30th Annual Congress of the European Childhood Obesity Group (ECOG)

November 11–12, 2021 (Online): Abstracts

Scientific Committee

Emma Boyland
Department of Psychology, Institute of Population Health, University of Liverpool, Liverpool, United Kingdom

Margherita Caroli
Nutrition Unit, Department of Prevention ASL, Brindisi, Italy

Eva Erhardt
Department of Paediatrics, University of Pécs, Pécs, Hungary

Anders Forslund
Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden

Artur Mazur
Institute of Medical Sciences, Medical College, University of Rzeszow, Rzeszow, Poland

Dénes Molnár
Department of Paediatrics, University of Pécs, Pécs, Hungary

David Thivel
Laboratory of the Metabolic Adaptations to Exercise under Physiological and Pathological Conditions Clermont Auvergne University, Clermont-Ferrand, France

Daniel Weghuber
Department of Pediatrics, University Hospital Salzburg, Division of Gastroenterology, Hepatology and Nutrition, Paracelsus Medical University, Salzburg, Austria

Elpis Vlachopapadopoulou
Department of Endocrinology-Growth and Development, "P & A Kyriakou" Children's Hospital, Athens, Greece

Disclosure Statement

The members of the Scientific Committee have no conflicts of interest to declare.

1

Relationships between Follicle-Stimulating Hormone Levels and Insulin Resistance Markers in Peripubertal Children

Kucukemre Aydin, B.[1,2]; _Stenlid, R._[1,2]; _Ciba, I._[1,2]; _Dahlbom, M._[2]; _Bergsten, P._[1,2]; _Nergårdh, R._[2]; _Forslund, A._[1,2]

[1]Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden; [2]Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden

Background: Studies in perimenopausal women revealed that elevated serum follicle-stimulating hormone (FSH) levels are associated with obesity, insulin resistance (IR) and metabolic syndrome (MetS). Like perimenopause, gonadotropins increase during puberty and rapid changes in body size occur. Increase in IR is also a well-known phenomenon in puberty.

Aims: To investigate the relationships of FSH with anthropometric changes, IR markers and MetS in peripubertal children.

Methods: Uppsala Longitudinal Study of Childhood Obesity (ULSCO) is an ongoing study with the aims of defining and understanding the factors contributing to childhood obesity and development of obesity-related diseases. The subset of participants who were prepubertal at the first visit (n=95, 77 with obesity, 47 girls and 48 boys) were included in this study. Analyses were done for the first and last visits. Mean follow-up time was 3.0±1.4 years.

Results: Age was not different between the genders both at the first visit [girls 8.8(7.6-9.5), boys 8.3(7.0-9.8) years, p=0.53] and at the follow-up visit [girls 11.8(10.3-13.2), boys 11.0(9.8-13.3) years (p=0.39)].

Serum FSH levels were higher in girls [1.45(0.78-2.0)IU/L] than boys [0.63(0.45-0.88)IU/L] (p<0.001) both at the first and the follow-up visit [girls 3.8(2.3-5.3)IU/L, boys 1.18(0.62-3.2)IU/L, p=0.002].

At the first visit, FSH was negatively correlated with BMI SDS both in girls (r=-0.355,p=0.01) and boys (r=-0.333,p=0.02). In girls, FSH was positively correlated with sex hormone-binding globulin (SHBG) (r=0.407,p=0.009) at the first visit.

Follow-up FSH remained negatively correlated with BMI SDS in boys (r=-0.588,p=0.001). In girls however, correlations of FSH with BMI SDS and SHBG became non-significant. In girls, FSH became positively associated with fasting insulin (β=0.668,p=0.03), and HOMA-IR (β=0.678,p=0.03) at the follow-up visit.

Thirteen children (6 girls/7 boys) fulfilled the MetS criteria at the follow-up visit. Higher FSH levels at the first visit was associated with an increased likelihood of having MetS at the follow-up visit (p=0.04,OR=4.67).

Conclusion: We found non-linear relationships between varying serum FSH levels and anthropometric parameters as well as markers of IR, especially in girls. Higher FSH levels in prepubertal ages were associated with an increased risk of MetS development at the follow-up.

Disclosure: Anders Forslund received patent related consulting fees from Empros Pharma.

2

Early Life Outcomes of Assisted Reproduction Technologies and the Underlying Epigenetic Changes

Bokor, Sz.[1]; _Vass, RA._[2]; _Funke, S._[2]; _Ertl, T._[2]; _Molnár, D._[1]

[1]University of Pécs, Department of Paediatrics; [2] University of Pécs, Department of Obstetrics and Gynaecology, Pécs, Hungary

Introduction: Assisted reproduction technologies (ART) are increasing worldwide (9 million babies have been born with the help of ART since the first successful case in 1978) and its possible health consequences are a topic of intense study. The aim of the present study was to summarise the available literature data on the early life outcomes of ART and the possible underlying epigenetic changes.

Methods: An electronic literature search was performed in English on PubMed database and via the Google utility in May 2021. The search was based on the combinations of key terms: ART, in vitro fertilisation, growth, development, obesity, body composition, metabolic, imprinting disorders, birth defects, foetus, postnatal, infants, children, epigenetic, DNA methylation.

Results: ART involve multiple exposures that occur at critical times of development, coincidence with global reprogramming of the epigenome and the establishment of epigenetic changes. Therefore, multiple studies have focused on the association between ART and candidate gene regions and/or global methylation levels, and support that ART is linked to epigenetic changes including alterations in DNA methylation of imprinted genes and genes related to growth, development, and body composition of the foetus and in the postnatal period, however, the results are still conflicting. Growing evidence in the current literature suggest that children conceived through ART are at increased risk for a number of perinatal complications, birth defects (OR: 1.32 [1.24-1.42]), alterations in body composition and rare imprinting disorders (OR: 3.67 [1.39-9.74]). Parental characteristics, underlying infertility etiology and ART procedures themselves may contribute to this.

Conclusion: The perinatal outcomes in children born after ART have improved over the time, still many concerns remain over the health and development of ART children, thus large scale, well-controlled studies are necessary.

3

Health-Behavior in 18-Year-Old Viennese Students during COVID-19 Lockdown in Austria

Czernin, S.[1]; Moliterno, P.[1,3]; Gansterer, A.[1]; Schönthaler, K.[1]; Matjazic, J.[1]; Widhalm, K.[1,2]

[1]Austrian Academic Institute for Clinical Nutrition; [2]Vienna, Austria; Medical University Vienna, Vienna, Austria; [3]Escuela de Nutrición, Universidad de la República, Uruguay

Introduction: COVID-19 mitigation measures have impacted many aspects of our lives. Widespread lockdowns with closed schools and movement restrictions increased adolescents' exposure to obesogenic environments. Home confinement has shown to increase screen time, exposure of unhealthy food marketing and unhealthy food intake. Adolescents from lower socioeconomic backgrounds have been disproportionally affected. This study investigates the health behavior of 18-year old students during a lockdown-period in Austria.

Methods: In this study 495 students aged 18 were included who participated in an online survey conducted in January 2021. During that time schools, sports-clubs, shops and restaurants were closed, home confinement and movement restrictions were in force. Students received education remotely. Participation in the survey was voluntarily and data were self-reported.

Nutritional status was assessed by body-mass-index (BMI). Questions about health-behavior included hours of sleep, screen time, physical activity and eating habits.

Results: Mean BMI was 23.19 kg/m^2 (SD = 4.57). 9.5% of this group were underweight, 64.8% were normal weight, 17.2% were overweight and 8.5% were obese. A high BMI was positively correlated with meat and processed meat consumption (r=0.115, p=0.010). 31% of adolescents with obesity sleep less than 5 hours per night and 38% consume sugar-sweetened-beverages (SSBs) on a daily basis. Adolescents living in families that do not own a computer have a higher BMI than those whose families own one ($p = 0,038$), two ($p = 0,009$), three or more ($p = 0,001$) computers. No significant differences could be shown in regard to screen time and BMI, however 80% of all individuals reported to spend at least 7 hours or more in front of a screen.

Conclusion: Results of this study show that adolescents living with obesity exhibit a less healthy lifestyle compared to their normal weight peers, they sleep less and consume more meat and SSBs. These observations are not novel; however, we want to take into consideration the detrimental effects of the necessary public health responses over the past 18 months. We want to stress the importance of taking effective and equitable measures to halt the exacerbation of risk factors for adolescent obesity amplified by the response to COVID-19.

