Metabolic syndrome and its components in young healthcare professionals working in a university hospital in Dhaka

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Abstract

Background: Young healthcare professionals (HCPs) are often exposed to stress, shifting duties, and sedentary lifestyles, predisposing them to an increased risk of metabolic syndrome (MetS).

Objectives: To assess the prevalence of MetS and its components in young HCPs working in a university hospital in Dhaka.

Methods: In this cross-sectional study, 180 young (aged 18-34 years) HCPs were screened by non-probability sampling (39% physician, 61% nurses, 75% female, 49% overweight/obese) as part of a diabetes screening program by Study on Diabetes and Obesity in Young (SODY) group, Department of Endocrinology, Bangladesh Medical University, during Sep'23-Feb'24. The consensus definition developed by the International Diabetes Federation and the American Heart Association/National Heart, Lung, and Blood Institute in 2009 was used to define MetS.

Results: Among the young HCPs, 46 of 180 [25.6% (95% CI 19.4-32.6)] had MetS. The physicians had a prevalence of 37%, and nurses 18%. Abdominal obesity was present in 66%, while reduced high-density lipoprotein cholesterol, elevated triglycerides, elevated fasting plasma glucose, and elevated blood pressure were present in 36%, 27%, 13%, and 22% of the participants, respectively. HCPs with MetS had relatively higher age (median, 31 vs. 26 years), higher frequency of male gender (44% vs. 19%), overweight/obesity (91% vs. 48%), and upper monthly income tertiles (48% vs. 31%) compared to the non-MetS group (p<0.05 for all).

Conclusions: One in four young HCPs had MetS, with abdominal obesity as the most common component. *[J Assoc Clin Endocrinol Diabetol Bangladesh,* January 2026; 5(1): *21-27]*

Keywords: Metabolic syndrome; Young; Healthcare professionals; Bangladesh

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Introduction

Non-communicable diseases (NCDs) represent a significant public health concern, especially in developing countries.[1] These diseases are currently responsible for about 74% of global deaths, with 77% occurring in low- and middle-income countries, placing a growing strain on healthcare systems and economies.[2] Metabolic Syndrome (MetS), also known as insulin resistance syndrome or syndrome X, is a cluster of metabolic abnormalities that significantly increase the risk of NCDs, particularly cardiovascular diseases.[3]

MetS is diagnosed when at least three of the following criteria are met: elevated fasting glucose, hypertension, hypertriglyceridemia, low high-density lipoprotein cholesterol (HDL-C), and central obesity.[4] The global prevalence of MetS demonstrates a wide range, from 12.5% to 31.4%, largely influenced by the diagnostic criteria employed.[5] In South Asia, reported rates of MetS were 14.0% to 32.5% according to various criteria.[6]

In Bangladesh, significant epidemiological shifts have occurred, driven by rapid urbanization and evolving lifestyle patterns. These changes, including increased

consumption of processed foods, irregular eating habits, and reduced physical activity, have led to a sharp rise in NCDs.[7] A recent meta-analysis reported a 37.0% prevalence of MetS in Bangladesh in the general population.[8] Currently, NCDs are responsible for 67% of all deaths in Bangladesh, with cardiovascular disease being the leading cause, a condition closely linked to MetS as a major risk factor.[9]

The high prevalence of MetS highlights the need to address key risk factors such as physical inactivity, unhealthy diets, inadequate sleep, smoking, alcohol use, and irregular work shifts. Adults who sleep fewer than 6 hours per day have nearly 5 times the odds of developing MetS.[10] Other contributors include genetic factors, obesity, insulin resistance, and conditions like polycystic ovary syndrome (PCOS). Maternal obesity may also predispose offspring to MetS.[11] Socioeconomic disparities also influence metabolic health.[7]

