical analysis, anthropometry, CI(Cosmed Q-NRG+)(data on REE and RQ were collected), bioimpedance(Bodystat Quadscan 4000 touch and Inbody 970)-data on REE and body composition was collected. Mifflin St.Jeor and HarrisBenedict equations were used as validated equations for the REE estimation.
Results: 50 patients were recruited:46%women; mean age 59,5±7,65 years; mean BMI38.2kg/m^2±5.68. 20% had T2D.
Statistically significant differences were observed between the 4 REE evaluation methods(p<0.0001), BIA(1832kcal±327,7) and HarrisBenedict(1872,7kcal±351,4) formula significantly overestimate REE, while Mifflin St.Jeor(1751,8kcal±294,2) formula was closer to the measured value by IC(1758,9kcal±453,8). Statistically significant differences by sex were also observed with HarrisBenedict formula compared with IC, men 2056,8kcal±361,5,p<0.0001; women 1656,7kcal±173,6,p<0.0001 and men 1941,7kcal±423,8,p<0.0001; women 1544,3±396,6,p<0.0001, respectively.
No statistically significant differences were observed between the different methods in the groups with or without T2D.
Regarding the oxidative substrate, mean RQ was 0.74±0.46, with preferential consumption of fats 87%±13.7. We found no case with protein as consumed substrate. Gender and presence of T2D significantly influenced the preferred oxidative substrate, as follows: men presented greater fat consumption(p<0.05), women had higher carbohydrate consumption(p<0.05). Patients with T2D there was a higher consumption of fat compared to carbohydrates(p<0.05).
Conclusions: In the present study we found that current methods largely used in the daily clinical practice overestimates REE in PwO. Gender and presence of T2D significantly influences the results of the estimated REE and the preferred substrate for oxidation. New methods should be developed to allow a more accurate calculation of REE in the daily clinical practice, as well as to provide data on the oxidative substrate and to allow a more personalized approach in PwO.

GC4.338

Association of obesity with respiratory, cardiac and mortality outcomes in patients with COVID-19 infection in a third level institution

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Introduction: Some 768.2 million cases of COVID-19 have been recorded in the world and more than 6 million in Colombia with 142,780 deaths. Several clinical risk factors associated with increased complications and death were evidenced, such as obesity, smoking, advanced age, high blood pressure and diabetes. The aim of this study was to describe the sociodemographic and clinical characteristics of patients hospitalized for COVID -19 at the University Hospital of Santander (HUS) and the association

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between obesity and respiratory outcomes, cardiac and mortality upon discharge.

Methods: A retrospective, longitudinal, analytical observational study of 984 patients aged 18 and over with confirmed COVID-19 infection, of whom 757 patients had anthropometric measurement data, who entered HUS between 1 August 2020 and 31 August 2021, during which time three major peaks of COVID -19 occurred in Bucaramanga, Santander. A multivariate logistic regression model was made to explore the association between obesity and death by COVID-19.

Results: The 263 (35%) people with Obesity (PwO) were categorized as grade I (52%), grade II (35%) and grade III (13%). Fifty-seven per cent were between 27 and 59 years old, 54 per cent were men and 42 per cent had a baccalaureate. 24% with a history of smoking and 16% of alcohol consumption. 37% pre diabetic, 42% type 2 diabetic with 18% in pharmacological treatment, 40%hypertensive with 30% receiving pharmacological treatment, 8% with chronic renal disease, 11% with dyslipidemia and 5% with a history of acute myocardial infarction. Regarding the severity of COVID-19, 69% had newscore2 >7 points, median ferritin 1207mcg/l (RIQ 612-2016), troponin t 15ng/ml (RIQ 6-58), dimer D 1153mcg/ml (RIQ 566-3253); also, only 2% had vaccination forsarscov2. 16% had used dexamethasone prior to admission, 8% azithromycin and 4% ivermectin. 34% of PwO had hospital stay of 0-8 days. The outcomes found were severe pneumonia OR 1.67 (95% CI 1.04-2.71); multilobar tomographic finding OR 1.5 (95% CI 1.40-11.59), mechanical ventilation OR 1.79 (95% CI 1.29-2.49) and myocarditis OR 2.76 (95% CI 1.04-7.34). After adjusting for other risk factors, an association was found between BMI and mortality (OR 1.07; 95% CI: 1.02-1.12)

Conclusion: After exploring the relationship between obesity and different outcomes in our population, positive associations were found with severe pneumonia; mechanical ventilation and myocarditis. After adjustment by age, gender, diabetes, severity markers, po2 and tomographic findings, it was found that the increase of 1 unit of BMI confers an increased risk of mortality 7%.

GC4.339

Ecological momentary assessment of preliminary efficacy of N-Acetylcysteine for loss of control eating: an open label feasibility study

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Introduction: Loss of control eating negatively impacts outcomes of obesity treatment. However, there are a lack of effective medications for this maladaptive eating behaviour. N-acetylcysteine (NAC) has been shown to restore glutamatergic dysfunction in the brain and reduce several compulsive behaviours. We evaluated the feasibility and preliminary efficacy of NAC for loss of control eating.

Methods: A single site open label study involving community residents in greater Melbourne was conducted between January and October 2023. A total of 30 participants with loss of control eating were enrolled in the study. Participants received oral NAC medication (2400 mg/day) for 12 weeks. Treatment outcomes were assessed using both retrospective questionnaires and ecological momentary assessment (EMA). The primary outcome was feasibility including recruitment rate, retention rate at week 12, and adherence to medication. The secondary outcome was change in loss of control eating from baseline to week 12. Changes in drivers of eating behaviour as a result of NAC treatment were also explored.

Results: Recruitment rate was 3.8 participants per month; retention rate was 90% and medication adherence was 93%. Average EMA compliance was 81%. Participants reported significant reduction in the frequency and severity of loss of control eating after NAC treatment. Participants showed less food craving, emotional eating, and pre-occupation with food at the end of week 12. Our data show that delivering a 12-week NAC intervention in people with loss of control eating and conducting behavioural assessments using EMA is feasible.