Disclosure: Nothing to disclose

4

Qualitative Evaluation, with French Healthcare and Childcare Professionals, of a Brochure Containing the Latest Official Child Feeding Recommendations to Help Prevent Childhood Obesity

De Rosso, S.[1]; Riera-Navarro, C.[1]; Ducrot, P.[2]; Schwartz, C.[1]; Nicklaus, S.[1]

[1]Centre des Sciences du Goût et de l'Alimentation, AgroSup, CNRS, INRAE, Université Bourgogne Franche-Comté, Dijon, France; [2]Nutrition and physical activity unit, Santé publique France, French national public health agency, Saint-Maurice, France

Background/Aims: Parents are crucial in establishing their children's eating habits and need to be properly informed about child feeding. Healthcare (HCPs) and childcare professionals (CCPs) are trusted information sources for parents, they repeatedly interact with them during the 0-3-year period providing meaningful feeding guidance, that could be facilitated by the use of communication supports. With the upcoming release in France of the official brochure containing the new child feeding recommendations, this study aims at 1) assessing professionals' practices and perceptions regarding their communication with parents on child feeding, 2) evaluating their perceptions of the new brochure and acceptance of the recommendations.

Methods: Semi-structured video interviews with 13 HCPs and 8 CCPs were conducted in April-May 2021 after the provision of the official 15-page brochure to all professionals. Interview data was transcribed verbatim and a thematic analysis (inductive approach) was conducted.

Results: Regarding practices and perceptions in terms of communication with parents on child feeding, three subthemes were identified: communication practices, barriers and needs to improve communication. Regarding the evaluation of the brochure, subthemes included general impressions, new recommendations, suggestions to improve the brochure and perceptions of its utility in professionals' practice. Professionals agreed that the brochure might be a good support, not only in their communication with parents regarding child feeding, but also to update their own knowledge, providing that scientific references are included. For HCPs giving the brochure to parents enables providing systematic advice and saving time during consultations. CCPs would feel more legitimate advising parents with the help of the brochure. Professionals dealing with parents from lower socio-economic status would prefer shorter sheets with many illustrations, but in general the messages were considered easy to understand by all. HCPs found the newly introduced recommendations easier to understand than CCPs.

Conclusions: This study highlights that the new official public health policy brochure as a mean to spread child feeding recommendations is welcomed by French professionals, but some adaptations (especially for CCPs) could facilitate the relay of information.

Disclosure: Nothing to disclose.

30th Annual Congress of the European Childhood Obesity Group (ECOG)

5

The Feasibility of a Smartphone Application as a Personalized Treatment Tool for Overweight Adolescents: An Explorative Study

Desmet, M.[1,†,*]; *Franssen, S.*[2,†]; *Varol, T.*[3]; *Fillon, A.*[4,5]; *Thivel, D.*[4,5]; *Roefs, A.*[2]; *Braet, C.*[1]

[1]Department of Developmental, Personality and Social Psychology, Faculty of Psychology and Educational Sciences, Ghent University, Ghent, Belgium; [2]Department of Clinical Psychological Science, Faculty of Psychology and Neuroscience, Maastricht University, Maastricht, the Netherlands; [3]Department of Work and Social Psychology, Faculty of Psychology and Neuroscience, Maastricht University, Maastricht, the Netherlands; [4]Laboratory of the Metabolic Adaptations to Exercise under Physiological and Pathological Conditions Clermont Auvergne University, Clermont-Ferrand, France; [5]National Observatory for Physical Activity and Sedentary behaviors (ONAPS), Clermont-Ferrand, France

Background/Aims: The 'childhood obesity epidemic', referring to the increased prevalence of childhood and adolescent overweight and obesity worldwide, is associated with numerous negative consequences. This makes focusing on both the prevention and the treatment of pediatric overweight of great importance. Over the last decade, e-health has been used as supporting tools in numerous mental health treatments. The present study composes the first step of a 3-year European project in which a network-informed tailored smartphone application will be developed and tested as a potential helping tool in the personalized treatment of children and adolescents with overweight.

Methods: In this explorative needs assessment study, focus groups were conducted to investigate which perceptions overweight adolescents have on healthy/unhealthy behaviour that should be taken into account, which drivers should be differentiated, leading to healthy/unhealthy behaviour and whether and how a smartphone application could be a helping tool for them. In total,10 focus groups (n = 48 participants) were conducted in three European countries (Belgium, The Netherlands and France): 6 focus groups with adolescents with overweight (12-16 years; n=30) and 4 groups with parents of adolescents with overweight (n=18). Data-analysis followed an inductive, bottom-up approach with thorough content analysis using the software Nvivo12.

Results: Coding of the transcriptions was grouped according 5 broad themes: 1) *healthy lifestyle;* 2) *unhealthy lifestyle;* 3) *drivers healthy lifestyle;* 4) *drivers unhealthy lifestyle* and 5) *needs E-health application.* We can state that adolescents with overweight have a well-articulated perspective on their lifestyle and their needs. Parents underestimate their influences and report difficulties for healthy lifestyle parenting, which makes their role as a coach rather ambiguous. Regarding the drivers leading to healthy/unhealthy behaviour, both parents and adolescents formulated some challenging expectations regarding the content and the format of a new smartphone application. The results of this analysis will form the basis for designing a personalized smartphone application, which will be tested in a next phase.

Conclusion: We can conclude that a new smartphone application could be of great help for adolescents with overweight, fulfilling the role of monitoring and supportive tool.

Disclosure: Nothing to disclose

6

Preschool Children who were Bottle-Fed during Infancy Consume Larger Portions of Food and Exhibit Greater Plate-Clearing Tendencies

Dobrescu, AT.; *Rogers, PJ.*; *Ferriday, D.*

Nutrition and Behaviour Unit, School of Psychological Science, University of Bristol, UK

Introduction: Research suggests that breastfeeding is associated with a reduced risk of obesity in childhood, while formula-fed infants are more likely to experience rapid infant weight gain. However, the mechanisms underlying these associations remain unclear. One proposition is that caregivers who breastfeed are more responsive to their infant's cues of hunger and fullness, thereby increasing satiety responsiveness (the ability of the infant to self-regulate their intake). To date, research has predominantly focused on the relationship between feeding practices and satiety responsiveness in infants. This study investigated whether preschool children demonstrate differences in satiety responsiveness based on early infant feeding practices.

Methods: An online survey was distributed to UK caregivers (N=564), who reported retrospectively how they fed their infant (*e.g.*, exclusively breastfed). Caregivers also completed three measures assessing their child's current satiety responsiveness; a. Child's typical portion size (Potter *et al.*, 2018); b. Habitual plate-clearing (Robinson *et al.*, 2015); and c. Satiety Responsiveness subscale from the Child Eating and Behaviour Questionnaire (CEBQ; Wardle *et al.*, 2001).

Results: Breast-fed (M=289.09, SD=89.24) and mixed-fed children (M=294.61, SD=101.97) typically consumed smaller portions of food compared to formula-fed children (M=326.11, SD=92.42). Children who were formula-fed (M=2.99, SD=1.07) demonstrated greater tendencies to plate-clear than those who were mixed-fed (M= 2.69, SD=1.04). However, there were no significant differences in plate-clearing tendencies between breast-fed children (M=2.75, SD=1.07) and those who were formula-fed or mixed-fed. No reliable differences were observed between formula-fed (M =1.63, SD = .81), mixed-fed (M =1.76, SD = .76), and breast-fed children (M = 1.74, SD = .71) on the satiety responsiveness subscale of the CEBQ.

Conclusions: Preschool children who were formula-fed during infancy consumed larger portions of food and exhibited greater plate-clearing tendencies. Research suggests that caregivers who formula-feed might encourage bottle emptying, which in turn reduces infants' satiety responsiveness and normalises plate-clearing. Our data suggest that these differences in satiety responsiveness might persist from infancy to preschool. Future research should aim to replicate this observation and, since bottle feeding is extremely common, investigate how to support caregivers to bottle-feed responsively.

Disclosure: Nothing to disclose

7

Metformin Protects against Palmitate Induced Hypersecretion of Glucagon in Mouse αTC1 cells

Fathalla, A.[a]; Cerenius, S.[a]; Wen, Q.[a,b]; Stenlid, R.[a,b]; Bergsten, P.[a]; Chowdhury, A.[a]

[a]Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden; [b]Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden

Background: The importance of GLP-1 in glucose metabolism has increased substantially. Upon nutrient intake, GLP-1 secretion from L-cells is stimulated, whereas glucagon secretion from α-cells is inhibited. This relationship is altered in the presence of high plasma levels of free fatty acids (FFAs), as observed in children with obesity who have lowered levels of active GLP-1 and elevated levels of glucagon. Similarly, in mouse α-cells, FFAs stimulate glucagon secretion and inhibit GLP-1 secretion. GLP-1 is rapidly deactivated by dipeptidyl peptidase 4 (DPP4). Adolescents with obesity have elevated plasma levels of DPP4. Cleavage of proglucagon by prohormone convertase (PC) 2 yields glucagon, while PC 1/3 yields GLP-1. FFAs effects on α-cells is relatively unknown. Both short- and long-term treatment with palmitate (PA) increases glucagon secretion, but the role of PA in GLP-1 secretion is not yet clear. The antihyperglycemic drug metformin has beneficial effects on β-cells. Our aim was to determine if metformin can reverse FFA-induced hyperglucagonemia and increase secretion of GLP-1 from α-cells?

