ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

THE RELATIONSHIP BETWEEN METABOLIC SYNDROME AND ARTERIAL HYPERTENSION: PATHOGENESIS, DIAGNOSIS, AND TREATMENT APPROACHES

Mavlonov Namoz Xalimovich

Associate Professor, Department of Internal Medicine in Family Medicine, Bukhara State Medical Institute named after Abu Ali Ibn Sina, PhD

namoz_mavlonov@bsmi.uz

ORCID ID: 0000-0003-0348-9860

Abstract: Metabolic syndrome and arterial hypertension are currently among the most serious and pressing issues in global healthcare. These two conditions frequently coexist and significantly increase the risk of cardiovascular diseases, decreased insulin sensitivity, and the development of type 2 diabetes. This article explores the interrelation between these conditions, their pathophysiological mechanisms, diagnostic criteria, and modern treatment approaches.

Keywords: Cardiovascular diseases, metabolic syndrome, arterial hypertension, insulin resistance, treatment.

Introduction.

Metabolic syndrome (MS) is a cluster of multiple metabolic disorders occurring simultaneously. It typically includes abdominal obesity, elevated blood glucose levels, lipid metabolism disorders (dyslipidemia), and arterial hypertension. Metabolic syndrome is recognized as a major risk factor for serious complications such as cardiovascular diseases, stroke, and type 2 diabetes. Notably, arterial hypertension is one of the core components of this syndrome and requires careful medical monitoring and management.

THE CONCEPT OF METABOLIC SYNDROME AND ITS COMPONENTS

Arterial hypertension is considered one of the key and most dangerous components of metabolic syndrome. According to research, 50–70% of patients with metabolic syndrome have elevated blood pressure levels. This condition leads to increased cardiovascular load, decreased elasticity of the aorta and other blood vessels, and a significantly heightened risk of myocardial infarction and stroke. The development of hypertension in the context of metabolic syndrome is driven by several major factors:

Insulin resistance – the body's cells become less responsive to insulin, resulting in endothelial dysfunction. The endothelium (the inner lining of blood vessels) produces less nitric oxide (NO), which is crucial for vasodilation. As a result, blood vessels remain constricted, vascular tone increases, and blood pressure rises.

Hyperinsulinemia – excess insulin levels in the blood promote increased reabsorption of sodium in the kidneys, leading to fluid retention, increased blood volume, and elevated blood pressure. Additionally, elevated insulin activates the sympathetic nervous system, causing increased heart rate and vasoconstriction.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

Adipokines and inflammatory markers – obesity-associated substances such as leptin, resistin, tumor necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6) contribute to chronic inflammation within the circulatory system, exacerbating hypertension. At the same time, levels of adiponectin — a protective molecule — are reduced, diminishing vascular protection and regulation.

Renin-angiotensin-aldosterone system (RAAS) activity – in metabolic syndrome, the RAAS becomes overactive, leading to vasoconstriction and sodium/water retention via aldosterone, which plays a central role in the pathogenesis of hypertension.

In metabolic syndrome, arterial hypertension typically develops insidiously, often without noticeable symptoms, and may remain undiagnosed for a long time. Therefore, it is essential to regularly monitor blood pressure in all patients with metabolic syndrome, to ensure early diagnosis and timely preventive measures.

The International Diabetes Federation (IDF) and the U.S. National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) define metabolic syndrome based on the following key criteria:

Abdominal obesity (waist circumference: >94 cm in men, >80 cm in women)

Triglycerides: >1.7 mmol/L

HDL cholesterol: <1.03 mmol/L in men, <1.29 mmol/L in women

Blood pressure: ≥130/85 mmHg

Fasting glucose: ≥5.6 mmol/L

If a patient meets at least three of the above criteria, a diagnosis of metabolic syndrome is established.

