IS001 / #573

PLENARY SESSION 01: EARLY LIFE NUTRITION AND LONG TERM OUTCOMES

PROTEIN CONTENT

Gregorio Milani, Carlo Agostoni
Foundation IRCCS Ca' Granda Ospedale Maggiore Policlinico, Pediatric Unit, Milan, Italy

Protein Intake in the First Two Years of Life: Implications for Childhood Growth and Obesity Risk This talk delves into the critical role of protein intake during the first two years of life and its potential impact on childhood growth and the risk of obesity. We draw insights from recent research, focusing on two key studies. The first study explored the influence of protein intake during the first year of life. A systematic review of twelve papers, followed by a meta-analysis of five of them, examined the effects of high-protein versus low-protein formulas during exclusive milk-feeding. Surprisingly, the findings challenge the assumption that early protein intake significantly affects growth outcomes in the initial months of life, shedding light on an intriguing debate in infant nutrition. In the second part of the talk, we shift our focus to the second year of life. Recent research highlights the association between protein intake during this period and childhood weight gain and obesity risk. We present findings from a systematic review of ten studies involving a substantial cohort of 46,170 children. While evidence suggests a link between higher protein intakes and increased childhood fatness, other outcomes such as BMI, obesity risk, and adiposity rebound onset remain inconclusive due to heterogeneity and limited data. This presentation underlines the complex relationship between early protein intake and childhood growth. It challenges conventional wisdom and emphasizes the need for further research to comprehensively understand the nuances of this critical period. Our findings have significant implications for public health strategies and guidelines for infant nutrition. Join us to explore the latest insights and engage in a thought-provoking discussion on this pertinent topic.

IS002 / #110

PLENARY SESSION 01: EARLY LIFE NUTRITION AND LONG TERM OUTCOMES

BIO-ACTIVE COMPOUNDS

Miguel Saenz De Pipaon
La Paz Hospital Autonoma University of Madrid, Neonatology Pediatrics, Madrid, Spain

Nutrition in the fetal period has a significant impact on neurological development throughout life. Maternal structured lifestyle intervention during pregnancy based on a Mediterranean diet significantly improved child neurodevelopmental outcomes at age 2 years. Participants in the Mediterranean diet group received monthly individual and group educational sessions and free provision of extra virgin olive oil and walnuts. Neurodevelopment in children was assessed by Bayley-III at 24 months of corrected postnatal age. Among 1221 pregnant women randomized in the IMPACT BCN trial, 626 (51%) children (293 [46.8%] female and 333 [53.2%] male; mean [SD] age, 24.8 [2.9] months) were evaluated for Bayley-III assessment. Compared with children from the usual care group, children in the Mediterranean diet group had higher scores in the cognitive domain (mean [SD], 123.6 [17.8] vs 118.6 [18.3]; β, 5.02; 95% CI, 1.52-8.53; P = .005) and social-emotional domain (mean [SD], 108.6 [22.0] vs 103.4 [18.5]; β, 5.15; 95% CI, 1.18-9.12; P = .01).
Does breastfeeding alter early brain development? The prevailing consensus from large epidemiological studies posits that early exclusive breastfeeding is associated with improved measures of IQ and cognitive functioning in later childhood and adolescence. The percentage of breast milk intake is significantly correlated with the verbal intelligence quotient at the age of 15 years and 9 months; in boys, with all IQ scores, volumes of total brain and white matter. Increased subcortical white matter and gray matter volume, and parietal lobe cortical thickness, associated with IQ, in adolescents who received BF as infants compared to those who were exclusively formula-fed. These data support the hypothesis that breast milk promotes brain development, particularly white matter growth. The selective effect in males accords with animal and human evidence regarding gender effects of early diet.
Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age. For every 10 ml/kg/day increase in breast milk intake: The Mental Development index increases 0.53 points, The Psychomotor Development index increases 0.63 points and the percentile on the Behavior scale increases 0.82 points; therefore, the impact of breast milk ingestion during the hospitalization for infants in the highest quintile (110 mL/kg per day) on the Bayley Mental Development Index would be 10 x 0.53, or 5.3 points. The societal implications of a 5-point potential difference (one third of an SD) in IQ are substantial.
A drop in weight z-score from birth to 36 weeks could predict neurological development. Effects of early nutrition and growth on brain volumes, white matter microstructure, and neurodevelopmental outcome in preterm newborns: Enteral protein intake was positively associated with cerebellar volume ($P<0.01$). Greater enteral protein intake is associated with greater volume of the thalamus and basal ganglia ($P<0.05$). Enteral protein intake is related to brain volume ($P=0.01$). Enteral protein intake during the first 28 days shows a significant positive relationship with white matter maturation at term age (Anisotropy of the posterior arm of the internal capsule, $P<0.01$). the study demonstrated a positive association between nutrition, and brain volumes. Moreover, authors found a positive relationship between nutrition and white matter maturation at Term equivalent age. These findings emphasize the importance of growth and nutrition with a balanced protein, fat, and caloric content for brain development.

IS003 / #111

PLENARY SESSION 01: EARLY LIFE NUTRITION AND LONG TERM OUTCOMES

MILK GLOBULES

Magnus Domellof
Umea University, Clinical Science, Pediatrics, Umea, Sweden

Breastfeeding is associated with many health benefits in the infant, including improved cognitive development and a reduced risk of infections. Human milk is a complex emulsion of fat globules surrounded by a triple phospholipid membrane, with membrane-bound complex lipids and proteins. Lipid components of this highly complex membrane, the ”milk fat globule membrane” (MFGM) include choline, sphingomyelin, gangliosides, cholesterol, sialic acid, inositol and cerebrosides, which are all involved in brain development. Further, the MFGM contains protein components, including mucins, butyrophilin, lactadherin, CD14, TLR1, TLR3 and xanthine oxidase, which are all important for immune function. Studies in animals support these associations suggest that MFGM may indeed improve neurodevelopment and reduce the risk of infections. Interestingly, even though infant formula is based on cow’s milk, the dairy fat is routinely discarded in the production of standard infant formulas and replaced by vegetable fats, thus removing the MFGM which is also present in cow’s milk. We performed a randomized, controlled trial where 160 healthy, term, formula-fed infants were randomized at < 2 months of age to receive a standard formula or a formula with added MFGM up to 6 months of age. The MFGM group had a significantly lower overall risk of infections during the intervention period, with the cumulative incidence of acute otitis media during the intervention being 1% vs 9%, P=0.034. The incidence of antipyretics use was also significantly lower: 25% vs 43%, P=0.021. Furthermore, the MFGM group had significantly higher cognitive Bailey III score at 12 months compared to the standard formula group: 105.8 compared with 101.8, P = 0.008). These results suggested that the addition of MFGM to infant formula may reduce infections and improve neurodevelopment in infants. Since the publication of our results, there has been a huge interest in the field and several clinical trials have been started. With regards to effects on neurodevelopment, several new studies of MFGM fractions added to infant formula have been published between 2019 and 2023. These include two Chinese RCTs, one of which showed higher Bayley-III scores for cognition, language and motor development at 12 months, no remaining effect at 18 months of age. A follow-up of that trial showed significantly higher WPPSI IV scores for full-scale IQ (98.7 vs 93.5, p=0.012) at 5.5 years of age. A limitation of that trial was a high drop-out rate. The other Chinese RCT showed no effect on Bayley III score for cognitive, language or motor development at 12 months, but higher scores for social-emotional and general adaptive development as well as better short-term memory. Also, a Dutch RCT using MFGM-derived phospholipid-coated droplets found better results in some neurodevelopmental tests at 5 years of age. However, a follow-up of our Swedish study could not demonstrate any remaining effect on neurodevelopment at 6.5 years of age. A Chinese RCT published in 2019 no effect on infections. With regards to safety, several recent well-performed RCTs in different populations have shown that MFGM supplemented infant formulas are well tolerated, without adverse effects and result in normal growth. While commercially available MFGM isolates, used in infant formulas, are predominantly bovine-sourced, different processing techniques result in considerable differences in the types and amounts of polar lipids and membrane proteins, and therein, their potential bioactivities. Overall, heterogeneity in the composition of commercially available MFGM may be a major reason for the discrepancy in results from clinical trials of MFGM supplementation in infants MFGM is a very promising food component that may confer health benefits to infants and young children but further studies are needed to confirm these effects and to establish which type of MFGM fraction which is most effective.

IS004 / #113

PARALLEL SESSION 01: MANAGEMENT OF CHILDREN ON A VEGETARIAN-TYPE DIET

VEGETARIAN-TYPE, RAW-FOOD, MACROBIOTIC AND FRUITARIAN DIETS: CONSEQUENCES FOR CHILDREN'S MICRONUTRIENTS STATUS

Rosan Meyer
KU Leuven, Medicine, Leuven, France

Plant-based diets have gained popularity in the last 10 years due to health and environmental reasons. A recent narrative review reported that vegetarian or vegan weaning was followed in 9.2% of infants. The reduction or omission of animal-based foods have led to the expression of nutritional concern for growth and dietary adequacy (including vitamin B12, iron, essential fatty acids) in particular in during early childhood. Guidelines from individual countries and paediatric associations have either advised against or advised caution when following a mainly plant-based diet and have suggested the additional support of dietitians when embarking on such a diet. This presentation will focus on the evidence in paediatrics on micronutrient status in vegetarian-type, raw-food, macrobiotic and fruitarian diets and will discuss practical guidance in short.

IS005 / #114

PARALLEL SESSION 01: MANAGEMENT OF CHILDREN ON A VEGETARIAN-TYPE DIET

NUTRITION AND GROWTH IN VEGAN CHILDREN

Helena Ferreira Mansilha
CMIN/CHUdSA, Pediatrics, Porto, Portugal

Over the last decades, restrictive diets have become more popular worldwide with an increasing prevalence and interest, and consequently a growing trend of families choosing to consume vegan diets and extending for their offspring. It is estimated that the number of vegans has increased by 350% over the past 10 years [1]. Some studies have indicated that weight, height, body mass index and other anthropometric measures of vegan children were slightly below the references [2]. However, current literature on nutrition, development and growth suggest that a well-planned vegan diet using adequate supplementation is likely to provide for normal progression of height and weight in children of all age classes, including particularly delicate life stages, which emphasizes the need of careful and regular medical and dietetics oversight. In spite of this, some position papers published by relevant scientific pediatric associations still caution against vegan diets for children and adolescents, citing potential harms [3]. Actually, as many as 3,6 % of vegan children may be stunted in growth and another 3,6% may be wasted, possibly due to some kind of malnutrition [4]. In the current days, poorly constructed vegan diets might predispose children to nutritional imbalance namely macronutrient deficiencies (protein, n-3 fatty acids) and micronutrient deficiencies (vitamin B12 and vitamin D, iron, zinc, calcium, iodine) and higher folate and n-6 fatty acids concentrations. Regarding blood lipids profile, vegan children had lower triglyceride, HDL-C, non HDL-C, LDL-C and total cholesterol concentrations than vegetarian and/or omnivorous children [5]. Bone mineral content (adjusted for body size) could be decreased 3,7-5,6% in children consuming a vegan diet [6]. Vegan diets could be associated with a healthier cardiovascular risk profile typically referred in adults, but positive health benefits may not necessarily apply directly to children [5]. Moreover, there is no clear evidence that a vegan diet which begun in childhood, especially early childhood, confers a lasting health benefit. Nevertheless, potential benefits in some aspects like preventing the development of childhood obesity and their comorbidities could be reached [3,7]. The discrepancy of positions of relevant scientific pediatric associations about the appropriateness of a vegan diet for children could be attributed to scarcity of high-quality, well-designed, representative studies and/or the existing unrepresentative and outdated studies. Scientific rigor suggests performing a comparable assessment of applying the same evaluation approach towards omnivorous and vegan diets and their lifelong outcomes [3]. Regardless of the dietary choice, both diets can easily be practiced in an unhealthy manner. 1.Ferrara P, Corsello G, Quattrocchi E, et al. Caring for infants and children following alternative dietary patterns. J Pediatr 2017; 187: 339-340. 2. Schürmann S, Kersting M, Alexy U. Vegetarian diets in children: a systematic review. J Nutr. 2017; 56(5): 1797-1817. 3. Jakše B, Fras Z, Fidler Mis N. Vegan Diets for Children: A Narrative Review of Position Papers Published by Relevant Associations. Nutrients 2023; 15(22): 4715. 4. Weder S, Hoffmann M, Becker K, Alexy U, Keller M. Energy, macronutrient intake, and anthropometrics of vegetarian, vegan and omnivorous children (1-3 years) in Germany (VeChi Diet Study); Nutrients 2019; 11(4): 832. 5. Weder S, Keller M, Fischer M, Becker K, Alexy U. Intake of micronutrients and fatty acids of vegetarian, vegan, and omnivorous children (1-3 years) in Germany (VeChi Diet Study); Eur J Nutr 2022; 61: 1507-1520. 6. Desmond MA, Sobiecki JG, Jaworski M, Pludowski P, Antoniewiskicz J, Shirley MK, et al. Growth, body composition, and cardiovascular and nutritional risk of 5-to 10-y-old children consuming vegetarian, vegan or omnivore diets. Am J Clin Nutr 2021; 113: 1565-77. 7. Sutter DO, Bender N. Nutrient status and growth in vegan children. Nutr Res. 2021; 91: 13-25.

