



## Metabolic Syndrome in the Context of Evolutionary Development, Modern Methods

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### Resuem

Metabolic syndrome is a serious public health problem due to its high prevalence, increasing treatment costs and adverse consequences. Despite the fact that obesity has accompanied mankind since the appearance of man, it was recognized as a disease with certain pathophysiological consequences about 100 years ago [1-3].

Metabolic syndrome as a term does not occur until the XVII century, and then it can only be seen in the literature to describe excessive fullness [4]. The impact of obesity on the quality of life began to be assessed in the XVIII century, in the middle of the nineteenth century it was recognized as the cause of deterioration of health, and in the first decades of the twentieth century its complications and connection with increased mortality were documented [1-3, 5]. The exponential increase in morbidity at the present time and accumulating scientific data prompted the World Health Organization to declare obesity is a global pandemic and a global public health crisis [6, 7]. According to WHO data, in 2009, about 2.1 billion people in the world were overweight or obese, while in Russia, 51.7% of women and 46.5% of men among people with such a diagnosis. By 2016, this indicator has grown and is already 57% (and this is more than 82 million people!). According to 2017 data, every second adult and every sixth child is overweight or obese. The United States leads in terms of obesity — 38.2% of the population has this diagnosis; the lowest figure is in Japan — 3.7%. According to the study, women with a lower level of education are 2-3 times more likely to be obese compared to more educated representatives of the weaker sex.[1] According to the study, women with a lower level of education are 2-3 times more likely to be obese compared to more educated representatives of the weaker sex.[1] According to etiology, there are: alimentary-constitutional (primary) accounts for 90-95% of all cases, is a consequence of lifestyle — reduced physical activity, consumption of fatty high-calorie foods, foods high in sugar and refined carbohydrates. Endocrine obesity (secondary) — its cause may be endocrine pathology (decreased thyroid function, hypogonadism, "empty" Turkis saddle syndrome, pituitary tumors, Cushing's syndrome, etc.), genetic defects in the structures of regulation of fat metabolism, mental illness. Lifestyle also plays a significant role in the pathogenesis of secondary obesity.[2]

Hypothalamic obesity associated with the presence and treatment of hypothalamic tumors belongs to the same group. Causes of obesity in children Obesity in children develops with a genetic predisposition in combination with perinatal, environmental, psychosocial and dietary factors. However, the main reason for obesity is that a child consumes more calories than he expends energy. Symptoms of obesity The main complaint of patients is overweight. Among other complaints: shortness of breath during exercise, increased blood pressure, dry mouth, menstrual cycle disorders in women, loud snoring in sleep, increased daytime drowsiness, joint pain, decreased potency in men, etc.

Paeogenesis: Hereditary factors (25-70%);

1. Excessive consumption of fatty and high-calorie foods, sugar, refined carbohydrates, alcohol, mainly in the evening;
2. Violation of eating behavior, which is determined by family and national stereotypes of nutrition. Mental activity and eating habits are closely interrelated, so there is an assumption that one of the causes of obesity is a violation of serotonin metabolism and endorphin reception. Thus food (especially carbohydrate) is a kind of "doping", so you can draw a parallel between obesity (by the type of psychological dependence) and drug addiction or alcoholism. Perceiving food intake as a means of calming down in stressful situations, many people demonstrate a hyperphagic reaction to stress.
3. Low physical activity. As a result of a sedentary lifestyle, lack of regular physical activity (especially aerobic — walking at a moderate pace of 30-40 minutes 3-4 times a week, running, cycling, swimming, etc.), the body's energy consumption decreases, and in combination with a high calorie diet, all this contributes to weight gain;
4. Insulin resistance plays a crucial role in the development of obesity and metabolic syndrome, being the cause of obesity and type 2 diabetes mellitus. Insulin is a hormone that ensures the normal course of metabolism and supports energy balance by inhibiting the formation of glucose by the liver and increasing its absorption by muscle and adipose tissue.

### **Classification and stages of obesity development**

Today, the classification adopted by WHO is used, which is calculated according to the Body Mass Index (BMI) (weight in kg / height m<sup>2</sup>). According to this classification, normal body weight corresponds to a BMI of 18.5–24.9; excess — a BMI of 25-29.9; obesity of the 1st degree corresponds to a BMI of 30-34.9; obesity of the 2nd degree corresponds to a BMI of 35-39.9; obesity of the 3rd degree (morbid) – with a BMI above 40. There are 2 main types — android (by the type of "apple", as a rule, observed in men — fat deposition mainly in the upper abdomen) and gynoid (by the type of "pear", observed in women — fat deposition in the hips and lower abdomen). Fat deposition according to the "apple" type is less favorable, since visceral obesity (fat deposits around internal organs) is more often observed with this type of obesity, which contributes to an increased risk of concomitant diseases. A sign of visceral obesity is considered to be a waist size of more than 80 cm in women and more than 94 cm in men. Also, the ratio of waist to hip volume should normally be no more than 1.0 for men and 0.85 for women. Recently, the term "sarcopenic obesity" has been used — it is accompanied by a loss of muscle mass and muscle strength; it can often be found in elderly people. Loss of muscle mass in combination with obesity is fraught with the development of type 2 diabetes mellitus, cardiovascular diseases, a decrease in the patient's quality of life and disability.[6]

