

PUBLICATIONS

THE ROLE OF BIOMARKERS OF RENAL DYSFUNCTION IN METABOLIC SYNDROME

M.Kh. Shukurlaeva, R.A. Sabirova

Tashkent State Medical University, Tashkent, Uzbekistan

Metabolic syndrome (MS) represents a major global health challenge and is characterized by a cluster of metabolic abnormalities, including insulin resistance, dyslipidemia, abdominal obesity, and chronic low-grade inflammation. The growing prevalence of MS worldwide has led to a substantial increase in the incidence of cardiovascular, endocrine, and renal complications. Renal impairment is a common consequence of metabolic syndrome and may occur at an early stage of the disease, frequently preceding the onset of clinically apparent symptoms. Therefore, the identification of sensitive biomarkers capable of detecting early renal dysfunction is essential for preventing the progression of kidney damage and improving clinical outcomes. Biomarkers such as cystatin C, interleukin-18 (IL-18), neutrophil gelatinase-associated lipocalin (NGAL), and lipocalin have emerged as promising indicators for the early diagnosis and monitoring of renal injury associated with metabolic syndrome.

An experimental study was conducted using Chinchilla rabbits weighing 2.2–2.4 kg. Metabolic syndrome was induced according to the method proposed by Saidov S.A. (2006). Serum levels of cystatin C, IL-18, NGAL, and lipocalin were measured using enzyme-linked immunosorbent assay (ELISA). Metabolic disturbances were corrected using standard and modified ketogenic diets, as well as pharmacological interventions with ezetimibe, metformin, and their combined administration.

The induction of metabolic syndrome resulted in a significant elevation of all investigated biomarkers. Increased serum cystatin C levels indicated an early decline in glomerular filtration capacity. Elevated IL-18 concentrations reflected the activation of inflammatory and immune-mediated pathways. Higher levels of NGAL and lipocalin were associated with early tubular epithelial injury and the development of subclinical renal dysfunction. Administration of ketogenic diets, together with treatment using ezetimibe and metformin, led to a reduction in biomarker concentrations. The most pronounced therapeutic effect was observed in animals receiving combination therapy with both agents.

The findings demonstrate that cystatin C, IL-18, NGAL, and lipocalin are sensitive and reliable biomarkers of early renal injury in metabolic syndrome. Alterations in their serum concentrations reflect the initiation and progression of renal dysfunction before the appearance of clinically significant manifestations. These biomarkers may therefore serve as valuable tools for the early detection, monitoring, and timely diagnosis of metabolic syndrome-associated nephropathy, facilitating improved disease management and prognosis.