IS006 / #115

PARALLEL SESSION 01: MANAGEMENT OF CHILDREN ON A VEGETARIAN-TYPE DIET

EFFECT OF DAIRY PRODUCTS ON CHILDREN'S GROWTH

Christian Molgaard, Anni Larnkjær, Benedikte Grenov, Kim F Michaelsen
University of Copenhagen, Department Of Nutrition, Exercies And Sports, Frederiksberg C, Denmark

During early life, a period with very high growth velocity, milk is the major source of energy and nutrients for mammals. Cow's milk stimulates fast growth in calves and may also stimulate growths in humans. The strongest evidence comes from observational and interventions studies in low-incomes settings. In addition, a cross-sectional study has shown higher adult male stature in countries with a high intake of animal proteins compared to plant protein. A meta-analysis from 2012 has shown a positive effect on linear growth of 0.4 cm/year per daily intake of 245 ml of cow's milk during childhood. However, a new review with studies from well-nourished populations does not report a clear association between protein intake and linear growth, but a positive association between high protein intake from cows' milk in infancy and later BMI seems consistent. The mechanism is not completely clear. Dairy products provide several nutrients that may have a positive influence on growth e.g. calcium, phosphorus, zinc, and high-quality proteins. The high protein quality of casein and whey may play a key role by stimulating different growth factors such as e.g. IGF-1 and insulin. Nevertheless, some newer studies comparing milk protein and high-quality plant proteins have shown similar stimulation of growth factors and growth. However, these are short term interventions, and the long-term effect is not known. More studies are needed to determine to what degree high quality plant-based proteins can replace milk proteins in a healthy diet for children to ensure optimal growth.

IS007 / #117

PARALLEL SESSION 02: NUTRITION TREATMENT OF FUNCTIONAL GI DISORDERS

INFANTILE COLIC

Yvan Vandenplas
KidZ Health Castle UZ Brussel, Pediatrics, Brussels, Belgium

Infantile colic Yvan Vandenplas KidZ Health Castle, UZ Brussel, Vrije Universiteit Brussel, Brussels, Belgium Although the prevalence of infantile colic is ~20%, its pathophysiology is not understood. The lack of devices that objective would measure the duration and intensity of the crying and distress is major problem. Clinical trials have to rely on the (subjective, biased) information provided by the care givers. Literature proposes many different options contributing to the development of colic. Slow development of lactase activity, cow's milk allergy and maturity of the enterohepatic bile acid cycle are proposed mechanisms. Administration of antibiotics and other medications during the perinatal period have also been proposed as they contribute to dysbiosis. Gastro-intestinal dysbiosis related to chronic low grade inflammation has also been proposed. Today, administration of specific probiotics strains, such as *Limisolactobacillus reuteri* DSM 17938 *Bifidobacterium animalis lactis* BB-12, are the best documented management in breastfed infants. According to the recent Espghan position paper, cow's milk allergy should not be considered in clinical routine if crying and distress is the single manifestation. According to literature, acid blocking medication does not reduce crying time, despite the fact that this kind of medication is still increasingly prescribed in many parts of the world. There are data suggesting that comfort formulas (partial hydrolysates, palm-oil free, supplementation with "biotics") have positive impact in a subgroup of colicky infants. Recent literature confirmed that the composition of the gastro-intestinal microbiome is associated with infantile colic. It can be speculated that full sequencing and bioinformatics analysis to identify the microbiome down to the species level may provide answers towards the etiology and management of infantile colic, in at least a part of the infants.

IS008 / #119

PARALLEL SESSION 02: NUTRITION TREATMENT OF FUNCTIONAL GI DISORDERS

CONSTIPATION

Iva Hojsak[1,2]
[1]University of Zagreb, Medical School, Zagreb, Croatia, [2]Children's Hospital Zagreb, Referral Center For Pediatric Gastroenterology And Nutrition, ZAGREB, Croatia

Nutritional treatment of constipation Functional constipation is considered a widespread disorder in children, with a worldwide prevalence of 9.5%. In the great majority of those children (more than 90%) no underlying organic cause can be found. The etiology of functional constipation is considered multifactorial, and the exact reason is not yet fully clarified. One of the most important causes is withholding behavior, often seen in children with functional constipation. According to the guidelines developed by the European and North American Societies for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN/NASPGHAN), polyethylene glycol (PEG) is a first-line treatment for children presenting with functional constipation. For many patients, current treatment options do not provide sustained relief of the symptoms and they seek for new strategies including fiber and probiotics. This lecture will focus on the role of fiber and probiotics in the management of constipation in children.

IS009 / #121

PARALLEL SESSION 03: NUTRITION DURING PUBERTY

NUTRITION, PUBERTY AND GROWTH DURING ADOLESCENCE: CHALLENGES AND RESEARCH GAPS

Michal Yackobovitch-Gavan[1], Naama Fisch-Shvalb[2]
[1]Schneider Children's Medical Center of Israel, Institute Of Endocrinology And Diabetes, Petach Tikva, Israel, [2]Schneider Children's Medical Center of Israel, Institute Of Endocrinology And Diabetes, Petah Tikva, Israel

Adolescence, a pivotal phase in human development, marks a critical window of opportunity to influence growth, development, and long-term health outcomes. Nutrition plays a central role in shaping the timing and tempo of pubertal development, impacting the trajectory of growth in males and females. However, this period remains underexplored compared to earlier life stages. Our presentation will delve into the intricate interplay between nutrition, puberty and growth during adolescence, addressing key facets of this complex relationship. The introductory segment will provide a comprehensive overview of normal pubertal growth in both sexes. The next section will discuss the effect of nutrition during childhood on puberty and growth patterns. A synthesis of evidence-based data will be presented, elucidating the influence of energy imbalance (addressing both obesity and undernutrition), as well as the role of macronutrients, micronutrients, and overall diet quality in determining the timing of puberty and growth patterns. The subsequent section will focus on the impact of nutritional interventions on linear growth during adolescence. Drawing on evidence from low- and high-income countries, we will navigate through the challenges of implementing effective interventions in contexts where dietary inadequacy and micronutrient deficiencies prevail. Special attention will be given to the limited research on nutritional interventions in this age group. We will also discuss the intricacies of researching nutritional interventions during adolescence, outlining challenges such as high dropout rates, low adherence, the influence of various environmental factors on growth outcomes and the large heterogeneity in the growth rate. To illustrate these challenges, we will share insights from our own, including practical strategies employed to overcome methodological hurdles in conducting nutritional intervention studies during adolescence.

IS010 / #122

PARALLEL SESSION 03: NUTRITION DURING PUBERTY

UNDER NUTRITION AND ITS EFFECT ON PUBERTY

Susan C Campisi[1,2]
[1]University of Toronto, Dalla Lana School of Public Health, Nutrition And Dietetics Program, Clinical Public Health Division, Toronto, Canada, [2]Hospital for Sick Children Research Institute, Global Child Health; Neuroscience And Mental Health, Toronto, Canada

Monitoring adolescents' growth and pubertal development is essential for understanding their overall health. Factors like nutrition, environment, and hormones significantly shape this phase, impacting growth trajectories and developmental milestones. This understanding is crucial for tailoring interventions effectively. The timing of pubertal milestones has far-reaching implications for long-term health outcomes in both males and females. However, gaps persist, particularly in adolescent-specific evidence and the enduring effects of undernourishment. Chronic undernutrition, characterized by prolonged inadequate food intake and a deficiency in essential nutrients, disrupts the delicate balance necessary for healthy growth and development during adolescence. This nutritional insufficiency creates a domino effect within the body's metabolic processes, forcing a prioritization of vital functions while compromising others. As a result, the body conserves energy by prioritizing essential metabolic activities, such as maintaining basic organ functions, at the expense of secondary functions like linear growth and the initiation of reproductive maturation. This disruption in the normal physiological course can manifest as stunted growth, where adolescents experience a slower-than-expected increase in height and delayed puberty, significantly impacting their overall physical development. Moreover, the implications extend beyond physical stature, affecting cognitive development, immune function, and overall well-being. The repercussions of undernutrition during this critical phase can have lasting effects, influencing an individual's health trajectory well into adulthood, predisposing them to a higher risk of chronic diseases and impacting their quality of life. In this presentation, recent research from low- and middle-income countries will be highlighted, emphasizing the relationship between undernutrition, impaired growth, and delayed puberty. Additionally, it will address the challenges in defining these factors consistently across studies and the complexities in obtaining accurate puberty and growth data on an individual level. These insights will shed light on the multifaceted landscape of addressing nutrition, growth and pubertal timing during adolescence.

IS011 / #123

PARALLEL SESSION 03: NUTRITION DURING PUBERTY

OVER NUTRITION AND ITS EFFECT ON PUBERTY

Wieland Kiess
University of Leipzig, Director, Hospital For Children And Adolescents, Leipzig, Germany

There has been a decline in the age of pubertal onset and importantly pubertal onset and duration of puberty maybe influenced by weight status and socioeconomic living conditions of a child..

This presentation will present data as to pubertal onset/duration and puberty-triggering effects of obesity, overweight, socioeconomic status and hormones.

Lower SES is associated with earlier thelarche and longer duration of puberty in overweight/obese girls, whereas age of menarche was not affected. In boys with low SES, a trend versus earlier puberty onset can be seen. Lower SES was significantly associated with boys' age at mutation. No significant differences in boys' and girls' serum levels of LH and FSH during puberty according to SES were observed. Serum LH levels of 0.56 IU/L and serum FSH levels of 1.74 IU/L showed the best prediction of gonadarche in boys.

Puberty onset/duration and boys' age at mutation is affected by SES. Effects of obesity on pubertal development is multifold and results remain controversial.

IS012 / #188

PARALLEL SESSION 04: HOSPITAL-RELATED MALNUTRITION IN CHILDREN

PREVALENCE OF UNDERNUTRITION AND THE EFFECT OF HOSPITALIZATION ON NUTRITIONAL STATUS OF HOSPITALIZED CHILDREN

Koen Huysentruyt
UZ Brussel, Vrije Universiteit Brussel (VUB), Pediatric Gastroenterology, Brussels, Belgium

Disease associated undernutrition has recently been defined as a condition resulting from imbalanced nutrition or abnormal utilization of nutrients which causes clinically meaningful adverse effects on tissue function and/or body size/composition with subsequent impact on health outcomes in a position paper of the special interest group on clinical malnutrition of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN). This presentation will focus on providing an update on the evolution of the prevalence of undernutrition in hospitalized children. The presentation will also focus on the evolution of the nutritional status during hospitalization and the possible benefit of nutritional or dietetic interventions.

IS013 / #126

PARALLEL SESSION 04: HOSPITAL-RELATED MALNUTRITION IN CHILDREN

HOW THE UNDERNUTRITION IN DISEASED CHILD AFFECTS THE CLINICAL OUTCOME?

Sanja Kolaček
Children's Hospital Zagreb, Referral Center For Pediatric Gastroenterology, Hepatology And Nutrition, ZAGREB, Croatia

Over the past several decades prevalence of malnutrition remained unchanged in many hospitals across the USA and Europe despite technical improvements and increased knowledge in the field of nutrition, affecting as many as 15 to 25% of adult and paediatric patients. Children are particularly vulnerable compared to adults due to limited body reserves, potentially rapid losses, and exceptionally high growth and organ maturation requirements. Therefore, their ability to compensate for even a marginal supply of nutrients and for unbalanced nutrition is severely limited. Hospitalized children with chronic illnesses are vulnerable to nutritional deficiencies because not only metabolic needs are increased, but also utilization and absorption of nutrients may be impaired. Furthermore, hospitalization is an important risk causing ongoing acute impairment of body weight irrespective of whether located in developed or underdeveloped countries. Once malnutrition develops, it compromises muscle and immune function, prolongs wound healing, and initiates intestinal dysfunction, thereby increasing the risk of serious complications. All these factors, particularly if acting in concert, further alter nutrient intake and requirements, making this a vicious circle and leading to the progression of the underlying disease, prolongation of the hospital stay, and increasing the costs of health care. The negative impact on clinical outcomes has been shown for many different diseases, namely for the outcome of surgery, pneumonia, children with malignant diseases, and patients in intensive care units, to name just a few. Nutritional support is, therefore, an essential part of the management of paediatric patients with the primary goal of preventing undernutrition, and if it is already present, restoring normal nutritional status while avoiding nutrition-related complications. The benefits and the impact of nutritional support on clinical outcomes have been shown in cohorts of children with different underlying conditions such as surgical, malignant, in cardiac patients, children with cystic fibrosis, cerebral palsy, and many others. References: *Hulst J, Huysentruyt K, Gerasimidis K, et al. A practical approach to identifying pediatric-disease associated undernutrition: A Position Statement from the ESPGHAN Special Interest Group on Clinical malnutrition. JPGN 2022;74:693-705 Kolacek S. Enteral nutrition support. World Rev Nutr Diet 2022;124:240-6.*

IS014 / #130

OPENING CEREMONY AND KEYNOTE LECTURE

KEYNOTE LECTURE: HOW CHILDREN GROW

Jan Maarten Wit
Leiden University Medical Centre, Paediatrics, Leiden, Netherlands

The fact that the fertilized oocyte contains all the information to develop into a fully grown adult is one of the big miracles of life. I have been intrigued by the time course of linear growth and body proportions, the underlying mechanisms of growth regulation, early detection and diagnosis of short or tall stature, and clinical management of growth disorders. In my view, there are five strategies to increase the understanding of how children grow. First, in a combined effort of paediatricians, preventive youth health workers and biostatisticians, population studies can be performed to describe mean and spread of height and body proportions during the years that linear growth takes place. The resulting growth charts do not only provide a necessary tool for health workers in preventive and clinical settings, but can also document secular change and be used for international comparisons. A positive secular change (secular trend) of height has been observed in many countries in the foregoing 150 years. Secular trend is still poorly understood, but it is assumed that a change in dietary habits plays a role. Unfortunately, in the last 50 years this has been combined with increasing percentages of overweight. Second, as a general paediatrician or paediatric endocrinologist, one can study individual children with an unusual growth pattern, leading to either short or tall stature, with or without body disproportion or dysmorphic features. In the last two decades, the use of whole exome sequencing in such children has been very informative of the role of genetic factors involved in linear growth. These findings have important consequences for growth monitoring in preventive health care, and the diagnostic workup of short or tall children in paediatric care. In children in whom the cause of growth faltering can be fully taken away (for example in Cushing syndrome or juvenile hypothyroidism), full catch-up growth can be observed. Catch-up growth is a fascinating phenomenon that still awaits full clarification. Third, as a clinical scientist, one can perform studies on groups of children with a similar presentation or similar genetic abnormality, and study the natural history and response to various forms of treatment. The efficacy of medical treatments, nutritional interventions or medication (e.g. growth hormone, IGF-I or CNP) can offer clues for a better understanding of the pathophysiology of the disorder. Fourth, in collaboration with laboratory scientists, one can be involved in in vivo and in vitro studies in animals or cell cultures to try to better understand the mechanisms underlying growth and differentiation of the chondrocytes in the epiphyseal growth plate. Such studies have shown the complex interplay of numerous proteins in and around the epiphyseal chondrocytes. Fifth, in collaboration with child psychologists and medical ethicists, one can study the effects of short or tall stature on health-related quality of life in children, adolescents and adults. It has been debated whether treatment of short or tall stature should be considered a form of medical treatment or enhancement. In my lecture I shall offer my interpretations of data that have been generated with these scientific approaches.

