

Phenotypic Features Of Metabolic Syndrome And Associated Conditions In Individuals Of Organized Occupational Groups: A Clinical And Epidemiological Analysis

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Article History	Abstract
Received: 28 th March 2026 Accepted: 26 th April, 2026	Metabolic syndrome (MS) remains one of the most pressing multidisciplinary problems in contemporary medicine, combining abdominal obesity, arterial hypertension, atherogenic dyslipidemia, and impaired glucose tolerance on the basis of insulin resistance. The study of MS among working-age individuals belonging to organized occupational groups — whose activity is associated with elevated physical and psychoemotional demands, irregular work schedules, and sleep disturbances — is of particular scientific importance. This review systematizes current data on the prevalence, pathogenesis, comorbid conditions, and clinical and preventive determinants of MS in this population group. The prevalence of MS among this contingent is shown to be comparable to general population figures, at approximately 21%, although the spectrum of associated conditions has a distinct profile, dominated by post-traumatic stress disorder, sleep disturbances, cardiovascular disease, and non-alcoholic fatty liver disease. Key determinants are analyzed, including age, length of professional service, behavioral risk factors, chronic stress, and neuroendocrine dysregulation. Current laboratory and instrumental approaches to the early detection of comorbidity are discussed (HOMA-IR, the TyG index, the atherogenic index of plasma, high-sensitivity C-reactive protein, eGFR, and echocardiographic parameters), together with a multi-level prevention strategy that includes the integration of psychological

	support. The findings support the need to develop personalized programs for early screening and prevention of metabolic disturbances that take into account the specific features of the occupational activity of the examined contingent.
Keywords: Metabolic syndrome; insulin resistance; comorbidity; arterial hypertension; non-alcoholic fatty liver disease; risk factors; prevention; organized occupational groups.	

INTRODUCTION

At the threshold of the third decade of the twenty-first century, humanity has encountered a large-scale non-communicable epidemic in which metabolic syndrome (MS) occupies a central position. Experts of the World Health Organization characterize this situation as a "new pandemic" affecting primarily industrially developed countries. MS represents a complex of metabolic, hormonal, and clinical disorders that act as powerful predictors of cardiovascular catastrophes and type 2 diabetes mellitus (T2DM). According to forecasts, the prevalence of this condition is expected to increase by 50% over the next 25 years, making its study in specific organized populations a priority task of medical science.

The prevalence of MS in the global population is steadily rising, varying across different estimates from 20% to 40%. A global analysis of 3,236 data arrays covering more than 45 million adults in 198 countries demonstrated an increase in the global MS rate from 11.9% in 2000 to 28.4% in 2023. It is important to note that in middle-income countries, including Uzbekistan, urbanization and changes in dietary patterns are generating a sustained metabolic risk reaching 19.7% among the adult population.

Data from the national STEPS survey in Uzbekistan indicate a high density of metabolic burden: 56.4% of the population is overweight, and abdominal obesity is recorded in 64.4% of men. In organized occupational groups these figures may be even higher. For example, in certain occupational cohorts the prevalence of MS reaches 21%, with the risk increasing significantly in individuals over 35–45 years of age.

The evolution of views on MS has led to changes in several diagnostic concepts. Whereas the WHO criteria historically emphasized insulin resistance, the NCEP ATP III approach (2005) simplified screening by requiring the presence of three of five criteria: abdominal obesity, hypertriglyceridemia, reduced high-density lipoprotein (HDL) cholesterol, arterial hypertension (AH), and hyperglycemia. The International Diabetes Federation (IDF) designated abdominal obesity as a mandatory criterion, underlining the role of visceral fat as a clinical marker of cardiometabolic threat.

The central link in the pathogenesis of MS remains insulin resistance (IR) and compensatory hyperinsulinemia. Visceral adipose tissue is not merely an energy depot but a metabolically active endocrine organ. The excessive flux of free fatty acids into the portal system overloads the liver, stimulating neoglucogenesis and the synthesis of atherogenic lipids.

In individuals working within organized groups with high levels of responsibility, the pathogenesis is further complicated by activation of the hypothalamic-pituitary-adrenal axis under the influence of occupational stress. Hypercortisolemia promotes redistribution of fat to the abdominal type and reduces tissue sensitivity to insulin. A significant role is also played by sympathetic activation sustained by chronic psychoemotional tension, sleep deficiency, and disturbances of circadian rhythms (for example, during shift work or night duties). Circadian disorganization interferes with the hormonal regulation of appetite (leptin/ghrelin), creating a vicious cycle of metabolic instability.

Contemporary literature proposes viewing MS not as a sum of criteria but as a "cardiorenal-metabolic continuum" in which metabolic shifts sequentially affect target organs.

Arterial hypertension occupies a dominant position, frequently manifesting with a disturbed diurnal blood pressure profile and early myocardial remodeling (left ventricular hypertrophy, diastolic dysfunction). Disorders of carbohydrate metabolism encompass a spectrum from borderline glycemia to T2DM, which acts as a powerful "amplifier" of all vascular risks.

Non-alcoholic fatty liver disease (NAFLD) is today recognized as the hepatic component of MS. In patients from risk groups, NAFLD often runs an asymptomatic course, serving as a marker of the overall severity of metabolic overload and increasing the risk of fibrosis. Renal involvement in MS is characterized by early reduction in the glomerular filtration rate (GFR) and microalbuminuria, indicating systemic endothelial damage.

A special category is formed by the comorbidity of MS with psychoemotional disorders arising from extreme occupational demands (for example, conditions associated with post-traumatic stress). Dysregulation of stress systems in such states creates a pro-inflammatory background (elevated C-reactive protein, interleukin-6), accelerating the development of atherosclerosis and obesity.

In organized occupational groups, cumulative exposure to adverse factors directly correlates with length of service. Behavioral patterns such as tobacco smoking and alcohol consumption — frequently employed as stress-coping strategies — substantially worsen the cardiometabolic prognosis.

Physical inactivity during periods between peaks of occupational activity reduces muscular glucose utilization, while irregular high-calorie nutrition under occupational constraints promotes rapid accumulation of visceral fat. Even

among individuals formally meeting physical fitness requirements, many employees of organized groups harbor latent lipid and carbohydrate metabolism disorders detectable only by targeted screening.

PREVENTION STRATEGY

Prevention of MS in at-risk individuals must be multilevel in character.

Primary level: Lifestyle modification, promotion of rational nutrition, and optimization of work and rest regimens.

Secondary level: Introduction of expanded screening into annual medical examination programs. In addition to blood pressure measurement and waist circumference assessment, it is necessary to determine glycated hemoglobin (HbA1c), calculated indices of insulin resistance (HOMA-IR, TyG-index), and to evaluate liver function (ALT, AST, FIB-4 index) and kidney function (microalbuminuria).

Tertiary level: Multidisciplinary correction of identified comorbid conditions with mandatory integration of psychological support for the correction of stress-associated disorders.

CONCLUSION

Metabolic syndrome in working-age individuals employed within organized occupational groups represents a systemic challenge for contemporary healthcare. The transition from simple registration of risk factors to in-depth analysis of related comorbid domains — carbohydrate, hypertensive, hepatic, renal, and cardiac — enables timely identification of patients at the stage of the "clinical window," when preventive measures are maximally effective. Preserving human potential requires the development of personalized monitoring algorithms that take into account the specific features of occupational activity and the psychoemotional status of employees.

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