Health care professionals (HCPs) play a vital role in health promotion and are expected to model healthy behaviors. However, cardiometabolic risk within this group is a concern, as unhealthy habits among HCPs may undermine public health efforts. Studies show that professionals who adopt healthy lifestyles are more likely to influence patient attitudes and encourage prevention positively.[12] Despite their medical knowledge, factors such as job stress, shift duties, poor work–life balance, and physical inactivity contribute to a high prevalence of MetS. A pilot study in Bangladesh reported a prevalence of MetS of 38.8% among physicians.[13] Young physicians and nurses in their early careers (age <35 years) who often work shifts, serve as frontline caregivers, and continue postgraduate studies, face added risks due to limited exercise, unhealthy diets, and chronic stress. Yet, the prevalence of MetS in this subgroup remains less explored, highlighting a research gap. The present study addresses this by assessing the prevalence of MetS among young physicians and nurses at a university hospital in Dhaka, Bangladesh.

Methods

Study subjects and design: This cross-sectional study was conducted in the Department of Endocrinology, Bangladesh Medical University (BMU), Dhaka, Bangladesh. In this study, 180 young (age < 34 years) HCPs were enrolled through non-probability purposive sampling as part of a diabetes screening program by the Study on Diabetes and Obesity in Young (SODY) group from September 2023 to February 2024. Exclusion criteria included known acute or chronic severe diseases,

taking steroids, pregnancy, and lactation.

Sample size: The sample size was calculate using the formula $n=(z^2 pq)/d^2$, where $Z=1.96$ for a 95% confidence level, p was the expected prevalence of MetS (38.8% from a pilot study in Bangladesh), $q=1-p$, and $d=0.05$ as the margin of error.[13] This yielded a required sample of 365 participants. However, due to logistic and resource constraints, recruitment was limited to 180 young physicians and nurses. With this sample, the expected precision is approximately ±7% for prevalence estimates, which, although lower than the ideal, provides valuable preliminary evidence to guide future, larger studies.

Study procedure: The demographic and clinical features of the participants (age, sex, monthly family income, smoking status, occupation, physical activity level, sleep duration, screen time, and frequency of shifting duties) were recorded in a structured datasheet. A history of diabetes mellitus (DM), hypertension (HTN), and medication use - including anti-diabetic, anti-hypertensive, and lipid-lowering agents - was obtained. Height was measured by using a stadiometer, weight was measured by a balance on a hard flat surface, waist circumference (WC) was measured to the nearest centimeter with a flexible tape, while the subjects were in a standing position at the end of gentle expiration, and hip circumference was measured at the level of the widest portion of the buttocks. Blood pressure (BP) was measured in millimeters of mercury by a standard sphygmomanometer. A 4 mL fasting blood sample was then collected from each participant for measurement of fasting plasma glucose (FPG) and lipid profile.

Physical activity was classified as vigorous, moderate, or light when such activities were continued for at least 10 minutes.[14] Vigorous activity referred to tasks that cause a large increase in breathing or heart rate (e.g., running, carrying heavy loads, digging, or construction work). Moderate activity involved a small increase in breathing or heart rate (e.g., brisk walking or carrying light loads). Light activity included tasks such as light household or office work. The metabolic equivalent task (MET)-minutes/week was calculated, assigning 1, 4, and 8 MET-minutes to each minute of light, moderate, and vigorous activity. Participants were categorized as having low (<600 MET-minutes/week), moderate (600–3000 MET-minutes/week), or high (>3000 MET-minutes/week) physical activity.[15] BMI interpretation was done according to the WHO adult obesity category for Asians. BMI cut-offs (as for South Asians) were underweight <18.5, normal 18.5-22.9,

overweight 23-24.9, and obese ≥25 kg/m².[16]

Metabolic syndrome: Metabolic syndrome was defined according to the 2009 recommendations of the International Diabetes Federation and the American Heart Association/National Heart, Lung, and Blood Institute, and was diagnosed when at least three out of five specific factors were present, which include elevated waist circumference (≥90 cm in men and ≥80 cm in women as for Asians), high triglycerides (TG) (≥ 150 mg/dL) or on drug treatment for high TG, low HDL-C (<40 mg/dL in men and <50 mg/dL in women) or on drug treatment for reduced HDL-C, elevated blood pressure (≥130/85 mm Hg) or use of antihypertensive medication, and elevated fasting glycemia (≥5.6 mmol/L) or use of antidiabetic agent.[17]