Conclusion: This pilot study provides a rationale for conducting a randomised controlled trial to determine the efficacy of NAC for compulsive eating.

Conflict of interest: None disclosed

Funding: No funding to report

GC4.340

Use of GLP-1 analogues in the management of weight gain and hot flashes in women entering menopause

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Introduction: Disorders related to menopause can be particularly disabling for women who face this phase of life and in particular the presence of hot flashes and weight gain are two of the disorders most complained about by women who enter menopause.

Increase in body weight, which occurs to a variable extent in all menopausal women and represents a problem in more than 50% of women over 50. Along with age, estrogen deficiency conditions a slowdown in metabolism in general and increases appetite with an "apple-shaped" distribution of body fat, i.e. at waist level, a typical location for the male sex, which entails greater cardiovascular risk.

GLP-1 analogues can significantly reduce cardiovascular risk in people with obesity and hot flashes can be an indicator of increased cardiovascular risk in menopausal women.

Aim of the study

Based on 3 case reports of 3 women followed in our clinic who had just entered menopause and who saw their hot flashes disappear as soon as they started therapy with low-dose liraglutide, we analyzed the role of GLP-1 analogues in the management of hot flashes and weight gain associated with menopause

Results: GLP-1 analogues have receptors on the vascular endothelium and prevent cardiovascular events in persons with obesity and their influence in the management of hot flashes associated with menopause is likely. In women affected by obesity entering menopause, the use of GLP-1 analogues can be a valid aid in managing menopause-related symptoms, preventing and treating weight gain associated with menopause and preventing cardiovascular events.

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GC4.341

Patient perspectives on long-term weight management support: a survey of patients attending a tertiary obesity management clinic

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Background: The efficacy of short-term weight loss interventions is well researched. Extending patient contact after initial interventions can reduce weight regain and support lifestyle changes. However, there is a dearth of research exploring patients' perspectives. This study aimed to

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explore patients' perspectives on support for managing their weight in the long-term.

Methods: A specifically designed online survey was administered to patients who had attended a tertiary obesity management clinic for ≥6 months, between 29 August and 6 October 2023. The 22-item survey was co-designed with patients. It included questions about the programs they had undertaken and self-reported height, weight and weight change from their initial engagement with the clinic. Long-term support questions included frequency of contact, preferred type of healthcare professional for that contact, appointment format and attendance barriers. Long-term was defined as ≥2 years.

Results: A total of 151 participants completed the survey with a response rate of 28%. Most participants were aged 45-64 years (58%), female (79%), Caucasian (68%) and had obesity (91%); over half had a body mass index (BMI) ≥40 kg/m² (53%). Sixty-eight per cent had been attending the clinic for over 2 years. The majority (70%) reported weight loss, 10% weight gain, 7% within 5kg of their weight when they initially engaged with the clinic and the remainder were not sure. Of those who reported weight loss, 82% reported ≥10 kg weight loss.

Most participants felt they required long-term support (96%). The preferred frequency was every 3 (37%) or 6 months (25%) for 2-5 years (30%). Dietitians (35%) and endocrinologists (31%) were ranked as the preferred healthcare professionals to provide long-term support. Most patients preferred a face-to-face appointment (58%) or a combination of face-to-face and telehealth appointments (18%); individual appointments (92%) were preferred to group sessions. Preferences did not differ significantly when controlled for age, gender, BMI or the programs they had undertaken. The greatest barriers to attendance were work or study (26%), parking (26%) and distance from the clinic (25%); 29% reported no barriers to attendance.

Conclusion: Most patients felt they required long-term support for managing their weight after engaging with weight loss interventions at an obesity management clinic. Obesity is a chronic relapsing condition and our treatment and ongoing support needs to be long-term from both a medical perspective and that of our patients. Whether such care is provided by a specialised service or in primary care needs consideration.

GC4.342

Changes in emotional and uncontrolled eating predict weight loss and regain on GLP1 agonists

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Introduction: Emotional eating (EE) and uncontrolled eating (UE) are prevalent among PwO. GLP 1 analogs (GLP1a), by acting on stress response and emotion regulation, could have the potential to ameliorate these eating patterns and thereby affect body weight.

Methods: A survey was sent to patients followed in a hospital-based weight management clinic and posted to local social networks, which included questions regarding demographics, anthropomorphic measures, comorbidities, medication use and effects. To assess the relationship between GLP1a and eating behaviors, respondents were asked to complete the widely used Three-Factor Eating Questionnaire Revised 18 item version (TFeRQ-18) twice: once considering their state while under the maximal effect of GLP1a and once considering their state off this therapy (before initiation or after cessation). The TFeRQ-18 consists of 3 scales assessing UE, EE and cognitive restraint (CR), with higher scores indicative of more of each behavior.

Results: Between July 2 and August 14, 2023, 257 responses were collected from PwO taking GLP1a over the past 2 years. Mean age was 53.1±12.7 and baseline BMI 37.7±7.0 kg/m^2. Seventy percent of respondents were female and 22% endorsed T2DM. Semaglutide use was reported by 209 respondents (81%), taking 1.1±0.5mg weekly or 24±18 months, and liraglutide use by 48 (19%), taking 2.5± 0.7mg for 17±13 months. Overall weight loss was 11.8±11.9% and 7.0±7.6% for semaglutide and liraglutide users respectively (p=0.003). Weight regain during continued drug use was reported as 3.5±8.3% and 6.1±12.3% for semaglutide and liraglutide users respectively (p=0.09). Comparing semaglutide to liraglutide users, there were higher rates of drug cessation for the latter (29 vs. 42%, p=0.08), with side effects more often cited as the main reason for discontinuation (48.3 vs. 65.0%, p=0.052). There were significant improvements in eating behaviors as assessed by TFeRQ-18 on therapy ($\rho\tau$=0.84)

There was a positive correlation between overall weight loss and the ability to reduce both UE and EE on GLP1a (r=0.31 and r=0.29, p<0.001 for both). In contrast, there was a negative correlation between weight regain on therapy and change in both UE and EE (r=-0.16, p=0.01 and r=-0.121, p=0.052). Given a similar negative correlation with age, younger age was associated with greater changes in UE and EE (r=-0.23, p<0.001 and r=-0.15, p=0.02). Females had greater changes in EE and UE scores than males on therapy (25.7±28.2 vs. 20.2±26.7, p=0.04 and 20.0±28.5 vs. 11.1±27.4 p=0.005). While no aforementioned correlations existed

Tab. 1. Baseline Characteristics.