IS015 / #131

PARALLEL SESSION 05: FOOD ALLERGY

ADVANCES IN FOOD ALLERGY DIAGNOSIS

David Fleischer
Children's Hospital Colorado, Allergy And Immunology, Denver, United States of America

In this lecture, we will discuss briefly the current diagnostic tools utilized for the diagnosis of food allergy and their limitations. We will also explore future diagnostic tools that are under investigation that may improve the diagnosis of food allergy.

IS016 / #132

PARALLEL SESSION 05: FOOD ALLERGY

FEEDING DIFFICULTIES IN CHILDREN WITH FOOD ALLERGIES: UNDERSTANDING, ASSESSMENT, AND MANAGEMENT

Carina Venter
Unversity of Colorado, Section Of Pediatric Allergy And Immunology, Denver, United States of America

Feeding Difficulties In Children With Food Allergies: Understanding, Assessment, And Management
The development of feeding skills is a complex process occuring in early childhood through the presentation of foods. Feeding difficults can emerge in the context of food allergy due to infant discomfort, ongoing inflammation, inadequate presentation of foods, and parental and/or child anxiety. Poor or delayed skill development and/or maladaptive eating and feeding behaviors may develop. There is currently no consensus definition for feeding difficulty due to its complex nature and presentation. The term “feeding difficulties” includes behaviors such as picky or selective eating, food refusal, food fads, food neophobia, limited, excessive or variable appetites, prolonged mealtimes, and disruptive mealtime behavior. Maladaptive caregiver responses may also arise such as coercing children while feeding or restricting foods being offered.Though behaviors may be transient, feeding can become more difficult when a number of symptoms present over a prolonged period of time. Beyond feeding difficulites, the term “Pediatric Feeding Disorder” (PFD), defined as impaired oral intake that is not age-appropriate, and is associated with medical, nutritional, feeding skill, and/or psychosocial dysfunction, has been proposed. A severe form of pediatric feeding disorder, ARFID, is associated with 1) Significant weight loss (or failure to achieve expected weight gain or faltering growth in children) 2) Significant nutritional deficiency 3) Dependence on enteral feeding or oral nutritional supplements 4) Marked interference with psychosocial functioning and differs from conventional eating disorders due to the absence of body dysmorphia. Feeding difficulties are prevalent in children with both IgE and non-IgE mediated food allergies, persist despite adequate food allergy management, and can result in nutritional deficiencies and faltering growth. Selective eating may continue long after the food allergy has been outgrown. Early diagnosis followed by referral to a specialist multi-disciplinary team is essential to address and treat the feeding problems and prevent nutritional deficiencies and faltering growth. Interventions may include addressing skill based dysfunction, supporting the parent child feeding relationship, implementinf approaches to support adherence to dietary recommendations, decrease anxiety, fears and familial stress at mealtimes, and sharing strategies to help the child to confidently integrate within the social world.

IS017 / #135

PARALLEL SESSION 06: THE IMPACT OF MIGRATION ON CHILD GROWTH AND NUTRITION

WHAT HAPPENS TO THE GROWTH OF CHILDREN WHEN FATHERS MOVE ABROAD FOR WORK? EVIDENCE FROM A COHORT IN RURAL NEPAL

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Background Nepal has a high prevalence of child stunting and international labour migration, but little is known about how the fathers' migration affects the growth of left-behind children. **Objective** The objective of this study was to determine the association between paternal labour migration and the growth of the left-behind children in Dhanusha district, Nepal. **Research questions** 1. What is the overall association between fathers' labour migration and the linear growth of children from birth to six years? 2. Does the association between the fathers' labour migration and child growth differ by the duration he has been abroad? 3. Are some child age-periods more sensitive to the impact of paternal migration? **Methods** We used data from a previous birth cohort study (*n*=602) conducted in Dhanusha district. Children were enrolled at birth in 2012 and their length was measured every 28 days until they were two years. We followed up this cohort in 2018 when the children were six years old. We took measurements of their height and collected data on the household migration history to determine the children's exposure to migration during their lifetime and during pregnancy. We used mixed-effects linear regression to determine the association between exposure to paternal international labour migration and the length/height- for age *z*-score (HAZ) of the left-behind children. **Results** We followed up 529 children in 2018 of which 525 could be included in the analysis. Two thirds of fathers had migrated for work at least once over the recall period of seven years. Mean HAZ ranged from -1.0 at birth (2012) to -2.0 at two years (2014). At the six-year follow-up (2018) the mean HAZ was -1.6. Mixed-effects regression models showed that (1) the children of labour migrants were shorter than children whose father did not migrate. We found that (2) children of fathers who recently went abroad (≤ 12 months ago) were shorter than children of non-migrants, but there was no difference between children of longer-term migrants (>1 year) and children of non-migrants. Stratifying the children by age showed that (3) the negative association between fathers' labour migration and the growth of the left-behind children was only significant at younger ages (≤ 6 months) but not at older ages (12-72 months). **Conclusions** There was no indication of a positive association between paternal labour migration and child growth. Under some circumstances such as very young age and shortly after the fathers' departure, there was a negative association between labour migration and the growth of the left-behind children. There is a need for interventions to support left-behind women who are pregnant and mothers with small babies, especially if their husband recently left for work overseas.

IS018 / #136

PARALLEL SESSION 06: THE IMPACT OF MIGRATION ON CHILD GROWTH AND NUTRITION

MIGRATION THROUGH MARRIAGE AND IMPLICATIONS FOR ADOLESCENT NUTRITION: EVIDENCE FROM RURAL NEPAL AND INDIA

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In South Asia, the norm is for women to relocate to their husband's house upon marriage. Whilst this form of migration is widely practiced, it can still have major implications for women and their children. The geo-social niche of women's marital household will shape the life-course of women and their children, and the kind of household that they marry into is in large part associated with their age at marriage. This presentation will share data from rural Nepal and India on the implications for adolescent nutrition associated with migrating through marriage. Using data on 17,000 women from lowland rural Nepal, we found that women who had married as adolescents were more likely to be lower educated, have poor nutritional status, indexed by shorter stature, and have poorer mental health. These early married women were also more likely to give birth to pre-mature babies. Our research in India, on 650 mother-child dyads, provides further evidence for an intergenerational cycle of disadvantage being perpetuated through early marriage. In rural India, women who were born pre-mature, and those who had poor physical growth in early life were also more likely to marry early. In turn, children of these early married and less educated women were more likely to have lower education and poorer nutritional status. Daughters also married and had children at a young age. At a broader level, marrying later also means that girls get a chance to experience adolescence, and not just go straight from childhood or early adolescence to womanhood and motherhood through marriage. Pay-offs for marrying later include more education for girls, which may give them more confidence and knowledge to improve their own health and that of their children. Biologically, later marriage would enable girls to develop physically and gain the maturity to be ready for both marriage and motherhood. Migration through marriage is widely practiced and hence the consequences are likely to be far reaching for both women and their children. In 2023, according to UNICEF, 1 in 5 women aged 20-24 years were married before the age of 18 years. However, despite substantial effort, policies and interventions are not yet able to shift gendered norms around the roles and expectations of women in society. They are just slightly delaying the age at which women experience a major form of migration, through marriage.

IS019 / #137

PARALLEL SESSION 06: THE IMPACT OF MIGRATION ON CHILD GROWTH AND NUTRITION

MATERNAL INTERNAL MIGRATION AND CHILD GROWTH AND NUTRITIONAL HEALTH IN PERU

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Rural-urban migration in low-middle income countries has been associated with greater obesity and other non-communicable disease in adults. A systematic review we carried out suggested there may be intergenerational effects; notably, when compared to rural non-migrants, children born to rural-urban migrant parents had both greater linear growth and risk of overweight. Compared to urban non-migrants, findings were mixed and contemporary data was lacking, particularly from Latin America, and among older children. We therefore assessed associations of maternal internal migration and child growth and nutritional status in Peru. Associations were first explored in children under 5 years using national Demographic & Health Survey data from 2020 comparing children of mothers who had never migrated or had migrated from either rural or urban areas in adulthood and stratified by rural (n=2,346) or urban (n=3,710) place of current residence. Only children born after maternal migration were included. Outcomes were z scores for age of height (HAZ) and BMI (BAZ) using WHO reference data and derived cut-offs for stunting and obesity. Regression analyses were conducted adjusting for covariates reflecting confounding and migration selection effects. We found that in both rural and urban areas, having a migrant mother was associated with lower BAZ and obesity while in rural areas (but not urban areas) it was also associated with greater HAZ and lower stunting. In addition, comparisons across rural and urban areas showed that children of mothers from rural areas currently living in urban areas had greater HAZ, BAZ and obesity but lower stunting than children in rural areas. Associations were also explored in children aged 5-15 years old living in a deprived area of urban Lima (Villa El Salvador) using primary data (N=282). As in younger children, results indicated lower BAZ and obesity in children of migrant women, though only from rural areas. There was little evidence of any differences for linear growth and stunting. The findings overall suggest that, for women, migrating from rural to urban areas may be beneficial to the growth of their offspring though it may also increase their risks of obesity. Nonetheless, risks of obesity in children of migrant women, particularly from rural areas, remained lower, both in urban and rural areas, than for non-migrants. The findings provide new evidence on child health inequalities in Peru and further insight into determinants of child and adolescent health and the impacts of internal migration in low- and middle-income countries, which may stimulate further longitudinal research and help inform policy and intervention looking to reduce child health inequalities and prevent obesity and non-communicable disease across the life course.

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IS020 / #575

PLENARY SESSION 02: YEARBOOK

MALNUTRITION AND CATCH-UP GROWTH DURING CHILDHOOD AND PUBERTY

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In 2022, approximately 148.1 million children, or 22%, of all children under 5 years of age across the globe were estimated to be to be affected by stunting, and 45 million children under five by wasting, of whom 13.7 million were severely wasted. Although remarkable progress has been made in the reduction of stunting in the first 15 years of the millennium, since 2015 this progress has begun to slow down. The COVID-19 pandemic further exacerbated the situation, as it overwhelmed healthcare systems and disrupted vital healthcare services. To achieve the targets set forth in the Sustainable Development Goals by 2030, a substantial increase in attention and investment, both in terms of financial resources and political commitment, is imperative. In this yearbook session we will review the most recent data on various aspects of childhood malnutrition, stunting, and catch-up growth published between July 1, 2022, and June 30, 2023.

