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## LEPTIN AS A MARKER OF METABOLIC DISORDERS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS AND ARTERIAL HYPERTENSION

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**Introduction.** The comorbid course of arterial hypertension and type 2 diabetes mellitus, especially in the presence of obesity, represents a significant medical and social problem due to the high risk of cardiovascular complications and metabolic maladaptation. Modern research highlights the important role of adipose tissue hormones, particularly leptin, in the regulation of energy metabolism, insulin sensitivity, inflammatory processes, and vascular remodeling. Leptin resistance, which develops under conditions of chronic hyperleptinemia, contributes to impaired glucose metabolism, increased body weight, and progression of cardiometabolic disorders. Therefore, studying leptin as an integral biomarker of metabolic disturbances is of particular relevance.

**Objective.** The objective of this study was to determine the characteristics of leptin levels in patients with arterial hypertension and type 2 diabetes mellitus depending on the presence of obesity and to establish the relationships between leptin concentration and indicators of carbohydrate metabolism, insulin resistance, vitamin D status, and body mass index.

**Materials and Methods.** The study included 250 patients with arterial hypertension who were divided into groups depending on the presence of obesity and type 2 diabetes mellitus. Anthropometric measurements were performed, including calculation of body mass index. Laboratory assessment included determination of leptin, insulin, glycated haemoglobin, and 25-hydroxyvitamin D levels using enzyme-linked immunosorbent assay methods. Blood samples were collected in the morning after fasting. Statistical analysis involved nonparametric methods, correlation analysis, and comparison between groups, with statistical significance set at  $p$  less than 0.05. The study was conducted in accordance with international ethical standards.

**Results.** The obtained results demonstrated that leptin levels were significantly higher in patients with combined arterial hypertension, obesity, and type 2 diabetes mellitus compared to patients with isolated arterial hypertension, which is also confirmed by the data presented in the study (for example, increased leptin levels up to approximately 28.85 ng per milliliter in comorbid patients). A positive correlation was established between leptin concentration and body mass index, indicating a direct relationship between leptin production and adipose tissue volume. In addition, leptin levels positively correlated with glycated haemoglobin, reflecting its involvement in chronic hyperglycemia. An inverse correlation was found between leptin and insulin levels, suggesting a possible inhibitory effect of leptin on pancreatic beta cell function and its role in the development of insulin resistance. Furthermore, a negative association between leptin and vitamin D levels was identified, indicating a potential interaction between adipokine imbalance and vitamin D deficiency. Patients with higher body mass index and lower vitamin D levels had significantly higher leptin

concentrations. These findings confirm that leptin is closely associated with key components of metabolic syndrome and reflects the severity of metabolic disturbances.

**Conclusions.** Leptin levels are significantly increased in patients with arterial hypertension combined with type 2 diabetes mellitus and obesity and are associated with worsening metabolic parameters. Leptin demonstrates significant relationships with body mass index, glycated haemoglobin, insulin levels, and vitamin D status, which indicates its involvement in the pathogenesis of metabolic disorders. Elevated leptin levels can be considered an important biomarker of metabolic maladaptation, leptin resistance, and vitamin D deficiency. The assessment of leptin concentration may improve risk stratification and contribute to the individualization of therapeutic strategies in patients with type 2 diabetes mellitus and comorbid cardiovascular pathology.

**Key words:** type 2 diabetes mellitus, leptin, obesity, arterial hypertension, insulin resistance, vitamin D.