Complications of: Obesity is one of the significant factors that contribute to the development of metabolic syndrome. Its signs are: visceral obesity; disorders of carbohydrate and lipid metabolism; arterial hypertension. Metabolic syndrome is often accompanied by: cardiovascular diseases; diabetes mellitus; non-alcoholic fatty liver disease (NAFLD); gallstone disease; polycystic ovary syndrome; obstructive sleep apnea syndrome; joint diseases (osteoarthritis, gout); increased risk of cancer (for example, studies have revealed a link between metabolic syndrome and insulin resistance with prostate cancer).[7][8] It is impossible not to take into account the traditional upbringing for many peoples with the awarding of sweets to children as a reward for good behavior. Since eating behavior is closely related to mental activity, it is assumed that changes in this area may be associated with disorders of serotonin metabolism and endorphin reception. In this case, the use of carbohydrate products is a kind of doping, and obesity has similarities with diseases such as alcoholism and drug addiction. Many people use such an undeniably pleasant procedure as eating to calm down in difficult life situations (hyperphagic reaction to stress).

Clinical picture. Obesity is often accompanied by depressive disorders, anxiety, violations of interpersonal and social contacts. An obese person is subjected to varying

degrees of discrimination, especially severe in adolescence. Low self-esteem hinders harmonious social and personal development. With dynamic long-term monitoring of the life of obese adolescents in comparison with other children suffering from chronic diseases, it was noted that overweight girls were significantly less likely to create a family, the annual income of former obese adolescents was significantly lower. Thus, obesity, more than many other chronic diseases, hinders the full life of young people. As with any other disease, the examination of an obese patient begins with a survey and anamnesis collection, while the anamnesis may have some deviations from the real picture of events, and complaints may be vague. [10]The range of complaints is quite large: from overweight as an aesthetic problem to characteristic manifestations of diseases often associated with obesity (coronary heart disease, diabetes mellitus, circulatory insufficiency) and nonspecific symptoms (apathy, drowsiness, fatigue, tendency to constipation, joint pain). Despite the fact that patients almost never complain of increased appetite, it is necessary to try to clarify the nature of the patient's diet. Possible solutions to the problem are to ask the patient to tell about the food being eaten and about the frequency of its intake, as well as about the time of the last meal during the day. You can ask the patient to provide records of the food eaten in the last 2-5 days. This is a longer, but also more effective way.

The anamnesis typical for a patient with exogenous constitutional obesity is as follows. Patients are convinced that they eat little, and emphasize that they do not eat at all in the morning. The cup of coffee they drink with sugar (B0 kcal) and a sandwich with cheese and butter (A00 kcal) are usually not counted as food. At work, patients begin to "snack". This is usually a high-calorie food with a high fat content.

Often, patients chew while working automatically, without noticing it; they eat when they are agitated, before going to bed and at night. The set of products is usually standard, people consume essentially the same products 5-6 times a week (in the Russian version — fried potatoes with smoked sausage as a traditional late dinner), and correction of eating behavior could give good results. Patients are not aware of the real caloric content of alcoholic beverages.

The assessment of physical activity is of fundamental importance.[9] Obese patients usually underestimate the calorie content of the food they eat and overestimate their physical activity. For an unclear reason, people with insulin resistance and their closest relatives have reduced exercise tolerance, which creates a prerequisite for the development of obesity. Taking part in game sports, obese people often remain relatively sedentary.[12]

The first stage of examination of a patient with obesity is to assess the nature of obesity (abdominal or buttock-femoral). To do this, the ratio of the waist circumference to the hip circumference is investigated (see earlier). The examination is investigated (see earlier). The examination is primarily aimed at finding clinical manifestations of diseases in which obesity is one of the symptoms;

in other words, a search is underway for symptomatic forms of obesity (hypothyroidism, hypercorticism, etc.). At the same time, it must be remembered that obesity itself leads to a deterioration in the activity of the gonads, hypothalamic-pituitary system and adrenal glands. Thus, many of the detected symptoms can be attributed to both suspected primary disorders and secondary disorders. For example, the so-called Behr symptom (the symptom of "dirty elbows" - hyperkeratosis and darkening of the skin on the elbows) is equally characteristic of hypothyroidism and obesity [11]. In patients with android type of obesity and with advanced gynoid obesity, the function of sweat and sebaceous glands is often increased, therefore the skin of patients is moist, greasy, with pustules, eczema, pyoderma, furunculosis. Inguinal and umbilical hernias are typical.

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"Hypothalamic" stigmas of obesity: cyanotic striae, pigmentation in places of friction, black acanthosis, skin impurity — in the 50s and 80s were regarded as signs of primary hypothalamic lesions, and in these cases, the diagnosis of neuroendocrine form of hypothalamic syndrome was often established. Currently, it has been shown that the formation of obesity is part of the so-called metabolic syndrome, or syndrome X (see chapter 10). This syndrome was also called the "deadly quartet" (upper type of obesity, impaired tolerance to carbohydrates, hyperlipidemia, arterial hypertension). Other components of the metabolic syndrome are hyperuricemia, atherosclerosis, coronary heart disease, diabetes mellitus.[11]

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