Characterisic	All Respondents (n=257)	Semaglutide (n=209)	Liraglutide (n=48)	P value
Age (years)	53.1±12.7	53.2±12.8	52.5±12.7	0.72
Female	181 (70.4%)	150 (71.8%)	31 (64.6%)	0.33
Weight before drug (kg)	105.3±22.6	104.8±22.5	107.2±22.6	0.53
BMI before drug (kg/m^2)	37.7±7.0	37.6±6.8	38.2±7.9	0.83
History of bariatric surgery	45 (17.5%)	40 (19.1%)	5 (10.4%)	0.15
Medical comordbidities				
Dyslipidemia	84 (32.7%)	58(27.6%)	26 (54.2%)	0.81
HTN	79 (30.7%)	60 (28.7%)	19 (39.6%)	0.12
NAFLD/NASH	66 (35.7%)	53 (25.4%)	13 (27.1%)	0.86
T2DM	56 (21.8%)	54 (25.8%)	2 (4.2%)	0.001
Psychiatric disorders	37 (14.4%)	25(12.0%)	12 (25.0%)	0.02

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Tab. 2. GLP1 Analog Use.

Characteristic	All Respondents (n= 257)	Liraglutide (n=48)	Semaglutide (n=209)	P value
Mean drug dose (mg)		2.5 ± 0.7	1.1 ±0.5	-
Length of treatment (months)¥	18.4±16.6	24.1±18.0i	16.5±12.8ii	0.007
Respondents reporting taking drug 80-100% of time (n)	80	60 (75%)	20 (25%)	0.33
Overall weight loss (%)*	11.3±12.4	11.8±11.9	7.0±7.6	0.003
Maximal weight loss on drug (%)**	14.1±9.3	14.9±9.3	10.8±8.6	0.17
Weight regain on drug (%)***	4.0±9.3	3.5±8.3	6.1±12.3	0.09
Time to achieve nadir weight (months)	10.2±8.1iii	10.9±8.4iv	7.4±6.0v	0.19
Overall weight loss (kg)*	10.9±11.3	12.3±13	7.2±8.3	0.90
Maximal weight loss on drug (kg)**	14.7±10.5	15.5 ±10.7	11.2 ±8.9	0.09
Weight regain on drug (kg)***	3.4±7.8	3.2 ±7.8	4.0± 7.5	0.62
TFeRQ-18 UE	24.1±27.8	24.7±28.4	21.5±25.5	0.26
TFeRQ-18 EE	17.3±28.4	17.3±28.9	17.6±26.3	0.96
TFeRQ-18 CR	-6.7±23.4	-6.4±28.8	-8.0±21.6	0.69
Patients stopping drug (n)	80 (31.1%)	60 (28.7%)	20 (41.7%)	0.08
Endorsed side effect as the main reason for cessation	44	29	13	0.052

¥ length of treatment at time of answering survey or until drug cessation *Overall weight loss: baseline weight minus last weight on therapy ** Maximal weight loss: baseline weight minus nadir weight on therapy ***Weight regain: last weight on therapy minus nadir weight on therapy. i: missing data (n=138) ii:missing data (n=28) iii: missing data (n=238) iv: missing data (n=191) v: missing data (n=47), TFeRQ-18: Three-Factor Eating Questionnaire Revised 18 item version, EE: emotional eating, CR: cognitive restraint, UE: uncontrolled eating

Tab. 3. Correlations for TFeQ-18 on GLP1a.

	Δ uncontrolled eating (UE) scale	Δ emotional eating (EE) scale	Δ cognitive restraint (CR) scale
Overall % weight loss*	0.31 (<0.001)	0.29 (<0.001)	-0.09 (0.15)
Weight regain on drug (Kg)**	-0.16 (0.01)	-0.12 (0.052)	0.01 (0.85)
Age (years)	-0.23 (<0.001)	-0.15 (0.02)	-0.05 (0.5)
Baseline BMI (kg/m^2)	0.04 (0.52)	-0.08 (0.21)	-0.09 (0.14)

Spearman correlation used to calculate reported r values. P value listed in parentheses. Change in TFeQ-18 scores reflect values off therapy minus value on therapy during perceived maximal effect. *Overall weight loss: baseline weight minus last weight on therapy **Weight regain: last weight on therapy minus nadir weight on therapy

with CR, those who stopped GLP1 vs. those who did not, reported less improvements in UE (11.8±28.7 vs. 29.8±25.7) and EE (7.4±26.9 vs. 21.8±26.9), as well as CR (0.6±21.4 vs. -10.0±23.6, p<0.001 for all).

Conclusion: In PwO treated with GLP1a, weight loss is associated with ability to reduce UE and EE on treatment, while a rise in these behaviors is associated with weight regain, and these associations are modulated by age and gender. Lastly, reduced capability to improve UE, EE or CR is associated with drug cessation.

GC4.343

The importance of obesity-related cancer risk and acceptability of weight loss intervention - Patient and public involvement and engagement

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Introduction: Obesity is a well-established cause of cancer. With studies showing 4-8% of worldwide cancer being directly attributable to the presence of obesity. However, evidence for the treatment of obesity reducing this risk is not well established. This project aims to elicit the current state of this evidence, establish consensus on further work and provide a study of feasibility of a weight loss intervention to prevent cancer clinical trial.

Methods: Patients were invited from Obesity Voices, recruited from the community with lived experience of overweight and obesity. Run by Leeds Beckett University Institute of Obesity. The session included a mix of group discussion, small group discussion and polls, providing a mix of qualitative and quantitative data.

