

## OVERWEIGHT AND OBESITY IN YOUNG PEOPLE (REVIEW)

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### Abstract

Obesity in young people is one of the main problems of modern health care due to its high prevalence, complex adverse health effects, risk of complications and low effectiveness of existing treatments. The urgency of this problem is also increasing in low- and middle-income countries, including Ukraine. The article presents data on the medical and social significance of obesity at a young age, the prevalence of overweight and obesity among children of all ages in the world and in our country, key risk factors for overweight, as well as key WHO strategies and programs for the prevention of food-related diseases. In Ukraine, there is an insufficient level of registration of cases of obesity, which is due to the imperfection of the existing system of prevention of this pathology. Thus, important measures on this issue in our country, according to modern strategy, are the study of the environment where the child is, the lifestyle of families, the health of overweight children, followed by the organization of prevention and treatment.

**Keywords:** *obesity, adolescents, epidemiology, overweight, alimentary-dependent diseases, eating behavior, physical activity, childhood, eating disorders, risk factors, lifestyle, diet, prevention, strategy.*

Obesity is one of the most common chronic diseases in the world. Currently, every fourth person on our planet is already overweight or obese. In all countries there is a progressive increase in the number of obese patients among both adults and young people. The World Health Organization has recognized obesity as an epidemic of the XXI century. Epidemiologists estimate that 40 % of men and 50 % of women will be obese by 2025 [1]. With the spread of obesity on the planet, the associated severe somatic diseases are multiplying and deepening - type 2 diabetes, hypertension, coronary heart disease, cancer and others that lead to poor quality of life, early disability and premature death [2]. But in clinical practice, the negative impact of obesity on the occurrence, course and effectiveness of treatment of diseases that have developed against the background of overweight is often underestimated.

Patients with complicated obesity, as a rule, receive medical care only for pre-existing

comorbidities, they do not receive treatment aimed directly at weight loss and thus to prevent complications.

Today, the issue of overweight and obesity among young people is becoming more common: sedentary lifestyles, unbalanced diet, fast food and many other aspects that affect the change of dietary preferences and contribute to obesity.

During the Covid-19 pandemic, the issue of overweight became extremely important. Online training, delivery of anything to the door of the house, quarantine restrictions on movement and the absence of even the need to move do a great "service" to our body and contribute to the development of socially significant disease called "obesity".

Young people from different countries talk about the aggravation of overweight problems and that the habit of eating well is part of the national culture (United Arab Emirates, Nigeria, Israel, etc.)

Obesity is a multifactorial disease. In most cases (90 %) at a young age are exogenous-constitutional obesity. Other forms of this pathology are associated with medical problems: the use of certain drugs (eg, glucocorticoids, some antidepressants, antipsychotics, antiepileptics) or the presence of diseases (tumors of

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the hypothalamus or brain stem and its treatment, radiation therapy of brain tumors, hemorrhoids or hemobra skull, stroke, hypercorticism, hypothyroidism or other neuroendocrine diseases, monogenic obesity, chromosomal or other genetic syndrome) are quite rare and usually have a morbid course and the presence of specific symptoms [3, 4, 5, 6, 7, 8, 9, 10, 11, 12].

Obesity in young people is one of the main problems of modern health care due to its high prevalence, complex adverse health effects, risk of complications and low effectiveness of existing treatments [13, 14, 15, 16].

