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Review Article

# Obesity prevention in children and adolescents – Current recommendations

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ABSTRACT

*Introduction:* The epidemic of obesity in children and adolescents is one of the major problems of 21st century society. About 70–80% of young people diagnosed with obesity in adolescence will become obese adults. In Poland, an excess of body weight affects every 7th teenager aged 13–15 (13.3%). The prevalence of excess body weight in 14–15 year olds has increased over the past 10 years by about 2.0% and obesity by 1.5%.
*Aim:* This work aimed at demonstrating the merits of obesity prevention and rehabilitation.
*Discussion:* The effectiveness of the prevention of obesity and being overweight among children and adolescents depends on early diagnosis, which involves screening in elementary, middle and high schools as well as the implementation of effective prevention programs and education. The planning of treatment for obese children should be guided by their family history, environment, neurological and physical examinations and the hitherto rehabilitation for the delineation of an optimal individualized rehabilitation program. In addition, laboratory tests should be taken into account for a complete assessment concerning the current condition of the child.
*Conclusions:* The prevention of obesity requires early diagnosis and rehabilitation as well as effective obesity prevention programs and education.


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## 1. Introduction

Obesity is a disease of modern civilization and is more common in industrialized countries.[7] The epidemic of obese and overweight children and adolescents is one of the major problems of 21st century society.[6] The current population of American children will be the first to have a shorter life expectancy than their parents.[17,20] About 70–80% of people diagnosed with obesity during adolescence will become obese adults.[6] In the United States, if current trends are maintained, obesity will become the most common cause of premature death, decreased quality of life and increased healthcare costs. This problem imposes a direct financial burden on society. Researchers from George Washington University estimate that an average obese person, due to the decline in their productivity and the need to ensure additional medical care for them, costs the American society about $7000 per year.[7]

As defined by the World Health Organization (WHO), obesity is an abnormal or excessive accumulation of body fat, leading to deterioration in health and is the result of a long-term imbalance between the amount of energy input and its expenditure.[20] The basis of this mechanism is the regulation of energy which is subject to genetic (40–50%) and environmental factors (50–60%). Obesity can lead to hypertension, glucose metabolism and lipid disorders, macroelements, microelements and musculoskeletal disorders, sleep apnea, as well as psychological disorders such as low self-esteem and lowered self-esteem.[20]

## 2. Aim

This paper is intended to outline the need for and the implementation of prevention and rehabilitation in the treatment of obesity in children and adolescents by increasing muscle mass and body fat reduction.

## 3. Discussion

### 3.1. *Epidemiology and causes of obesity*

By analyzing obesity among children and adolescents in relation to the country of its occurrence, it can be concluded that the following states are burdened with the epidemic: the United States, Canada, Brazil, Chile, Australia, Japan, Finland, Germany, Greece, Spain, and the United Kingdom. As compared to European countries, the number of overweight and obese children in Poland is average.[14,20] In Poland, excess body weight affects one in seven teenagers aged 13–15 years (13.3%).[14,6] The peak for being overweight and obese, in both boys and girls, occurs at the age of 14.[2] The prevalence of excess body weight for 14–15 year old adolescents has increased over the past 10 years by about 2.0% (2.4% in boys and 2.0% in girls) and obesity by 1.5% in boys and 2.0% in girls.[6] Currently 42 million children under the age of five are overweight or obese, of which 35 million are living in middle and low income countries.[21]

The main causes of obesity are poor eating habits, a low level of physical activity and an inappropriate range of extracurricular activities. Research concerning the prevalence of obesity among children conducted in different Polish provinces and regarding the educational and professional status of their parents has shown no significant statistical differences.[6] Another factor contributing to abnormal weight in children and adolescents is eating as a response to environmental stress and isolation from peers and teachers.[20] More than a third of overweight students do not participate regularly in physical education classes and 2% of them are permanently exempt.[10] The risk of obesity is increased by frequent snacking between meals, consumption of highly sweetened carbonated beverages and having one or two obese parents (which is the case for 40% of children).[6]

Theoretical grounds for obesity are found at various levels: at the level of the central nervous system – in biochemical terms, constant overeating is similar to drug addiction; at the metabolic level – a low level of brown fat as compared to that of white fat in the subcutaneous and visceral tissue; and at the genetic level – the presence of over 20 different genes that predispose one to more rapid weight gain.[7] The problem of obesity is influenced by the global economy (junk food is much cheaper than fresh produce) and marketing (food manufacturers use evolutionary and social conditions in order to maximize the sales of unhealthy products to generate high profits). Independent factors for being overweight or obese include a mother's poor diet during pregnancy, too short or too long a period of breastfeeding, and a family history of poor eating habits.[20] Also, irrational and extreme methods for losing weight like fasting, smoking, or induced vomiting contribute to being overweight.[6]

