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Professional Paper

RISK FACTORS FOR OVERWEIGHT AND OBESITY IN CHILDREN AND ADOLESCENTS

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ABSTRACT: Obesity among children and adolescents can be characterized as a worrying public health problem in the 21st century. The timeline covering the last three decades records the growth of the prevalence of obesity in children and adolescents. The consequences of obesity are incalculable because they lead to many chronic diseases of the cardiovascular system, endocrinological, gastrointestinal diseases and disorders of the musculoskeletal system as well as psychological diseases. The risk factors of excess body weight and obesity are associated with the disproportion between caloric intake and physical inactivity as the main factors, and other important factors that can lead to the development of the disease (genetic, endocrine, social environment and socioeconomic factors) should not be underestimated. The aim of the work is to point out the risk factors that can lead to the development of obesity in childhood and the adequate measures for the primary prevention of this disease. Research methods. The paper used relevant literature data that indicate risk factors for the development of obesity in children and adolescents, the importance of their early detection as well as prevention measures. Conclusion. Direct the health policy towards the goal of identifying overweight children and adolescents in order to reduce the risk of developing obesity in adulthood. Prevention should include educational programs for children and adolescents with the aim of acquiring knowledge, but also changing habits related to nutrition, physical activity and lifestyle.

Keywords: children, adolescents, overweight, obesity, risk factors, chronic diseases, prevention.

INTRODUCTION

Obesity among children and adolescents (between the ages of 2 and 18 years) has increased rapidly in the last three decades of the 21st century in both developed and developing countries (1, 2). It is also alarming that around 55% of obese children become obese in adolescence. Similarly, about 80% of obese adolescents will continue to be obese in adulthood, while about 70% will be obese at the age of 30 (3). In extensive studies that included the population of children and adolescents in the time period from 1975 to 2016, they showed a trend of BMI growth. It is estimated that in 2016 worldwide, 124 million children and adolescents between the ages of 5 and 19 were obese, and 213 million were overweight (4). The World Health Organization (WHO) reports that in 2020, 39 million children under the age of 5 were overweight or obese. Considering the growth of overweight and obesity in children and adolescents, WHO member states have set a goal until 2025 to stop this negative trend and approved a project under the slogan “No increase in overweight and obesity” (5).

DEFINITION

According to the World Health Organization (WHO), overweight and obesity (obesity) is defined as abnormal or excessively accumulated fat tissue to such an extent that it endangers health and daily life (5). Health disorders caused by excess body weight and obesity include cardiovascular conditions (hypertension, hyperlipidemia), endocrinological diseases (diabetes type 2, metabolic syndrome), gastrointestinal conditions (non-alcoholic fatty liver disease), disorders of the musculoskeletal system as well as psychological disorders (depression, anxiety) (6-9). BMI (eng. Body mass index) shows nutrition as a coefficient

that is calculated through the ratio of mass in (kg) and height in meters (m) by dividing the mass by the square of the height (kg/m²). According to WHO guidelines, there are four categories of BMI for adults: underweight (BMI < 18.5 kg/m²), normal weight (BMI 18.5 - 24.9 kg/m²), overweight (BMI 25.0 - 29.9 kg/m²) and obesity (BMI ≥ 30 kg/m²) (5). Obesity is classified according to stages or degrees: 1st degree - BMI 30.0 -34.9 kg/m²; 2nd degree - BMI 35.0 - 39.9 kg/m² and 3rd degree - BMI ≥ 40.0 kg/m². To define the state of nutrition in the pediatric age group, percentile curves are used in relation to age and gender. Percentiles show the relationship between the child's BMI and the BMI of children of the same age and sex. The classification of the state of nutrition is as follows: malnutrition below the 5th percentile; normal body mass from the 5th to the 85th percentile; overweight between the 85th and 95th percentiles; obesity above the 95th percentile (10).

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ENDOCRINE FACTORS

The endocrine factors of obesity include: lack of growth hormone, hypothyroidism (lack of thyroid hormone) and Cushing's syndrome (excess secretion of cortisol). These factors lead to reduced growth rate and lower growth, while normal or accelerated growth rate excludes endocrine causes of obesity and mainly follows the genetic potential inherent in each individual. Acceleration of growth in children can be a consequence of Albright's hereditary osteodystrophy (pseudohypoparathyroidism type Ia) in the first two to three years, and after that age they are of lower growth. Hypothalamic obesity occurs as a result of damage to the hypothalamus by a tumor or surgery or radiotherapy. In children and adolescents, it is most often manifested by a normal growth rate, even though they have a lack of growth hormone, obesity and symptoms of tumor disease (11).