Method: Mouse αTC1 cells were stimulated with 2mM or 11mM glucose concentrations, in the presence or absence of 25μM metformin, with or without 0.25mM PA for 24 h. Glucagon and GLP-1 secretion was measured by ELISA, PC1/3 and DPP4 protein expression was detected via western blot, and oxygen consumption rate (OCR) was measured with a Seahorse XFe96 extracellular flux analyser.

Results: In response to PA treatment, αTC1 cells doubled their glucagon secretion compared to control, in both 2mM and 11mM glucose. GLP-1 secretion, DPP4 expression, and mitochondrial OCR increased significantly when cells were exposed to PA, in both glucose concentrations. When treated with metformin, glucagon secretion was reduced compared to PA only. Metformin treatment did not alter GLP-1 secretion compared to PA only, however decreased OCR. PC1/3 in all three treatment groups compared to control.

Conclusion: PA elevates GLP-1 and glucagon secretion, mitochondrial OCR, and expression of DPP4 in αTC1 cells. Metformin reduces these elevations, suggesting a protective role of metformin in PA-induced hyperglucagonemia. Elevated PC1/3 expression might lead to increased GLP-1 via cleavage of proglucagon.

Disclosure: The study was sponsored by AstraZeneca.

8

Total Sleep Deprivation Effect on Saliva Ghrelin Levels in Adolescence

Felső, R.[1,3]; Lányi, E.[2]; Erhardt, E.[1]; Laufer, Zs.[1]; Kardos, D.[1]; Herczeg, R.[3]; Gyenesei, A.[3] Hollódy, K.[1]; Molnár, D.[1]

[1]Department of Paediatrics, University of Pécs, Medical School, Pécs, Hungary; [2] Department of Laboratory Medicine, University of Pécs, Medical School, Pécs, Hungary; [3]Szentágothai János Research Centre, University of Pécs, Pécs, Hungary

Background/Aims: Sleep deprivation is one of the risk factors promoting weight gain. Ghrelin, a regulator of food intake and energy expenditure, has been shown to be associated with insufficient sleep. The goal was to investigate the effect of a single night total sleep deprivation (TSD) on fasting salivary ghrelin levels compared to the values during the day with normal sleep duration in a randomized cross over experimental trial. Further aim of the study was to determine if total sleep deprivation alters the circadian variation of salivary ghrelin level.

Subjects and Methods: 37 adolescents (18 boys; age: 13,7 ± 1,4 years; body mass index [BMI]: 21,4 kg/ m2; all non-smokers, without acute and chronic medical conditions, without sleep problems) were studied under two conditions; normal sleep and total sleep deprivation. Saliva samples were collected during the two experimental nights at 21.00 h, 1.00 h and 6.00 h. During both sleep conditions, food and drink (except water) consumption was not allowed from 18.00 h to 6.00 h. Food consumption and physical activity were recorded on both examination days.

Results: There were no significant differences between food consumption and physical activity parameters of the two days. Total ghrelin concentration showed a continuous increase from the evening until 6.00 in the morning. However, this increase was blunted by TSD. Total-ghrelin levels were significantly lower (p=0.02) during TSD at 1.00 and 6.00 o'clock as compared to values during normal sleep. Acyl-ghrelin levels did not present any change in the three time points and were not affected by TSD.

Conclusions: We found that a single night total sleep deprivation causes decreased human fasting saliva total ghrelin concentrations. The present study demonstrated a gradual increase in saliva total ghrelin concentration during normal sleep and TSD condition, respectively..

Disclosure: Nothing to disclose

9

Social Media Use and BMI z-score: A Cross-Sectional Explanatory Pathway Analysis of 10,798 14-Year-Old Boys and Girls

Foubister, C.[1]; *Jago, R.*[2]; *Sharp, SJ.*[1]; *van Sluijs, EMF.*[1]

[1]UKCRC Centre for Diet and Activity Research (CEDAR) and MRC Epidemiology Unit, University of Cambridge, Cambridge, United Kingdom; [2]Centre for Exercise, Nutrition & Health Sciences, School for Policy Studies, University of Bristol, United Kingdom

Background: In the UK, 87% of adolescents aged 12-15 years have social media accounts. Adolescents spend between 7-21 hours/week using social media. Social media use has been suggested to have both direct and indirect effects on BMI z-score. Social media use patterns may differ by sex. However, existing findings are inconclusive, present contrasting findings, and use self-reported BMI z-score. We explored the association between social media use and objectively measured BMI z-score, potential explanatory pathways, and whether these differ by sex.

Methods: Data from 5332 female and 5466 male adolescents from the Millennium Cohort Study (Age 14) were used. BMI z-score was regressed on self-reported social media use (hours/day). Potential explanatory pathways explored included dietary intake, sleep duration, depressive symptoms, cyberbullying, body weight satisfaction, self-esteem, and wellbeing (all self-reported). Sex-stratified multivariable linear regression was used to examine potential associations. Structural equation modelling was used to examine explanatory pathways individually.

Results: Using social media for ≥5 hours/day (vs. 0 to <1 hour/day) was positively associated with BMI z-score for girls (β [95%CI]) (0.15 [0.06, 0.25]). No associations were observed for boys, therefore potential explanatory pathways were explored for girls only. For girls, sleep, depressive symptoms, body weight satisfaction, and wellbeing attenuated associations between social media use and BMI z-score.

Conclusions: In girls, social media use of ≥5 hours/day was positively associated with BMI z-score. This association was partly explained by sleep, depressive symptoms, body weight satisfaction, and wellbeing. Associations were small and when compared to known risk factors for increased BMI z-score may have limited impact at the population-level. Findings are relevant for the ongoing debate regarding adolescent social media use. However, findings are based on cross-sectional data which prevents inferring a causal effect of social media use on BMI z-score or mediation via explanatory pathway variables. Caution is necessary when drawing conclusions about the relationship between social media use and BMI z-score given the majority of studies to date are cross-sectional, use self-reported data, and characterize social media use by quantity alone.

Disclosure: Nothing to disclose

10

Positive Impact of a Multi-Component Kindergarten-Based Health Behaviour Intervention on Overweight and Obesity in 3-6 Year-Old Children: Toybox Study Malaysia

Gibson, EL.[1]; *Kn Poh, B.*[2]; *Cheah, WL.*[3]; *Koh, D.*[4]; *Lee, JAC.*[3]; *Ruzita, AT.*[2]; *Essau, CA.*[1]; *Reeves, S.*[5]; *Summerbell,C.*[6]

[1]Department of Psychology, University of Roehampton, UK; [2]Nutritional Sciences Programme & Centre for Community Health Studies (ReaCH), Faculty of Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia; [3]Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak (UNIMAS), Sarawak, Malaysia; [4]Sports and Recreation Programme & Centre for Education and Community Well-being, Faculty of Education, Universiti Kebangsaan Malaysia, Selangor, Malaysia; [5]Department of Life Sciences, University of Roehampton, London, UK; [6]Department of Sport and Exercise Sciences, Durham University, Durham, UK

Background/Aims: Interventions focusing on young children are needed in Malaysia to prevent the rise in obesity. ToyBox Study Malaysia is a multi-component, family-involved intervention to improve energy-balance related behaviours, in 3-6 year-old kindergarten children. Based on the European ToyBox-Study, the intervention was delivered in 2017-2018 through training of kindergarten teachers, with environmental adaptations, and focused on improving four target behaviours: drinking more water, eating healthily, reducing sedentariness and increasing physical activity. Here we examine the effect of the intervention compared to the control group on anthropometric indicators of overweight and obesity in kindergarten children.

Methods: The intervention lasted 24 weeks, with a focus on each behaviour for 4-week periods, followed by 2-week repetition periods. Kindergartens were recruited from those managed by the Community Development Department (KEMAS), Malaysia, sampling from three states with different urbanisation and ethnicities: Kuala Lumpur (10 intervention, 13 control), Selangor (5 intervention, 5 control), and Sarawak (7 intervention, 8 control), with random allocation to group.

Anthropometric outcomes were examined in 812 children who completed either the intervention (n=403) or control (n=409) conditions (dropout: 9%, 11%, respectively). Changes in age- and sex-standardised body mass index z-scores (BAZ) were compared between groups in children who were overweight or obese (BAZ at least 1; intervention n=65, control n=72).