### 3.2. *Effects of obesity*

In overweight children and adolescents we can expect to find components of the metabolic syndrome such as increased levels of blood serum triglycerides, low HDL cholesterol levels and high blood pressure.[10,20] These factors contribute to an increased risk or incidence of myocardial infarction, left ventricular heart failure, stroke, nephropathy, elevated plasma glucose, and fasting insulin resistance. Contemporary children present a significant increase in the left ventricular mass index (LVM) in relation to the previous generation (currently: $32.7 \pm 7.8$ g/m; previously: $31.5 \pm 8.1$ g/m) and this increase is linked primarily to the increase in body mass index (BMI) of about 8 kg/m$^2$.[9] Obesity is associated with endocrine disorders such as excessive growth of fat tissue around the nipples in boys (steatomastia), excessive accumulation of fat in the abdomen and pubic mound (pseudohypogenitalism), hyperinsulinemia, polycystic ovarian syndrome and precocious puberty in obese girls (average age at menarche is 0.3 years earlier than in their non-obese peers).[6,20]

Regardless of etiology, obese patients have fatty liver. This condition can lead to inflammation and cirrhosis. Overweight children report psychosomatic disorders.[6] Typical postural deformities of obese children are valgus knee as well as flat and lopsided foot due to overloading of joints, which may lead to pain in the future.[12] There is no correlation between the incidence of asthma and being overweight in children.[22]

In Poland, nearly 90% of obese adolescents feel anxious about their appearance.[2] Significantly more obese adolescents evaluate their fitness as poor and one-third of this group exhibit low self-esteem. Obese students are more often victims of violence inflicted by their peers than those of normal weight.[6]

### 3.3. *Diagnostics*

The simplest test that determines the degree of obesity is the BMI test that involves a reading of the appropriate percentile of the percentile chart. A BMI above the 90th percentile means overweight and a BMI above 97 indicates obesity. BMI can be calculated by the following formula:

$$\text{BMI} = \frac{\text{Weight in kilograms}}{\text{Height in meters}^2}$$

In 2007, the American Medical Association (AMA) has established a risk assessment of overweight and obese children as a multidisciplinary approach. The most important risk predictors are BMI scores measured on the basis of percentile charts, which are given in accordance with age and nationality.[3] Complementary tests are used to measure skin-fold and estimate body composition in terms of body fat and muscle – fat free mass (FFM). Unfortunately, BMI is of limited diagnostic predictability. Not all obese children have an increased risk of metabolic diseases and cardiovascular disorders.[2] Evaluation of waist circumference in relation to a patient's height is a more sensitive indicator of the risk of metabolic and cardiovascular diseases since it determines the distribution of visceral fat. A non-invasive and simple test is to measure the wrist circumference.[2] This is a good parameter for an easy anthropometric assessment of long bones. Many studies indicate that hyperinsulinemia is associated with an increased bone mass in children. Therefore, the wrist circumference measurement is a good predictor of insulin resistance.[8,16,18] In addition, the following conditions of thyroid diseases should be ruled out: hypothyroidism, chronic autoimmune thyroiditis (Hashimoto's disease) and iatrogenic Cushing's syndrome caused by a long-term use of polysteroids.

### 3.4. *Principles of managing obese children*

The aim of rehabilitation is to improve the strength and stamina of the patient as well as to change the body composition and percentage of body fat, by increasing the muscle mass and decreasing fat mass.[19] The planning of the rehabilitation of obese children should be guided by family history and environment, along with physical and neurological examinations, to devise an optimal individualized program. In addition, laboratory tests should be analyzed to fully assess the current condition of the child.[4,7,20] The basic principle of rehabilitation is treatment involving physical exercises. The rehabilitation process is determined by recommendations and patterns of behavior.

The program must be individualized and adequately tailored to the needs and abilities of the patient. The following tests must be employed for the assessment of a given individual: strength grip test, the Sargent Jump test also known as the vertical jump test (used to monitor the development of the flexibility of the lower limbs), evaluation of the skin-fold, spirometry, a metabolic test (the $VO_2$ test), and assessment of the child's flexibility (sit and reach test).[2]