GENETIC FACTORS

Genetic factors have an impact on fat metabolism and control and regulate hormones that affect appetite. They are considered responsible for 30% to 70% of obesity cases. They affect the rate of metabolism, the way fat is distributed in the body, and the energetic reaction to excessive eating. The lack of the hormone leptin in the body leads to a constant state of hunger, which results in excessive food intake in the body and leads to the development of obesity and metabolic disorders such as insulin resistance and dyslipidemia (12,13). Its role is to send information to the body when it is hungry and when it is full. The discovery of more than 60 genetic markers responsible for increased susceptibility to obesity in an individual is certainly significant in terms of genetic research. The difference between individuals in BMI with a difference of 1.45% is associated with the 32 most common genetic variations. Thus, carriers with more than 38 different alleles have the highest risk for obesity and an average BMI higher by 2.7 kg/m² compared to those with low genetic risk. Although genetics plays an important role in the development of obesity, other risk factors such as diet, parental obesity, physical activity and sedentary lifestyle, endocrine disorders, smoking, socioeconomic factors, and general lifestyle should be taken into account (14).

NUTRITION

Proper nutrition is considered one of the most important factors that affect the development of the organism, the state of nutrition and contributes to the preservation of health. Children and adolescents are the most sensitive population to improper nutrition because the way they eat determines their emotional

and psychophysical development, affects school achievements and health in later life (15). Proper nutrition as well as proper eating habits during the growing up period of children are responsible for their physical, psychosocial and cognitive growth and development. As a consequence of bad eating habits from the aspect of increased energy intake, and correspondingly reduced energy consumption, obesity and comorbidities arise. To maintain the body's function and health, it is necessary to satisfy the body's needs for daily energy intake and a sufficient amount of protective and nutritional substances, which can only be achieved through proper nutrition. Nutrients are divided into micronutrients (vitamins and minerals) and macronutrients (proteins, carbohydrates and fats), and growth and development, especially during childhood and adolescence, require greater needs for nutrients, and the requirements for energy and nutrition should correspond to their needs. During growth and development, there are increased needs for minerals (calcium, zinc, iron), vitamins (B complex vitamins, vitamin C, vitamin D), and insufficient protein needs affect muscle development and energy level (16,17). In general, school children have irregular meals, most of them do not consume cooked food, nor do they have adequate representation of micronutrients, macronutrients and dietary fiber in their diet. The composition of the main meals is usually based on the consumption of red meat, potatoes and pasta, and they are very scarce with portions of fruits and vegetables. Also, unhealthy snacks such as high-calorie fruit juices, fatty crackers and an abundance of sweets, in addition to all of the above, contribute to the development of obesity, so an obese child most often grows into an obese person. With increasing age, it was observed that students have more irregular eating habits (irregular breakfast, more frequent consumption of sweets and snacks, reduced consumption of fruits and vegetables, increased intake of fast food and carbonated juices) (10). Increasing the intake of fast food can lead to a higher risk of overweight and obesity, especially in children and adolescents. These foods contain very high levels of calories, saturated fat, trans fat, sugar, sodium, and simple carbohydrates. It is very affordable because it is sold at very low prices (18). Poor and inadequate nutrition, combined with a decrease in physical activity and an increase in sedentary behavior, causes overweight and obesity in children and adolescents (19). There has been an increase in the size of portions as well as the consumption of high-energy foods, and a decrease in the intake of vegetables and fruits, which, in combination with physical inactivity, results in abdominal obesity and the development of cardiovascular diseases, neoplasms and metabolic diseases (20). In addition to adults, these problems affect children and adolescents all over the world. Adequate nutrition and physical activity in children with type 1 diabetes have a positive correlation with the course of the disease and treatment (20). That is why planning a proper (balanced) diet is very important for the proper growth and development of an individual or a certain population, because it aims to improve health and prevent the onset of diseases through defined energy values and nutritional structures (21). Many countries in the world, in order to prevent diseases that arise as a result of poor nutrition, introduce educational lectures in schools and teach children about healthy lifestyle habits (healthy diet, physical activity), which resulted in a positive development of knowledge about nutrition in children and changes in nutrition by consuming healthy food (22). Social networks (Internet), which are an integral part of children's environment and are often used as a learning tool, can serve as an effective method for providing additional information about good eating habits of children and adolescents (23). Table 1 shows "healthy foods" that are recommended in the diet of children and adolescents and "unhealthy foods" that should be avoided or consumed in minimal quantities. In addition to a good/correct selection of foods, it is necessary to consume a lot of liquid (water).