Results: In children who were overweight or obese, BAZ decreased in the intervention group but not in the control group, group x pre/post interaction, p=0.026, η_p=0.04. This effect was confirmed by analysis of covariance adjusting for baseline BAZ; post-intervention estimated marginal means, intervention =1.96, SE=0.102; control mean=2.29, SE=0.097. The intervention also significantly reduced BAZ in children with obesity (BAZ >=2; n=33) relative to control (n=42), p=0.007, η_p=0.10.

Conclusion: Thus, ToyBox Study Malaysia appears to be efficacious in reducing overweight and obesity in young children, supporting the feasibility of adapting the European ToyBox-Study intervention to the South-East Asian context.

Disclosure: No conflict of interest to disclose.

11

Improving Nutrition and Tackling Childhood Obesity in the EU through Food Labelling Regulation

Gokani, N.

[1]School of Law, University of Essex, Wivenhoe Park, Colchester, Essex, CO4 3SQ

Background: Despite the high prevalence of childhood overweight and obesity, the EU's legal response to unhealthy nutrition has heavily focused on regulating consumer food labelling. The purpose of this paper is to argue that the EU's response to childhood obesity is excessively focused on regulating consumer food labelling rather than adopting a comprehensive, multi-sector, multi-level approach.

Discussion: The first claim in this paper is that the EU's primary intervention to improve diets is based on regulating food labelling. It further shows that this is under presumptions that (i) consumers are well-informed, and (ii) are empowered to make healthy food decisions. The second claim is that, contrary to the EU's first presumption, consumers are actually well-informed because EU food law does not provide consumers with sufficient, non-misleading and clear food information. The third claim is that, contrary to the EU second presumption, well-informed consumers are not empowered to make healthy food decisions because consumers do not respond rationally to food labelling and because there are external factors which prevent healthy decision-making. In making these arguments, this paper argues demonstrate that EU rules are particularly ineffective for children as purchasers, as well for parents who are members of lower socioeconomic groups.

Conclusion: Bringing the analysis together, the paper concludes with calls for two changes in the EU's approach. Firstly, the EU should reform the rules on food information, particularly by introducing mandatory front-of-pack nutrition labelling and regulating food marketing to children. Secondly, the EU should make greater use of the various regulatory tools to complement information regulation. Such a comprehensive regulatory approach would be more successful in empowering families and children to make healthier decisions.

Disclosure: Nothing to disclose

12

The Longitudinal Impact of the Early Obesogenic Home Environment on Child Weight

Kininmonth, A.[1]; Schrempft, S._[2]; Smith, A._[3,4]; Dye, L._[1]; Lawton, C._[1]; Fisher, A._[4]; Llewellyn, C._[4] & Alison Fildes_[1]

[1]School of Psychology, University of Leeds, Leeds, LS2 9JT, United Kingdom; [2]Unit of Population Epidemiology, Division of Primary Care, Geneva University Hospitals, Geneva, Switzerland; [3]MRC Epidemiology Unit, University of Cambridge, Cambridge, United Kingdom; [4]Research Department of Behavioural Science and Health, University College London, London, United Kingdom

Background: The obesogenic home environment is hypothesised to play an important role in children's weight development but few prospective studies have investigated relationships across childhood. This study investigated the continuity and stability of the home environment from ages 4 to 12, as well as bi-directional relationships between the obesogenic home environment and BMI-SDS from ages 4 to 12.

Methods: Primary caregivers from the Gemini twin cohort completed the telephone administered Home Environment Interview (HEI), a comprehensive measure of the home environment, when their children were aged 4 and 12 (n=149 families, n=298 children). The obesogenic quality of the home environment was measured using four composite scores, capturing the food (21 variables), activity (6 variables) and media (5 variables) environments, as well as the combined overall home environment. Child weights and heights at ages 4 and 12 were used to calculate BMI-SDS. Continuity was assessed with correlations between scores at the two time points, and stability by changes in mean scores over time. Cross-lagged structural equation models were used to examine both cross-sectional and prospective bidirectional relationships between the home environment composite scores (food, activity, media and overall composite) and BMI-SDS at ages 4 and 12.

Results: The home environment showed moderate to high continuity from ages 4 to 12 (r=0.30-0.64). Stability analyses revealed that the home environment (overall composite, food and media composites) became more obesogenic over time (effect sizes ranged from 0.15-0.33). The overall home environment _(r=0.21, p=0.02)_ and media composites _(r=0.23, p<0.01)_ were positively, cross-sectionally associated with child BMI-SDS at age 12, but not at age 4. Longitudinally, the home media environment at age 4 predicted increases in child BMI-SDS at age 12 _(standardised β; 95% CI=0.18; 0.01,0.19, p<0.001)_. No associations were observed for the reverse path, or for the remaining composites and BMI-SDS in either direction.

Conclusion: These findings provide evidence for the tracking of the obesogenic home environment across childhood and highlights the importance of the early home media environment for child weight development. This study provides insights into aspects of children's early home environments that could be targeted when developing obesity treatment or prevention strategies.

Disclosure: Nothing to disclose.

13

Compliance with Mediterranean Diet in a Group of Greek Children with Normal Weight or Obesity

Vlachopapadopoulou, E.[1]; Kosteria, I.[1]; Dikaiakou, E.[1]; Leka-Emiris, S.[1]; Athanasouli, F.[1]; Moschonis, G.[2]; Michalacos, S.[1]

[1]Dept. of Endocrinology-Growth and Development, "P & A Kyriakou" Children's Hospital, Athens, Greece; [2]Department of Dietetics, Nutrition and Sport, La Trobe University, VIC 3086, Australia

Background/Aims: The Mediterranean diet (MD) is a plant-based, high-unsaturated fat dietary pattern that has been associated with lower rates of non-communicable diseases and overall mortality. Data on the effects of MD on weight and waist circumference (WC) remain controversial or scarce, especially when there are no caloric restrictions. We aimed to evaluate the compliance to MD of Greek normal and excess weight children and assess differences regarding body fat mass and WC.

Methods: Our study included 184 children (35.6% $\female$, 9.89±2.29 years). According to BMI percentile (%) (CDC), children were divided into two groups: normal weight (BMI% <85th, n=94) (NW) and excess weight (BMI%≥ 85th, n=90) (EW). Adherence to the MD was assessed by the KIDMED questionnaire, filled in by children or their parents. Compliance was rated as poor, moderate or very good when score was ≤ 3, 4-7 and 8-10, respectively. WC was measured and body fat mass was assessed by bioelectrical impedance. Statistical analysis was performed with the IBM SPSS 26.0 program

Results: The majority of children had moderate compliance with MD (62.4% NW vs 57.8% EW, 60.1% of total) while 26.2% of total had very good compliance. Poor adherence was higher in EW children compared to NW (18.9 % vs 8.6 %) and very good adherence was lower (23.3% vs 29%). However, differences were not significant. No differences were observed between genders. Only 3.2% of NW children had a WC >90th percentile, compared to 61.4% of the EW group. Moreover, only 32.1% of children with good compliance to the MD had a WC >90th percentile. However, adherence to the MD did not correlate with WC in either group. Similarly, although fat mass was significantly lower in the NW group (20.25 vs 30.68%, p<0.005), there was no significant correlation between adherence to the MD and fat mass.

Conclusion: Adherence to MD among children living in a Mediterranean country (Greece), attending the endocrine clinic, is not satisfactory. Poor compliance was higher among EW children. It is important to confirm these findings in larger groups and correlate them with biochemical factors.

Disclosure: Nothing to disclose

14

Parental Perception of their Seven Year Old Child Weight Status in Montenegro

Kujundžić, E.[1]; Mugoša, B.[1]; Vukčević, B.[2]; Đurović, D.[1]

[1]Center for Health Ecology, Institute of Public Health of Montenegro, Podgorica; [2]Department of abdominal surgery, Clinical Center of Montenegro, Podgorica

Background/Aim: Childhood obesity is one of the most serious public health problems of the 21st century. Parents can play an important role in the prevention and treatment of obesity in children. Parental perception of a child's weight status is one of the many factors necessary to improve preventive action and access to treatment. Aim of this study is to evaluate parental perception of weight status in seven years old children in Montenegro and to determine the relationship of the status of urbanization of the place where they live on their perception.

Methods: The fourth WHO COSI data collection round was conducted in 2016. in Montenegro, using a standardized protocol that included all three questinaires. The sample was stratified by regions (northern, central and southern) and type of area (urban, suburban and rural). The target age group were 7-year-old children, who attended the first and second grade of primary schools in Montenegro. 1257 seven year old measured children were selected who had fullfiled Family record form by their parents.