We included 6 participants from across the UK with lived experience of obesity, with a variety of prior experience with different weight loss measures. The age ranged from 55 to 74.

The session included a mix of group discussion, small group discussion and polls, providing a mix of qualitative and quantitative data.

Results: Themes elicited included risk communication, importance of risk and acceptability of interventions. 5/6 participants strongly agreed the risk of obesity-related cancer is very important to them. 5/6 participants ranked weekly injections as their top preference for the treatment of obesity.

Conclusion: Patients showed preference towards weekly injections and stated life-long, rather than episodic treatment of obesity is important. This group stated that the risk of obesity-related cancer is very important. This information will be used to inform clinical trial planning.

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GC4.344

Understanding Individuals with Obesity: Perceptions, Biases, and Challenges in Comprehensive Management

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Introduction: Obesity is a documented health concern, yet a gap exists in understanding how people with obesity (PwO) perceive their condition and the accuracy of their information. This data aids in improving obesity treatments. The study aims to uncover biases in self-perception and attitudes among patients about obesity.
Methods: PwO enrolling for the Elevate Now digital weight loss program received a questionnaire for weight loss assistance. Questions covered obesity definitions, health implications, lifestyle, treatment perceptions, medication hesitancy, and demographics. We assessed biases or stigmas against obesity. Data was quantitatively and qualitatively analyzed to understand patient perceptions, knowledge gaps, and self-biases influencing obesity management.
Results: -11.6% accurately understand their required weight loss, shown by deviations close to zero (Range +3, -3 kgs). Perceived weight loss ranges from -13 to +30 Kg from the actual weight required for a healthy BMI among surveyed patients. -9.4% believe 18 is a healthy BMI, 23.1% opt for 23, 12.8% for 27, 6% for 30, and 5.1% for 35. -35.9% believe self-control is the sole factor contributing to obesity, while 41% do not. -28.2% believe weight loss is the permanent cure for obesity. -45% PwO think they're overweight, not PwO; 1% believe they're of normal weight. -38.5% believe it's their fault they can't lose weight, and 34.2% think that may or may not be true. -65.5% seeking weight loss help were hesitant to use prescribed medication; post-program, 23% showed some hesitation to continue or try a different drug. -54.9% faced side effects without hindering life, 40.7% had no side effects, and 4.4% faced side effects affecting daily life.
Discussion: Perceptions of healthy weight and BMI definitions vary widely among PwO. In this study, 45% of PwO thought they were overweight, not PwO. This underscores the need for better education and awareness, enabling timely help-seeking and realistic goal-setting. Only 11% accurately understood their weight loss goal, emphasizing the crucial role of individualized counseling and relevant obesity education for treatment success. Over one-third attributed obesity to a lack of self-control, and this emphasizes the bias and stigma that patients suffer from. A substantial majority of patients believed that they were at fault when it came to weight loss and maintenance, underscoring the stigmatization of PwO. Awareness of the hormonal basis of obesity is essential. 65% Patients qualifying for obesity pharmacotherapy are initially hesitant, dropping to 23% post-program, a positive shift. Only 4.4% experienced adverse events interfering with daily life.
Conclusion: Mass awareness of obesity definitions and weight loss goals is crucial. Comprehensive obesity education, including causes, is vital for prompt help-seeking. Addressing perceptions and stigma of lack of self-control and self-blame during counseling is essential. Proper counseling on pharmacotherapy safety and use is necessary to reduce hesitancy around weight loss therapies

GC4.345

Patient Experiences of Weight Regain following Weight Loss Surgery: A Qualitative Systematic Review

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Introduction: Weight loss surgery (WLS) is seen as the most effective treatment for people living with severe obesity, yet a significant number of those having WLS will experience weight regain. This review will synthesise what is known of the patient's experience of weight regain (WR) following WLS, with the aim to inform future research and practice to reduce WR and to support those with WR.
Methods: The experience of WR following WLS was investigated through a qualitative systematic review of the research. A systematic search of six databases was conducted for this review. Initial searches had no start dates or filters and were completed up until 12th July 2022.
Included studies were assessed using Critical Appraisal Skills Programme criteria (CASP, 2022) and synthesised using thematic synthesis methods proposed by Thomas and Harden (2008).
Results: Seven studies (57 participants) were included in the synthesis, all used semi-structured interviews, but the qualitative methods used by researchers varied. There was an overrepresentation of females in the included studies compared to numbers of those having WLS in the UK.
Two main themes were found from the synthesis. The Neglected Mind and Social Withdrawal. These themes were organised and explained through descriptive themes; emotional eating, other coping mechanisms, psychological support, adjusting to life with WLS, blame, social isolation and judgement from others.
Conclusion: There were some reporting issues within the included studies. Other limitations are related to potential variations in experience based on the type of WLS and participants demographics that are yet to be explored in the evidence base.
Findings indicate that the influence of the mind is neglected, both by participants and those supporting participants with WLS. WR was experienced as an internal personal failure by participants. Further research is needed to establish how more psychological support can be implemented into the preparation and follow-up of WLS to reduce WR following WLS and support those experiencing WR. Blame and judgment from others lead to social withdrawal and need to be considered to best support patients post-WLS.