Analytic method: Blood samples were collected from all participants after a 10-hour overnight fast and distributed into serum and plasma collection tubes (two of each), labelled with the participant's unique code. FPG was measured using the glucose oxidase method using Dimension EXL 200 Integrated Chemistry System (Siemens, Germany), while total cholesterol (TC), HDL-C, and TG concentrations were determined by enzymatic colorimetric assays using the ARCHITECT Plus ci8200 integrated system (Abbott Diagnostics, Abbott Park, IL, USA). Low-density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald formula.[18]

Ethical aspects: Voluntary, informed written consent was obtained from each participant after a thorough explanation of the procedure and the purpose of the study. Each participant had the right to participate, refuse, or withdraw from the study at any time. Information about the participants was kept confidential. The project was run after approval of the Institutional Review Board (IRB) of BMU.

Statistical analysis: Quantitative data were expressed as median and interquartile range (IQR; 25th-75th percentiles), whereas qualitative data were expressed as frequency distribution and percentage. The prevalence of MetS among the overall study subjects and subgroups was reported as percentages with 95% confidence intervals. The association between categorical variables was analyzed using the $\chi2$ test and the Fisher's exact test, as applicable. A continuous variable with a skewed distribution was compared using the Mann–Whitney U-test. A p-value of <0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 25.0 (IBM

Corp., Armonk, NY, USA).

Result

The study included 180 HCPs, comprising 71 physicians and 109 nurses. The median age of participants was 27 years (IQR 24-31). There was a female predominance (75.0%), and more than half of the participants were overweight (20.6%) or obese (38.3%). Smoking prevalence was 5.6%, and physical activity levels were generally low (73.3%) (Table-I).

Overall, the prevalence of MetS among HCPs was 25.6% (95% CI 19.4-32.6). Physicians had a 36.6% (95% CI 25.5-48.9) prevalence of MetS, while nurses had a 18.3% (95% CI 11.6-26.9) prevalence. The prevalence of MetS across other subgroups is shown in Table II.

Abdominal obesity was the most prevalent MetS component (65.6%), followed by low HDL-C, elevated triglycerides, and elevated FPG (36.1%, 26.7%, and 22.2%, respectively). High BP was observed in 13.3% of the cohort (Table-III).

Participants with MetS were generally older, with a median age of 31 years, compared to 26 years for those without MetS (p<0.001). The MetS group also had a

Table-I: Baseline characteristics of the study participants (n=180)

Variables	Value
Age, years; median and IQR)	27 (24-31)
Female, n (%)	135 (75.0)
BMI categories, n (%)	
Underweight	15 (8.3)
Normal	59 (32.8)
Overweight	37 (20.6)
Obese	69 (38.3)
Smoker, n (%)	10 (5.6)
*Physical activity categories, n (%)	
Low	132 (73.3)
Middle	48 (26.7)
Family history of DM, n (%)	94 (52.2)
History of PCOS, n (%) (N=135)	6 (4.4)
History of GDM, n (%) (N=135)	3 (2.2)
Sleep duration, hours; median and IQR	7 (6-8)
Screen time, hours; median and IQR	3 (2-4)
Frequency of shifting duties/month; median and IQR	6 (3-12)

*None of the participants had a high level of physical activity
Within parentheses are percentages over the column total if not otherwise mentioned.
IQR: interquartile range, BMI: body mass index

Table-II: Prevalence of metabolic syndrome in the study participants and in different subgroups

