



**METABOLIC SYNDROME: PATHOGENESIS, CLINICAL SIGNIFICANCE AND
PREVENTIVE APPROACHES**

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Abstract: Metabolic syndrome (MS) is a complex set of pathophysiological conditions characterized by abdominal obesity, insulin resistance, arterial hypertension, dyslipidemia, and disorders of carbohydrate metabolism. In recent years, the prevalence of MS has been sharply increasing both worldwide and among the population of Uzbekistan. The clinical importance of this condition lies in the fact that it is a strong independent risk factor for cardiovascular diseases, type 2 diabetes mellitus, atherosclerosis, and myocardial infarction.

Genetic predisposition, unhealthy diet, insufficient physical activity, stress, and hormonal imbalances play leading roles in the development of MS. Early detection and comprehensive preventive strategies are essential for reducing the burden of cardiovascular diseases.

Keywords: abdominal obesity, cardiovascular diseases, atherosclerosis, diabetes mellitus.

Discussion and Results.

1. Main Pathogenetic Mechanisms

1.1. Insulin Resistance

Insulin resistance is the primary and central pathogenetic mechanism of metabolic syndrome. As a result of impaired insulin action:

- glucose cannot enter the cells;
- compensatory hyperglycemia and hyperinsulinemia develop;
- lipolysis is enhanced;
- free fatty acids increase.

These processes lead to hepatic steatosis, elevated triglyceride levels, and the development of atherogenic dyslipidemia[1].

1.2. Abdominal Obesity

Visceral adipose tissue is metabolically active and produces adipokines such as leptin, adiponectin, TNF- α , and IL-6. Dysregulation of these substances results in:

- amplification of systemic inflammation;
- worsening of insulin resistance;
- development of endothelial dysfunction.

Recent increases in abdominal obesity among women are associated with estrogen deficiency, physical inactivity, and high-calorie nutrition[2]. Metabolic syndrome is a complex cluster of conditions that includes abdominal obesity, insulin resistance, arterial hypertension, dyslipidemia, and disturbances in carbohydrate metabolism. In recent years, the prevalence of metabolic syndrome has risen both globally and among the population of Uzbekistan[3]. The clinical danger of this syndrome lies in the fact that it serves as a strong independent risk factor for cardiovascular diseases, type 2 diabetes mellitus, atherosclerosis, stroke, and myocardial infarction. Genetic predisposition, dietary disorders, sedentary lifestyle, stress, and hormonal changes play significant roles in the development of metabolic syndrome.



At the core of its pathogenesis lies insulin resistance: when cells no longer respond adequately to insulin, glucose cannot enter the cells, resulting in hyperglycemia and compensatory hyperinsulinemia. These mechanisms lead to hepatic steatosis, elevated triglyceride levels, and the development of atherogenic dyslipidemia[4]. Abdominal obesity is also a major contributor to metabolic syndrome, as visceral adipose tissue produces adipokines that promote inflammation. These substances further aggravate insulin resistance, damage vascular endothelium, and accelerate atherosclerotic processes.

Currently, the diagnosis of metabolic syndrome is based on parameters such as increased waist circumference, elevated glucose levels, triglycerides, HDL cholesterol, and arterial blood pressure[5]. The presence of any three of these criteria is sufficient to diagnose metabolic syndrome. Its clinical significance is substantial: the risk of cardiovascular diseases increases several fold, particularly the likelihood of myocardial infarction, stroke, and heart failure. Additionally, a large proportion of individuals with metabolic syndrome develop type 2 diabetes within 3–5 years.

The cornerstone of prevention is lifestyle modification. Balanced nutrition, moderate-calorie dietary patterns, increased physical activity, and achieving 5–10% weight reduction significantly improve insulin sensitivity and normalize metabolic parameters. When necessary, medications such as metformin, statins, ACE inhibitors, ARBs, and GLP-1 receptor agonists may be utilized. Regular screening, weight monitoring, and early detection of dyslipidemia, hypertension, and impaired glucose metabolism are essential for effective prevention[11].

On a population level, the rising prevalence of abdominal obesity among women, increasing lipid abnormalities, and the earlier onset of cardiovascular diseases underscore the relevance of metabolic syndrome as a major public health issue. Therefore, studying the prevalence of metabolic syndrome in local populations, determining the relationship between visceral fat accumulation and lipid profile changes, and developing national preventive algorithms have significant practical and scientific importance[6].

Modern Approaches to Prevention and Treatment

4.1. Non-pharmacological Measures

- **Nutrition:** a moderate-calorie diet with no more than 30% of total calories from fats, complete avoidance of trans fats, and preference for the Mediterranean diet.
- **Physical activity:** at least 150 minutes of aerobic exercise per week.
- **Weight reduction:** losing 5–10% of body weight significantly improves insulin resistance[7,8].

4.2. Pharmacological Approaches

- **Metformin** – reduces insulin resistance.
- **Statins (atorvastatin, rosuvastatin)** – normalize LDL and triglyceride levels.
- **ARB/ACE inhibitors** – preferred drug classes for hypertension management.
- **GLP-1 receptor agonists (semaglutide)** – demonstrate the highest effectiveness in weight reduction (up to 10–15%)[9,10].



Conclusion.

Metabolic syndrome is a widespread, multifactorial condition fundamentally driven by insulin resistance, abdominal obesity, and atherogenic dyslipidemia. Early detection, comprehensive preventive strategies, and individualized management significantly reduce the risk of cardiovascular diseases. The combination of modern pharmacological therapies and lifestyle modifications represents the most effective approach to managing metabolic syndrome.

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