Results: Out of 1257 children, 19.4% boys were overweight and 16,4% were obese, while 19,4% girls found overweight and 9,4 % girls were obese acording to the WHO growth chart. 87% of parents of preobese children and 53 % parents of children with obesity had perception that their child had normal weight. The sensitivity of perception by child's gender was analized and it was found that there was a higher probability of error of opinion among the parents of male children. Considering that a larger number of overweight and obese children were found to live in the urban area (about 75%), the sensitivity of perception according to the urbanization status was analyzed and it was found that parents living in the urban area have a more accurate perception of obesity and overweight of their children.

Conclusion: Parents largely do not have an accurate perception of their children's nutritional status. Achieving the goal of preventing and combating the obesity epidemic in children requires multifaceted programs and policies across the community, but even in such broad and comprehensive programs, parents have a key and influential role.

Disclosure: Nothing to disclose

15

Similar Lipidemic and Glycemic Profile among Greek School Age Children with Obesity or Severe Obesity

Leka-Emiri, S.[1]; _Vlachopapadopoulou, E._[1]; _Dikaiakou, E._[1]; _Athanasouli, F._[1]; _Kosteria, I._[1]; _Evangelopoulou, C._[1]; _Kafetzil, M._[2]; _Petrou, V._[1]; _Michalacos, ST._[1]

[1]Division of Endocrinology-Growth and Development; [2]Division of Biochemistry-Hormonology, "P&A KYRIAKOU" Children's Hospital, Athens, Greece

Background/Aims: Pediatric obesity remains an ongoing serious international health concern. Screening for comorbidities of obesity should be applied in a hierarchal manner for early identification before serious complications result. The aim of this study was to compare triglycerides, total cholesterol, HDL, LDL levels and insulin resistance indexes (HOMA-IR and Matsuda) between obese and severe obese children.

Methods: 279 children (143 females) with BMI ($\geq$95percentile) (CDC BMI curves) were divided in two groups (Group 1, obese: 95percentile$\leq$BMI<99percentile, Group 2, severe obese: BMI$\geq$99percentile) and analyzed retrospectively from the medical records. Age, sex, tanner stage, BMI in Kg/m^2, percentile (%) and z-score, triglycerides, total cholesterol, HDL and LDL (mg/dl) levels were recorded. The insulin resistance indexes HOMA-IR and Matsuda were calculated. Insulin resistance was defined as HOMA-IR$\geq$ 3 and Matsuda index $\leq$2.5. Non-parametric Mann Whitney test as well as x^2 test (p<0.05) were calculated among groups using the SPSS statistics.

Results: Mean age was 10.5yrs (SD, 2.9), BMI: $30.1Kg/m^2$ (SD,5.3), BMI percentile: 98.8%, BMI: 2.4(SD, 0.4), Total cholesterol: 164 (SD, 31), triglycerides: 113 (SD, 61), HDL: 50 (SD, 13), LDL: 97 (SD, 29), HOMA-IR:4 (SD,3.5), Matsuda index:3.2 (SD,2). Clinical and laboratory characteristics are summarized in table 1. There was neither statistically significant difference in the age, sex or tanner stage distribution nor statistically significant difference in the lipidemic or glycemic profile among the two groups.

Table 1. Clinical and laboratory characteristics, Mean (SD).

	Group 1 (n=68)	Group 2 (n=211)	p
Age (yrs)	10.9 (2.1)	10.3 (3.1)	0.1
Sex (males/females)	28/40	108/ 103	0.15
Tanner 1/>2	32/36	121/90	0.14
BMI (Kg/m^2)	26.4 (2.6)	31.3 (5.4)	*
BMI (%)	97.6(0.9)	99.2 (0.4)	*
BMI (z-score)	1.99 (0.1)	2.52 (0.4)	*
Total cholesterol (mg/dl)	165(35)	162 (30)	0.5
Triglycerides (mg/dl)	110 (57)	113 (63)	0.7
HDL (mg/dl)	52 (10)	49 (13)	0.06
LDL (mg/dl)	100 (30)	97 (28)	0.3
HOMA-IR	3.9 (3)	4.1 (3.6)	0.6
Matsuda	3.1 (1.8)	3.2(2)	0.9

*Non parametric Mann-Whitney test, p<0.05.

Conclusions: Greek children who attend the endocrinology clinic, with severe obesity (BMI $\geq$99%) present similar lipidemic and glycemic profile as compared to children with obesity (95%$\leq$ BMI <99%).

Disclosure: Nothing to disclose

16

Circulating microRNAs Crosslink Inflammation and Metabolic Disease in Pediatric Obesity

Lischka, J.[1]; _Schanzer, A._[1]; _Hojreh, A._[2]; _Ba Ssalamah, A._[2]; _de Gier, C._[1]; _Valent, I._[1]; _Item, CB._[1]; _Greber-Platzer, S._[1]; _Zeyda, M._[1]

[1]Clinical Division of Pediatric Pulmonology, Allergology and Endocrinology, Department of Pediatrics and Adolescent Medicine, Comprehensive Center for Pediatrics, Medical University of Vienna, Vienna, Austria; [2]Department of Biomedical Imaging and Image-guided Therapy, Medical University of Vienna, Vienna, Austria

Background: Chronic low-grade inflammation plays a pivotal role in dysregulation of central pathways involved in lipid and glucose metabolism in obesity leading to metabolic disease. MicroRNAs (miRNAs) are known to fine-tune gene expression upstream from known regulators of metabolic homeostasis. We aimed to assess the relationship of circulating miRNAs with inflammatory modulators and metabolic disorders in pediatric obesity.

Methods: From a pediatric cohort with severe obesity (n=109), clinically thoroughly characterized including diverse routine blood parameters, oral glucose tolerance test and liver MRI, a panel of 16 circulating miRNAs was quantified using qRT-PCR. Additionally, markers of inflammation TNFα, IL1 receptor antagonist, procalcitonin, CRP and IL-6 were measured.

Results: We identified a strong yet unrecognized relationship of miRNAs 34a, 122 and 192 with both obesity-associated inflammation and metabolic disease. Concentrations of miRNAs 122 and 192 correlated with serum adiponectin that links adipose tissue inflammation to glucose metabolism. Several miRNA levels including miRNAs 34a, 93, 122, and 192 were statistically significantly differing between individuals with prediabetes, impaired glucose tolerance, metabolic syndrome, or non-alcoholic fatty liver disease compared and the respective controls. Additionally, miRNA 192 was significantly elevated in metabolically unhealthy obesity.

Conclusion: An unfavorable miRNA pattern related to obesity-associated inflammation and comorbidities is already present in children and may be used to distinguish metabolically healthy from unhealthy pediatric patients with obesity. Moreover, these changes in epigenetic regulation could potentially be involved in the etiology of obesity-linked metabolic disease in children and adolescents.

Disclosure: Nothing to disclose

17

Long-Term Outcomes of Children Born after Maternal Bariatric Surgery

Van De Maele, K.[1,2,3]; *Bogaerts, A.*[2]; *Gies, I.*[1,3]; *Devlieger, R.*[2,4]

[1]Division of Pediatric Endocrinology, Department of Pediatrics, University Hospital Brussels, Jette, Belgium; [2]Research unit Organ Systems, Department of Development and Regeneration, Catholic University of Leuven, Leuven, Belgium; [3]Research unit GRON, Free University of Brussels, Jette, Belgium; [4]Department of Obstetrics and Gynecology, University Hospital of Leuven, Leuven, Belgium

Background: The offspring of women with obesity during pregnancy is at risk for adverse metabolic, inflammatory and cardiovascular programming. Currently, comprehensive long-term data is still lacking on the contribution of bariatric surgery before pregnancy on the cardiovascular and metabolic programming in the offspring.

Methods: We present data of the EFFECTOR study (ClinicalTrials.gov: NCT02992106). This study is a cross-sectional, long-term follow-up study of children (aged 4 to 11 years) born from mothers that underwent bariatric surgery (BS) before pregnancy (n= 36), controls with overweight/obesity (OW/OB) (n=71) and normal weight controls (NL) (n=35). Data on body composition and adiposity, eating habits and vascular health were collected prospectively during a single home visit by a trained pediatrician.

Results: The prevalence of overweight and obesity (BMI > 1.3 SD Score) was highest in the children of the BS group (38.9% vs 15.5% in OW/OB and 5.7% in NL; p=0.004). When matched on maternal pre-pregnancy BMI, this difference persisted. Even being born with the lowest weight SD score (-0.26 vs. 0.34 in OW/OB and -0.09 in NL; p=0.04), the children of the BS group presented with the highest weight and BMI SD scores at childhood age (0.70 vs. 0.14 in OW/OB and -0.09 in NL; p=0.006 and 0.47 vs. -0.02 in OW/OB and -0.42 in NL; p=0.01). The children of the BS group consumed more low-calorie sweetened beverages compared to the NL group (p = 0.01), but less fruit juice compared to the NL and OW/OB groups (p = 0.01). The children of the BS group had a higher diastolic blood pressure SD score and a lower Reactive Hyperemia Index (RHI) compared to the children of the OW/OB and NL group. After log transformation and correction for age, weight SDS, BMI SDS, body fat percentage and diastolic BP SDS, RHI was comparable between the groups.