Being overweight in childhood and adolescence causes both short-term and long-term adverse effects on physical and psychosocial health. [17, 18, 19, 20, 21, 22, 23, 24, 25] Systemic hormonal and clinical disorders associated with childhood obesity are combined into metabolic syndrome. [26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42] Manifestations of this syndrome are insulin resistance and the manifestation of type 2 diabetes, dyslipidemia, arterial hypertension and ovarian hyperandrogenism. [43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 31, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63] In addition, obesity causes digestive [64, 65, 66, 67, 68, 69, 70, 71, 72], endocrine [73], orthopedic [74] and other disorders [75, 76, 77, 78], apnea in a sleep [79, 80], reduces resistance to colds and infectious diseases [81, 82, 83] and dramatically increases the risk of complications from surgery and trauma. Psychological aspects of overweight and obesity in childhood are also very important. They are associated with low self-esteem, dissatisfaction with your body, depression, up to suicidal thoughts. Such young people are stigmatized by peers and have fewer friends than people with normal body weight. This, in turn, can affect academic performance. In the future, obese young people are more prone to social exclusion, early school leaving, exacerbations of eating disorders, alcoholism and drug addiction, and have lower marriages and overall life satisfaction. [84, 85, 86, 87, 88, 89, 90, 91, 92] Thus, the problem of obesity is at the intersection of different branches of medicine - pediatrics, therapy, endocrinology, gastroenterology, nutrition, gynecology, andrology, neurology and psychiatry. It is known that overweight in childhood is a significant predictor of obesity in adults: 50% of children

who were overweight at age 6 become obese in adulthood, and in adolescents this probability increases to 80%. It should be noted that often obesity and metabolic syndrome, which manifest in childhood and adolescence, lead to cardiovascular morbidity and mortality in adults, even at the stage of subclinical manifestations [93, 94, 95, 96, 97, 98, 99, 100].

Every year the problem of overweight in Ukraine becomes more urgent. According to statistics, only 39.6 % of Ukrainians were normal weight in 2019, while 59.1% of the population was overweight and 24.8% were obese. This is evidenced by the results of the STEPS study on the prevalence of risk factors for non-communicable diseases in Ukraine [101].

Numerous negative consequences of obesity create a number of social and economical and medical problems that need to be addressed using integrated approaches [102, 103, 104, 105].

#### **General trends in the epidemiology of overweight and obesity among young people**

The high prevalence of obesity in the modern world is considered a global non-infectious epidemic, which was declared by the WHO in 1997. Thus, the growth of overweight and obesity is observed in both adults and children regardless of gender, age, race, place of residence and social status. The problem of overweight has become relevant even for countries where a large part of the population is constantly starving. Such a sharp increase in this incidence is largely due to negative changes in the lifestyle of the modern population of the planet. According to the WHO, up to 60 % of deaths are related to destructive behavior. At the same time, the leading positions are occupied by excessive and irrational nutrition, which accounts for 25 % of deaths, 11.9 % of deaths are related to alcohol use, 17.1 % - to tobacco smoking and 6% - to low physical activity [106, 107, 108, 109, 110, 111].

In 2016, the WHO, together with experts from Imperial College London, conducted a study of the prevalence of overweight and obesity in the world. This study is the most comprehensive in the last 40 years. According to the results, more than 1,9 billion adults over the age of 18 were overweight and obese. Thus, the number of adults suffering from obesity increased from 100 million in 1975 to 671 million in 2016. It is noted that the country with the largest number of overweight people

is the United States (38,2 %), and the smallest - Japan (3,7 %). At the same time, WHO experts predict a further significant increase in the number of obese people by 2025 [112, 113, 114, 115].

The most worrying situation is the growing number of overweight and obese children and the shift in the peak of childhood obesity in the early ages compared to previous years. According to a 2016 study, the total number of overweight and obese children was about 41 million children under the age of 5 and 340 million between the ages of 5 and 19. Thus, the prevalence of overweight and obesity among children aged 5 to 19 years increased sharply from 4% in 1975 to 18 % in 2016. In 1975, slightly less than 1% of children and adolescents aged 5 to 19 were obese. 19 years old, and in 2016 their number reached 124 million (6 % of girls and 8 % of boys). This trend exacerbates the epidemic of obesity in adults and poses a growing threat to the health of the next generation [2, 111, 112, 113, 114, 116].

According to national epidemiological studies, up to 40 % of children in developed countries are overweight or obese. For example, in the United States, the average body weight of a child has increased by 5 kg over the past 30 years, and one in three people are overweight or obese in the pediatric population [112, 117, 118, 116]. In Europe, the incidence of overweight, including obesity, varies from 7-8% in Norway to 36 % in Italy and 40 % in Greece [2, 111, 112, 113, 119, 120, 121, 116].

