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THE ROLE OF UNBALANECED DIET IN METABOLIC SYNDROME PROGRESSION

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***Abstract.** This review is devoted to analysis of recent data concerning the role of unbalanced diet in metabolic syndrome progression. The impact of unbalanced diet on lipids and carbohydrates metabolism is demonstrated. The mechanisms of obesity and insulin resistance in the course of metabolic syndrome are discussed. The results of research confirmed that unbalanced diet can be regarded as a risk factor of metabolic syndrome progression associated with insulin resistance, BMI increase and obesity due to organism insensitivity to leptin.*

***Key words:** metabolic syndrome, unbalanced diet, insulin resistance, body mass index, lipids metabolism, leptin*

Adherence to unbalanced diet can cause the pancreatic beta-cells dysfunction leading to carbohydrates metabolism impairment and insulin resistance. The adaptation of an organism to the high content of lipids and carbohydrates in a diet is accompanied by early oxidative stress and changes in expression genes that regulate lipids metabolism promoting MS progression

Introduction.

Metabolic syndrome (MS) is accepted to be the issue of the day as one of predictors of contemporary diseases progression such as atherosclerosis, cardiovascular pathology, diabetes mellitus type 2, cerebral hemorrhage, and others widespread noninfectious diseases. The frequency of MS among European population from 24 to 75 years old and American adults reaches near 35 per cent [1, 2]. For the diagnostics of MS three from the five following risk factors must be present in a person: enhanced blood sugar (>5,6 mmol/L fasting), reduced concentration of LPHD (male – <1,0 mmo/L, female – 1,3 mmol/L), elevated level of triglycerides ($\geq$ 1,70 mmol/L), increase in waist circumference (female – > 80 cm, male – > 94 cm), and

elevated blood pressure (≥130/≥85 mm Hg) [1]. It is quite clear, that the mentioned factors are dependent the most of all on person's diet pattern and life style. On the other hand, there is a strong tendency for improving the concept about the influence of different nutritional systems on human heath as well as the role of nutrients and food products in healthcare.

Purpose.

This research purposed to analyze scientific data in order to find out the criteria of a balanced diet pattern and to assess the impact of unbalanced diet on the MS progression.

Methods.

There was conducted the analysis of scientific publications evaluable in databases PubMed, Scopus and Web of Science which reported the results of investigations with the emphases on the interplay between unbalanced diet and MS progression as well as recommendations concerning the healthy diet. Our research was concentrated on the influence of dietary patterns on body mass index (BMI), insulin resistance and adipose tissue metabolism.

Results.

Multiple experiments and clinical observations have revealed that the prevalence of certain food products in a diet can prevent some widespread noninfectious diseases progression and yet has a positive effect on the state of health, contributes to long-lasting health preservation [3, 4, 5, 6]. There were elaborated several models of healthy nutrition which aimed the prophylactics of cardiovascular diseases, cognitive disfunctions, diabetes mellitus type 2 and obesity, for instance, DASH – Dietary Approaches to Stop Hypertension, MIND – modified DASH diet for neurodegenerative diseases, etc. In accordance to most of recommendations, the balanced diet along with meet and fish must contain enough quantity of vegetarian products – fruits and vegetables (minimum 400 g per day), including legumes, whole grains and nuts. One of the strictest recommendations is to limit consumption of free sugar less than 10 per cent and lipids less than 30 per cent of total daily energy input with the preference to mono- and polyunsaturated fatty acids. Trans-lipids are

recommended to be avoided with the amount less than 1 per cent of total energy input. The industrially-produced trans-lipids in a diet are prohibited. Salt consumption is also recommended to be limited by less than 5 g daily with the control of sodium and potassium in meal, due to the fact that high sodium and low potassium intake may contribute to increase in blood pressure and promote the hypertension.

It was revealed that unbalanced diet results in obesity and MS progression even in individuals with normal body mass [7]. In observation of persons with the signs of unbalanced diet patterns (consumption of sugar-rich beverages) the increase of body weight along with other risk factors of MS was found in 53 per cent of cases, however, in others (47 per cent) the MS was not associated with BMI elevation[8]. In population-based cross-sectional studies the positive correlation between the quantity of fats in diet and MS progression was demonstrated – the frequency of MS was by 39 per cent higher in individuals with fat-rich diet than in ones with low fat consumption [9].

In experiments with rats it was found out that the long-term diet with high content of either fats or proteins promotes MS progression independently on body mass change [10]. Despite that there was no valid correlation between fat-rich diet and body mass, accumulation of lipids in hepatocytes and insulin resistance were demonstrated in experimental animals. The probable mechanism how the disfunctions of adipose tissue and liver promote MS progression is the change in expression of genes which regulate lipids metabolism. Unlikely, in experimental rats which had protein-rich diet the reduction of body mass, the size of subcutaneous adipocytes and blood cholesterol concentrations in were found. These changes were accompanied by increase in size of kidney (with normal creatinine), elevation of blood insulin and enhanced level of proinflammatory interleukin TNF-α, which revealed dysregulation of metabolic pathways and can increase the risk many pathologies, first of all – renal.

The analysis of data concerning impact of unbalanced diet on insulin resistance confirms that the most of researchers reported the positive correlation between fructose- and fat-rich diets and impairment of carbohydrates metabolism [10, 11, 12,

13]. Experimentally, the diet with high fructose content resulted in early oxidative stress and metabolic disfunction of abdominal adipose tissue, insufficiency of beta-cells of pancreas and insulin resistance in rats [13]. The results of observation demonstrated that in young men (by 30 years old) the adherence to unbalanced diet statistically correlated with insulin resistance, impaired glucose tolerance which are the risk factors of MS and diabetes mellitus[12].

In analyzed publications researchers substantiate multiple mechanisms of unbalanced diet role in progression of obesity and insulin resistance. One of such concepts suggests that high content of fructose and fat in a diet causes tissues insensitivity to leptin resulting in obesity [14]. One the other hand, the data ambiguity concerning unbalanced diet impact on BMI can be explained by genetic predisposition on an individual to obesity [15].

Conclusion.

The results of research confirmed that unbalanced diet can be regarded as a risk factor of MS progression. Unhealthy diet is associated with BMI increase and obesity in more than 50 per cent of cases which may result from organism insensitivity to leptin. Adherence to unbalanced diet can cause the pancreatic beta-cells dysfunction leading to carbohydrates metabolism impairment and insulin resistance. The adaptation of an organism to the high content of lipids and carbohydrates in a diet is accompanied by early oxidative stress and changes in expression of genes that regulate lipids metabolism promoting MS progression.

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