Conclusion: Maternal bariatric surgery before pregnancy does not appear to protect the offspring for unhealthy eating behaviors and the development of childhood overweight and obesity. The vascular function, however, seems not to be impaired in the BS group when taking their increased diastolic blood pressure and degree of adiposity into account.

Disclosure: Nothing to disclose

18

Early Life Factors and Obesity in Serbian Children

Marković, L.[1]; *Đorđić, V.*[1]; *Trajković, N.*[2]; *Božić, P.*[3,4]; *Halasi, S.*[5]; *Cvejić, D.*[6]; *Ostojić, SM.*[1]

[1]Faculty of Sport and Physical Education, University of Novi Sad, Novi Sad, Serbia; [2]Faculty of Sport and Physical Education, University of Niš, Niš, Serbia; [3]Serbian Institute of Sport and Sports Medicine, Beograd, Serbia; [4]Faculty of Sport and Physical Education, University of Montenegro, Nikšić, Montenegro; [5]Teacher Training Faculty in the Hungarian Language in Subotica, University of Novi Sad, Subotica, Serbia; [6]Faculty of Education in Sombor, University of Novi Sad, Sombor, Serbia

Introduction: The increasing rate of childhood obesity has become one of the major public health issues worldwide. Facing the same problem, Serbia joined the WHO Children Obesity Surveillance Initiative (COSI) in 2015 thus providing data for evidence-based policies tackling childhood obesity. Current study was conducted in order to examine the association between early life factors and overweight/obesity among Serbian children.

Method: Data was collected using cross-sectional, nationally representative sample of children aged 6.0 to 9.9 years. Standardized anthropometric measurements of children's height and weight were performed. The WHO growth reference was used to define children's nutritional status. Information on children's gestational age at birth, birth weight, and feeding practice (length of breastfeeding and exclusive breastfeeding) was provided by parents. The prevalence of overweight (including obesity) in groups was compared by Pearson χ^2 test for categorical variables. The risk of being overweight was assessed by OR and 95% CI.

Results: Final sample consisted of 2716 children (1283 females). Average age was 8.5 (±0.8), while prevalence of overweight, obesity, and severe obesity was 20.5%, 11.7%, and 3.1%, respectively. Most of the children were full term newborns (76.5%), with normal birth weight (82.9%), breastfed for at least one month (90.6%). The birth weight was identified to be significantly related to being overweight/obese. Higher overweight (including obesity) rate was observed in children with birth weight of 4000+ g (χ^2_2 = 25.1; p = .00). The prevalence of overweight/obesity in children with low birth weight, normal birth weight, and higher birth weight, was 31.2%, 33.9%, and 48.1%, respectively. Significant risk of being overweight/obese in Serbian children was associated only with birth weight (not with gestational age at birth and feeding practice). Children with higher birth weight (≥ 4000g) were 2.04 times more likely to be overweight than children with low birth weight (p = .00051).

Conclusion: In accordance with previous studies, our results suggest that children of higher birth weight are at significantly higher risk of being overweight/obese. Identifying early life risk factors might be important in addressing childhood obesity in Serbia and preventing obesity-related disabilities and diseases.

Disclosure: Nothing to disclose.

19
Glucagon, NAFLD and Amino Acids - an Evidence Map

Maruszczak, K.[1,2]; Koren, P.[1]; Radzikowski, K.[1]; Torbahn, G.[3]; Weghuber, D.[1,2]

[1]Department of Pediatrics, University Hospital Salzburg, Division of Gastroenterology, Hepatology and Nutrition, Paracelsus Medical University, Salzburg, Austria; [2]Obesity Research Unit, University Hospital Salzburg, Paracelsus Medical University, Salzburg, Austria; [3]Department of Pediatrics, Paracelsus Medical University, Nuernberg, Germany

Background: Health systems are not only confronted with the growing worldwide childhood obesity epidemic, but also associated comorbidities. These subsequently cause variations in distinct metabolic pathways, such as hepatic fat accumulation, which leads to non-alcoholic fatty liver disease (NAFLD). The aim of this evidence map is to systematically evaluate the literature and to identify research gaps on the glucagon induced amino acid turnover and its metabolic interaction with NAFLD.

Methods: A systematic literature search was conducted in April 2020 to identify research using three electronic databases. Two independent reviewers screened titles and abstracts, according to prespecified eligibility criteria, as well as full-text articles. Quantitative studies of either humans or animals, at all age, were included. Studies were required to contain at least two of the main research areas, being glucagon, amino acid metabolism and NAFLD. Data was independently extracted by two reviewers and summarized according to study design, publication year, comorbidities, age, sex, sample size, intervention, study duration and control group. Conflicts were resolved by discussion or a third reviewer.

Results: Twenty-nine references were finally included. The publication years dated back until 1965 and showed a great increase from 2012 to 2020. All studies were carried out among adults, only 1 study focused on adolescents. The most common comorbidity was obesity. In total there were 13 animal studies and 16 human studies. The study designs in the human experiments differed immensely. The hyperinsulinemic-euglycemic clamp and the oral glucose tolerance test were the most used experimental methods to evaluate metabolic changes. Thirteen studies focused on metabolic effects due to NAFLD, however only 2 studies focused on the interaction of NAFLD, glucagon and the amino acid metabolism, both being non-human studies. The other 14 studies focused on metabolomics, beta cell function or just on one topic of the research area and not as an interaction on one another.

Conclusion: Research on the interaction of NAFLD, glucagon and the amino acid metabolisms in human studies is sparse and completely lacking in pediatrics. Furthermore, longitudinal studies such as studies focusing on hyperglucagonemia independent of diabetes but related to NAFLD present an unambiguous research gap.

Disclosure: Nothing to disclose.

20
Determinants of Hyperglucagonemia in Pediatric Non-Alcoholic Fatty Liver Disease

Maruszczak, K.[1,2]; Radzikowski, K.[1]; Schütz, S.[1,2]; Bergsten, P.[3]; Mannell, H.[3]; Forslund, A.[4]; Mörwald, K.[1,2]; Mangge, H.[5]; Weghuber, D.[1,2]

[1]Department of Pediatrics, University Hospital Salzburg, Division of Gastroenterology, Hepatology and Nutrition, Paracelsus Medical University, Salzburg, Austria; [2]Obesity Research Unit, University Hospital Salzburg, Paracelsus Medical University, Salzburg, Austria; [3]Department of Medical Cell Biology, University Uppsala, Uppsala, Sweden; [4]Department of Women's and Children's Health, University Uppsala, Uppsala, Sweden; [5]Clinical Institute for Medical and Chemical Laboratory Diagnosis, Medical University Graz, Graz, Austria

Background: Over the years, non-alcoholic fatty liver (NAFLD) disease has progressed to become the most frequent chronic liver disease in children and adolescents. The full pathology is not yet known, but disease progression leads to cirrhosis and hepatocellular carcinoma. Risk factors included hypercaloric diet, obesity, insulin resistance and genetics. Hyperglucagonemia appears to be a pathophysiological consequence of hepatic steatosis, thus, the aim of the study is that hepatic fat accumulation leads to increased insulin resistance and impaired glucagon metabolism leading to hyperglucagonemia in pediatric NAFLD.

Methods: 132 children and adolescents between 10 and 18 years, with varying degrees of obesity, were included in the study. Using Magnetic Resonance Imaging (MRI) average liver fat was determined, and patients were stratified as NAFLD (>5% liver fat content) and non-NAFLD (<5%). All patients underwent a standardized oral glucose tolerance test (OGTT). Additionally, anthropometric parameters (height, weight, BMI, waist circumference, hip circumference) such as lab data including lipid profile (triglycerides, HDL, LDL), liver function parameters (ALT, AST), uric acid, glucose metabolism (fasting insulin and glucagon, HbA1c, glucose 120 min) and indices evaluating insulin resistance (HIRI, SPISE, HOMA-IR, WBISI) were measured.

Results: Children and adolescents with NAFLD had significantly higher fasting glucagon values compared to the non-NAFLD cohort (p=0.0079). In the NAFLD cohort univariate analysis of fasting glucagon was associated with BMI-SDS (p<0.01), BMI (kg/m²) (p=0.073), visceral adipose tissue volume (VAT) (p<0.001), average liver fat content (p<0.001), fasting insulin concentration (p<0.001), triglycerides (p<0.001) and HDL (p=0.034). This correlation equally applied to all insulin indices HOMA-IR, WBSI, HIRI (all p<0.001) and SPISE (p<0.002). Multivariate analysis (r²/R² adjusted 0.557/0.509) for the same subgroup identified HIRI (p=0.001), VAT volume (p=0.006) and average liver fat content (p=0.477) as the best predictors for hyperglucagonemia.