Despite the ongoing fight against hunger, an increase in the number of overweight and obese children is also observed in some developing countries (Southeast Asia, a number of countries in Africa). Foreign researchers (Popkin B.M., Adair L.S., 2012) associate this phenomenon with the gradual transition to Western life. As a result, these countries face a double problem: infectious diseases as a result of malnutrition and a sharp increase in the number of chronic diseases associated with obesity. WHO experts emphasize that, according to forecasts, in 2022 the number of obese children and adolescents will exceed the number of their peers suffering from malnutrition [2, 112, 122, 116].

The importance of obesity for modern health care is determined by the threat of disability of young patients and reduced overall life expectancy due to the frequent development of

severe comorbidities. Overweight and obesity lead to diseases such as type 2 diabetes in 80% of cases, in 35 % of cases to coronary heart disease and in 55 % of cases to hypertension in the adult population. It has been found that every third premature death in the world is associated with diseases that are the result of obesity and physical inactivity [123, 124, 125, 126, 127, 100].

Obesity-related diseases are generally the cause of a significant share of the overall burden of disease in the WHO European Region: the Region accounts for more than 1 million deaths and 12 million years of poor health each year. Thus, every 13th death in the EU is due to being overweight. It is proved that this pathology significantly reduces life expectancy: on average from 3 to 5 years with a slight excess of body weight and up to 15 years - with severe obesity. It is determined that if humanity managed to solve the problem of obesity, the average life expectancy would increase by 4 years. For comparison: if the problem of malignant neoplasms were solved, the average life expectancy would increase by 1 year [128, 129, 130, 61, 131, 132].

Being overweight and obese have economic consequences. Numerous studies have been conducted in recent years and attempts have been made to estimate the economic losses due to obesity. Most of these studies looked at cases of medical expenses related to illness (direct costs), while some studies looked at costs associated with loss of productivity (indirect costs).

There is much less scientific data on the individual costs of obese people and their families, such as the cost of home care, special clothing or weight loss products. According to a WHO study, direct spending on obesity care accounts for a total of 2-4 % of national health spending. In line with the steady growth of this problem, health care expenditures are projected to increase to 6 % of national expenditures in the WHO European Region [132, 133, 134, 135, 136, 137, 138].

The health care of economically developed countries is just beginning to develop approaches to the prevention and treatment of obesity that correspond to modern ideas about the origin of this disease. Thus, the main directions for the complex solution of the problem were formed and the corresponding programs were adopted [139, 140, 115, 141].

In 2004, the World Health Assembly adopted the WHO Global Strategy on Nutrition, Physical Activity and Health. The strategy lists the necessary measures to support healthy eating and regular physical activity and calls on all stakeholders to take action at the global, regional and local levels to improve nutrition and physical activity. The political declaration adopted in September 2011 at the high-level meeting of the UN General Assembly on the prevention and control of noncommunicable diseases recognizes the importance of reducing the prevalence of unhealthy diets and low physical activity. The declaration reaffirms its commitment to the further implementation of the WHO Global Strategy on Nutrition, Physical Activity and Health, including through policy action and action to promote healthy eating and physical activity among the general population, as appropriate. WHO has developed a "Global Plan of Action for the Prevention and Control of Noncommunicable Diseases 2013-2020" in the framework of the commitments made in the UN Political Declaration on Noncommunicable Diseases (NCDs), approved by the Heads of State and Government in September 2011. The Global Plan of Action will contribute to progress towards the 9 global targets for noncommunicable diseases by 2025, including a 25 % reduction in premature deaths from NCDs and a stabilization of the global obesity rate in 2010. The World Health Assembly approved the report of the Committee on the Elimination of Childhood Obesity (2016), which contains six recommendations for combating conditions that contribute to obesity and critical periods of life that should be addressed. In 2017, the World Health Assembly reviewed and approved a plan to implement the commission's recommendations, prepared as a guide for further action at the country level. Regular physical activity is key to the prevention and treatment of non-communicable diseases, including heart disease, stroke, diabetes and cancer. At the same time, according to the WHO, every fifth adult in the world and 4 out of 5 adolescents aged 11-17 are not physically active. That is why the World Health Organization has developed a "WHO Global Plan of Action to Increase Physical Activity for 2018-2030" [142, 143, 144, 115, 145].