IS021 / #576

PLENARY SESSION 02: YEARBOOK

STUNTING OF GROWTH IN DEVELOPING COUNTRIES

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Background Africa and Asia bear the greatest burden of stunted children under 5 globally. Despite some progress, stunting reduction efforts fall short of global targets. Among countries aiming to reduce stunting by 2024, only one-third have succeeded. Focussing on stunting targets alone overlooks the complexity of interaction between different forms of malnutrition within the same child living in an impoverished community. Addressing stunting requires an integrated approach to maternal and child nutrition. Widespread coverage of evidence-based antenatal and intrapartum interventions could prevent stunting alongside substantial gains in education and economic prospects. Additionally, leveraging 'big data' such as satellite-derived data provides an opportunity to inform targeted policies on socio-economic and environmental aspects of child malnutrition in vulnerable communities. For this chapter, we set out to identify publications on stunting in developing countries over the past 12 months, which tackled key areas of interest for policymakers, whilst also exploring new areas that are likely to enhance progress towards achieving the global targets. Methods Two co-authors conducted independent searches utilizing the PICO (population, intervention, comparator, and outcomes) framework. An extensive search was conducted in Pubmed and Google Scholar for publications between July 1, 2022, and June 30, 2023. We included recent data on planetary health insights into childhood stunting, maternal nutrition, health and well-being impact stunting, as well as other forms of malnutrition. A series of meetings were then held with the other co-authors to decide on the key themes for the chapter based on the available publications. The consensus was for our chapter to focus on publications that enhance the understanding of linear growth trajectories in low- and middle-income countries and their impact on stunting, as well as the evaluation of antenatal and postnatal nutrition interventions aimed at addressing stunting in these regions. Results Fifteen publications were included that cut across five key themes. Insights from the five publications on planetary health show that severe and recurrent floods have a negative impact on stunting. A study on ambient air control and clean cooking showed that using clean cooking fuel reduced odds of stunting (OR=0.81) as did a decrease in maternal PM2.5 exposure. From the two publications on the impact of maternal nutrition and health on stunting, we learn that maternal height-standardized prevalence of stunting (SPS) demonstrated better associations with various child health indicators, including diarrhea, anemia, under-five and child mortality rate compared to Crude Prevalence of Stunting (CPS). SPS is the standardized prevalence of stunting and is calculated by rescaling the sampling weights, to sum up the probability density within each stratum of maternal height in the MGRS reference population. The chapter also included 4 publications demonstrating the concurrent presence of stunting with other forms of malnutrition. Among 0-59 months old Ethiopian children stunting has been found to coexist with overweight or obesity. A longitudinal study on linear growth trajectories showed that faster linear growth was associated with faster weight gain, either preceding or happening concurrently. Additionally, faster weight gain occurred when the average linear growth increased in the same month. Finally, data on antenatal interventions showed that antenatal balance energy-protein (BEP) increased length-for-age z scores (LAZ) (0.11 standard deviation, 95% CI 0.01-0.21, p=0.032) and reduced stunting prevalence (3.18 percentage points, 95% CI [-5.86 – 0.51], p=0.020) at 6 months while postnatal BEP showed no significant effect. Conclusion Addressing stunting requires an integrated approach to maternal and child nutrition. A comprehensive approach to maternal and child nutrition, through leveraging 'big data' combined with understanding linear growth trajectories can help inform targeted policies to combat stunting.

IS022 / #578

PLENARY SESSION 02: YEARBOOK

OBESITY, METABOLIC SYNDROME AND NUTRITION

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Obesity is a major public health problem that affects more than 300 million children worldwide. Childhood obesity has negative effects on physical and mental health and tends to persist in adulthood, carrying an increased risk of morbidity and mortality. The development of obesity relates to the combined influence of genetic susceptibility and environmental factors, as sedentary lifestyle and high caloric diet. Early life environment can have lasting effects on the physiology and metabolism of the fetus. In utero exposure to maternal adverse conditions is associated with the early metabolic programming of human health. Both small and large for gestational age infants have been linked to an increased risk of later cardiometabolic diseases. Maternal obesity during pregnancy is associated with an increased risk of obesity and metabolic disease in the offspring. Also, maternal diet during pregnancy might influence offspring's predisposition to obesity and diet choice. Some studies reviewed in this chapter evaluate several in utero exposures such as maternal weight, maternal diet and maternal intake of ultra-processed food during pregnancy and their association with the subsequent development of childhood obesity and metabolic risk of the offspring. Another study assessed the impact of fish oil supplementation of mothers with overweight or obesity during pregnancy on infant body composition and metabolic effects on the offspring. Nutrition during the first years of life has also a significant impact on lifelong health. Exclusive breastfeeding is recommended for the first six months of life to promote adequate infant growth and development. Breastfeeding has been suggested as a preventive measure against obesity. One of the reviewed studies found that exclusive breastfeeding for at least 4 months has a protective role both for postpartum maternal weight gain and against childhood overweight and obesity. Another study evaluated the "early protein hypothesis" suggesting, that higher protein intake in the first year(s) of life enhances adipogenic activity. In addition, a randomized controlled trial reported the results of using a novel starting infant formula with reduced protein content and lower casein to whey protein ratio compared to a standard formula on weight gain and body composition of infants up to 6 and 12 months. Other studies tried to evaluate the impact of the diet composition during later childhood on adiposity. A healthy diet during childhood is fundamental for healthy growth and for the prevention of developing diseases later in life. As the association between dietary diversity and childhood obesity remains unclear, one of the studies was conducted to analyze the effects of dietary diversity on childhood obesity. Sugar-containing ultra-processed foods and beverages consumption has increased globally in recent years and contributes to the rising global trends of obesity. One of the reviewed studies reported that changes in diet from low to higher-dairy consumption and from sugar-sweetened beverages to non-caloric beverages or flavored milk resulted in favorable changes in body composition among children and adolescents. Children with obesity are prone to develop obesity-related comorbidities including metabolic syndrome. The association between oral intake of omega-3 fatty acids and metabolic syndrome in adolescents is reported in one of the studies. Finally, considering the deleterious consequences of obesity in childhood, public health interventions are urgently called to take nutritional measures with policies that encourage healthy eating among infants and children. In this year's edition of the Yearbook chapter focused on the relation between nutrition, obesity, and metabolic comorbidities from infancy to childhood and young adulthood, we selected 12 notable articles from many meritorious manuscripts published in the past year between July 2022 and June 2023.

IS023 / #579

PLENARY SESSION 02: YEARBOOK

NUTRITION AND GROWTH IN PRETERM AND TERM INFANTS

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Nutrition and growth in preterm and term infants This abstract summarizes for preterm infants three trials on neonatal nutrition and six systematic reviews on enteral nutrition (EN); for term infants, two papers on breastfeeding (BF) and two papers on food allergy (FA). **Preterm Infants Trials on neonatal nutrition** An RCT showed that an additional parenteral amino acid intake of 1 g per day for the first 5 days after birth did not change survival free from neurological disability at 2 years (1). Infants in the intervention arm had higher probable/proven sepsis rates. Two RCTs showed that the use of bovine colostrum showed no benefit on health outcomes (2,3). **Systematic reviews on enteral nutrition** A meta-analysis concluded that the use of oropharyngeal colostrum might reduce time to full EN and sepsis events (4). A Cochrane review and a meta-analysis concluded respectively that donor human milk decreases the risk of NEC compared with formula (5) while infants receiving merely formula versus MOM during the first month of life, have a threefold higher risk of NEC (6). A Cochrane review concluded that there was no increased risk of NEC or death of progressing EN before four days of life (7). An RCT showed that rapid daily progression of EN (> 30 mL/kg/d) reduced time to regain birth weight by 4 days and duration of hospitalization by 3 days when compared with slower rates (8). A Cochrane review concluded that omitting routine gastric residual assessment reduced time to full EN with 3 days and sepsis risk by nearly 35% (9,10). **Term infants Breastfeeding** A study showed that there were more screenshots about BF (n=303) than BMS (n=263) on websites from five US BMS manufacturers (11). However, they were significantly more likely to mention benefits of BMS (44 %) than BF (26 %). An RCT showed no differences on breastmilk production, perceived insufficient milk, or BF-efficacy between conventional cookies and lactation cookies (LCs) that contain galactagogues, *i.e.* substances believed to enhance breastmilk production (12). **Food allergy** A meta-analysis concluded that introduction of multiple allergenic foods (milk, egg, fish, shellfish, tree nuts, wheat, peanuts, and soy) from 2 to 12 months of age was associated with reduced risk of FA (RR, 0.49; 95%CI: 0.33-0.74). Introduction of egg from 3 to 6 months of age and peanut from 3 to 10 months of age was associated with reduced risk of egg allergy (RR, 0.60; 95%CI: 0.46-0.77) and peanut allergy (RR, 0.31; 95%CI: 0.19-0.51), respectively (13). In a longitudinal study, the risk of egg allergy at 6 years significantly (p=0.004) decreased with infant egg consumption at 12 months: 2.05% (no egg consumption), 0.41% (consumption <2 eggs/week), and 0.21% (consumption >2 eggs/week) (14). **References** 1. Bloomfield FH, *et al*. N Engl J Med 2022; 387: 1661-72. 2. Yan X, *et al*. Clin Nutr 2023; 42: 1408-17. 3. Ahnfeldt AM, *et al*. Clin Nutr 2023; 42: 773-83. 4. Kumar J, *et al*. Nutr Rev 2023; 81: 1254-66. 5. Quigley *et al*. Cochrane Database System Rev 2019; 7(7): CD002971. 6. Strobel NA, *et al*. Pediatrics 2022; 150 (Suppl 1): e2022057092D. 7. Young L, *et al*. Cochrane Database System Rev 2022; 1(1): CD001970. 8. Yang WC, *et al*. Pediatrics 2022; 150 (Suppl 1): e2022057092G. 9. Abiramalatha T, *et al*. Cochrane Database System Rev 2023; 6(6): CD012937. 10. Embleton ND, *et al*. J Pediatr Gastroenterol Nutr 2023; 76: 248-68. 11. Pomeranz JL, *et al.* Public Health Nutr 2023; 26: 934-42. 12. Palacios AM, *et al*. Am J Clin Nutr 2023; 117: 1035-42. 13. Scarpone R, *et al*. JAMA Pediatr 2023; 177: 489-97. 14. Wen W, *et al*. J Nutr 2023; 153: 364-72.

IS024 / #581

PLENARY SESSION 02: YEARBOOK

COGNITION

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The prenatal period, infancy, and childhood are critical phases for brain growth and function. Throughout these sensitive periods, environmental factors such as nutrition, can significantly impact the trajectory of neurodevelopment. Maternal diet during gestation and breastfeeding as well as infant and children's nutritional status and food habits exert significant effects on cognition throughout life. Therefore, it is highly recommended to monitor both the periconceptional period and pregnancy to enhance the optimal growth of the offspring's brain and cognitive functions. Over the past few decades, numerous studies have been conducted to unravel the specific mechanisms occurring during these phases. The primary focus has been on understanding how dietary components, among other variables, may impact these processes. This chapter includes articles published from July 1, 2022, up to June 30, 2023, regarding the connection between nutrition and cognition. Original articles on nutrition and cognition comprising randomized controlled trials (RCT), observational studies, and reviews have been selected. These studies fall into two macro-area, in turn, subdivided into different categories: 1. Mother-infant dyad: Macronutrients, Iodine, Vitamin B12, Other Nutrients, Gut Microbiome 2. Infants and children: Dietary Habits, Food and Nutrients.

IS025 / #583

PLENARY SESSION 02: YEARBOOK

EARLY NUTRITION AND ITS EFFECT ON GROWTH, BODY COMPOSITION AND LATER OBESITY

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Healthy nutrition during the first years of life is critical for optimal growth and development in the short and long term. Growth patterns in infancy are influenced by feeding practices and have been investigated extensively. Papers examining early nutrition and its effects on growth, body composition, and later obesity cover a range of topics including maternal diet, breast milk (BM) components, formula and especially the protein content in formula, and complementary feeding (CF) with studies conducted in low- and middle-income countries as well as high-income countries. This year we have focused on BM composition, protein content in formula, and sources of protein in CF in relation to growth and risk of later obesity. The studies are mainly from high-income countries, but a study from a middle-income country is also included. We have selected 10 publications published between July 1, 2022 and June 30, 2023, which we find of special interest. The original articles comprise randomized controlled trials, observational studies, and reviews and have been grouped into three categories: BM composition and infant growth (two studies), protein content of infant formula and infant growth (four studies), and CF and growth (four studies).

IS026 / #139

PARALLEL SESSION 07: NUTRITIONAL CARE FOR PRETERM INFANTS

2023 ESPGHAN GUIDELINES (ENTERAL NUTRITION IN PRETERM INFANTS)

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Infants born very preterm or with a very low birth weight have a high risk of malnutrition, poor growth and poor health outcomes. Suboptimal nutrition of preterm infants has been associated with severe metabolic disturbances, sepsis, necrotizing enterocolitis, osteopenia, bronchopulmonary dysplasia, retinopathy of prematurity and poor neurodevelopment. The field of preterm nutrition is a very active research area and improved nutrition has thus been identified as one of the most important targets for quality improvement within neonatology. In 2010, the European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESGPHAN) issued guidelines for enteral nutrition of the preterm infant, and these have been extensively used and cited. However, since the evidence base has grown rapidly. The 2022 ESPGHAN guidelines for preterm enteral nutrition (published in March 2023) is an update of the guidelines from 2010 and include recommendations for nutrient intakes (macro- and micronutrients) as well as advice on feeding practice, dietary products and monitoring of nutrition status. The guidelines were based on an extensive literature review and a delphi procedure including 25 experts. The guidelines are aimed at stable, growing infants with a birth weight < 1800 grams. They do not cover critically ill infants or post discharge nutrition. Recommendations for fluid and macronutrient intakes are similar to the 2010 guidelines, with a small increase in energy recommendations to 115-140 kcal/kg/d. The upper limits of fat and carbohydrate intakes are higher: 4.8-8.1 and 11-15 g/kg/d, respectively. Fatty acid intakes are better specified and recommended intakes for DHA (30-65 mg/kg/d) and ARA (30-100 mg/kg/d) are increased. Higher intakes are also recommended for potassium (2.3-4.6 mmol/kg/day), calcium (3.0-5.0 mmol/kg/d), phosphorus (2.2-3.7 mmol/kg/d), zinc (2-3 mg/kg/d) and copper (120-230 µg/kg/d). The recommended vitamin D intake is 400-700 IU/kg/d instead of the previous recommendation which was given in IU/d. Small volume enteral feeds should be started as soon as possible after birth and advanced as clinically tolerated with a target of 18-30 ml/kg/day in stable preterm infants. Mother's own milk should be the primary choice of feeding. When mother's own milk is not sufficient, donor human milk is conditionally recommended over preterm formula. Multinutrient human milk fortifier is recommended starting at enteral feed volumes of 40-100 ml/kg/d if the clinical condition allows. Routine monitoring of gastric residuals in the clinically stable infant is not recommended. Growth should be monitored regularly, e.g. daily weight measurements and weekly length and head circumference measurements. After a typical acceptable initial weight loss of 7%–10%, reaching a nadir at days 3–4, nutritional strategies should aim to regain birth weight by 7–10 days of age, followed by growth along a target centile and a gradual transition to the corresponding birth percentile on the WHO postnatal growth chart within the first weeks or months post term. Supplementation using certain probiotic strains is recommended for prevention of necrotizing enterocolitis. Despite some promising early research, other bioactive food supplements are currently not recommended for routine use in preterm infants. Standardized protocols for feeding, growth monitoring and management of growth faltering should be implemented in each NICU.

