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PREVALENCE OF METABOLIC SYNDROME AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN BELARUS

Introduction

Metabolic syndrome (MetS) refers to a constellation of metabolic risk factors including central obesity, insulin resistance, elevated blood pressure and dyslipidemia. It also encompasses other complications such as cardiovascular disease (CVD), chronic kidney disease, hyperuricemia, and hepatic steatosis. These are major contributors to global disability-adjusted life years (DALYS) and mortality. As the syndrome is interconnected with insulin resistance and Type 2 Diabetes mellitus (T2DM), early identification and intervention are crucial to slow disease progression and improve quality of life [1, 9].

MetS is a rapidly growing global health crisis with a poorly characterized global burden. Its prevalence more than doubled between 2000 and 2023, affecting 1.54 billion adults worldwide, where prevalence rose from 14.7% to 31.0% among women, and 9.0% to 25.7% among men. Age, urbanicity, and income level are linked with MetS prevalence [3].

As of January 1, 2020, the Republic of Belarus had 352,538 patients with diabetes under follow-up. This included 18,110 with type 1 diabetes mellitus and 2,438 children. The reported annual increase of patients with diabetes is 5% to 8%. Furthermore, the prevalence of obesity is rising with recent data indicating that 28.2% of adult women and 24.7% of adult men in Belarus are obese, a key factor in the development of MetS [4, 5].

MetS is primarily caused by insulin resistance, adipose tissue dysfunction, and chronic inflammation. Adipose tissue releases free fatty and secrete proinflammatory cytokines like C-reactive proteins which induce chronic inflammation. This inhibits insulin signaling in skeletal muscles, the liver, and adipose tissue, promoting insulin resistance. The result is endothelial dysfunction, arterial stiffness, and increased vascular resistance, raising the risk of CVD and renal impairment. Atherogenic dyslipidemia, another MetS component, exacerbates these effects [1].

Diagnostic criteria for MetS have been proposed by medical organizations, like the WHO, NCEP-ATP III, AACE, IDF etc. The principal components of these criteria are adiposity, dyslipidemia, elevated blood pressure, and insulin resistance or hyperglycemia [9].

Following a diagnosis of MetS, the management should be aggressive and uncompromising with a primary objective of reducing subsequent cardiovascular risks. Lifestyle modifications are the cornerstone of primary intervention while secondary intervention focus on mitigating the risk of individual components of the syndrome [1].

Goal

This study aims to find the prevalence of Metabolic syndrome among already diagnosed Type 2 Diabetes Mellitus patients in the Belarusian population.

Material and methods of research

A cross-sectional study was conducted among randomly selected hospitalized patients in the Endocrinology department of Gomel City Clinical Hospital No.3 from February to March 2026. Patients with an established diagnosis of T2DM, from age group 40 and older were included.

Patients with Type 1 Diabetes, Gestational diabetes or other specific types (e.g. Pancreatogenic or medication-induced DM), chronic comorbidities that distort metabolic parameter (e.g. ESRD,

decompensated liver cirrhosis, Cushing's syndrome) or acute unstable conditions at assessment were excluded from this study.

International Diabetes Federation Global Consensus Definition (2006) is used to define patients with MetS [1].

Table 1 – The new International Diabetes Federation (IDF) definition

According to the new IDF definition, for a person to be defined as having metabolic syndrome they must have central obesity (defined as waist circumference* with ethnicity specific values. Plus any two of the following four factors:	
Raised triglycerides	≥150 mg/dL (1.7mmol/L), or specific treatment for this lipid abnormality
Reduced HDL cholesterol	<40mg/dL (1.03mmol/L) in Males, <50mg/dL (1.29mmol/L) in Females or specific treatment for this lipid abnormality
Raised blood pressure	Systolic BP ≥130 or diastolic BP ≥85mmHg or treatment for previously diagnosed hypertension
Raised fasting plasma glucose	(FPG) ≥100mg/dL (5.6mmol/L), or previously diagnosed type 2 diabetes
* If BMI >30kg/m^2, central obesity can be assumed, and waist circumference does not need to be measured	

To study metabolic disorders, blood reports of patients including the blood lipid profile (total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG)) are analyzed and diabetic control assessed as per glycated hemoglobin level (HbA1c).

Blood pressures are measured manually at rest in a sitting position using an aneroid sphygmomanometer.

Anthropometric studies included the measurement of waist circumference (WC) (using an inelastic, flexible tape measure, in a horizontal plane, midway between the inferior margin of the ribs and the superior border of the iliac crest), height, and body weight, from which the body mass index (BMI) was calculated. Either a BMI >30kg/m^2 or an ethnic specific value for waist circumference for European origin (≥94cm for male and ≥80cm for female) is used to define Central obesity [1].

The results of the research and their discussion

A total of 72 patients are studied and 11 are excluded. Of the 61 patients, 64% are female (n=39) and 36% are males (n=22). The mean age is 66±23 with a range of 43–89 years. 67.2% of them had T2DM duration of 10 years or longer.

The overall prevalence of MetS among the studied T2DM population was 84% according to IDF criteria (figure 1) with 62.75% Females and 37.25% Males. 93% of patients fulfilled ≥3 individual criteria for MetS (with or without central obesity) while 47.5% met all the components of the IDF criteria which clearly shows agreement with other known defining criteria like NCEP-ATP III, and the latest harmonized criteria. Figure 2 shows the prevalence of individual components of MetS in the study population.

