A NEW EPIDEMIC IN CHILDREN: PEDIATRIC OBESITY

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Received 15 May 2022, Accepted 28 May 2022
https://doi.org/10.31688/ABMU.2022.57.2.08

Abstract

The prevalence of overweight among children has significantly increased in recent years and is associated with a significant burden at both individual and macro-social levels. Children and parents often do not recognize the problem and doctors are not prepared to deal with the challenges posed by childhood obesity. We conducted a review of the published data to date on the epidemiology, determinants, consequences, and intervention options for childhood overweight. The findings show that urgent action is needed to stop the rising prevalence of overweight children. Society needs to focus on determinants, parents need to understand the danger that obesity can have on their child in both the short- and long-term. Interventions need to focus on all determinants and to be tailored to each individual child so that obesity rates decrease and lead to a healthy society.

Keywords: children, obesity, overweight

Résumé

Une nouvelle épidémie chez l’enfant : l’obésité pédiatrique

La prévalence du surpoids chez les enfants a considérablement augmenté ces dernières années et est associée à un fardeau important tant au niveau individuel qu’au niveau macrosocial. Les enfants et les parents ne reconnaissent souvent pas le problème et les médecins ne sont pas préparés à gérer les défis posés par l’obésité infantile. Nous avons effectué une revue des données publiées à ce jour sur l’épidémiologie, les déterminants, les conséquences et les options d’intervention pour le surpoids chez l’enfant. Les résultats montrent qu’une action urgente est nécessaire pour arrêter la prévalence croissante d’enfants en surpoids. La société doit se concentrer sur les déterminants, les parents doivent comprendre le danger que l’obésité peut avoir sur leurs enfants à court et à long terme. Les interventions doivent se concentrer sur tous les déterminants et doivent être adaptées à chaque enfant afin que les taux d’obésité diminuent et conduisent à une société en bonne santé.

Mots-clés: enfants, obésité, surpoids
INTRODUCTION

In Romanian the saying “fat and beautiful” has been and is still used by parents and grandparents when their child gains several extra kilograms. Nowadays, being overweight in the paediatric population has become a global health problem. Overweight and obesity are not several extra kilograms or changes in physical appearance. The implications are much more extensive, the effects of obesity on the child affect the metabolism, other systems, the psyche and can persist in the child until adulthood in 80% of cases.

Globally, among adults, overweight reaches a prevalence of about 40% and the associated metabolic imbalances contribute to the development of many chronic conditions or to the unfavourable course of acute diseases.

While in adults the body mass index (BMI) is used to define overweight, in paediatric clinical practice BMI percentiles are used, which simultaneously weight, height, age and sex are considered. Children below the 5th percentile are considered underweight, those between the 5th – 85th percentiles are normal weight, while overweight children have BMI values above the 85th percentile but below the 95th percentile, and obesity is defined as BMI values greater than or at least equal to the 95th percentile.

In this context, we conducted a brief literature review of recent data on the impact of overweight in children.

EPIDEMIOLOGY

The prevalence of overweight and obesity among children increased by 47.1% globally between 1980 and 2013, and this trend has been observed in recent years not only in developed countries but also in developing societies, including countries in Africa. At the same time, it has been observed that the proportion of underweight children has remained constant, which means that the increase in obesity rates is occurring as a result of the decrease in the rate of normal-weight children. Globally, it is shown that approximately 17% of children aged 2 to 19 years are obese, and in the European Union and USA it has been reported that 1 in 3 children is overweight.

Romania is no exception when it comes to overweight children. In 2015 the obesity rate was 10% among children aged 6 to 18 years. In 2018, the data were worrying, showing an increase in overweight among Romanian children: 7.5% overweight children and 18.5% obese. In addition, an increase in the obesity rate was observed among young children aged 2 to 5. This trend has been observed globally. For Romania, the most affected age groups are between 10-14 years and 15-19 years. A higher incidence of obesity has also been observed in female and urban children.

DETERMINANTS OF OVERWEIGHT

Obesity is mainly driven by an imbalance between food intake and energy expenditure. Lifestyle and food intake preferences can represent modifiable risk factors for obesity, and they interact with each individual’s unique genetic background, which in turn represents a non-modifiable risk factor.

Factors that drive paediatric obesity can be classified into three main categories: genetic, behavioural, and environmental, but can also include the social-economic status, psychological factors such as depression, ambient factors such as pollution, or microbiological factors such as the gut microbiota.

Genetic risk factors have been the object of intensive study, and recent research has shown that 25-40% of people have a genetic risk for a high BMI. However, this genetic risk in itself is considered to be responsible for less than 5% of cases of infantile obesity, as in most other cases it also requires the association of behavioural and environmental risk factors as described.