Conclusions: Children and adolescents with NAFLD have significantly higher fasting plasma glucagon values, which can best be predicted by the insulin index HIRI and visceral adipose tissue.

Disclosure: Nothing to disclose.

21

Prevalence of Overweight, Obesity, Abdominal Obesity, and Obesity-Related Risk Factors in Polish Preschool Children

Matłosz, P.[1]; *Wyszyńska, J.*[2]; *Asif, M.*[3]; *Szybisty, A.*[1]; *Aslam, M.*[4]; *Mazur, A.*[5]; *Herbert, J.*[1]

[1]Institute of Physical Culture Sciences, Medical College, University of Rzeszów, Poland; [2]Institute of Health Sciences, Medical College, University of Rzeszów, Poland; [3]Department of Statistics, Govt. Degree College, Qadir Pur Raan Multan, Pakistan; [4]Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan; [5]Institute of Medical Sciences, Medical College, University of Rzeszów, Poland

Background/Aims: Increase in the prevalence of childhood obesity and overweight is a general public health concern. Worldwide, over 38 million children under 5 years of age are estimated to have overweight or obesity. The aim of this study was to assess the prevalence of overweight, obesity, abdominal obesity (AO) and obesity-related risk factors in children aged 5-6 years from Poland.

Methods: A cross-sectional study of 1,172 children aged 5-6 years was conducted using questionnaire forms and physical measurements. The physical measurements included body height, weight, waist circumference (WC), and body fat percentage (BFP). An univariate and multivariate logistic regressions were performed to evaluate the risk factors for excess weight, excess adiposity and abdominal obesity (AO).

Results: The prevalence of excess weight (BMI ≥ 85th percentile) was 11.0%. The prevalence of excess adiposity (BFP ≥ 85th percentile) was 42.3%. Prevalence of AO (WC ≥ 90th percentile) was higher in girls compared to boys (14.9% vs. 10.7%, respectively). Multivariate logistic regression analysis indicated that children whose both parents were obese had significantly higher risk of excess weight, excess adiposity and AO. Lower education level of fathers was associated with higher risk of excess weight and excess adiposity in children, while a lower level of maternal education was associated with higher risk of AO in children. Screen time over 120 minutes per day, participating less than once a week in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) and birth weight over 4,000 g were associated with excess weight, excess adiposity and AO. Moreover, cesarean delivery was associated with higher risk of excess weight and excess adiposity, and lower socio-economic status with higher risk of AO.

Conclusion: This study revealed that excess adiposity and AO differed by gender. Parental obesity, screen time, MVPA and birth weight could be significant determinants of excess weight, excess adiposity and AO in Polish preschool children.

Disclosure: Nothing to disclose

22

The Impact of the Global Economic Crisis on Portuguese Children's Obesity and Health-Related Behaviours, According to Socioeconomic Position and Sex

Rodrigues, D.[1,2]; *Gama, A.*[1,3]; *Machado-Rodrigues, AM.*[1,4]; *Nogueira, H.*[1]; *Silva, M-R.*[1,5]; *Padez, C.*[1,2]

[1]CIAS – Research Centre for Anthropology and Health, University of Coimbra, Coimbra, Portugal; [2]Department of Life Sciences, University of Portugal, Coimbra, Portugal; [3]Department of Animal Biology, Faculty of Sciences of the University of Lisbon, Lisbon, Portugal; [4]High School of Education, Polytechnic Institute of Viseu, Viseu, Portugal; [5]Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal

Introduction: Socioeconomic disadvantage has been linked to childhood obesity, and a widening gradient in childhood obesity risk before vs. after the 2008's crisis has been reported. This study aimed to: 1) examine the impact of a number of negative socio-economic consequences from the 2008's economic crisis on childhood obesity, according to socioeconomic status (SES) and sex; and 2) observe how the economic crisis was associated with children's fruit intake, sport participation, and screen-time recommendations.

Methods: Data is from the 2016/17 national project ObesInCrisis, collected in 4525 children aged 3- to 10-year-old, from 118 public and private schools in mainland Portugal. A validated questionnaire was used to collect information on risk factors, father education level (proxy measured of SES) and the impact of the 2008's economic crisis. The impact was measured through an index, calculated from 9 yes/no questions about changes occurring during the economic crisis to the daily aspects of families' routine life. Children's weight and height were objectively collected.

Results: Our findings indicate that the recession indicator was associated with lower consumption of fruit, lower participation in sports and higher screen-time, particularly in low-SES children. It was also associated with increased overweight and obesity rates, but only in boys from lower-SES.

Conclusion: Efforts to prevent excess weight in children should: (1) target the children of parents with lower education and (2) considerer that diet and physical activity, which requires a financial investment, are potential mechanisms to consider in future interventions. Overall, our study highlights that the 2008's economic crisis was associated with worsening health and health-related risk factors in Portuguese children, confirming the direct link between health and the economic environment. Our findings are of importance by given us an indication of how the economic crisis triggered by the COVID-19 pandemic may drive changes in health outcomes.

Disclosure: Nothing to disclose

23

Late Sleep Timing, and Less Organized Sport are Related to Lower Physical Activity Levels in Children and Adolescents with Severe Obesity

Skjåkødegård, HF.[1]; Danielsen, YS.[2]; Hystad, SW.[3]; Kleppe, MM.[4]; Olsson, SJG.[5]; Juliusson, PB.[1,6,7]; Frisk, B.[8,9]

[1]Department of Clinical Science, University of Bergen, Bergen, Norway; [2]Department of Clinical Psychology, University of Bergen, Bergen, Norway; [3]Department of Psychosocial Science, University of Bergen, Bergen, Norway; [4]Obesity Outpatient Clinic, Haukeland University Hospital, Bergen, Norway; [5]Independent researcher, Stockholm, Sweden; [6]Department of Paediatrics, Haukeland University Hospital, Bergen, Norway; [7]Department of Health Registry Research and Development, Norwegian Institute of Public Health, Bergen, Norway; [8]Department of Health and Functioning, Western Norway University of Applied Sciences, Bergen, Norway; [9]Department of Physiotherapy, Haukeland University Hospital, Bergen, Norway

Background: Lifestyle interventions for childhood obesity usually involve a physical activity (PA) component. However, few studies have compared PA in a clinical sample of children and adolescents with severe obesity and normal weight peers. Thus, this study aimed to compare objectively measured PA levels among treatment seeking children and adolescents with severe obesity and normal weight peers. Further, to investigate explanatory factors for time spent in moderate PA (MPA) and vigorous PA (VPA) among children and adolescents with severe obesity.

Methods: Cross-sectional study (n=170, aged 6-18 years). Children with severe obesity (n=85) were matched by age, gender, and the season for accelerometer measurements with normal weight peers (n=85). Stratified random sampling ensured that the groups were matched 1:1 on age, sex, and season for data collection. Children wore accelerometers for seven consecutive days, yielding measures of PA and sleep duration and timing. Parents reported on screen time, parental body mass index and participation in organized sports.

Results: Children and adolescents with severe obesity spent significantly less time in MPA (12 min, p<0.001) and VPA (21 min, p<0.001) per day compared to normal weight peers. No difference for time spent in sedentary activity was found between groups. For participants with severe obesity, age ≤12 years (p=0.009) and participation in organized sports (p=0.023) were related to more MPA, while age ≤12 years (p=0.038) and early sleep timing (p=0.019) were related to more VPA.

Conclusion: Children and adolescents with severe obesity were less physically active than their normal weight peers. Explanatory factors for more moderate and vigorous PA were lower age, participation in organized sports and earlier sleep timing.

Disclosure: Nothing to disclose

24

Six Months of Treatment with Bydureon® (Exenatide) Lowers 11 Inflammatory Biomarkers in Adolescents with Obesity

Stenlid, R.[a,b]; Cerenius, S.[b]; Wen, Q.[a,b]; Weghuber, D.[c]; Manell, H.[a,b]; Ciba, I.[a]; Bergsten, P.[b]; Forslund, A.[a]

[a]Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden; [b]Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden; [c]Department of Pediatrics, Paracelsus Medical University, Salzburg, Austria

Background/Aims: Glucagon-like peptide 1 (GLP-1) delays gastric emptying and lowers appetite, which improves glucose homeostasis and leads to reduced body weight. The Combat-JUDO study was a six-month, double-blind, multi-center randomized controlled trial performed between September 2015 and September 2016 in Uppsala, Sweden and Salzburg, Austria. Participants (aged 10-18, n = 88) with obesity were recruited and randomly assigned to receive weekly injections of either 2mg of the GLP-1 receptor agonist (GLP-1RA) exenatide (Bydureon®, AstraZeneca) or placebo. The study found that Bydureon® was well tolerated and led to a reduction of BMI-SDS. Obesity is associated with low-grade chronic inflammation in multiple tissues. Treatment with GLP-1RA has been shown to reduce inflammation in e.g., type 2 diabetes, vascular disease, and non-alcoholic steatohepatitis. However, the effects of exenatide on inflammation in pediatric obesity have not been fully investigated. Our aim was to determine if the GLP-1RA exenatide affects inflammation in adolescent obesity.