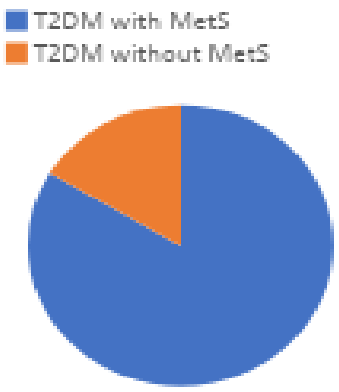


Figure 1 – Percentage of patients with MetS in T2DM

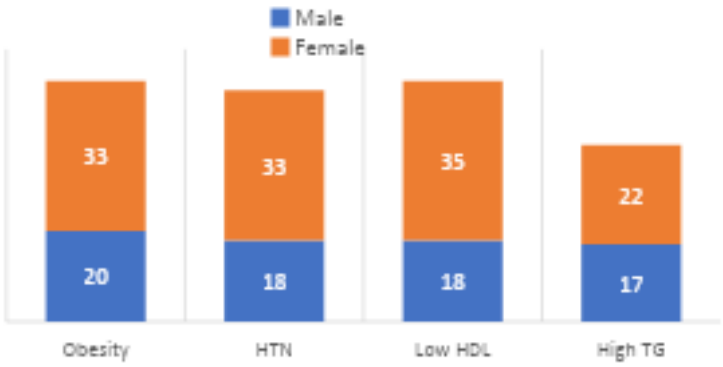


Figure 2 – Prevalence of individual components of MetS with type 2 DM. HTN (hypertension), HDL (high density lipoprotein), TG (Triglyceride)

A BMI of 25–29.9 kg/m^2 is observed in 22.95% of patients, while obesity (BMI ≥30 kg/m^2) is seen in 67.2%. As WC as a mandatory criterion was debated among other professional bodies, ICO (Index of central obesity, also referred to WC to height ratio) is further studied among the participants. Most patients have an ICO of >0.5 (n=41) indicative of central adiposity.

A study done in HUCSH, Ethiopia showed MetS prevalence rates in T2DM based on 4 diagnostic criteria. The overall MetS prevalence was 59.9% (IDF), 31.2% (WHO), 65.6% (Harmonized), and 70.1% (NCEP-ATP III). The concordance between the NCEP-IDF and IDF-Harmonized criteria was moderate (P=0.54) and good (P=0.65), respectively. The Harmonized criteria found females to be significantly associated with MetS, being 2.3 times (95% CI: 1.5–4.9; P=0.001) more likely than males. This finding aligns with our study [2].

The main limitation of our study is the small sample size, targeting only a specific region of the Belarussian population which may have limited the strength of our results. Moreover, all sociodemographic and environmental factors are not considered.

Conclusions

There is a significantly high occurrence of MetS among established T2DM and the co-existence of other components of MetS in this population is found to be common. Concurrently with the rising obesity rate in the Belarussian population, MetS is a growing concern. Therefore, it is imperative to use these diagnostic criteria as a screening tool at the primary care level to identify individuals at high risk of metabolic complications and cardiovascular diseases. This will enable clinicians to initiate and optimize treatment at the earliest possible time, to prevent deterioration linked to MetS.

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INFLUENCE OF GENDER ON THE MAIN PARAMETERS OF 24-HOUR BLOOD PRESSURE MONITORING IN PATIENTS WITH ARTERIAL HYPERTENSION

Introduction

Arterial hypertension (AH) remains one of the most important modifiable risk factors for cardiovascular morbidity and mortality worldwide. In the Republic of Belarus, AH represents a major public health concern. Epidemiological studies indicate that approximately 40–45% of the adult population is affected, which is considerably higher than the global average [1, 2]. Despite the availability of effective antihypertensive medications, many patients still fail to achieve recommended blood pressure (BP) targets. This highlights the need for more accurate diagnostic methods and improved monitoring strategies to ensure better control of AH [3].

Twenty-four-hour ambulatory blood pressure monitoring (ABPM) has become an essential tool in the modern diagnosis and management of AH. Unlike single BP measurements taken in a clinical setting, ABPM records BP continuously throughout the day and night, providing a more complete picture of a patient's BP profile [4]. This method allows clinicians to assess several important parameters, including average systolic and diastolic BP over 24 hours, as well as during daytime and nighttime periods, BP variability (expressed as standard deviation), and the BP load or time index, which reflects the percentage of readings above normal values [4].

Another clinically important aspect of ABPM is the evaluation of circadian BP rhythms. In healthy individuals, BP typically decreases by about 10–20% during sleep, a physiological phenomenon known as the "dipping" pattern. Based on the degree of nocturnal BP reduction, patients are classified into four circadian profiles: dippers (10–20% decline), non-dippers (0–10% decline), over-dippers (>20% decline), and night-pickers, in which nighttime BP exceeds daytime levels [4]. Abnormal circadian patterns, particularly the non-dipper profile, are associated with a higher risk of target-organ damage and cardiovascular complications [5].

Although these ABPM parameters are widely used in clinical practice, the potential influence of gender on these indicators remains an area of active research. Some studies suggest that women may demonstrate different BP regulation patterns compared with men, possibly due to hormonal influences and differences in vascular elasticity [5]. Understanding such gender-related variations may help improve risk assessment and support more individualized approaches to AH management.

Goal

The aim of this study is to evaluate and compare the main parameters of 24-hour ABPM in male and female patients with AH. The analysis focuses on key indicators, including average BP values, BP variability, BP load BP load or time index, and the degree of nocturnal BP decline. By comparing these parameters between genders, the study seeks to identify potential gender-related differences in ABPM profiles.