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Table 1

A summary of study characteristics

Reference	Focus/ Aim	Setting, Location, Recruitment	Participant Characteristics	WLS Characteristics	Key themes	Method/ epistemology	CASP Rating
[illegible]	Experience of WR following WLS Meaning of WR Impact and implications of WR	Norway Public and private WLS patients Support group	N = 3 female Age = 28-50years	Gastric bypass (Roux-en-Y) >5 years	1) WLS the only choice – inability to "live with their body" and unsuccessful attempts and WL 2) Reduced social life 3) Shame/ judgement 4) Disappointing post WLS support	Narrative-phenomenological exploration interviews between 90-120 minutes	8.5
[illegible]	Describe the experiences of patients who had failed to maintain WL following WLS	U.K. Public hospital	N = 10 female Age = 43-63years	laparoscopic adjustable gastric band (LAGB) >2 years	1) Living with the side effects 2) Regret 3) Lack of support	Thematic analysis Semi-structured interviews	9.5
[illegible]	To explore participants' understanding of unsuccessful WLS and the requirement for a further operation	U.K. 4 from an obesity clinic, 6 from a patient support group	N = 10 (8 female, 2 male) Age = 38-78years Some had second or revisional surgery after unsuccessful (WR or insufficient WL) first WLS	4 had LAGB followed by bypass 2 had LAGB followed by sleeve 3 had bypass 1 had LAGB and awaiting bypass >3 years since first WLS >8 months since second WLS	1) The operation failed 2) Cheating the operation 3) Emotional regulation 4) Neglected mind	Interpretive Phenomenological Analysis (IPA) Semi-structured interviews	9.5
[illegible]	To assess the emotional significance of WR following WLS	Brazil Hospital/ out-patient clinic	N = 8 female Age = 38-61years	Gastric bypass (Roux-en-Y) >3.5 years	1) WR (defeat/ failure) 2) Absence of regret and certainty of success 3) Abandonment 4) Loss of self-esteem and social isolation	Semi-structured interviews Did not state method of analysis used	7
[illegible]	To understand individual patients' experiences of WR following RYGB	U.K. Hospital	N = 10 (8 female, 2 male) Age = 28-61years	Gastric bypass (Roux-en-Y) >2 years	1) Passivity: Spectating at the post-surgery experience 2) Euphoria and liberation 3) WR: The missing signs 4) Abandonment and disempowerment 5) WR: The line of	Thematic analysis Semi-structured interviews	9

Fig. 1. A summary of study characteristics.

Reference	Focus/ Aim	Setting, Location, Recruitment	Participant Characteristics	WLS Characteristics	Key themes	Method/ epistemology	CASP Rating
					tolerance 6) Impact of WR: Guilt and shame 6) Self-management and support: Treating the mind as well as the body		
[illegible]	Experience of WR following WLS	Sweden Obesity clinic	N = 16 (12 female, 4 male) Age = 20-64years	Gastric bypass (Roux-en-Y) >3 years	1) Loss of control and focus 2) Reducing the burden of weight management	Thematic analysis Semi-structured interviews	10
[illegible]	Improved understanding of how patients with WR following WLS experienced support the received	Sweden Obesity clinic	N = 16 (12 female, 4 male) Age = 20-64years	Gastric bypass (Roux-en-Y) >3 years	1) A lonely struggle 2) Others as a source of compassion and control	Thematic analysis Semi-structured interviews	10

Fig. 2. A summary of study characteristics 2.

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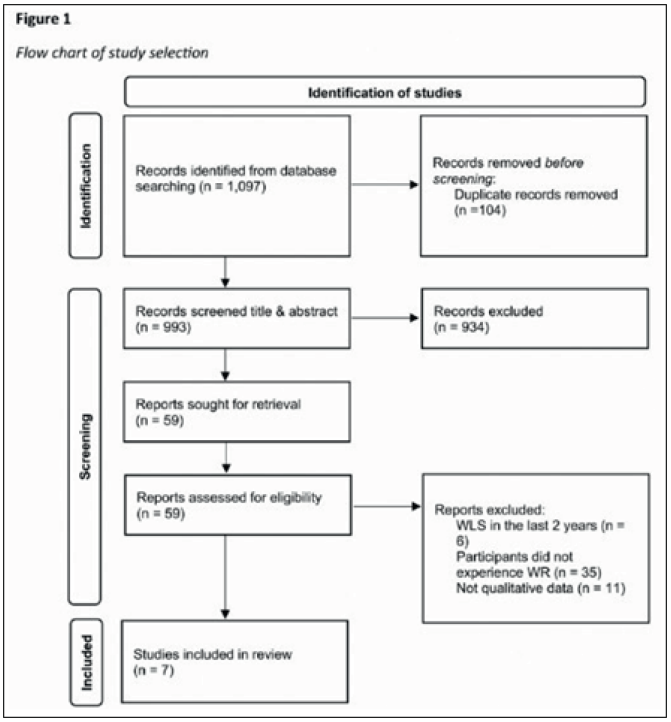


Fig. 3. Flow chart of study selection.

GC4.346

An exploration of patient and clinician experiences of telehealth in an Irish diabetes and bariatric hospital service during the COVID-19 pandemic

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Introduction: The COVID-19 pandemic accelerated telehealth use in healthcare services. This transformation in healthcare delivery brought advantages including increased flexibility and accessibility; and disadvantages including increased funding needs for modern IT equipment, training and support. Clinicians' perceptions of initial telehealth innovation at the outset of COVID-19 have shifted to a need for safe access and delivery of effective care.
Aims: This qualitative study explores patient and clinician experiences of telehealth in an Irish diabetes and bariatric hospital service during the COVID-19 pandemic.
Method: A series of semi-structured interviews and focus groups were conducted with 11 people living with obesity and/or diabetes and twenty clinicians (n=31). Transcribed qualitative data were analysed using reflexive thematic analysis.
Results: Strengths (e.g. accessible and flexible healthcare engagement, time and cost savings, improved quality of life for people living with obesity and/or diabetes) and challenges (e.g. less personal, reduced human connection) with integrating telehealth into a diabetes and bariatric health service were identified, including factors which enabled and improved the telehealth experience. Patients and clinicians reflected on their ideal future diabetes and bariatric service with a particular focus on the potential of combining face-to-face and telehealth service provision. Recommendations for future telehealth service provision were identified.
Conclusion: Person-centred, face-to-face care integrating positive aspects of telehealth can support advances in diabetes and bariatric care. There is an evolving shift in patient and clinician perceptions on the potential usefulness of integrating elements of telehealth into future healthcare provision. Continued evaluation of healthcare efficacy and quality is required, particularly for the enhancement of peoples' physical and mental health.