PATHOGENESIS

The main pathogenic links between metabolic syndrome and hypertension can be summarized as follows:

Mechanism	Description
Insulin resistance	Leads to endothelial dysfunction and reduced nitric oxide (NO) production, causing vasoconstriction.
Hormonal imbalance	Disruption in the balance between leptin and adiponectin contributes to vascular changes.
Chronic inflammation	Increased markers such as CRP and IL-6 damage blood vessel walls.
Hyperactive sympathetic system	Enhances cardiac output and elevates blood pressure.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

DIAGNOSIS

The following assessments are crucial in diagnosing metabolic syndrome:

Anthropometric measurements (e.g., waist circumference)

Blood pressure monitoring

Laboratory tests:

Fasting blood glucose level

Lipid profile (triglycerides, HDL, LDL)

HOMA-IR (Homeostatic Model Assessment of Insulin Resistance)

TREATMENT APPROACHES

Management of metabolic syndrome and arterial hypertension requires a comprehensive, multi-pronged approach:

A. Lifestyle modification:

Healthy diet (low in fats and sugars)

Regular physical activity (at least 150 minutes of aerobic exercise per week)

Weight loss in overweight/obese individuals

B. Pharmacotherapy:

Blood pressure control: ACE inhibitors, angiotensin receptor blockers (ARBs), diuretics

Glycemic control: metformin, GLP-1 receptor agonists

Dyslipidemia management: statins

Antiplatelet therapy: aspirin (in patients with high cardiovascular risk)

Conclusion:

Metabolic syndrome and arterial hypertension are interrelated conditions that represent pressing challenges for global healthcare systems. A deep understanding of their pathogenesis, timely diagnosis, and implementation of comprehensive treatment strategies are essential in reducing the risk of cardiovascular diseases. Promoting a healthy lifestyle among the general population plays a crucial role in the prevention of these conditions.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

References

1. Alberti, K. G., Eckel, R. H., Grundy, S. M., Zimmet, P. Z., Cleeman, J. I., Donato, K. A., ... & Smith, S. C. (2009). Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention. *Circulation, 120*(16), 1640–1645. https://doi.org/10.1161/CIRCULATIONAHA.109.192644
2. Grundy, S. M., Brewer, H. B., Cleeman, J. I., Smith, S. C., & Lenfant, C. (2004). Definition of metabolic syndrome: report of the National Heart, Lung, and Blood Institute/American Heart Association conference. *Circulation, 109*(3), 433–438. https://doi.org/10.1161/01.CIR.0000111245.75752.C6
3. Reaven, G. M. (1988). Banting lecture 1988. Role of insulin resistance in human disease. *Diabetes, 37*(12), 1595–1607. https://doi.org/10.2337/diab.37.12.1595
4. Mancia, G., Fagard, R., Narkiewicz, K., Redón, J., Zanchetti, A., Böhm, M., ... & Ruilope, L. M. (2013). 2013 ESH/ESC Guidelines for the management of arterial hypertension. *Journal of Hypertension, 31*(7), 1281–1357. https://doi.org/10.1097/01.hjh.0000431740.32696.cc
5. Kaur, J. (2014). A comprehensive review on metabolic syndrome. *Cardiology Research and Practice*, 2014, 943162. https://doi.org/10.1155/2014/943162
6. DeFronzo, R. A., & Ferrannini, E. (1991). Insulin resistance: a multifaceted syndrome responsible for NIDDM, obesity, hypertension, dyslipidemia, and atherosclerotic cardiovascular disease. *Diabetes Care, 14*(3), 173–194. https://doi.org/10.2337/diacare.14.3.173
7. Esser, N., Paquot, N., & Scheen, A. J. (2015). Anti-inflammatory agents to treat or prevent type 2 diabetes, metabolic syndrome and cardiovascular disease. *Expert Opinion on Investigational Drugs, 24*(3), 283–307. https://doi.org/10.1517/13543784.2015.985290
8. Whelton, P. K., Carey, R. M., Aronow, W. S., Casey Jr, D. E., Collins, K. J., Dennison Himmelfarb, C., ... & Wright Jr, J. T. (2018). 2017 ACC/AHA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Journal of the American College of Cardiology, 71*(19), e127–e248. https://doi.org/10.1016/j.jacc.2017.11.006