Among behavioural factors for obesity, the sedentary lifestyle ranks first. Many children increasingly engage in technology-driven sedentary activities, which unfortunately require minimal energy expenditure. Among European children, the amount of time spent sedentarily, i.e., watching TV, playing video games, or using a mobile phone, ranges from 3.2 to 9.2 hours per day, and this amount of time furthermore increases during adolescence. A European child is thought to spend an average of 2.7 hours watching TV, and each such hour is associated with a 2% increase in the prevalence of obesity.

The gut microbiota has been demonstrated to play a key role in weight gain and obesity. In vitro trials of microbiota transplants in germ-free animals have shown clear signals that the intestinal flora may drive paediatric obesity.

Increased body weight is also a factor of inappropriate eating habits, with high food portion sizes, frequent eating of fast-foods, sugary drinks or treats, all being associated with an increased BMI.
family’s food preferences and eating schedules are some of the main drivers of a child’s early eating behaviours, and can directly influence and maintain risk behaviours leading to obesity35.

**Implications of overweight on the child**

Overweight or obese children are likely to remain overweight into adulthood and develop many chronic conditions such as cardiovascular, hepatic, renal, pulmonary, metabolic, orthopaedic, and neuropsychiatric30,32.

The most significant consequence of paediatric obesity is damage to the cardiovascular system, the effects of which extend into adulthood3. Hypertension, dysglycaemia, dyslipidaemia, and systemic inflammation are associated with vascular changes in childhood, and these contribute to an increased risk of cardiovascular events in adulthood3. The pathophysiology of hypertension in children due to obesity is complex and involves several mechanisms: activation of the sympathetic nervous system, increased adipokine levels, oxidative stress, and inflammation35.

Studies have shown that the prevalence of asthma is higher in obese children, and they are more likely to have exacerbations with a longer duration of symptoms, often requiring evaluation in the Emergency Department. It has also been observed that overweight children have an unsatisfactory response to inhaled corticosteroids34. Thus, the increasing prevalence of overweight asthmatic children highlights the need for personalized medicine among these patients35.

Childhood obesity is associated with respiratory symptoms and diseases, including exertional dyspnoea, asthma, obstructive sleep apnoea syndrome and hypoventilation syndrome35. Obstructive sleep apnoea syndrome is associated with intermittent hypoxemia, hypercapnia, and sleep disturbances. Often, obese children present with snoring, pauses in breathing, mouth breathing and daytime sleepiness35. Weight loss has been associated with decreased severity of obstructive sleep apnoea syndrome and even its eventual resolution36.

Dyslipidaemia is common in children with obesity, especially through increased triglycerides and low HDL cholesterol37. Small, dense LDL cholesterol particles are deposited under the endothelium and increase atherosclerotic progression38, so the onset of atherogenesis in childhood will lead to cardiovascular manifestations such as heart attack, stroke or ischemic nephropathy in adulthood. Central adiposity in children up to 19 years of age has been associated with increased levels of C-reactive protein (CRP), interleukin-6 (IL-6) and tumour necrosis factor (TNF) alpha39.

Recent data have confirmed that obesity in children may contribute to a significant increase in the incidence of chronic kidney disease. It has been reported that obese children have larger kidneys and increased renal blood flow than their normal-weight counterparts, which supports the idea that obesity triggers changes in the kidneys as early as in childhood40.

Prediabetes was detected in 22-36% of obese children and adolescents. Childhood overweight has also been found to be directly associated with the development of diabetes in young children41.

Hepatic steatosis is common among overweight children42. Compared with adults, severely obese adolescents have been shown to have more advanced liver disease, characterized by higher prevalence of definite NASH and fibrosis, and higher systemic inflammatory markers43.

Another system affected by overweight is the skeletal system. Adiposity influences the development and health of children’s bones. Previous studies have reported an increased rate of fractures and poor bone quality in obese children44. The increased risk of fractures could be due to limited weight-bearing movements, postural instability and impaired gait, which increase the risk of obese children falling and suffering fractures45.

Another very important implication of paediatric obesity is psychiatric, psychological, and psychosocial disorders. Childhood obesity has been found to be associated with depression, negative mood states and low self-esteem32. Eating and behavioural disorders are also associated with obesity. These disorders are a risk factor for failure to control obesity, so these children require attention and tailoring of therapeutic interventions46. Overweight children may suffer more often from bullying due to their weight47. Therefore, they often suffer from social isolation. These negative social problems contribute to low self-esteem, a negative self-image and can affect educational performance30.

**INTERVENTIONS ON OVERWEIGHT**

Interventions to reduce the prevalence of obesity are difficult. Society as a whole is not truly ready to face the challenge of overweight. Parents often do not recognize the problem and doctors are not sufficiently prepared to intervene and treat this „new old disease”. In addition, health systems need to organise themselves for early and sustainable interventions to reduce childhood obesity rates.