GC4.347

Public Perception about Obesity and Obesity Treatment

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Background: The prevalence of obesity has steadily increased in Korea. The prevalence of obesity has steadily increased, becoming a socioeconomic burden.
Methods: We conducted an online survey of 1,000 adults (515 men and 485 women aged 20–59 years) in February, 2023 for investigating the perception of obesity and obesity treatment.
Results: Six out of 10 (61%) respondents said, "Our society tends to ignore and discriminate against them because they are obese." In particular, 71% of women and 52% of men said so, indicating that women are experiencing more stigma and discrimination due to obesity than men. When asked what they think about people with overweight or obesity, the survey also showed that ▲ they easily stand out because of their fat body shape (70%) ▲ look lazy (58%) ▲ lack of willpower and self-control (56%), confirming negative social perception people with obesity.
Only 5 out of 10 (47%) of patients with stage 2 or 3 obesity perceived themselves as highly obese, while 32% of normal and 5% of underweight considered themselves obese. Nine out of 10 (89%) of respondents know that "obesity causes various adult diseases and increases mortality," but only 39% perceived that it was a problem that needed expert help, and only 39% of respondents thought they needed expert help.
In addition, 66% of respondents thought that it could be solved with individual will by both diet control and exercise, suggesting that there is a high possibility that help or management through experts will not be carried out. Even in the case of severe obesity, only 20% of the patients used hospitals and clinics, and only after health problems such as ▲ complications (59%) ▲ high obesity (57%) ▲ eating disorders such as eating too much, they needed professional help. 69% of respondents said they had experienced dieting, and 64% of respondents who tried to lose weight said they had experienced regaining weight. While 39% blamed their lack of will for the weight-regaining, the most important thing to maintain weight loss is also their firm will.
Conclusions: Obese patients are likely to try to lose weight in a way such as temporary diet control due to misperception and information about obesity, and to experience a yo-yo phenomenon that increases weight further by attributing the failure to a problem of their will. There is a need for social promotion on accurate standards and all-bar management methods for obesity.

GC4.348

Reconciling health-centric approaches to obesity management: the Health at Every Size ® paradigm and the Edmonton Obesity Staging System

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Introduction: Weight stigma represents a threat to the health and well-being of people living with obesity, with the conventional weight-centric approach to obesity management being recognized as a contributor to this issue. In response, alternative approaches that prioritize health-related outcomes over weight loss have emerged as potential solutions to mitigate the negative impacts of weight stigma. Health at Every Size ® (HAES) and the Edmonton Obesity Staging System (EOSS) are two different

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approaches that have been proposed to address weight stigma by shifting the clinical focus from weight to health in obesity management.
PURPOSE: In this study, we explored HAES and EOSS as two contemporary health-focused approaches to obesity management, to address the following questions: 1) what can medicine learn from the HAES movement that can be applied in a health-centric clinical practice? 2) What can medicine contribute to the HAES movement while remaining true to the concern that obesity is a health risk? 3) What are the messages we need to promote in health and medicine when it comes to reframing the discussion away from weight and towards health?
Methods: We conducted 10 semi-structured qualitative interviews with key informants with expertise in areas relating to the topics of interest, including HAES, EOSS, and weight stigma in obesity management. We used critical thematic analysis (CTA) as the guiding methodology to analyze the transcripts.
Results: We identified five critically-informed themes: 1) a shared commitment by HAES and EOSS to challenging dominant, weight centric approaches to reduce the harms of weight stigma; 2) tensions in understanding obesity as a chronic disease versus a social justice issue; 3) the power of language and the language of power: tensions in how weight and health are conceptualized; 4) the disposition to 'do no harm' in medicine versus understanding the health care system as a place of harm; and 5) changing messaging about obesity in medicine is essential for shifting the narrative from weight to health and reduce weight stigma.
Conclusion: Our identification of these themes revealed a complex relationship between the various dimensions of the discourse on weight and health, contributing to a better understanding of weight stigma and its implications within different obesity management frameworks. This understanding is crucial for developing interventions that minimize the negative consequences of weight stigma while enhancing factors that contribute to better health. The recommendations that emerged from this study can help healthcare providers prioritize the health and well-being of people living with obesity, in a holistic, patient-centred manner.

GC4.349

How often do people with obesity experience stigmatizing situations?: Comparison between Spain and Mexico (LATAM-OBESTIGMA study)

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Introduction: According to the OBESTIGMA-Spain study, individuals with obesity show a worrying increase in stigmatizing situations among younger people (Front Psychol.2023;14:1209245). In Mexico, the prevalence of obesity is higher than in Spain, although data on the stigmatization of obesity are scarce.
Objective: To compare the frequency with which people with obesity experience situations recorded in the Stigmatizing Situations Inventory (SSI) considering their country of origin.
Methods: Observational study with individuals from Spain (n=1,018) and Mexico (n=823). The SSI consists of 10 questions with a range of responses from "never" to "daily."
Results: The Spanish population experiences stigmatizing situations more frequently (at least once a year) compared to the Mexican population: "Children make fun of me" (46.3% vs. 22.1%), "People have low expectations of me" (35.0% vs. 15.3%), "People think I overeat" (70.2% vs. 42.7%), "I can't find clothes in my size" (69.7% vs. 46.1%), "People stare at me because of my weight" (58.9% vs. 32.2%), "The doctor recommended a diet even though I visited for a reason other than weight" (74.5% vs. 29.4%), "The doctor relates any health problem to my weight" (59.4% vs. 30.3%), "A stranger has suggested I lose weight" (49.1% vs. 27.5%), "A close relative has insistently told me to lose weight" (60.1% vs. 38.9%); in all cases, $p<0.005$.
Conclusions: The most frequent stigmatizing situation in Spain occurs in the healthcare environment, while in Mexico it is related to access to clothing. The country of origin is a key factor in respect for people with obesity.

Acknowledgments: Not listed among the signing authors but should be considered as such are the members of the Mexican Association of Nutrition (Ana_Luisa Ricárdez, Mónica_del_Rosario Silva, Miriam Elizabeth Rosa-Gil, Berenizze Castro, Alejandra_Soledad Jiménez, Claudia_Cecilia Pérez, Marco_Antonio Castro, Sarai Martínez, Jesús Flores).