In order to implement programs in some countries around the world, studies have been

conducted to study the incidence of overweight and obesity, diet and physical activity among the general population and its subgroups, depending on age, sex, social and economic status and place of residence, and interventions were also carried out at various levels [146, 147, 148, 149, 150, 151, 152, 153].

Solving the problem of obesity in the world is to increase the quality and length of life, reduce morbidity and mortality, save huge amounts of money that society now spends on obesity and its complications [154, 155].

The urgency of this problem is also increasing in low- and middle-income countries, where the incidence of overweight and obesity in children is much lower than in developed countries. Until recently, there were virtually no large-scale epidemiological studies of obesity among children and adolescents in Ukraine. Despite the fact that in recent years in some regions significant progress has been made in studying the epidemiology of alimentary-dependent diseases, including obesity in children and adolescents, the diagnostic process for this type of pathology is ineffective. Thus, the prevalence of obesity in Ukraine in 2017 was 13.4 %, with a negative trend over the past 2 years. According to official statistics, in our country the highest incidence of pathology is observed among adolescents, with a moderate tendency to annual growth in this age group (from 21,9 in 2010 to 28,3 in 2015 per 1 thousand children aged 15-17 years inclusive) against the background of a gradual decrease in the prevalence of obesity among adolescents (from 11,4 in 2010 to 10,8 per 1 thousand children aged 0-14 years inclusive) [156, 157, 158, 159, 160].

Insufficient level of registration of obesity in Ukraine is due to the imperfection of the existing system of prevention of alimentary-dependent diseases and its information and communication support, lack of unified and standardized programs for early detection of overweight in children and related health disorders, accounting such children and medical supervision of them. This is the reason why the awareness and vigilance of the population of our country on this issue is low. In many families, obesity is not considered a disease, but rather a sign of children's health, especially boys. Therefore, children and adolescents often have complications due to premorbid conditions associated with obesity and the reason for seeing

a doctor is not overweight, but complaints related to the development of obesity complications: headache, shortness of breath, dizziness, thirst, pain in legs, sexual dysfunction. It was found that only 5,5 % of children with obesity of the I degree see a pediatrician, while among all obese patients they make up at least 65 % [161, 162, 163].

The International Consensus on Childhood Obesity states that early intervention, including diet, change in eating behavior and physical activity, is recommended to prevent the development of complications. It is known that the effectiveness of techniques used to treat this disease is low, and drugs are practically not used in children under 12 years of age. [164, 165, 166, 3, 139, 167, 6, 168] Important measures to address this problem in Ukraine in accordance with the current strategy are the study of the child's environment and lifestyle of families with children, statistics on the health of children with EBM with further organization of prevention and treatment using health technologies that affect on the lifestyle and health of children [169, 170, 95, 155, 172, 173, 174, 175].

#### **Features of the formation of excess body weight in children and adolescents**

It is known that the basis for the development of exogenous constitutional obesity is an energy imbalance, which is a mismatch between the number of calories that come with food and energy expenditure of the body [176].

Among the causes of childhood obesity are genetic (defects of certain genes that affect the rate of metabolism), metabolic, hormonal and external factors that cause failure of the mechanism of regulation of energy balance and disease development. When assessing the risk factors for obesity, it is necessary to take into account the child's belonging to a certain age, sex, race and ethnic group. [177, 178, 179, 180, 181, 182]

Leading factors in overweight and obesity in children are eating disorders and sedentary lifestyle. Numerous eating disorders include unbalanced diet, overeating, eating fast food, eating disorders and irregularities, lack of breakfast or the so-called "night" eating syndrome and eating disorders. Because the modern market is full of foods not recommended in children's diets, children often consume too many calories due to lack of vegetables and fruits. In addition, parents do not always monitor

the child's diet during the day or encourage delicious food [182, 183, 156, 184]. An additional factor of social influence is an active advertising campaign with the promotion of high-calorie products [185]. Sedentary lifestyle in most cases is due to the fact that today children and adolescents widely use electronic devices necessary not only for entertainment but also for learning [186, 187, 188, 189, 190, 191].

