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Living Well: Understanding the Tapestry of Obesity Risks

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Abstract: Obesity is an important health problem in many countries. Obesity is currently considered as a multifactorial, chronic, relapsing disease associated with the development of a number of diseases that reduce a person's life expectancy and reduce its quality. Obesity has become so widespread that it has pushed into the background the problem of malnutrition in the population of underdeveloped countries and even infectious diseases, although the last two items were previously considered the main threats to human health.

Keywords: obesity, healthy lifestyle, risk factors.

Relevance. Obesity poses a threat to the health of populations in many countries, with its prevalence surpassing issues like malnutrition and even infectious diseases in less developed regions. Recognized as a disease, obesity adversely affects nearly all body systems [1].

In most countries, obesity has become a major risk factor for the development and progression of chronic non-communicable diseases [43], largely due to its continually increasing prevalence [30, 44].

Excess weight and obesity are risk factors for metabolic syndrome, emerging as a significant global health concern for both children and adults in nearly all countries. Metabolic syndrome comprises a cluster of cardiometabolic disorders, adding to the risk of cardiovascular diseases and type 2 diabetes. It is more prevalent in individuals with excess body weight, affecting a small percentage (3–4%) of young individuals with normal body weight and 26–50% of children and adolescents with obesity [6].

Recent data indicates that approximately 65% of the working-age population in the country is overweight, including varying degrees of obesity. High rates of obesity and excess weight are also noted among children and adolescents. The social significance of this issue is evident in the threat of maladaptation, disability in young and middle-aged patients, and reduced life expectancy due to the frequent development of associated diseases. In contemporary society, addictive disorders, including those related to eating behavior, have become widespread, posing a serious medical, social, educational, and psychological problem [51].

Obesity plays a significant role in the pathogenesis of comorbid conditions such as type 2 diabetes, hypertension, non-alcoholic fatty liver disease, metabolic syndrome, and various cancers. Additionally, obesity may contribute to musculoskeletal disorders, obstructive sleep apnea, depression, behavioral disorders, disruptions in sexual maturation, and reproductive dysfunction [29]. The issues of obesity and excess weight have not only medical and

psychological but also social and economic consequences, leading to increased healthcare expenditures and reduced productivity, efficiency, and income levels [7].

Furthermore, obesity can generate social and economic consequences, triggering pathological conditions that contribute to copulative and reproductive failure in young men (up to 60% of relevant pathological conditions) and complicating the realization of reproductive function in women with excess weight [2, 12, 24]. In the United States, more than half the population has a body mass index (BMI) exceeding the norm, with similar trends in the UK (51%), Germany (50%), China (15%), and Japan (16%). In Russia, obesity and excess weight prevalence among adults ranges from 20.5% to 54% according to various sources [8, 27].

Obesity and metabolic syndrome are widely recognized as sources of chronic inflammation, associated with the production of proinflammatory cytokines and an increase in acute-phase proteins. One of the pathogenetic mechanisms of obesity is insulin resistance, which can subsequently lead to impaired β-cell function, disturbances in carbohydrate metabolism, including the development of diabetes. The implementation of national quarantine measures during the current pandemic contributes to increased sedentary behavior and stress levels, negatively impacting changes in population eating habits, creating a vicious circle and promoting weight gain [11].

Today, especially in countries with low to medium levels of economic development, several classes of opposing problems manifest simultaneously: issues arising from insufficient nutrition coexist and exacerbate problems caused by obesity. In such states, one part of the population suffers from hunger and diseases related to malnutrition, while another part suffers from obesity and its associated conditions. The rising prevalence of obesity requires the adoption of all possible measures to curb it. Considering that obesity in 95–99% of cases is exogenously constitutional, influenced by environmental factors in the presence of a genetic predisposition to weight gain, the impact of lifestyle and habits on the population is crucial [20].

The significant increase in obesity prevalence in the last 30 years is a result of cultural and environmental influences. Researchers attribute the growing imbalance between consumed and expended calories to high-calorie diets, disrupted eating behaviors, larger portion sizes, sedentary lifestyles, and low physical activity [16, 25, 40].

The mechanisms underlying the formation of arterial hypertension (AH) in obesity are currently the subject of numerous studies. It has been concluded that the distribution of adipose tissue, characterized by the predominance of abdominal visceral adipose tissue (VAT), is the most important factor in increasing blood pressure in individuals with excess weight and obesity [13, 32, 35, 48].

According to modern views, obesity is a chronic metabolic disorder resulting from an imbalance between energy intake and expenditure. It manifests as excessive development of adipose tissue, progresses naturally, has specific complications, increases the risk of various diseases, and has a high probability of recurrence after completing a course of treatment [3, 21]. The increase in body mass index (BMI) correlates with population mortality [33, 39, 42]. The global average level of premature mortality from obesity is 60 cases per 100,000 population [36].

In a large population study conducted in Sweden, symptoms characteristic of irritable bowel syndrome (IBS) were significantly more frequently registered in individuals with obesity (OR 1.58, 95% CI 1.05, 2.38) [31]. Similar results were obtained in a large population study conducted in Australia [49]. In a study by R. Sadik et al. (2010), it was shown that the severity of IBS symptoms was directly correlated with the BMI of patients [4, 47].