IS027 / #140

PARALLEL SESSION 07: NUTRITIONAL CARE FOR PRETERM INFANTS

PROBIOTICS –BEYOND NEC

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During the third trimester of pregnancy and in the first days after birth, important processes of intestinal maturation take place. Although anatomical differentiation of the human gut is usually achieved within 20 weeks of gestation, the functional maturation of the gastrointestinal tract occurs later and requires organized peristalsis and coordinated sucking and swallowing reflexes that are not established until 29–30 weeks and 32–34 weeks of gestations, respectively . Sensory-motor gastrointestinal functions are strictly related to the infant's immune system, which plays a crucial role in modulating appropriate and non-exaggerated responses to luminal antigens. This fundamental enteric function, known as "oral tolerance" is based on the interaction between the luminal content (microbiota, food antigens, and other molecules), the intestinal epithelium, and the tolerogenic dendritic cells (DCs) from mesenteric lymph nodes of the gut associated lymphoid tissue (GALT) , and is associated with specific cytokine patterns. It has been suggested that the early composition of the intestinal microbiota at birth can influence the correct ontogenesis of the gut barrier, and motor and immune function through a complex neuroendocrine cross-talk . Consequences of prematurity like antibiotic usage, feeding type, and being located in neonatal intensive care unit (NICU) may cause an intestinal dysbiosis that affects the intestinal integrity and disrupts the delicate balance between intestinal microbiota and the immune system of premature infants. An aberrant microbial colonization pattern might contribute to the development of an early traumatic inflammatory insult on the gut-brain axis with short- and long-term consequences on gastrointestinal well-being . Early colonization of the gastrointestinal tract with a probiotic may contribute to the neonatal tolerance, as breast-feeding does, resulting in correct gut ontogenesis .

IS028 / #141

PARALLEL SESSION 07: NUTRITIONAL CARE FOR PRETERM INFANTS

HUMAN MILK FORTIFICATION: TYPES AND EFFECTS

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It has long been known that very-low birth weight preterm infants fed exclusively breast milk cannot match intrauterine growth patterns and may end up with extrauterine growth restriction. Efforts have been made to develop liquid or powder multi-nutrient products for the fortification of human breast milk. These fortifiers increase nutrient intake and are expected to improve both growth and neurodevelopmental outcomes. Nutrient fortification of human milk fed to premature infants is widely practiced because the nutrients provided by human milk do not meet the needs of premature infants. There is evidence that multi-nutrient fortification of human milk increases in-hospital growth of preterm infants, but fortification has not been shown to improve long term growth and neurodevelopmental outcome. In this lecture I will discuss shortly the different types human milk fortification and discuss whether randomized controlled trials: 1) have determined the effect of early versus late introduction of fortifiers upon growth and/or other outcomes; and 2) have compared the efficacy/adverse effects of human milk-based versus cow milk-based fortifiers.

IS029 / #143

PARALLEL SESSION 08: OBESITY AND ITS EFFECTS

STRATEGIES FOR PREVENTING AND MANAGING CHILDHOOD OBESITY

Strategies for Preventing and Managing Childhood Obesity *Carla Rêgo, MD PhD* Prevention of childhood obesity remains a public health priority as effects of available treatements are incipient and stability of pediatric obesity is undoubted. Primary prevention is a critical part of a sustainable stategy. Identification of children at risk of obesity, early in the life cicle, is the first step for prevention of obesity and is mandatory for all healthcare professionals, as early life factors modulate lifelong obesity risk. Those with parental obesity, specialy those born from a pre-pregnancy obese mother, or from a mother who have increased their weight during pregnancy above recomendations, as also newborns larger (LGA) or smaller (SGA) for gestational age or with intra-uterin retardation (IUR), specialy whit a rapid increase of weight during first months – years of life, are childrens at risk. Social-economic disadvanted groups are also at risk. The success of intervention depends on the precocity of diagnosis and management. It is urgent to provide immediate approach, in a holistic patient-centered intervention, for all children at risk as also as soon as the diagnosis of obesity is made. Strategies include promotion of breastfeed, diverse and healthy diet behaviour since the introduction of complementary feeding, healthy sleep patterns and not-sedentary behaviour/physical active lifestyle. It is also importante for the success that intervention starts immediatly when childrens start to cross BMI percentiles upward, even before they approach the 85th or the 95th. As later is the intervention and as longer is the duration of the disease, as greater is the fallure of the treatment. It is no dought that treatment of obesity is in line with prevention and treatment of its psichological and cardiometabolic comorbidities, in a longitudinal strategy envolving family (parental role modeling of healthy dietary and physical activity behaviours) and comunity. Improve nutritional literacy of the families and the society, improve knowllege on nutrition and health, promotion of healthy environement and encourage familiy and school physical activity, regulate food advertisements and promote healthy food choices are some family-society strategies for prevention obesity for life. In fact, effective prevention and management of childhood obesity requires an integrated multicomponent approach, with the healthcare professional in the center, guiding the orchestra, but envolving multiple stakholders who must be informed, educated, empowered but also responsabilized. Children is the “weak link” in the story of obesity and we have the obligation to protect them!

IS030 / #145

PARALLEL SESSION 08: OBESITY AND ITS EFFECTS

PHARMACOLOGICAL APPROACHES IN CHILDHOOD OBESITY

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Childhood obesity continues to be a major health problem worldwide with the consequent associated comorbidities becoming apparent at very early ages and increasing throughout life. Although the prevention of obesity is essential and should be emphasized at all stages of life, treatment is essential when prevention has failed, and this is especially true in specific cases of obesity. The treatment of obesity in children and adolescents continues to be based on a program constituted on the reorganization of eating habits, physical activity, and eating behavior. However, due to the enormous amount of investigation carried out in the past decade in search of efficient treatments for obesity, new drugs are gradually becoming available, including liraglutide, semaglutide, setmelanotide and phentermine/topiramate, among others. Although these treatments are now available, they are not applicable and/or accessible for every patient and we are still learning about the best approach for the use of these new treatments. Furthermore, it is still early to clearly interpret their effectiveness in the medium and long term. Moreover, it remains to be clarified whether the use of these meditations will be required for life once they have been started in a patient in order to maintain the reduction in body weight. Regarding bariatric surgery in children and adolescents, the available data are limited with scarce data regarding the long-term results. Thus, there have been important advances in the treatment of childhood obesity, but there is still much to be done.

IS031 / #148

PARALLEL SESSION 09: MICROBIOTA

MICROBIOME DEVELOPMENT AND HEALTH OUTCOMES IN PRETERM INFANTS

Samuli Rautava
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Preterm birth, which afflicts 10-11% of all children globally, is a major cause of mortality and neonatal morbidity. In addition, individuals born too soon are at increased risk for long-term health problems including impaired growth and metabolic changes associated with cardiovascular disease risk. The etiology of these problems remains incompletely understood. Preterm neonates exhibit aberrant gut microbial colonization. It is not clear whether the gut microbiota disturbances are primarily caused by prematurity per se or detrimental exposures including Caesarean section delivery, antibiotic exposure, delayed breastfeeding and reduced skin to skin contact, which often cluster in preterm neonates. Furthermore, the long-term significance of aberrant gut colonization and its role in the complications of preterm birth has not been fully elucidated. We have explored the factors affecting gut colonization in preterm infants. According to our data, preterm neonates exhibit aberrant gut microbiome composition already during the first days of life. Moreover, the initial gut microbiome in preterm neonates is affected by the cause of preterm delivery – individuals born preterm after spontaneous or iatrogenic delivery display differences in their microbiome. The same is observed in their mothers suggesting a potential role for the maternal gut microbiome in the pathogenesis of preterm delivery. Preterm infants typically exhibit lower gut microbiome richness and diversity, delayed colonization with bifidobacteria and increased abundance of antibiotic resistance genes in their gut microbiome as compared to those born full term. These perturbations are partially explained by increased frequency of caesarean section delivery, antibiotic exposure and lower rates of breastfeeding, but prematurity appears to play an independent role. The clinical significance of these early gut microbiota alterations may exceed the relatively well-established link to necrotizing enterocolitis. We have reported that germ-free mice receiving a fecal microbiota transplant from very preterm neonates display growth failure and inflammatory and metabolic disturbances as compared to mice receiving transplants from neonates born full term. These experimental data suggest a causal link between the gut microbiome and some of the typical features of the preterm infant phenotype. We have provided data indicating that the preterm infant gut microbiome gradually begins to resemble that of their full term piers over course of the first year of life. This process may be supported by the administration of specific dietary interventions such as probiotics or prebiotics. Future research will reveal whether these measures may also alleviate the long-term adverse consequences of preterm birth.

IS032 / #149

PARALLEL SESSION 09: MICROBIOTA

MICROBIOTA MODULATION IN EARLY CHILDHOOD

Hania Szajewska
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This presentation will focus on the crucial role of microbiota within the first 1000 days of a child's life, from conception to their second birthday. This period is pivotal in shaping future health and wellbeing, significantly influencing a child's growth, development, and susceptibility to both infectious and non-communicable diseases. The session will delve into the relationship between early-life microbiota and immune function, with special emphasis on the role of breastfeeding and its bioactive components in developing a balanced gut microbiota. It will also explore various dietary strategies for modulating early childhood microbiota, particularly emphasizing the impact of 'biotics' on enhancing health outcomes and reducing disease risks in later life. Additionally, current guidelines from scientific societies will be discussed, providing a practical approach for healthcare professionals. Finally, the presentation will address current research gaps and identify potential areas for future studies in this rapidly evolving field.

IS033 / #151

PARALLEL SESSION 10: INTESTINAL INSUFFICIENCY

INTESTINAL INSUFFICIENCY IN CHILDREN – BURDEN TO THE FAMILIES AND HEALTH SYSTEM

Susana Corujeira
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Intestinal failure (IF) is a condition that develops when there is a critical reduction of the gut mass or its function below the minimum needed to absorb nutrients and fluids required for adequate growth in children for a minimum of 60 days within a 74 consecutive day interval. Causes of intestinal failure include short bowel syndrome (SBS), congenital diseases of enterocyte development and severe motility disorders. Home parenteral nutrition (PN) is unquestionably life-sustaining for patients with IF who would otherwise have died from malnutrition or dehydration. Although home PN administration is the cornerstone of management, promoting quality of life for the child and the family, it is also a high-risk, high-expenditure, and potentially problem-prone therapy. Patients who require home PN are at risk of catheter-related bloodstream infections, venous thrombosis, metabolic bone disease, and liver disease. Pediatric SBS-IF requires complex and resource-intensive care at the hospital, including long hospitalization periods, multiple surgeries, and intensive post-discharge long-term care by a multi-disciplinary team. The burden to the healthcare system is high with an elevated healthcare resource utilization and associated costs, especially when the onset is as newborns with SBS-IF who spend a significant part of their first year of life in the hospital. Home PN dependency also creates technological challenges, psychosocial problems, and financial constraints that are known to influence quality of life of both patients and caregivers. Survival rates of SBS patients have increased significantly over the years and are currently over 90%, due to the advances in medical and surgical treatment options. Prevention and treatment of complications, to restore enteral autonomy and reduce long-term dependence on PN, have been the focus of management on SBS-IF. IF patient management is characterized by a substantial therapeutic burden and health resource utilization, translating into high direct costs and lower quality of life.

IS034 / #152

PARALLEL SESSION 10: INTESTINAL INSUFFICIENCY

HOW TO COPE WITH LONG TERM PARENTERAL NUTRITION

Lorenzo Norsa
Ospedale Vittore Buzzi, Paediatric Department, Milano, Italy

The current presentation will focus on short and long outcome of children with intestinal failure dependant on home parenterale nutrition (HPN). It will be dedicated on how to prescribe parenteral nutrition support, how to organize a multidisciplinary team and how to prevent HPN complications.

IS035 / #153

PARALLEL SESSION 10: INTESTINAL INSUFFICIENCY

STANDARD OR PERSONALIZED PARENTERAL NUTRITION IN PEDIATRIC PATIENTS?