A recent meta-analysis of 153 studies showed that in the 0-5 years age group, the physical activity in combination with a balanced diet can reduce the risk of obesity. Also, in the age groups 6-12 years and 12-18 years there is evidence showing a decrease in
obesity when physical activity was used as the sole method of treatment and prevention. Pharmacological treatment is very limited and cannot be considered as a viable option in paediatric patients, so the most effective measures in reducing overweight are physical activity, diet, and behavioural changes (sedentary lifestyle, TV shows, video games, etc.). Lifestyle changes should be made as early as possible in childhood in order to prevent as well as possible the complications that may arise in adult life as a result of childhood obesity. Thus, treatment could be tailored according to the type of prevention that is to be applied, i.e., primary, or secondary prevention.

A common problem leading to regaining excess weight is the interruption of regular exercise and/or diet with a t-fold increased risk in previously sedentary people. It is necessary to eliminate the following foods from the diet of children who are obese or at risk of becoming obese: processed foods, fast food, high fructose/glucose foods. The American Academy of Paediatrics and the US Department of Agriculture also recommend avoiding foods high in saturated fatty acids, eating fruit, and stopping/interrupting activities that lead to excessive food consumption. Daily activity should be a minimum of 20 minutes, with an optimal time of 60 minutes. Screening for potential mental health conditions and counselling if detected is also recommended. Food and Drug Administration-approved anti-obesity medications can only be administered after implementation of a healthy lifestyle that includes the dietary modifications mentioned above and regular physical activity and that results in poor or unfavourable response in the context of excess calorie control. Bariatric surgery should be reserved for severe cases refractory to the above treatments, in the absence of untreated psychiatric pathology and only after demonstration of the ability to maintain a healthy lifestyle.

Bariatric surgery often has spectacular results when applied to highly selected obese patients, but it also carries risks in addition to surgical ones. Among these risks the most important are micronutrient deficiencies and the risk of requiring future abdominal reintervention.

Orlistat is the only approved pharmacological therapy that can be given to adolescents. Its effect on weight loss has only been evaluated in conjunction with the dietary and physical measures outlined above. A dose of 120mg of orlistat 3 times daily for 52 weeks has a favourable effect in reducing weight in obese adolescents.

To prevent or treat obesity successfully, the American Academy of Paediatrics recommends that physicians have motivational discussions with both patients and their families, to increase the chances of adopting and maintaining a healthy lifestyle. It is also recommended to treat the patient in a multidisciplinary clinic including psychotherapist, physical therapist and dietician specialising in obesity treatment. Physical activity should be adjusted according to the preferences of each individual child and supported by collective physical activity with the family to increase adherence to this therapeutic intervention.

Recommendations to adopt a diet that excludes foods high in carbohydrates and saturated fats may have a risk of developing an eating disorder particularly in the adolescent population. Thus, several behavioural types related to diet adoption have been described in the literature. These are the optimal healthy behavioural type which involves increased consumption of fruits and vegetables, the unhealthy behavioural type which involves starvation, the use of dietary supplements instead of regular meals and the 3rd type of behaviour called extreme which involves the use of laxatives and diet pills and self-induced vomiting.

There is an association between a child’s relationship with their parents in the early years and their risk of developing obesity later in life. Thus, maintaining an optimal relationship between child and parents seems to play an important role in preventing childhood obesity.

The methods of treating obesity in the paediatric population in the future could include the use of new pharmacological therapies such as naltrexone-bupropion, metformin, GLP-1 agonists, lorcaserin, etc. and the induction of transformation of white adipose tissue to brown adipose tissue.

The Centres for Disease Control and Prevention recommend five basic principles for preventing and treating childhood obesity. These are “Eat the Rainbow” (including fruits, vegetables and fibre in the diet), “Move More” (regular physical activity), “Slow Down on Sugar” (limiting carbohydrate intake), “Reduce Screen Time” (decreasing time spent in front of cell phone, tablet, TV, etc.) and “Sleep Well” (9-12 hours of uninterrupted sleep per night for the 6-12 age group and 8-10 hours of sleep for the 13-18 age group).

**Conclusions**

Childhood overweight is a growing global problem. The short- and long-term implications put a huge strain on both the child and his family, and on health systems. The factors that lead to obesity can be controlled, but a well-organised plan of action is needed, implemented as early as possible. Early warning signals are needed to raise awareness of the problem of overweight children.
Author Contributions:
V.D.M. conceived the original draft preparation. D.N.G., C.F., D.G., A.K., and V.D.M. were responsible for conception and design of the review. D.N.G., C.F., D.G., A.K., and V.D.M. were responsible for the data acquisition. D.N.G., C.F., D.G., A.K., and V.D.M. were responsible for the collection and assembly of the articles/published data, and their inclusion and interpretation in this review. All authors contributed to the critical revision of the manuscript for valuable intellectual content. All authors have read and agreed with the final version of the manuscript.

Compliance with Ethics Requirements:
“The authors declare no conflict of interest regarding this article”

“The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008 (5), as well as the national law.”

“No funding for this study”

Acknowledgements:
All authors have the same contribution with the first author.

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