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INSULIN RESISTANCE IN METABOLIC SYNDROME AS A CARDIOVASCULAR RISK FACTOR: AN ANALYSIS OF MODERN PERSPECTIVES

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Introduction. Metabolic syndrome is a significant risk factor for the cardiovascular system, with insulin resistance serving as one of the primary mechanisms of its development. Decreased tissue sensitivity to insulin is accompanied by impaired carbohydrate and lipid metabolism, endothelial dysfunction, and chronic inflammation, ultimately leading to the development of cardiovascular diseases. Current calculated indices of insulin resistance, including the triglyceride-glucose (TyG) index and the metabolic score for insulin resistance (METS-IR), are of particular interest.

Objective. To evaluate the association between insulin resistance and cardiovascular risk in metabolic syndrome, as well as the potential role of calculated indices in risk stratification.

Materials and Methods. An analytical review of clinical and epidemiological studies on the relationship between insulin resistance, metabolic syndrome, and cardiovascular outcomes was conducted. Publications were searched in the PubMed, Scopus, and Web of Science databases. The analysis primarily included cohort studies and meta-analyses from 2021–2026 that assessed the association of HOMA-IR, TyG, and METS-IR with cardiovascular diseases.

Results. In a cohort study of 6,240 adults without baseline cardiovascular disease, the median follow-up was 14 years, during which 909 new cardiovascular events were recorded. Insulin resistance assessed by HOMA-IR was not associated with an increased risk of cardiovascular disease (HR 1.56; 95% CI 1.29–1.89), whereas in individuals with poor

cardiovascular health, the HR reached 1.9 (95% CI 1.13–3.23). A meta-analysis of 8 cohort studies involving 437,283 individuals demonstrated that a high METS-IR is associated with an increased risk of cardiovascular disease (HR 1.65; 95% CI 1.36–2.02), ischemic heart disease (HR 1.82; 95% CI 1.50–2.20), and stroke (HR 1.47; 95% CI 1.19–1.83). With each one-standard-deviation increase in METS-IR, the risk of cardiovascular disease also increased (HR 1.16; 95% CI 1.10–1.22).

The PURE study, which included 141,243 participants from 22 countries, recorded 6,345 cardiovascular events over a median follow-up of 13.2 years. Higher TyG levels were associated with an increased risk of a composite cardiovascular outcome (HR 1.21; 95% CI 1.13–1.30), myocardial infarction (HR 1.24; 95% CI 1.12–1.38), and stroke (HR 1.16; 95% CI 1.05–1.28) compared to the lowest tertile.

Conclusions. Insulin resistance is associated with an increased cardiovascular risk in individuals with metabolic disorders. METS-IR and TyG demonstrate a predictive association with cardiovascular events and can be considered additional accessible tools for cardiometabolic risk stratification.