Paula Guerra
Universitário São João, Centro Hospitalar, Porto, Portugal

Individualized parenteral nutrition (PN) has been considered the best clinical practice and the first choice in the pediatric population, given the particularities and needs of this population. With the evolution of PN, particularly in the last decade, standard PN formulations have been shown to improve patient safety, minimizing compounding errors and microbiological contamination, and optimizing resource efficiency, decreasing pharmacy workload and associated costs.
While a wide variety of standard formulations for adults are commercially available, these are not optimal for children as their nutritional requirements differ significantly depending on age, weight, underlying disease, nutritional and hydration status and environmental factors. Nevertheless, some standard PN formulations designed specifically to meet the wide range of nutritional requirements of neonates, infants, children and adolescents have been developed and made commercially available over the last decade.
Several studies have been performed with standard PN formulations on preterm, hospitalized children, and in paediatric home PN. The use of standard PN formulations has been extensively studied in preterm and very low birth weight infants and is currently common in neonatal intensive care units. Several studies have also been performed on hospitalized children and demonstrate that standard PN solutions are safe and able to meet the nutritional requirements of most pediatric patients over short periods (up to three weeks). On the other hand, for children on prolonged parenteral nutrition, and according to the recently updated Guidelines on Paediatric PN, the uncritical use of standardized formulations, particularly over longer periods of time, may be less than optimal for growth and development. These recent European guidelines recommend that individualized PN should be used in infants and children requiring long-term treatment. However, data supporting this conclusion are lacking. Some studies on children on home PN show that standardized PN mixtures have a comparable effect on growth when compared to individualized PN mixtures. Also, standardized PN mixtures (with added micronutrients) seem non-inferior to individualized PN mixtures in terms of electrolyte disturbances and basic biochemical abnormalities. The longer shelf life and increased availability of commercial PN solutions could help reduce the frequency of visits for patients on home PN to the hospital pharmacy for PN bags' collection.
In conclusion, both standardized formulations compounded by pharmaceutical companies and individualized formulations compounded by the pharmacy are available, and their use has several potential benefits. In the decision tree for choosing the type of PN, it is advised to choose a standard PN solution instead of individualized PN, if it is available and meets the child nutritional requirements. However, individualized PN should always remain an option for a subgroup of patients with specifics needs, such as patients on prolonged home PN or patients with high-output stomas, among others.

IS036 / #160

PARALLEL SESSION 12: WHAT MAKES CHILDREN GROW? THE COMMUNITY EFFECTS OF COMPETITION, COOPERATION, LOVE & HOPE

WHAT MAKES CHILDREN GROW? LOVE & HOPE

Barry Bogin
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Background: Hope and love are popular themes of literature and art in many human societies. The human physiology of love and hope is less well understood. This review presents evidence that the lack of love and/or hope delays growth disturbs development and maturation and even kills. Methods: Love and hope intersect in promoting healthy human development. Love provides a sense of security and attachment, which are necessary for healthy physical, cognitive, and emotional development. Hope provides a sense of optimism and resilience in the face of adversity. Loving relationships can foster a sense of hope in individuals and in society by providing support systems during difficult times. Similarly, having a sense of hope can make it easier to form loving relationships by providing individuals with the confidence to connect with others. Hope and love are the fundamental basis of human biocultural reproduction, which is the human style of cooperation in the production, feeding, and care of offspring. Results: Examples are given of the association between human growth in height with love and hope, including (1) the global “Long Depression” of 1873–1896, (2) “hospitalism” and the abuse/neglect of infants and children, (3) adoption, (4) international migration, (5) colonial conquest, and (6) social, economic, and political change in Japan between 1970 and 1990. Neurohormonal pathways by which love and hope regulate skeletal growth and are embodied are presented; especially the hypothalamic - growth hormone - insulin-like growth factor I pathway, the hypothalamic - adrenal - stress hormone pathway, and the hypothalamic - oxytocin - bone formation pathway. Conclusion: Overall, this review suggests that love and hope are both critical factors in promoting healthy human development and that they intersect in complex ways to support skeletal growth as well as emotional well-being.

IS037 / #161

PARALLEL SESSION 12: WHAT MAKES CHILDREN GROW? THE COMMUNITY EFFECTS OF COMPETITION, COOPERATION, LOVE & HOPE

THE EVOLUTION OF THE SOCIAL REGULATION OF GROWTH

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Background: Animal societies are structured by dominance hierarchy and can be viewed as networks. Recent analyses highlighted the importance of pairwise agonistic contests, inter-individual signaling and winner-loser effects on the emergence of efficient network structures. Efficiency is a natural target in the evolution of social structures. **State of the art:** Success in contests reflects “hard skills”: physical fitness, resource holding power, fighting ability, mirroring an individual’s current metabolic and endocrine condition. Handsome sex characteristics, impressive weaponry and large body size reflect fitness and fighting ability. Success also depends on current opportunities, motivation, and the ability of signaling one's physical capabilities. “Soft skills” mirror emotionality and preceding experiences. Both skills are reciprocally linked. Sexual attractiveness and size predispose to success, dominance, and upward social mobility. On the other side, a complex system of hypothalamic neuropeptides that regulates stress, sex steroids and skeletal growth allows for “adaptive developmental plasticity”, “strategic adjustments” and “competitive growth”. Aggression and the drive for status maintenance/improvement activate these neuropeptides and their endocrine sequelae which in turn then signal the respective attributes of dominance/subordination. Inter-individual signaling avoids lethal conflicts. Signaling facilitates rank adjustments, network centralization, thereby improving network efficiency, and survival at the group level, at low-risk. **Conclusion:** The ability to signal dominance/subordination plays a crucial role in evolution. The hypothalamic-pituitary axes for stress and reproduction have been conserved for at least 700 million years; the hypothalamic-pituitary-IGF-1 axis for some 400 million years. Social growth regulation is an evolutionarily preferred long-term trait for optimizing social network efficiency.

IS038 / #162

PARALLEL SESSION 12: WHAT MAKES CHILDREN GROW? THE COMMUNITY EFFECTS OF COMPETITION, COOPERATION, LOVE & HOPE

SOCIAL NETWORKS, COMPETITION AND ADOLESCENT GROWTH

Detlef Groth
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Background and Aims: Network and graph theoretical approaches can be employed to analyze and visualize the relationships between interacting factors in biomedical and sociological researc. These methods also enable the monitoring of social structures in both animals and humans. In addition to exploring existing associations between variables or individuals within network structures, creating models to reconstruct networks closely related to observed structures in nature allows to discover essential mechanisms and requirements. Recent research has focused on the dependencies between access to food resources and changes in the dominance structures of social animals [1,2]. Our investigations delved into the requirements for a minimal model to create networks of interacting individuals using Monte Carlo simulations [3]. We hypothesize that social network structures can be established with a simple winner-loser model drawn from game theory. Methods: We investigated a winner-loser model of pairwise competitions using Monte Carlo simulations. After creating networks with 12 or 400 agents, we conducted pairwise competitions were in the 12-agent networks, where each agent played against every other agent, In the 400-agent network, agents were placed in a grid-like layout and primarily played against closely positioned other agents. Each agent initially received 5 tokens, and in the event of winning, obtained token from the game partner; in the case of losing, the agent had to give a token to the game partner. We compared two models: the null model, where winning chances are unrelated to the number of tokens an agent owns, and a winner-loser model, where winning chances in a game were proportional to the number of owned tokens. Wins were represented as arrows pointing from the winner to the loser, thereby indicating dominance hierarchies. Results: Network structures were monitored by the frequencies of triad structures, counting the type of relationships between each group of three connected agents. Both network models, the 12-agent and the 400-agent model, yielded similar results, where the winner-loser model led to network structures closely resembling those observed in animal societies. In contrast, in the null model, where winning chances were not related to the number of tokens, resources did not reveal network structures observed in animal societies. Conclusion: Access to resources, including basic necessities like food, can influence the network structures among interacting individuals. Employing a straightforward Monte Carlo simulation with a winner-loser model and an initial allocation of five resource tokens can be used to create network structures commonly observed in various social animals. Literature: [1] Huchard, Elise, et al. "Competitive growth in a cooperative mammal." Nature 533.7604 (2016): 532-534.
[2] Brotherton, P. N. M., et al. "Offspring food allocation by parents and helpers in a cooperative mammal." Behavioral Ecology 12.5 (2001): 590-599.
[3] Hermanussen, M., et al. "Winner-loser effects improve social network efficiency between competitors with equal resource holding power." Scientific Reports 13.1 (2023): 14439.

IS039 / #163

PARALLEL SESSION 12: WHAT MAKES CHILDREN GROW? THE COMMUNITY EFFECTS OF COMPETITION, COOPERATION, LOVE & HOPE

CULTURE, PERSONALITY AND GROWTH

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THE IMPACT OF CULTURE AND PERSONALITY TRAITS ON THE SOCIAL REGULATION OF HUMAN GROWTH Background and Aims: The regulation of growth of body height is influenced by socio-economic-politic-emotional factors (SEPE) of environment (Bogin 2021). Nutrition and genes are only biological requirements of human growth, the influence on regulation is overestimated. The impact of emotional factors on human growth is obvious. A common psychological tool to measure individual emotions are the so called “Big Five” personality traits. The score of personality traits is changed in Western populations in the last century, parallel a positive secular trend of body height is observed. We hypothesise that personality traits have a direct associated with body height. Methods: We investigated 203 mothers (aged 19-47) in March 2023 on the islands Java and West-Timur (Indonesia). Both islands have different cultural background. We measured body height and used a questionnaire on personality traits (openness, extraversion, neuroticism/emotionality) that was also evaluated for Indonesia. We used the confirmatory factor analysis to check the quality of personality trait data, compared the personality scores between the island and calculated the island-specific correlation of body height and personality score. Results: Personality traits and body height are positive associated. Curiosity (openess) is positive associated with body height in West-Timor, whereas extraversion is positive associated with body height in Java. The differences are culturally based. Conclusion: The impact of emotion to regulate human growth is measurable. The individual emotional perception of culturally based interactions in a population/society affected the socio-endocrine regulation of growth of body height in humans.

IS040 / #155

PARALLEL SESSION 11: PITFALLS AND TOP TIPS ON NUTRITIONAL ASSESSMENT IN CHILDREN

PAEDIATRIC MALNUTRITION SCREENING TOOLS

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The use of pediatric nutritional screening tools to facilitate the identification of children at risk for malnutrition who need further assessment and possible nutritional ntervention has been advocated by several scientific societies such as the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) and the North-American Society for Enteral and Parenteral Nutrition (ASPEN). Different pediatric nutritional screening tools have been developed, of which some tools were developed for use in specific diseases and/or circumstances. This presentation is aimed at updating the knowledge on newly developed tools and their applicability in specific pediatric patient groups. The presentation will also address the recently published recommendations around nutritional screening by the ESPGHAN special interest group in clinical malnutrition.

IS041 / #156

PARALLEL SESSION 11: PITFALLS AND TOP TIPS ON NUTRITIONAL ASSESSMENT IN CHILDREN

ASSESSMENT AND INTERPRETATION OF MICRONUTRIENT STATUS IN PAEDIATRIC PATIENTS

Konstantinos Gerasimidis
University of Glasgow, Human Nutrition, School Of Medicine, Glasgow, United Kingdom

Assessment of vitamin and trace element status is important in the clinical management of the sick child. There are 4 main approaches to assess the vitamin and trace element status of an individual patient including clinical examination, dietary assessment, and measurement of direct and indirect biomarkers of vitamin and trace element in biological samples. Clinical signs of vitamin and trace element deficiencies usually present only when body stores are substantially depleted and are often difficult to detect or differentiate from other non-nutrient-related causes. In isolation, dietary assessment of micronutrients can be inaccurate and imprecise, in disease and in individual patient assessment but may be useful to complement findings from other vitamin and trace element assessment methods. Use of biomarkers is the most common approach to assess vitamin and trace element status in routine practice but in the presence of systemic inflammatory response and in the absence of appropriate paediatric reference intervals, interpretation of biomarker results might be challenging and potentially mislead clinical practice. The use of a multimodal approach, including clinical examination, dietary assessment, and laboratory biomarkers is proposed as the optimal way to ascertain the vitamin and trace element status of individual patients. In the presence of acute inflammatory conditions, vitamin and trace element measurements in plasma should be replaced by biomarkers not affected by systemic inflammatory response or delayed until inflammatory state is resolved.

IS042 / #166

PARALLEL SESSION 13: DOUBLE BURDEN OF MALNUTRITION: FROM EPIDEMIOLOGY TO EPIGENETICS

EVOLUTIONARY PERSPECTIVE

Jonathan Ck Wells
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The double of burden of malnutrition (DBM) refers to the co-occurrence of forms of undernutrition and overweight. Initially detected within countries, then within local communities and families, there is increasing awareness that individuals may experience the DBM through their life-course, through being exposed to undernutrition (low birth weight, infant growth faltering, wasting) in early life, and subsequently developing overweight. From an evolutionary perspective, two key questions are (a) whether early undernutrition actually predisposes to later developing overweight, and (b) how life-course exposure to the DBM impacts health outcomes and reproductive fitness. In many populations, children born with low birthweight or who experience undernutrition in early post-natal life remain thin, indicating that there is no direct biological pathway to overweight. However, the interaction of catch-up growth with certain diets may allow excess weight gain to develop, and this interaction can be explored through an evolutionary lens. Evolutionary life history theory assumes that all organisms are under selective pressure to optimise the allocation of energy across four competing functions – maintenance, growth, reproduction and defence. Greater energy allocation to one function means reduced energy allocation to the others (trade-offs). Fetal/infant undernutrition reduces the level of investment in homeostatic ‘maintenance’, making such individuals more susceptible to develop non-communicable diseases such as type 2 diabetes, cardiovascular disease and stroke if they subsequently become overweight. However, this elevated disease risk can be understood as the consequence of more fundamental trade-ffs between health and Darwinian fitness. Fetal/infant undernutrition, indicating reduced maternal investment, favours increased allocation of energy to reproduction and defence, at a cost to maintenance and growth. In environments of nutritional constraint, such trade-offs may alter the regional profile of fat deposition without directly driving overweight, however in obesogenic settings catch-up growth may contribute to increased risk of overweight developing. Adults exposed to the DBM may demonstrate earlier initiation of the reproductive career, but women may also experience an increased risk of childbirth complications. Humans appear to have evolved more successful adaptive responses to the stress of undernutrition than to the stress of overnutrition, which may be due to overweight being relatively rare until recently in human evolution. Overall, life-course exposure to the DBM indicates an interaction between adaptive responses and obesogenic stresses that may vary across populations.