The increase in adipose tissue primarily occurs not by increasing the number of cells but by enlarging their size. Mature fat cells do not divide; their size increases due to the storage of fatty acids in lipid droplets within the cytoplasm in the form of nonpolar triglycerides. As obesity progresses, there is an increase in the number of adipocytes from their precursors, preadipocytes.

Preadipocytes migrate to adipose tissue from the bone marrow under the influence of imperative proliferation factors, which include saturated and monounsaturated fatty acids [18].

The gradual accumulation of triglycerides in fat cells initiates a biological proliferation reaction. Further accumulation of triglycerides leads to excessive enlargement of lipid droplets and, consequently, disruption of the function of cellular organelles. This results in the formation of endoplasmic reticulum stress syndrome and the accumulation of non-physiological proteins that disrupt cell function [22]. Further triglyceride accumulation causes the fat cell to exceed its physiological size, triggering the apoptosis program [28].

It is widely acknowledged that obesity is an independent risk factor for socially significant chronic diseases such as type 2 diabetes, atherosclerosis, coronary artery disease (CAD), and arterial hypertension. Cardiovascular diseases currently lead the causes of death in developed countries. However, according to some predictions, by 2030, oncopathology may take their place. Over the last 10–15 years, it has become increasingly clear that obesity is also a risk factor for certain types of cancer. The first official report on the causal link between cancer and nutrition, based on data from over 100 experts, was published by the World Cancer Research Fund in 1997 [26, 38].

The formation of apoptotic bodies occurs – biological "garbage" with a large molecular mass. Their accumulation in the intercellular environment activates several biological functions, including an inflammatory reaction. In paracrine cell communities of loose connective tissue, cells enhance the synthesis of primary humoral mediators of inflammation [41]. This leads to the development of a systemic inflammatory response, compensatory proinflammatory protection syndrome, and the synthesis of secondary mediators of inflammation – acute-phase proteins [46]. Thus, foci of chronic aseptic inflammation are formed [17]. The biological reaction of aseptic inflammation in adipose tissue is one manifestation of obesity [50].

Adipose tissue functions as an endocrine organ, secreting various biologically active substances involved in regulating carbohydrate metabolism (adiponectin, resistin), lipid metabolism (cholesterol ester transport protein inhibitor), aseptic inflammation (TNF-α; IL-6, IL-8, C-reactive protein, monocyte chemotactic protein), hemostasis (plasminogen activator inhibitor 1 inhibitor), blood pressure regulation (angiotensin II, angiotensinogen), and appetite control (leptin) [37]. Additionally, adipose tissue is a source of steroid hormone synthesis. Under the action of enzymes, it converts androgens into estrogens, dihydroepiandrosterone into androstenediol, estradiol into estrone, and so on [14, 45].

Annually, at least 2.8 million adults die due to excess body weight or obesity. Additionally, 44% of diabetes cases (DM), 23% of ischemic heart disease cases (IHD), and 7-41% of oncological cases are attributed to excess body weight and obesity. An increase in body weight by 1 kg raises the risk of developing cardiovascular diseases (CVD) by 3.1%, and type 2 DM by 4.5-9% [3]. The risk of developing arterial hypertension (AH) is three times higher in individuals with obesity compared to those with normal body weight. Elevated mortality rates and the frequency of cardiovascular complications are primarily due to vascular damage, as obesity is a significant factor predisposing to atherosclerosis, AH, and sudden death. Furthermore, the independent impact of obesity on the cardiovascular system may be explained by its influence on myocardial function and structure, increased cardiac output, development of eccentric hypertrophy of the left ventricle, dystrophic disorders, and the onset of congestive heart failure [9].

According to modern views, metabolic syndrome is a complex of metabolic, hormonal, and clinical disorders closely associated with obesity, type 2 diabetes, and factors contributing to the development of cardiovascular diseases, with insulin resistance at its core. Components of metabolic syndrome currently include abdominal (visceral) obesity, diabetes, and other glucose tolerance disorders, arterial hypertension, atherogenic dyslipidemia, hyperuricemia, non-alcoholic fatty liver disease, disorders of fibrinolytic activity, hyperandrogenism, and polycystic ovary syndrome in women, as well as hypoandrogenism in men, hyperuricemia,

microalbuminuria. The list of pathological conditions associated with this term is steadily growing [5, 19, 23].

It is anticipated that implementing strategies will contribute to achieving several global goals in the fight against non-communicable diseases by 2025, including a 25% reduction in premature mortality and stabilization of global obesity rates. The increasing prevalence of obesity requires the adoption of all possible measures to curb it. Considering that obesity in 95–99% of cases is exogenously constitutional, influenced by environmental factors in individuals with a genetic predisposition to weight gain, the impact on the level and lifestyle of the population is of great importance [20].

High-calorie diet, increased portion size, disrupted daily eating rhythm, sedentary lifestyle, chronic stress, and increasingly diagnosed eating disorders are the main factors contributing to the development of obesity. Therefore, the hereditary predisposition to obesity is realized under the influence of these factors [10, 34].

Conclusion. Thus, obesity is currently a significant social problem. Most individuals with excess weight or prone to obesity suffer not only from diseases and mobility restrictions but also experience low self-esteem, depression, emotional distress, and other psychological problems. Changes in the lifestyle of modern individuals, a sharp decrease in physical activity, consumption of high-glycemic-index foods, disrupted eating patterns, genetic predisposition contribute to an increase in the number of individuals with obesity and, consequently, metabolic syndrome.

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