GC4.350

Reporting the effectiveness of Dietary Intervention on Weight Loss Outcomes in Patients with Obesity and Overweight: A Retrospective Chart Review at a Center of Excellence in the UAE

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Objective: This retrospective chart review aims to assess the effectiveness of a dietary intervention on weight loss outcomes in patients with obesity and overweight attending a Center of Excellence for Weight Reduction and Obesity Management in the UAE.
Method: Modest weight loss of 5% has been recognized as a significant factor in preventing the progression to type 2 diabetes, blood pressure, and other risk factors are associated with obesity. Dietary intervention plays a pivotal role in obesity management and addressing metabolic conditions. This retrospective study, comprising 269 participants at a Center of Excellence for Weight Reduction and Obesity Management in the UAE, aimed to assess the effectiveness of a dietary intervention on weight loss outcomes. Descriptive analysis revealed a diverse sample, with an average age 23.0-69.0 years and predominantly female (64.3%) and Caucasian (81.0%). Total number of sessions between 2- 23 sessions. Length of treatment varies between 1month to 48 months.
Results: Results showcased 5.4 % significant reductions in weight following the treatment. BMI dropped significantly by 1.7% from 31.84 kg/m^2 to 31.23kg/m^2. Fat percentage reduced from 40.64% to 38.39% with 5.5% change in fat percentage. Waist circumference changes from 101.39cm to 96.03cm with 5.2% reduction in waist circumference. Visceral fat dropped from 3.45L to 2.62L showing a reduction of 24%.
BMI changes of 1.47kg/m^2 and waist change 5.36 cm were positively correlated with total number of sessions.
Waist change 5.36 cm was positively correlated with length of treatment.
A cessation period with dietitian of more than 3 months was negatively correlated with fat mass change. All of which highlighting the positive impact of compliance to dietician visits.
Gender-based differences, showed that females experienced significant changes in fat percentage and waist circumference compared to males. Males exhibited a greater reduction in visceral fat, with a significant difference in BMI.
On the other hand, there was negative correlation between fat loss and cessation of dietician visit. Unexpectedly, this finding was offset by a positive correlation between the weight change and waist change and the cessation period of more than 3 months.
The long interruption of dietician visit correlated with more weight gain and less fat loss. That can possibly be explained that patients who had long pauses in their follow up had more time to achieve more weight loss,

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Tab. 1. Comparison between Anthropometric indices between before and after treatment (n=269).

variable	pre- treatment	post - treatment	P- Value
Weight (Kg)	90.89 ± 21.30	85.96 ± 20.13	< 0.001*
BMI	31.84 ± 5.92	31.23 ± 15.49	< 0.001*
Fat (Kg)	37.10 ± 13.29	41.97 ± 13.8	0.177
Fat %	40.64 ± 9.79	38.39 ± 8.86	< 0.001*
Muscle mass (Kg)	26.83 ± 16.80	25.15 ± 6.77	< 0.001*
Waist circumference (cm)	101.39 ± 16.52	96.03 ± 15.31	< 0.001*
Visceral fat L	3.45 ± 3.37	2.62 ± 2.00	< 0.001*

however at the expense of muscle loss rather than fat loss. Our finding s reinforced the importance of continuous dietary sessions.

Conclusion: The dietary intervention at the Center of Excellence resulted in notable improvements in anthropometric indices. These findings provide valuable insights into the efficacy of the dietary intervention, emphasizing the importance of individualized treatment durations and sessions. The gender-specific variations underscore the need for tailored approaches in obesity management.

GC4.351

Relevance of Body Weight and Weight Change on Cardiovascular Benefit with Semaglutide: A Pre-specified Analysis of the SELECT Trial

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Background: In the SELECT trial of patients with overweight or obesity and established cardiovascular (CV) disease but no diabetes, there was both a 20% reduction in 3-point MACE and substantial body weight loss (9.4%) with once-weekly subcutaneous semaglutide 2.4 mg. We now report a pre-specified analysis of the relationship between weight measures at baseline, their change during early treatment and cardiovascular outcomes.

Methods: The SELECT trial randomised 17,604 patients aged ≥45 years with BMI ≥ 27 kg/m² (72% male / 28% female) from a geographically and racially diverse population to semaglutide or placebo for a mean of 40 months. The relationship between time to first MACE and baseline weight, BMI, waist circumference and waist:height ratio as well as changes in these parameters over the first 20-weeks of treatment was analysed using a Cox proportional hazards model with treatment subgroup, and the interaction between treatment and subgroup as categorical fixed factors.

Results: Within each treatment arm, MACE rates were comparable across subgroups defined by baseline adiposity measurements. Semaglutide reduced the risk of MACE compared to placebo, with no difference in the magnitude of benefit of semaglutide across all baseline weight or anthropometric subgroups (Figure 1). By week 20, 62% of semaglutide and 10% of placebo patients had lost ≥5% of their body weight. The reduction in the MACE rates by semaglutide vs placebo was similar in patients who lost ≥5% and those who lost <5% or gained weight (hazard ratio 0.67 [95% CI; 0.52–0.87] and 0.85 [0.72–1.00] respectively; interaction P-value >0.10) (Figure 2A). MACE rates among patients on semaglutide were similar in the two weight loss categories, whereas patients on placebo who lost ≥5% weight had higher MACE rates than those who lost <5% or gained weight (Figure 2B).

Conclusion: In this CV outcomes trial of semaglutide in patients with overweight or obesity but without diabetes, a reduction in MACE was achieved regardless of the level of baseline adiposity. The magnitude of this treatment effect with semaglutide was also independent of the extent of achieved weight loss. This suggests alternative mechanisms of improved cardiovascular outcome beyond reduction in adiposity, which may benefit many patients on top of current guideline-directed care.

Reference

Lincoff AM, Brown-Frandsen K, Colhoun HM, SELECT Trial Investigators et al, N Engl J Med. 2023 Dec 14;389(24):2221–2232.