IS043 / #168

PARALLEL SESSION 13: DOUBLE BURDEN OF MALNUTRITION: FROM EPIDEMIOLOGY TO EPIGENETICS

THE LINK BETWEEN DOUBLE-BURDEN OF MALNUTRITION AND LONG-TERM HEALTH OUTCOMES: THE ROLE OF GUT MICROBIOTA, METABOLIC AND EPIGENETIC FACTORS

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Double burden of malnutrition (DBM) is an emerging public health problem that has been recognized in several countries worldwide especially in those facing nutritional transition. The co-existence of undernutrition and overnutrition in children results not only in short-term adverse outcomes but can also alter the biological infrastructure and physiological function of the body, contributing to long-term health problems, particularly if it occurs at an early stage of life. A body of evidence strongly supports a relationship between DBM and subsequent changes in metabolism, gut microbiota and an individual phenotype controlled by epigenetic mechanisms. These changes might be different or overlapping in those experiencing different forms of DBM (i.e., wasting, stunting, micronutrient deficiency and overweight/obesity) and can lead to similar morbidities or potentially shorten lifespan. In children experiencing nutritional stunting, metabolic trade-offs may occur in response to chronically inadequate nutrient intake such as low levels of insulin-like growth factor 1, high cortisol, an impairment of fat oxidation and decreased plasma essential and conditionally essential amino acids. Furthermore, other forms of undernutrition, whether severe acute protein-energy malnutrition or micronutrient deficiencies (e.g., iron, zinc, vitamin B12, vitamin D and vitamin E), may also contribute to metabolic phenotypes representing an adaptation to the specific nutritional restriction. More importantly, these metabolic changes closely interplay with gut microbiota and epigenetic mechanisms. The establishment and diversity of intestinal flora can be influenced by malnutrition, whether undernutrition or overweight/obesity. Additionally, the metabolites from normal flora are also affected. This can lead to gut dysbiosis which has been linked to the pathogenesis of both intestinal and extra-intestinal diseases such as inflammatory bowel disease, coeliac disease, diabetes, Alzheimer's disease, depression disorder and cancer. Finally, the detrimental effects of DBM could be attributed to epigenetic mechanisms such as methylation of DNA, modification of histone proteins and expression of non-coding RNA. DBM may influence gene expression and phenotypic traits via these epigenetic mechanisms without any effect on gene sequences. Scientific evidence from human epidemiological studies strongly supports epigenetic effects on abnormal metabolism of energy, glucose, and amino acids as well as worsening insulin sensitivity in adults who experienced malnutrition in early life. Furthermore, there are studies highlighting a bidirectional effect of gut microbiota and epigenetic mechanisms. Metabolites of gut flora such as folate and butyrate may contribute to changes in the pattern of DNA methylation and histone proteins of metabolic-target genes, while the host may also regulate the composition and diversity of gut flora through many non-coding RNAs such as microRNAs and other epigenetic factors. Although evidence for these underlying mechanisms contributing to the link between DBM and long-term health are rapidly increasing, the complexity of their interaction is not yet fully understood.

IS044 / #172

PARALLEL SESSION 14: ULTRAPROCESSED FOODS AND NUTRIENT PROFILING

ULTRAPROCESSED FOODS: POTENTIAL MECHANISMS OF ACTION

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Published data has indicated that the consumption of ultra-processed foods [UPFs] may be associated with negative health outcomes. The NOVA classification is the first classification defining ultraprocessed foods. Limited data exist regarding the role of UPFs in the occurrence of allergic diseases. The underlying mechanisms underpinning any such associations are also poorly elucidated. We performed a systematic review and narrative evidence synthesis of the available literature detailing associations between UPFs consumption and allergic outcomes, including data on the association seen with the gut microbiome and immune system structure and function. 54 publications were identified. These human studies linked the intake of UPFs, sugar and emulsifiers with alterations of the gut microbiome (n= 16 papers), the immune system (n= 11 papers; + 1 paper also included in the microbiome section) and allergy outcomes in the pediatric age (n= 26 papers). We found also papers reporting *in vitro* and animal suggesting similar links. Dietary exposure to fructose, carbonated soft drinks, and sugar intake was associated with increased risk of asthma, allergic rhinitis, and food allergies in children. Commercial baby foods intake (not defined) measured by food diaries in infancy was associated with oral food challenge proven childhood food allergy. Reported childhood intake of fructose, fruit juices, sugar sweetened beverages, high carbohdyrate UPFs, monosodium glutamate, UPFs, and advanced gylcated end-products was associated with the occurrence current diagnosis of allergic diseases (based on reported or clinician verified information), particularly asthma, atopic dermatitis and food allergy. We conclude that based on a limited number of human studies, consumption of UPFs and common ingredients in UPFs have been associated with alterations in the gut microbiome, both in terms of structure and function. Similarly, alterations in the immune system, with increased inflammatory processes, and detrimental effects on the gut barrier have been reported. Finally, the exposure to UPFs and common ingredients in UPFs seem to be associated with increased occurrence of allergic diseases mainly self-reported asthma, wheeze, food allergies, atopic dermatitis and allergic rhinitis, in most, but not all studies.

IS045 / #173

PARALLEL SESSION 14: ULTRAPROCESSED FOODS AND NUTRIENT PROFILING

FRONT-OF-PACK NUTRITION LABELLING: THE NUTRI-SCORE EXAMPLE

Melanie Deschasaux-Tanguy, Barthélémy Sarda, Chantal Julia, Serge Hercberg, Mathilde Touvier
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The Nutri-Score is a front-of-pack label aiming to provide a simple indication to rank the overall nutritional quality of foods and beverages using 5 colours and letters (from green-A to orange-E). The Nutri-Score system is based on an algorithm balancing points attributed to several food components for which a limited consumption is recommended (salt, saturated fatty acids, sugars, energy) and points attributed to more favourable components (fibres, proteins and fruit, vegetables and legumes), using information readily available on back-of-pack of food packagings. The Nutri-Score is supported by more than 130 studies performed in 20 countries validating 1) its algorithm, by showing an association between the consumption of foods with a more favourable Nutri-Score algorithm and a lower risk of chronic diseases as well as decreased all-cause mortality in several populations and countries ; and 2) its graphical format, by showing good performances in enabling individuals to choose food products with better nutritional quality (objective understanding) and with a positive impact on the overall nutritional quality of shopping baskets. Since its first adoption in France in 2017, it has been selected as the official nutrition label in 6 other European countries and is considered in the ongoing discussions at the EU level to select a unique and mandatory front-of-pack nutrition label for the bloc. Nutri-Score is largely popular among the public and has the support of scientists and public health professionals, consumer and patient's associations. Its use, first limited to pre-packaged food, is already planned to expand to unpacked foods (e.g., fruit and vegetables) and in the out-of-home sector and is considered as a basis for marketing regulation. In 2022-2023, modifications to the Nutri-Score algorithm were made by the Scientific committee in charge of its update in order to take into account more recent scientific evidence and to align better with most recent nutritional recommendations. A recent study demonstrated the interest of a front-of-pack label combining the Nutri-Score with an additional graphic mention indicating when the food is ultra-processed.

IS046 / #174

PARALLEL SESSION 14: ULTRAPROCESSED FOODS AND NUTRIENT PROFILING

ULTRAPROCESSED FOODS AND HEALTH OUTCOMES IN CHILDREN: WHAT IS THE EVIDENCE?

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Food processing can be defined as the use of equipment, energy, and tools to safely and efficiently transform foods like grains, meat, vegetables or fruits with minimal waste into more convenient processed food products; however, other definitions have also been proposed. In practice food processing involves different techniques, from the simplest to the most complex: Washing, peeling, slicing, shredding, juicing, drying, fermenting, freezing, refrigerating, brining, pasteurizing, centrifuging, tumbling, filtering, extruding, canning or sterilizing. Processing may have positive effects, such as increasing food availability, convenience, variety, safety, palatability, nutritional quality, fortification or affordability. In terms of assessment of processed food consumption in humans, different classifications are available. The most widely used is the NOVA classification, considering four categories: unprocessed or minimally processed foods, processed culinary ingredients, processed foods and ultraprocessed foods (UPFs). One systematic review showed that a high consumption of UPFs in the children's diet was associated with different maternal-child outcomes, such as increase of weight gain, adiposity measures, overweight, early weaning, lower diet quality, metabolic alterations, some diseases, and consumption of plastic originated from packaging (1). In terms of association with health outcomes in children, the most widely assessed association was with obesity; a recent systematic review identified five longitudinal and five cross-sectional studies, mainly conducted in Brazil. Four longitudinal studies in children with a follow-up longer than 4 years found a positive association between the consumption of UPFs and obesity and adiposity measurements, whereas cross-sectional studies failed to find an association (2). There are some drivers of high energy intake from UPFs and other mechanisms that could explain the link between UPFs and health outcomes; the most often considered are: energy density, nutrients density, portion sizes, texture, additives, fortification, palatability, satiation, satiety, endocrine response, packaging, shelf life, transit time, bioactive components, food matrix, contaminants, type of processing, degree of processing, preparation time, sensory properties or cooking process. For many of these mechanisms there is not enough evidence to support the hypothesis, such as for additives, hyper-palatability or decreased satiety effect. Despite some evidence linking UPFs with health outcomes in children, it is important to consider UPFs includes an heterogenous group of foods with different processing techniques used in their elaboration, with no clear understanding of the mechanisms producing the different health effects. From a Public Health point of view, we should recommend food-based guidelines or dietary patterns with a positive health effect and positive health messages like traditional diets (Mediterranean as the most widely studied) or currently the Planetary diet, aiming not only to have positive health effects but also reducing the environmental impact. 1. de Oliveira PG, de Sousa JM, Assunção DGF, de Araujo EKS, Bezerra DS, Dametto JFDS, Ribeiro KDDS. Impacts of Consumption of Ultra-Processed Foods on the Maternal-Child Health: A Systematic Review. Front Nutr. 2022 May 13;9:821657. 2. De Amicis R, Mambrini SP, Pellizzari M, Foppiani A, Bertoli S, Battezzati A, Leone A. Ultra-processed foods and obesity and adiposity parameters among children and adolescents: a systematic review. Eur J Nutr. 2022 Aug;61(5):2297-2311.

IS047 / #176

PARALLEL SESSION 15: CHALLENGES IN NUTRITION AND GROWTH IN THE PRIMARY PEDIATRICIAN SETTING

CAN WE PREVENT FOOD ALLERGY?

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Can We Prevent Food Allergy Ketil Størdal Food allergy is common among children growing up in the Western world. The estimates for IgE-mediated allergy and/or sensitization against food allergens indicate a stable prevalence in Europe the last 20 years.
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6E653C2F72656D6F74652D6461746 1626173652D6E616D653E3C72656D6F74652D64617461626
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465723E3C2F7265636F72643E3C2F436974653E3C2F456E644E6F74653E (1) The true prevalence of non-IgE mediated allergies and parent-reported allergies is hampered with uncertainty. Some evidence suggests a global increase over time for specific food allergies, particularly in urbanized settings in low- and middle-income countries.
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4653E (1, 2) Transient reactions are common whereas food allergy particularly against peanuts and tree nuts tend to persist. The spectrum of severity ranges from mild symptoms to anaphylaxis, the more severe reactions may lead to reduced quality of life and emergency hospitalizations. Thus, there is a need for prevention of food allergies. Primary prevention targets individuals before any sign or symptom of food allergy appears, typically starting early in infancy. Secondary prevention targets those with symptoms or signs, to promote the development of tolerance. In 2015, a randomized controlled trial showed that atopic children subjected to peanut avoidance had a markedly higher risk of peanut allergy compared to those who continued their exposure.
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436974653E3C2F456E644E6F74653E (3) A group of study participants with low grade sensitization to peanuts before randomization, as an example of secondary prevention, proved to have markedly lower risk of peanut allergy at the age of 5 years if peanut exposure was continued. In the group without any sensitization at randomization this difference was even more pronounced, proving the principle of primary prevention in food allergy. This finding in a high-risk cohort has been replicated in large interventional studies. The most recent study from Norway recruited children regardless of atopy risk and found significantly lower risk of food allergy (mainly peanuts) at three years in those who were introduced to allergenic foods from age 3-4 months compared to 6 months.
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2D6E756D3E3C2F7265636F72643E3C2F436974653E3C2F456E644E6F74653E00 (4) Well-designed observational studies report similar differences for infants exposed to allergenic foods early vs late in infancy. These trials shall be regarded as a paradigm shift in food allergy prevention, abandoning the previous general concepts about allergen avoidance to prevent food allergies. Further, any limitations of dietary allergens during pregnancy or lactation seem unwarranted. The microbiota remains a potential target to change the risk of food allergies. The modelling of the microbiota takes places the first 2-3 years of life and is modified by mode of delivery, breastfeeding

and introduction of weaning foods, as well as contact with other children including siblings. Repeated antibiotic exposures have more sustained impact than single exposures, and the microbiome is less resilient during early phases of development compared to later in childhood. The etiological link between microbiota and food allergy is not entirely clear, and pre/pro/synbiotics have until now not proven to benefit food allergy prevention or treatment. 1. Spolidoro GCI, Ali MM, Amera YT, Nyassi S, Lisik D, Ioannidou A, et al. Prevalence estimates of eight big food allergies in Europe: Updated systematic review and meta-analysis. Allergy. 2023;78(9):2361-417. 2. Peters RL, Krawiec M, Koplin JJ, Santos AF. Update on food allergy. Pediatr Allergy Immunol. 2021;32(4):647-57. 3. Du Toit G, Roberts G, Sayre PH, Bahnson HT, Radulovic S, Santos AF, et al. Randomized trial of peanut consumption in infants at risk for peanut allergy. N Engl J Med. 2015;372(9):803-13. 4. Skjerven HO, Lie A, Vettukattil R, Rehbinder EM, LeBlanc M, Asarnoj A, et al. Early food intervention and skin emollients to prevent food allergy in young children (PreventADALL): a factorial, multicentre, cluster-randomised trial. Lancet. 2022;399(10344):2398-411.