Socio-economic factors play a very important role in the development of obesity, even in young children. These include low level of education and profession of parents, social status, single-parent family, number of children in the family (the frequency of overweight is much lower in large families). Obesity is more common among people with low socio-economic and educational levels. These factors determine dietary preferences, physical activity, family traditions, awareness of healthy lifestyles, the dangers of obesity to health and methods of prevention, and others. Low family incomes can be one of the barriers to a healthier diet and active recreation, sports [192, 193, 194, 195, 196].

The development of the disease can also be influenced by psychological factors: stressful situations, mental trauma, negative emotions and lack of interesting activities. Such circumstances can provoke excessive eating, lack of exercise and excessive weight gain [88, 197]. The "intrauterine programming" of the energy balance of the organism is determined. In the perinatal period, the following markers of obesity are distinguished: acute and chronic diseases, threats of abortion at different stages of gestation, preeclampsia, fetoplacental insufficiency, as well as other causes of chronic fetal hypoxia during pregnancy, overweight and inadequate maternal nutrition, burdened obstetric anamnesis [70, 198, 199, 200]. Predictors of obesity in neonatal and infant age are insufficient or overweight of the child at birth [201, 202], the duration of breastfeeding and others [203, 204]. Studies have shown that breast milk contains hormones that potentially prevent obesity in children. At the same time, artificial feeding, on the contrary, has a negative impact. Thus, according to research, it was found that the level of protein in the diet of infants was significantly correlated with an increase in body mass index. Based on this, the

mechanism of possible action of excessive protein intake was suggested: high nutrient levels are accompanied by increased plasma levels of insulin-induced amino acids, which stimulate insulin secretion and insulin-like growth factor 1, which increases the proliferation and differentiation of adipocytes and causes the development of obesity in the future. Other studies have shown that eating unadapted dairy products in infancy leads to higher values of body weight and length, from 6 months to 4-9 years of age. According to some data, the addition to the child's diet of any solid foods in the absence of grain-based foods up to 6 months of age is a risk factor for obesity in the future, especially for children with a burdened anamnesis. Thus, the detection of markers of obesity in the neonatal period and early childhood is important for the timely assessment of predictors of obesity in adolescents [205, 206, 207, 208].

Data from a nationally representative German study to identify possible determinants of childhood obesity have shown a direct link between overweight in children and parental obesity. The risk of developing obesity is doubled in children if both parents are obese. At the same time, the results of studies of familial predisposition such as childhood obesity indicate a lack of consensus on the importance of genetic factors. The child's body weight depends on the complex interaction of the genetic background with environmental factors. It is estimated that the genetic background explains about 40% of the differences in body weight. The factor of parental obesity is one of the main factors in the formation of excess body weight in children, primarily due to the similarity of the food stereotype [209, 210, 211].

Recently, there has been a steady increase in the number of patients suffering from various types of eating disorders. It was found that in 30-40% of cases of obese patients, certain disorders are registered, among which the most common are: hyperphagic reaction to stress, compulsive hyperphagia, carbohydrate thirst and premenstrual hyperphagia. Therefore, an important role in the prevention of overweight belongs to the identification and elimination of factors that cause these disorders. These include genetic, dietary, endocrine, psychological, psychiatric factors and inadequate physical activity. Eating disorders are often combined and in one patient to some extent may be expressed some of them or even all. The latter may