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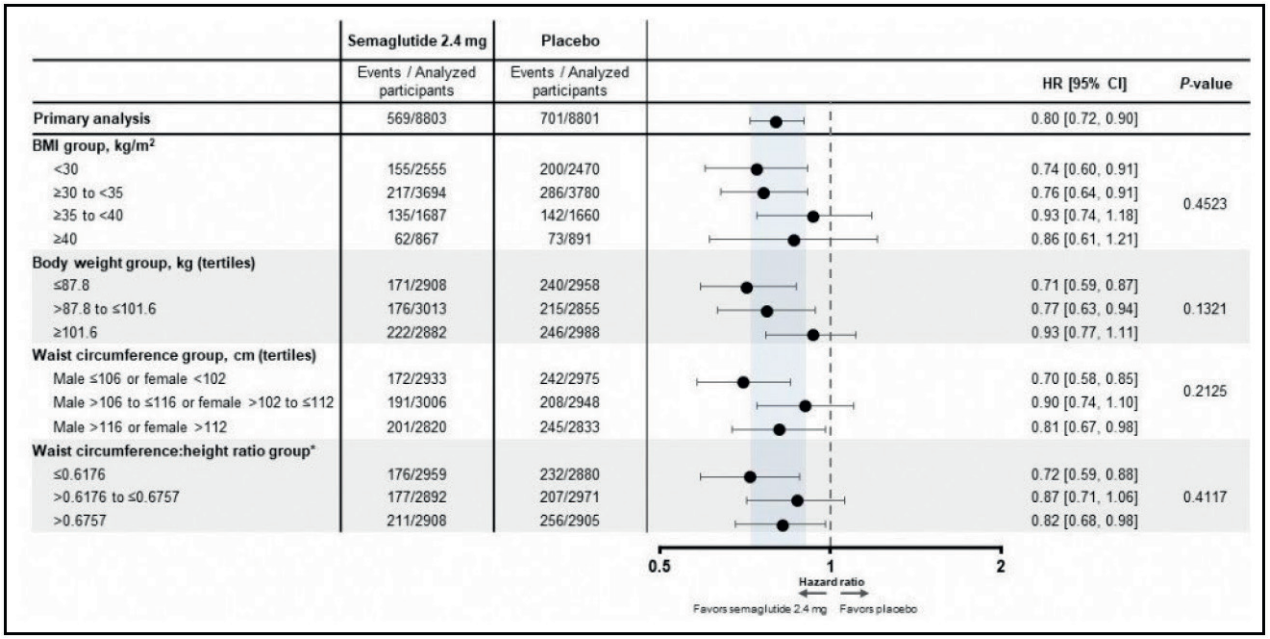
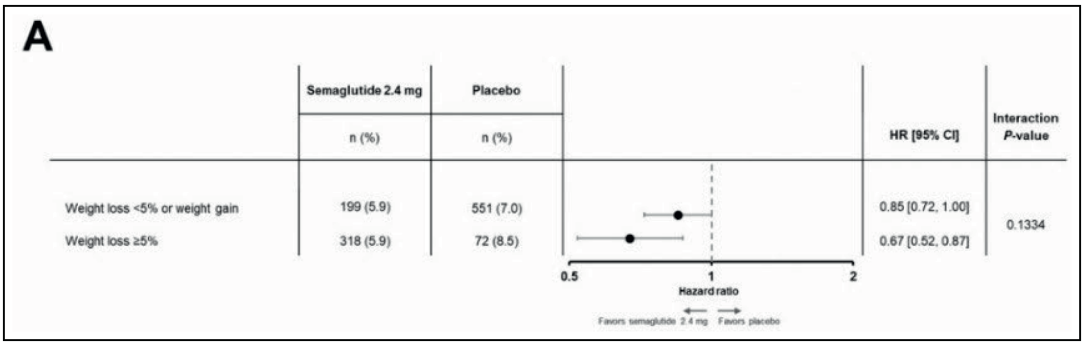


Fig. 1. Time from randomisation to first MACE by baseline BMI categories, body weight and anthropometrics for semaglutide and placebo treated groups.



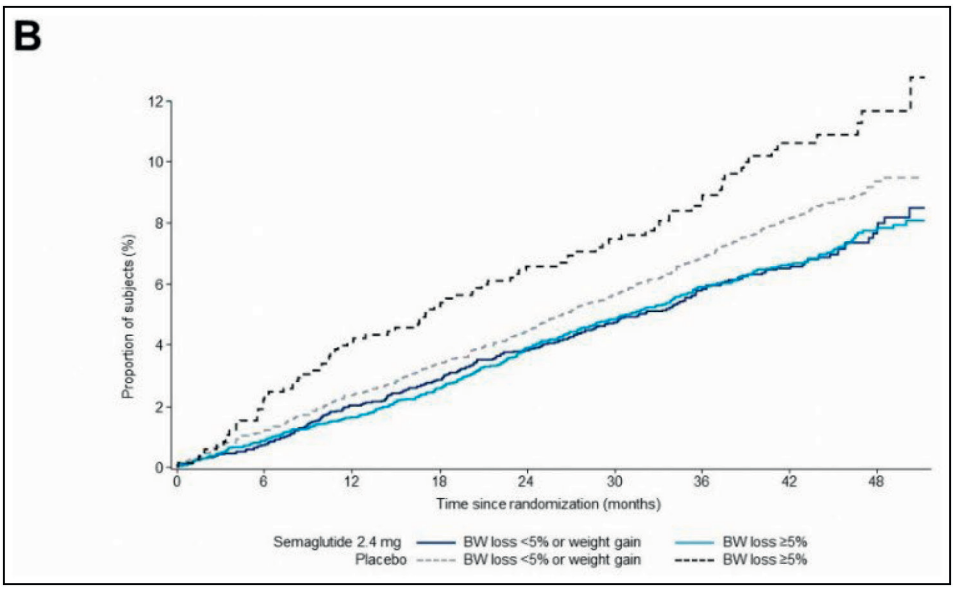


Fig. 2. MACE after week 20 by change in body weight (baseline to week 20) (A). Time to first MACE by change in body weight (baseline to week 20) in semaglutide vs placebo treated groups (B).

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