Table 1. Tabular representation of examples of “Healthy and unhealthy foods”

Healthy food	Unhealthy food
Bread, rice, flour, potatoes, pasta, cereals	“fast food”
Fruits/vegetables foods rich in vitamins, minerals, dietary fiber and antioxidants	All types of carbonated drinks Snacks
Dairy products (cheese, yogurt, milk), meat (fish), eggs rich in calcium, protein	low in saturated fat Oils, fats, concentrated sugars

PHYSICAL ACTIVITY

According to the results of scientific studies, children and adolescents in most countries have a low prevalence of overall levels of physical activity, a high prevalence of sedentary behavior and a growing prevalence of obesity, which can be associated with long-term risks for children’s health, including elevated levels of cholesterol, triglycerides and glucose in the blood (development of type 2 diabetes, high blood pressure). In adulthood, it is an important risk factor for the development of metabolic syndrome (19,24). Sedentary behavior is defined as time spent awake, sitting or lying down with low energy consumption in the context of educational, home and social environments and transportation. Includes: watching television, working on a computer, reading/studying while sitting, driving a car, using smartphones/tablets. Sedentary behavior in children and adolescents is associated with poor health outcomes and may lead to the development of obesity, which results in increased cardiovascular risk, type 2 diabetes, menstrual abnormalities, sleep-disordered breathing, or psychosocial effects (stigmatization of obese children) (25,26). It is recommended that children and adolescents limit the time they spend in a sedentary lifestyle, especially the time spent in front of screens, and to engage in various forms of physical recreation (27,28). The WHO guidelines regarding the physical activity of children and adolescents (5 - 17 years) from 2020 recommend that it be carried out as part of recreation and free time (games, sports or planned exercise), physical education, transportation (cycling, walking, wheelie driving), or performing household chores in the context of educational, home and community settings (29). In children and adolescents, physical activity has a positive effect on the cardiovascular profile, they are thinner and have better bone mineral density, which reduces the risk of developing osteoporosis in old age. Behavioral patterns are also transferred into adulthood, so active children remain physically active, which can be a prerequisite for good health (30). A generally active lifestyle and participation in daily physical activity that includes physical activity of light and moderate intensity in children and adolescents is recommended because it is associated with multiple positive health outcomes. The promotion of physical activity and its benefits for human health should be represented from the earliest childhood in all educational systems, recommended by teachers, parents and the wider social community.

ENVIRONMENTAL FACTORS

The emergence of obesity can also be observed in the context of complex social environments in which children and adolescents grow up. The mutual influence of these risk factors, such as family, peer groups, schools and communities, is reflected in the way of eating, physical activity and sedentary behavior. Parents represent the primary social context and pattern of behavior in the approach to nutrition and physical activity that children adopt and develop as healthy or unhealthy lifestyles (25). The role of parents is great in adopting healthy eating habits from an early age, because if parents adhere to them, children will accept them, especially if care is taken about main meals, snacks and healthier varieties of snacks. The results of longitudinal studies regarding children’s lifestyle (consumption of fast food, time spent in front of the screen, sports activities) show a stronger influence of their peers compared to the lifestyle of siblings

(25). Schools should also organize their own kitchens with the aim of promoting proper nutrition and applying it in practice (27). As children grow up and stay more and more outside the home environment, there are new social influences and a reduction in the influence of the family environment in eating habits. These changes are particularly visible during the transition from childhood to early adolescence, when the influence of peers increases and changes in eating behavior occur. Socializing with peers affects the change in the food environment, they buy more meals and snacks in fast food restaurants and reduce moderate to vigorous physical activity in combination with an increase in the time spent using smartphones and computers in their free time. Other studies have also shown that among adolescents, the intake of fast food and snacks, the level of physical activity and sedentary behavior in their free time correlates with their friends and peers (26,27). Thus, fast food restaurants (FFR) are considered environmental factors and are defined as places where unhealthy food is sold that has a negative impact on the environment (14).

SOCIOECONOMIC FACTORS

The emergence of obesity in early childhood is increasingly linked to poverty and poor nutrition, social stressors, lower parental education and lower income. These socioeconomic factors can affect the lower availability of high-quality food, and the consumption of energy-rich and nutrient-poor food. Also in economically developed countries with high incomes, obesity rates are higher in the lowest socioeconomic groups among children (1).

PSYCHOLOGICAL FACTORS

Obesity is a risk factor for depression in children and adolescents and vice versa. Adolescent girls with depression suffer from obesity much more often than adolescent boys (31). Also, due to excess weight, many adolescents have a lack of self-confidence, which leads to certain emotional problems and the most common symptoms of anxiety.

CONCLUSION

Obesity is a growing public health problem for both adults and children and adolescents. An obese child tends to be obese in adulthood. It is worrying that since the first recorded prevalence of obesity in 1975, we have a growing trend at the world level. Thus, in 2016, on a global level, it was estimated that 124 million children and adolescents aged 5-19 were obese, and 213 million of them were overweight. The reports of the World Health Organization state that 39 million children under the age of 5 are overweight or obese. Overweight and obesity are most often caused by several risk factors: improper diet, low level of physical activity and sedentary behavior in free time, endocrine and genetic factors. Also, the influence of environmental factors, certain socioeconomic factors can lead to the development of obesity, which in children and adolescents results in the appearance of certain psychological disorders. Therefore, the prevention of obesity is the most important, and measures should be started from early childhood through the implementation of intervention programs that would affect the risk factors of overweight and obesity, especially those that are variable such as physical activity and proper nutrition.

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