Methods: Blood was collected in EDTA tubes after 10h of fasting from all participants in the Swedish arm of the Combat-JUDO study. Relative concentrations of 92 proteins associated with inflammation were measured by PEA (Proseek Multiplex Inflammation I, Olink Bioscience, Uppsala). Intention-to-treat (ITT) and Last Observation Carried Forward approaches were used for all data analysis.

Results: Of the 44 participants, 22 received exenatide treatment (9 males, 13 females, mean age 14.55, mean BMI-SDS 3.12), and 22 received placebo (13 males, 9 females, mean age 13.55, mean BMI-SDS 3.28). 37 participants completed the study. Of the 92 inflammatory markers, 12 showed significant change in concentration following exenatide treatment compared to placebo: IL18R1, TRAIL, CXCL5, CD40, OPG, CX3CL1, CD244, LAPTGFβ1, CXCL1, LIFR, IL10, and CCL4. All except IL10 decreased in concentration. IL10 increased significantly more in the placebo group compared to treatment. IL-1β, TNF-α and IFN-γ were excluded due to plasma concentrations below limit of detection.

Conclusion: In conclusion, weekly injections of 2mg Bydureon® lowers inflammatory biomarkers in adolescent obesity.

Disclosure: The study was sponsored by AstraZeneca.

30th Annual Congress of the European Childhood Obesity Group (ECOG)

25

Non-Invasive Cardiovascular Risk Assessment in Prepubertal Children

Stomfai, S.[1]; Gyenesei, A.[2]; Ahrens, W.[3]; De Henauw, S.[4]; Günther, K.[3]; Marild, S.[5]; Mehlig, K.[6]; Moreno, L.[7]; Siani, A.[8]; Tornaritis, M.[9]; Veidebaum, T.[10]; Molnár, D.[1]; Erhardt, E.[1]
on behalf of the IDEFICS Consortium

[1]Department of Paediatrics, Medical School, University of Pécs, Pécs, Hungary; [2]Szentágothai Research Centre, University of Pécs, Pécs, Hungary; [3]Leibniz Institute for Prevention Research and Epidemiology - BIPS; [4]Department of Public Health/ Department of Movement and Sport Sciences, Ghent University, Faculty of Medicine and Health Sciences, Ghent, _Belgium_; [5]Department of Pediatrics, The Queen Silvia Children's Hospital, Goteborg University, Goteborg, Sweden; [6]Department of Public Health and Community Medicine at Institute of Medicine, Goteborg, Sweden; [7]Growth, Exercise, Nutrition and Development Research Group, University of Zaragoza, Domingo Miral s/n 50009 Zaragoza, _Spain_; [8]Institute of Food Sciences, Unit of Epidemiology & Population Genetics, National Research Council, _Italy_; [9]Research and Education Institute of Child Health, _Cyprus_; [10]National Institute for Health Development, Tallinn, _Estonia_

Aims: In spite of the fact that the development of cardiovascular diseases begins in childhood, there is no widely accepted tool for early risk assessment. The aim of the present investigation was to introduce a new, noninvasive risk estimation method for prepubertal children.

Methods: 5960 IDEFICS (Identification and prevention of Dietary- and lifestyle-induced health EFects In Children and infantS) children with a complete data set for this analysis (boys: 3079; age range: 2.1-9.9 years; body weight: [mean±SD] 23,8±7.01 kg; BMI: 16.36±2.42) of the total population (n=16229) were selected. The input variables consisted of individual clinical (overweight/obesity, waist-to-height-ratio, hypertension, weight small/large for gestational age, breast feeding) and family history (early cardiovascular disease, diabetes type 2, hypertension and dyslipidemia) parameters. These factors were analyzed together and validated against the presence of pathological cardiometabolic laboratory parameters (fasting blood glucose, total cholesterol, HDL-cholesterol, triglyceride, HOMA-index, HbA1C and CRP). The laboratory parameters were categorized by using the cutoff point of the 90th percentile's of IDEFICS population taking age and gender into account. In case of HDL the 10th percentile values were used as cutoff points.

Results: Children having more than three abnormal input variables had a significantly higher risk (OR > 1.7 [CI: 1.4-2.0]; p<0,05) for having at least one pathological cardiometabolic laboratory parameter. It was also revealed that each input variable had different effect on the examined laboratory values.

Conclusions: Our results indicate that the developed simple, noninvasive tool can be applied to detect children with cardiovascular risk. The current results demonstrate that the presented method can be useful in primary care setting.

Disclosure: Nothing to disclose

26

Metformin Normalizes Palmitate-Induced Insulin Hypersecretion

Wen, Q.[a,b]; Chowdhury, A.[b]; Stenlid, R.[a,b]; Forslund, A.[a]; Bergsten, P.[a,b]

[a]Department of Women's and Children's Health, Uppsala University Hospital, Uppsala, Sweden; [b]Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden

Background: Children with obesity and high fasting FFA concentrations showed insulin hypersecretion early in life, as observed during an oral glucose tolerance test (OGTT), compared to children with obesity and low FFA concentrations. Such insulin hypersecretion was proposed to be an early factor promoting obesity development. In human isolated islets the FFA palmitate induced insulin hypersecretion, which was prevented if metformin was introduced at the same time as when palmitate was introduced. Clinically insulin hypersecretion precedes administration of metformin. The aim of our study was therefore to investigate whether metformin can revert or normalize insulin hypersecretion in islets exposed to palmitate.

Methods: Isolated human islets were exposed to elevated palmitate for 12, 24 or 48 hours after which metformin was introduced for the subsequent 12 or 24 hours. Glucose-stimulated insulin secretion (GSIS) was measured from the islets after the culture period.

Results: When metformin was added to islets after 12 hours treatment with palmitate, reduction in insulin hypersecretion was observed. In contrast, when metformin treatment was 24 or 48 hours, GSIS from some donors showed attenuation of insulin hypersecretion, but was accentuated from islets from other donors. Metformin alone did not affect insulin secretion.

Conclusion: Metformin has capacity to attenuate insulin hypersecretion, when introduced early after hypersecretion has started.

Disclosure: nothing to disclose.

Consumption of Snacks and Soft Drinks among Children in North Macedonia: Results from the Fifth Round of the Childhood Obesity Surveillance Initiative (COSI)

Spiroski, I.[1,2]*; Nikolić, M.*[3]*; Memeti, S.*[1,2]

[1]Institute of Public Health – Skopje, North Macedonia; [2]Faculty of Medicine, Ss. Cyril and Methodius University – Skopje, North Macedonia; [3]European Food Safety Authority – Parma, Italy

Background: In Europe, 29% of boys and 27% of girls aged seven to nine were overweight and 12% of boys and 9% of girls obese. Eating habits are important for understanding the obesity problem. The aim of our research was to describe the consumption of snacks and soft drinks among second grade children in North Macedonia (MKD).

Methods: 3246 children selected for data collection for the 5th round of Childhood Obesity Surveillance Initiative (COSI). Measurements of height and weight, as well as frequency of consumption of soft drinks, savory snacks, and sweet snacks was examined. WHO Growth references were used to assess the nutritional status of children.

Results: In total, 38.5% of children in second grade in North Macedonia were overweight or obese. There were significantly more obese boys compared to girls (22.9% vs. 16%) while more girls were overweight (21.5% vs. 16.6%, p<0.0001). Obesity was more prevalent in urban areas of the country. BMI was not significantly influenced by frequency of eating of snacks and soft drinks. Consumption of soft drinks, for more than three days per week, was reported for significantly higher proportion of boys comparing to proportion of examined girls (45% vs. 37%, p<0.001). 37% of girls and 40% of boys reported consumption of the savory snacks for more than three days per week. Predominant unhealthy dietary habit was consumption of sweet snacks. It is worth to note that proportion of boys was again higher (44%) compared to examined girls (40%).

Conclusion: Consumption of snacks and soft drinks among second grade children in MKD should be improved. Frequency of consumption those foods should be reduced, particularly among boys. COSI collects data and present evidence to policy makers and should continue to be leading surveillance program for health risk factors among children in the country.

Disclosure: Nothing to disclose