Direct measurement of oxygen consumption by employing a cardiopulmonary test is more accurate in the evaluation of physical performance than the classic stress test. Ergospirometry – Cardiopulmonary Exercise Test (CPET) – is more useful in assessing the intensity of exercise and effort. CPET provides an objective assessment of the patient's maximum exertion level and is the source of limiting its tolerance. The rehabilitation process should also include psychological support and supervision. In this regard, assessment is conducted by the employment of tests such as the Rosenberg Self-Esteem Scale (RSES) which is used to study global self-esteem and self-acceptance of adolescents as well as the Body Figure Perception Questionnaire (BFPQ) regarding the appearance, self-esteem and body weight.[6] Parents of overweight and obese children and adolescents play a crucial role in the rehabilitation process. Effective support provided for children in their struggle with obesity requires the involvement of all family members. Active participation of parents in the rehabilitation process helps to continue the program at home which runs simultaneously to professional aid and is effective when combined with professional procedures.[1,13]

Especially in the initial phase of rehabilitation, a patient should seek to modify eating habits to eliminate extra food intake and eating one item at a time, i.e., small steps method. Reduction of high sugar content beverages and carbonated water significantly reduces the risk of obesity and associated cardiovascular diseases.[11] One should also pay attention to the nutritional value of milk and meat. These products are most valuable in terms of nutrition.[15] A high nutritional value of milk is due to its complex chemical composition and proportions that ensure best digestion, absorption and assimilation. The nutritional value of milk is mainly associated with its energy content, digestibility, bioavailability and biological properties. Milk dry matter contains the basic ingredients necessary for the proper functioning of human organism, the most important being lactose, protein, fat, minerals and vitamins. Energy values of milk are fat – 49%, lactose – 40% and protein – 11%. Unfortunately, milk allergens can cause allergic reactions and food allergy symptoms.[23] A Decalogue of healthy nutrition for children aged 1–3 years recommends a daily consumption of bread and cereal with whole grain cereals, dairy products, and vegetables; lean red meat 2–3 times a week; poultry meat 2–3 times a week; and fish and vegetable fats 1–2 times a week.[15,20] A reduction in the amount of consumed salt and sweetened beverages is of particular significance.

Physical exercises are extremely important. To be enjoyed by children, they must be of a spontaneous nature, yet must be performed systematically on a weekly basis and be properly planned in terms of difficulty, duration and frequency. Regular physical activity reduces weight and improves heart function, prevents cardiovascular and lung diseases, increases calories burned, lowers blood pressure, improves mood, and eliminates excess energy. Activities that are attractive to patients involve marching, movement games and activities, horse riding, cycling, swimming, dancing, ball games, jogging and skiing.[5] Physical exercise sessions should

be one of the most important elements in the rehabilitation process.[6] To facilitate and support obese and overweight children in the process of rehabilitation, teachers of physical education in schools should strive to change the assessment system to encourage all types of activities and involvement and lessen the emphasis on individual results, events and sports.[10]

In terms of psychological support, the best solution is to build upon tried and tested methods of behavioral psychology (Weight Watchers).[7] Studies described in the Journal of Pediatrics in 2010 demonstrated that children undergoing behavioral therapy maintained an annual BMI of 1.9–3.3 lower than those who did not participate in the therapy.[13] If physical activity combined with adherence to healthy eating habits in obese adolescents does not result in weight loss, physicians may recommend (beginning with 14 years of age) the Cambridge weight loss program with the exception of very low energy diets (VLED). The program recommends a balanced diet. Each product covers 33% of the Recommended Dietary Allowance (RDA) for vitamins, minerals, and high-quality proteins. It provides an appropriate level of carbohydrates and polyunsaturated fatty acids. These products are not only recommended for weight loss but also chosen as a balanced nutritional model because they contain all the essential nutrients, whilst having an energy deficit. Every diet should be accompanied by dietary supplements. A lack of adequate amounts of vitamins and minerals can lead to serious health problems.

### 3.5. *Prevention*

The effectiveness of the prevention of obesity and being overweight among children and adolescents depends on early diagnosis, which involves screening in elementary, middle and high schools as well as the implementation of effective prevention programs and education. Prevention at the national level should be a response to the WHO recommendation that all countries implement a greater control of the marketing of foods and products that are high in saturated fats, trans fats, sugar, salt, and carbonated beverages aimed at children.[21] WHO recommendations also apply to reducing the number of techniques that target the sale of unhealthy foods to children in places where they gather, such as playgrounds, kindergartens, schools, pediatric offices and clinics, along with limiting the advertising of junk food during children's peak TV viewing times. This issue requires a broad interdisciplinary knowledge and cooperation of specialists from various fields. When diagnosing and treating patients, it is important to draw attention to their individual needs with respect to the development of an effective weight loss program and a properly balanced diet rich in appropriately selected micro- and macro-elements.

## 4. Conclusions

The main objective of rehabilitation should be to improve the strength and fitness of obese patients and to initiate changes in body composition regarding fat tissue and muscle mass. In order to prevent obesity, early diagnosis, the introduction of effective prevention programs and education are all essential.

## Conflict of interest

None declared.

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