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PARALLEL SESSION 15: CHALLENGES IN NUTRITION AND GROWTH IN THE PRIMARY PEDIATRICIAN SETTING

COWS MILK ALLERGY: ANY PROGRESS IN THE DIAGNOSTICS?

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Children's Hospital Colorado, Allergy And Immunology, Denver, United States of America

In this lecture, the clinical scenarios of the various forms of milk allergy presentation will be discussed, broken down into IgE- and non-IgE-mediated forms. The diagnostic tools we currently have available, and their diagnostic accuracy, will be disucssed. In addition, new potential diagnostic tools will be examined as to their ability to improve the diagnosis of milk allergy.

IS049 / #178

PARALLEL SESSION 15: CHALLENGES IN NUTRITION AND GROWTH IN THE PRIMARY PEDIATRICIAN SETTING

CELIAC DISEASE COMES IN ALL SIZES: GROWTH IN THE PRESENTATION AND AFTER DIAGNOSIS OF CELIAC DISEASE

Kalle Kurppa
Tampere University, Tampere Center For Child, Adolescent And Maternal Health Research, Tampere, Finland

Celiac disease is a chronic immune-mediated condition driven by dietary gluten. In recent decades, the disease has become particularly common, with an estimated global prevalence of 1-3%. However, due to diverse and unspecific clinical presentation, it remains heavily underdiagnosed. The only current treatment is a strict and life-long gluten-free diet (GFD). Case-finding and risk-group screening can be achieved utilizing sensitive and specific serum transglutaminase antibodies. Celiac disease may manifest with various gastrointestinal and extraintestinal symptoms, including for example abdominal pain, diarrhea, failure to thrive, anemia, joint pains and rash. One of the commonest symptoms in children is impaired growth, often combined with reduced weigh gain, although nowadays many of the patients are overweight at diagnosis. Poor growth can be either the sole clinical manifestation, or a part of multiorgan clinical involvement. Young age and severe histological disease may predispose to growth disturbances at diagnosis. The pathogenesis may involve e.g. reduced absorption of essential micro- and macronutrients, mucosal inflammation, and abnormalities in the growth hormone/IGF-1 axis. Regardless of the cause, on a GFD significant catch-up growth usually follows. Maximum growth normally occurs approximately six months after the diagnosis but may continue up to 2-3 years. However, particularly in those diagnosed in later childhood this may remain incomplete, leading possibly to reduced adult height. This emphasizes the importance of timely diagnosis and active screening of celiac disease, as well as careful monitoring of the dietary response. It is also good to remember the possibility of a co-existing celiac disease-associated condition, such as autoimmune thyroidal disease, in children with poor growth despite a strict GFD.

IS050 / #157

PLENARY SESSION 03: COMPLEMENTARY FEEDING

DOES THE AGE AT COMPLEMENTARY FEEDING INTRODUCTION HAVE AN IMPACT ON HEALTH OUTCOMES LATER IN LIFE?

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The timing of introduction of complementary feeding is a pivotal issue in paediatrics. In most Low-Medium Income Countries (LMICs), national guidelines recommend beginning complementary feeding at 6 months of age, and the same stands for the American Academy of Paediatrics. According to the Committee of Nutrition of European Society for Paediatric Gastroenterology Hepatology and Nutrition, complementary foods (i.e., solid foods and liquids other than breast milk or infant formula) should not be introduced before 4 months but should not be delayed beyond 6 months. This indication is provided because an early introduction of complementary foods (CFs) before 4 months, results harming for both renal and gastrointestinal function and inadequate with respect to neurodevelopmental skills. The concern about late introduction after 6 months mainly arises from inadequacy of breastmilk in providing critical nutrients, particularly iron. Moreover, accumulating evidence suggests a potential higher risk of food allergies (i.e. peanuts) when delaying the exposition to allergens, rather than preventing from their occurrence. Therefore, the window of introduction of CFs between 4 to 6 months, has been generally regarded as safe, particularly in high-income countries where paediatric societies often support this recommendation. The World Health Organization has recently raised some concern whether the introduction of CFs before 6 months of age (180 days) might pose potential health risks, with a particular focus targeted for LMICs. In its newly released dietary guidelines for complementary feeding, 4 major topics are addressed: higher morbidity from gastrointestinal disorders (such as diarrhoea) in areas where food and water hygiene are an issue; the provision of complementary feeding with lower nutritional quality compared to breastmilk in low-resource environments; inadequate developmental readiness to have foods; and the programming to later onset and risk of obesity. According to the WHO report, globally, in LMICs the introduction of CFs before 6 months occurs in 29% of infants. The report collected a total of 40 observational studies to assess the association between early introduction of complementary foods, defined as <6 months of age, and later introduction, defined as ≥6 months of age. Regarding growth parameters, no association were found for early introduction and stunting or wasting compared to late introduction (≥6 months). Interestingly, an association indicating more underweight among infants with early compared to later introduction was found across studies (OR = 1.29 [1.08, 1.53]). When evaluating the association between timing of CFs introduction and BMI or BMI z scores, in four studies an earlier introduction was linked to a higher BMI or BMI z scores values, compared to late introduction. Four studies looked at overweight, obesity, and overweight and obese together. Overweight and obesity did not show any association, but when looking at the combined category, early introduction was related with greater levels of overweight/obesity (OR = 1.34 [1.09, 1.65]). While 2 studies did not find an association between anaemia and early introduction of CFs, one study identified an association with iron deficiency anaemia, suggesting that earlier exposure was related with decreased risk (OR = 0.34 [0.18, 0.63]). Other health outcomes, i.e. diarrhoea, food allergy, asthma, lower track respiratory infections, wheeze, eczema or rickets, revealed no statistically significance. It should be noted that the type of observational studies severely limits the possibility of drawing conclusions and, collectively, the evidence for all previous outcomes was rated as low to very low. Overall, there is substantial uncertainty about the harms associated with introduction earlier than 6 months, arising the question whether the window of timing of complementary feeding should be graded according to high and low-resource settings.

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PLENARY SESSION 03: COMPLEMENTARY FEEDING

WHEN SHOULD COMPLEMENTARY FEEDING BE INTRODUCED IN PRETERM INFANTS?

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In full term infants the ESPGHAN (European Society for Pediatric Gastroenterology, Hepatology and Nutrition) recommends a stepwise introduction of complementary food (CF) between the 17th and 26th week of life. In preterm infants, guidelines on the optimal time for starting solids and the ideal composition of CF meeting their special requirements are missing so far. Observational studies have shown that in general solids are introduced early to preterm infants. The odds for being weaned before 4 months are 9.9 times higher in infants born between 22 to 32 weeks' gestation, and 6.19 higher infants born between 33 to 36 weeks' gestation when compared with term infants. Another interesting finding was that in general formula fed infants are weaned earlier than breastfed infants or infants on mixed feeding. To date only three RCTs have investigated time of introduction and nutritional quality of solids for preterm infants. A study which was published before post-discharge fortification of breastmilk and post-discharge formula were introduced, randomized preterm infants either into a “preterm weaning strategy (PWS)” group or to a control group. Infants in the PWS group received high-energy, high-protein, semisolid foods together with a preterm infant formula starting at 13 weeks of uncorrected age, provided they had reached at least 3.5 kg body weight. Infants in the control group were started on CF at 17 weeks of uncorrected age, provided they weighed at least 5 kg, and no specific advice for food quality was given. At 12 months of age, infants in the PWS group had greater length compared to those in the control group, with no differences in weight or HC. A more recent RCT from India published in 2017 couldn’t find an effect of CF introduction at 4 vs 6 months on weight for age z-scores, other anthropometric parameters or neurodevelopmental outcome at one year in preterm infants with a GA <34 weeks. Breastfeeding, type of formula or maternal education didn’t influence results. However, this study was conducted in a lower-middle income country indicating that setting and results cannot be transferred to high income countries. In this study infants in both groups showed a remarkable loss in Z-scores of -2.8 around term which did not correspond with normal growth trajectories in European cohorts. This growth retardation persisted up to one year of corrected age where Z-score loss was still -1.6 in both groups. The results of the study also highlight the importance of quality of solid foods indicating that a nutrient rich diet is important in these infants. Recently, a prospective 2-arm interventional study in preterm infants investigated the introduction of a standardized complementary diet at two different timepoints and its effect on growth during the first year of life. Infants had to adhere to a standardized, diverse, preprepared complementary diet which was either introduced early (10th-12th week corrected for term) or late (16th-18thweek corrected for term). The authors didn’t find differences in anthropometric parameters between the study groups except for a transient effect on weight Z-score at 6 months and concluded that in preterm infants, starting solids should rather be related to neurological ability than to considerations of nutritional intake and growth. In general data from high quality, prospective randomized trials investigating the optimal timepoint for CF introduction under consideration of chronological or corrected age, the optimal composition and appropriate supplements such as vitamin D or iron are limited. Up to date studies on baby led weaning in preterm infants are missing.

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PLENARY SESSION 03: COMPLEMENTARY FEEDING

BABY LED WEANING: PROGRESS OR RISK? - 20 MINUTES

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Complementary foods (CFs) are an important stage in the transition from milk feeding to family foods. Traditionally, pureed foods were introduced from around 4-6 months, moving through semi-solid to solid foods and finger-foods as infant development progressed. Recently, baby-led weaning (BLW) has become a popular method for introducing CFs, where infants feed themselves from the start of weaning starting around 6 months of age when most infants have acquired the necessary developmental skills to sit and self-feed with finger-foods. In its 'purest' form, BLW misses out the puree stage. However, there is not a generally accepted definition of BLW; many different versions are used in practice, including combining elements of traditional and BLW. Proponents assert that BLW may promote greater self-control over feeding, less risk of over-feeding and more healthy weight. However, there remains a lack of good quality empirical data to establish benefits and risks of BLW compared to the traditional approach, with only three randomised trials (RCTs). Observational data are problematic given potential confounding from differences between mothers who practice BLW compared to those who do not. The three RCTs all used a version of BLW modified to address concerns about nutritional adequacy and choking risk (BLISS). The first trial[1] included 206 healthy infants from New Zealand and showed no difference in weight status of the participants at 1 or 2 years of age, risk of choking and little difference in nutrient intakes, including iron. A second trial[2] included 280 Turkish infants. Those following the traditional approach were heavier at 12 months of age, with no difference in reported choking between groups. The third trial[3] included 139 Brazilian infants randomised to traditional weaning, BLISS or a mixed approach. Adherence to assigned method was overall low (34.1% at 12 months) but highest in the mixed group; with most non-adherent participants from traditional or BLISS groups using the mixed approach. There were no differences in reported gagging or choking between groups. Several systematic reviews have evaluated evidence on BLW. A narrative using a single database[4] included 29 studies and concluded that benefits of BLW included lower food fussiness, higher food enjoyment, lower food responsiveness and higher satiety responsiveness. However, few studies robustly examined the relationship between BLW and obesity risk. A second review[5] of 4 databases included 8 studies and reported inconclusive results. Another[6] investigated effects of a wider range of CF practices. Whilst there was no evidence that BLW approaches had any benefit for infant growth or adiposity, responsive feeding practices resulted in adequate weight gain and lower incidence of overweight/obesity during the first two years of life. Most recently, a narrative review[7] included 29 studies and concluded that the available data do not lend themselves to recommend this practice over traditional approaches. Overall, current evidence does not demonstrate superiority of either traditional or BLW, and most expert groups have concluded that the choice of method should be left to the mother-infant dyad. In reality, many mothers use a combined approach. The evidence for a beneficial effect of responsive feeding/parenting practices on infant weight and adiposity risk appears greater than that for BLW, although the latter may form part of responsive feeding by increasing infant control during feeding. CFs need to be safe so that they do not present a choking hazard, but prolonged use of pureed foods can lead to feeding problems and reluctance to consume textured foods later on. Thus, regardless of the method chosen for introducing CF, all infants must receive food that is nutritionally adequate and of the correct texture for their developmental skills at the time. 1.Taylor 2017,2.Dogan 2018,3.Belin 2022,4.Boswell 2021,5.Martinón-Torres 2021,6.Bergamini 2022,7.Bocquet 2023.