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AGE-RELATED TRENDS AND RISK FACTOR INTERRE-LATIONS IN METABOLIC SYNDROME

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Abstract: The prevalence of the components of metabolic syndrome in the studied population is significantly higher, and both the overall prevalence of metabolic syndrome and its individual components increase with age. The most pronounced rise in metabolic syndrome and its components is observed after the age of 40, while the distribution dynamics of individual components remain unclear. In addition to cholesterol and beta-lipoprotein levels, a correlation is observed between body mass parameters and the investigated risk factors.

Key words: Arterial hypertension, obesity, hyperlipidemia, diabetes mellitus.

Relevance

A substantial body of international research highlights the multifactorial nature of metabolic syndrome (MS) and its key role in the development and progression of cardiovascular diseases (CVD), including ischemic heart disease (IHD). MS is recognized as one of the major contributors to morbidity and is strongly associated with a heightened risk of comorbid conditions. According to the literature, individuals with MS are more prone to developing CVDs, which tend to present more severely and are more frequently complicated by myocardial infarction and stroke than in individuals without MS. Furthermore, MS has been identified as a risk factor for numerous other diseases [1,2].

In addition to the known impact of hypercholesterolemia (HC) on IHD development, increasing attention is being paid to the so-called lipid triad: hypertriglyceridemia (HTG), hyper-beta-lipoproteinemia (HβLP), and reduced alpha-cholesterol levels. The pivotal role of diabetes mellitus (DM) in IHD pathogenesis is also well-established [1,3,5], with DM often developing in individuals with prior impaired glucose tolerance (IGT). Notably, IGT is closely linked with insulin resistance and can be considered a pre-diabetic state [4,7,8]. This underlines the importance of early detection of hyperglycemia as a potential avenue for understanding the pathogenesis and improving the prevention of IHD.

Recent global discussions have increasingly focused on the pathophysiological connections between insulin resistance and the major risk factors for chronic non-communicable diseases. Insulin resistance is now considered the central mechanism of MS, significantly contributing to the development and outcomes of IHD when combined with other risk factors. Given the considerable increase in CVD mortality associated with MS, it has been referred to as the “deadly quartet” (Kaplan J., 1989) and later as the “deadly sextet” (Enzi G., 1994). Despite the wide range of conditions proposed by researchers as components of MS, international

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guidelines generally define its core elements as hypertension, elevated BMI or obesity, hyperlipidemia, and diabetes or impaired glucose tolerance [11,12,15].

Aim of the study: To assess the dynamics of risk factor prevalence in individuals with metabolic syndrome.

Materials and methods:

A total of 110 patients were enrolled to study the progression of risk factors associated with metabolic syndrome by monitoring its primary components. The cohort included 60 men and 50 women. Gender distribution is shown in Table 1.

Table 1.

Distribution of patients by sex and age

Group	Age Range	Men	Women	Total
I	20–80 yrs	30	25	55
II	20–80 yrs	30	25	55
Total		60 (54.5%)	50 (45.5%)	110

Within this study, we analyzed the dynamics of average values of key risk factors. The results revealed varying trends across different parameters (Table 2). In addition to a decline in blood pressure levels, reductions were also noted in postprandial glucose levels measured 2 hours after a glucose challenge, as well as in glucose levels measured at the 1-hour mark. Notably, both systolic and diastolic blood pressure levels showed significant reductions. However, no marked differences were found between the rates of change in systolic and diastolic pressures.

A slight increase in fasting glucose levels and a decrease in the Quetelet Index (QI) were observed, though these changes were not statistically significant. Glucose levels 2 hours post-challenge increased by 14.42 mg%, whereas a reduction of 17.52 mg% was noted 1 hour after the glucose challenge. Although the frequency of elevated BMI decreased, this did not correspond to a significant reduction in the Quetelet Index. To better understand this discrepancy, we examined the dynamics of QI across normal and overweight groups. The average QI decreased from 0.259 to 0.241 ($p<0.05$) with increasing body mass.

Table 2.

Blood pressure, Quetelet Index, and glycemia

Parameter	Group I	Group II

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SBP (mmHg)	121.63	114.37
DBP (mmHg)	92.13	77.87
Quetelet Index (QI)	0.259	0.241
Fasting glucose (mg%)	6.28	56.72
1h post-load glucose	8.86	7.14
2h post-load glucose	7.04	61.96
Cholesterol (mg%)	77.14	32.86
Triglycerides (mg%)	82.36	27.64
Beta-lipoproteins (mg%)	85.51	24.49

The average dynamics of lipid levels largely paralleled the prevalence of hyperlipidemia. While increases in triglycerides and beta-lipoproteins were noted, cholesterol levels showed a decreasing trend. With age, increases in both systolic and diastolic blood pressure were observed. Additionally, the prevalence of hyperglycemic conditions rose with advancing age.

It was found that the incidence of diabetes mellitus (DM) and second-phase abnormalities in glucose curves rose with age, whereas the frequency of first-phase abnormalities declined. The observed decrease in BMI prevalence with age did not adequately reflect changes in body composition, which warranted further analysis of the Quetelet Index in normal and overweight groups.

The frequency and intensity of risk factors (RFs) increased with age, justifying the need for targeted early detection and preventive measures. Notably, the combination of RFs increased most significantly between the 30–39 and 40–49 age groups. However, in older groups, this increase plateaued. Interestingly, no metabolic syndrome cases were observed in the 20–29 age range. As the number of unidentified RFs decreased with age, there was a shift in the profile of existing RFs, indicating a correlation between age and the number or combination of RFs.

Additionally, the interrelationships between various RFs were explored (Table 3). While a significant correlation existed for most variables, QI showed no clear association with cholesterol or beta-lipoprotein levels.

Table 3.
Correlation coefficients between blood pressure, Quetelet Index, and glycemia

	SBP	**DBP**	**QI**	**Cholesterol**	**TG**	**Beta-LP**	**Fasting Glu**	**1h Glu**	**2h Glu**
DBP	0.77 *								
Quetelet Index (QI)	0.35 **	0.45 *							
Cholester	0.1 *	0.03	0.01						

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ol									
Triglycerides (TG)	0.2 *	0.09	0.11 *	0.45 *					
Beta-lipoproteins	0.12 *	0.06	0.08	0.61 *	0.34 *				
Fasting glucose	0.13 *	0.12 *	0.21 *	0.2 *	0.35 *	0.18 *			
1h post-load glucose	0.18 *	0.14 *	0.22 *	0.05	0.22 *	0.1 *	0.41 *		
2h post-load glucose	0.25 *	0.21 *	0.29 *	0.16 *	0.52 *	0.11 *	0.43 *	0.42 *	

Conclusion.

The prevalence of metabolic syndrome components in the studied population is significantly elevated, and this prevalence increases with age. The most substantial growth in MS and its elements occurs after age 40. The dynamic distribution of individual components remains ambiguous. A significant correlation exists between body mass parameters and most RFs, excluding cholesterol and beta-lipoproteins.

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