indicate close mechanisms of their origin and development. Thus, with a hyperphagic response to stress and compulsive hyperphagia, patients periodically consume large amounts of food, often high-calorie, sweet and fatty. However, in the first case, the cause of the stress is realized, and in the second - no. Because the stress factor can last for a long time, excessive food intake can gradually lead to obesity. As a type of compulsive hyperphagia, nocturnal hyperphagia is considered, so-called carbohydrate thirst or food thirst - an imperative increase in appetite in the evening and at night. The term "carbohydrate or food thirst" is used if patients need to eat both sweet and fatty foods - chocolate, ice cream, cream, etc. In this case, the brain releases large amounts of endorphins and food is similar in effect to a drug. In its absence, patients develop a severe depressive state, reminiscent of abstinence, while the consumption of sweet foods, these phenomena disappear. Premenstrual hyperphagia is also characterized by a predominance of sweet and fatty foods and can occur in some women for 4-7 days before menstruation. It is important to note that the presence of eating disorders is one of the significant predictors of weight gain after its successful reduction [212, 213, 214].

Today, the EAT-26 Adaptation Questionnaire and the Dutch Food Behavior Questionnaire (DEBQ) are widely used to diagnose eating behavior. However, it should be noted that the reliability of the relationship between such conditions and the development of obesity in most cases is observed in adults. Adolescents with normal body weight can often be overwhelmed by emotional and / or restrictive eating habits due to youthful maximalism and the influence of fashion and the media. Children under the age of 12 almost never have significant increases in emotional overeating, as they usually find a more direct way to express their emotions [215].

The peculiarity of studying the mechanisms of development and formation of obesity in children is that, in addition to the main causes of overweight, it is necessary to take into account the age periods: children and adolescents.

Critical periods of overweight in children are actively discussed in the literature. Thus, we can distinguish three main periods: early childhood, prepuberty and adolescence. In the 1st year of life, overfeeding is the cause of an

increase in the number of adipocytes, but not their size. With timely and competent correction of the diet during this period, a successful outcome is possible. In prepuberty (5-7 years), obesity can be recurrent and often persistent, because during this period the excessive number of adipocytes does not decrease and creates a reserve for fat depots. More than 60 % of overweight children before puberty will be overweight in early adulthood, reducing the average age of noncommunicable disease detection and increasing the burden on health services, which must provide treatment for the most part. Adult life of these children. During adolescence, the vast majority of overweight adolescents retain it in adulthood. This obesity is largely due to the restructuring of the neuroendocrine system associated with puberty and often forms the so-called hypothalamic syndrome of puberty. Puberty is a transitional period between childhood and puberty. It is during this period that a number of changes occur that lead to physical, psychological and reproductive maturity of the organism. Biological changes during puberty are regulated by neurosecretory factors and hormones that accelerate somatic growth, development of the gonads, their endocrine and exocrine functions. Excess adipose tissue leads to dysfunction of the hypothalamic-pituitary-gonadal system in adolescence, and this disrupts the formation of reproductive function. Periods of critical weight gain in girls - 9, 10 and 12 years, in boys - 7, 13 years, which corresponds to the age of initiation of sexual development. Both girls and boys have a maximum prevalence of overweight at 12-13 years of age.

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As you grow older, the number of overweight children decreases, which is associated with the physiological peak of growth in 14-16 years, but formed and rooted at this age, the nature of nutrition and lifestyle can later lead to obesity [216, 114, 218].

The medical and social significance of obesity and overweight determines the need for research in this area. At the same time, the official documentation of medical institutions does not reflect the actual prevalence of obesity and overweight among young people today, so identify the true prevalence of obesity among young people in the Kharkiv region, with further study of potential risk factors and quality of life, the organization of medical care for young people is relevant. Addressing these challenges will help improve the quality and effectiveness of prevention among young people.

In this regard, research is devoted to one of the most important scientific and practical tasks of modern health care - the prevention of obesity and overweight among young people.

### Declarations

#### Statement of Ethics

The author has no ethical conflicts to disclose.

#### Consent for publication

The author gives her consent to publication

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The data can be requested from the author.

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