Groups		MetS	
	N	n	% (95% CI)
All participants	180	46	25.6 (19.4-32.6)
Gender			
Male	45	20	44.4 (29.6-60.2)
Female	135	26	19.3 (13.0-26.9)
Occupation			
Physicians	71	26	36.6 (25.5-48.9)
Nurses	109	20	18.3 (11.6-26.9)
BMI category			
Normal or underweight	74	4	5.4 (1.5-13.3)
Overweight or obese	106	42	39.6 (30.3-49.6)
Physical activity			
Low	132	36	27.3 (19.9-35.7)
Middle	48	10	20.8 (10.5-35.0)
Smoking status			
Smoker	10	4	40.0 (12.2-73.8)
Non-smoker	170	42	24.7 (18.4-31.9)
Family income category			
Low	60	7	11.7 (4.8-22.6)
Middle	79	23	29.1 (19.4-40.4)
High	41	16	39.0 (24.2-55.5)

BMI: body mass index

Table-III: Prevalence of Individual components of metabolic syndrome among the study participants (n=180)

Individual components of MetS	n	%
Abdominal obesity	118	65.6
Low HDL-C	65	36.1
High TG	48	26.7
High BP	24	13.3
High FPG	40	22.2

FPG=Fasting plasma Glucose, TG=Triglycerides, HDL-C=High Density Lipoprotein cholesterol, BP=Blood pressure
Abdominal obesity: Waist circumference ≥90 cm in men and ≥80 cm in women
Low HDL-C :<40 mg/dL in men and <50 mg/dL in women or on drug treatment for reduced HDL
High TG: ≥150 mg/dL or on drug treatment for high TG
High BP: ≥130/85 mm Hg or use of antihypertensive medication
High FPG: ≥5.6 mmol/L or use of antidiabetic agent

higher proportion of individuals with elevated BMI (91.3% vs. 47.8%, $p<0.001$), male gender (43.5% vs. 18.7%, $p=0.001$), and higher family income (47.8% vs. 30.6%, $p=0.009$) than the non-MetS group. However, there were no significant differences between the two

Table-IV: Association between metabolic syndrome and different variables

	MetS, n=46 n (%)	Non-MetS, n=134 n (%)	*p
Age (years) (median and IQR)	31 (27-33)	26 (24-30)	**<0.001**
Sex			
Male	20 (43.5)	25 (18.7)	**0.001**
Female	26 (56.5)	109 (81.3)	
BMI (Kg/m^2)			
Underweight/Normal	4 (8.7)	70 (52.2)	**<0.001**
Overweight/Obese	42 (91.3)	64 (47.8)	
Smoking status			
Smoker	4 (8.7)	6 (4.5)	0.281
Non-smoker	42 (91.3)	128 (95.5)	
**Physical activity			
Low	36 (78.3)	96 (71.6)	0.381
Middle	10 (21.7)	38 (28.4)	
Family income tertiles			
Low	7 (15.2)	53 (39.6)	
Middle	17 (37.0)	40 (29.9)	**0.009**
High	22 (47.8)	41 (30.6)	
Sleep duration (hours; median and IQR)	7.0 (6.0-8.0)	7.5 (6.5-8.0)	0.170
Screen time (hours; median and IQR)	3.0 (1.5-4.0)	3.5 (2.5-4.3)	0.290
Frequency of shifting duties/month (median and IQR)	4.5 (2.0-10.0)	7.5 (3.0-13.0)	**0.042**

*p-value stands for comparison between Mets and Non-Mets. Significance level was measured by Chi-square, Fisher's Exact test, and Mann-Whitney U-test, where applicable
**None of the participants had a high level of physical activity
BMI: Body mass index

groups in terms of smoking status, physical activity level, sleep duration, and screen time. The frequency of shifting duties were higher in non-MetS group (p=0.042).

Discussion

This study revealed a notable prevalence of MetS among young HCPs. The overall prevalence of MetS (25.6%) in this relatively young and educated group is concerning especially in South Asia, where urbanization and increasingly sedentary lifestyles contribute to elevated cardiometabolic risks.[19] However, this prevalence is lower than the estimated pooled prevalence of MetS (37%) reported in the general population and among HCPs (39%) of Bangladesh.[8,13] The relatively lower prevalence of MetS among HCPs observed in the current study may reflect their young age and should be compared with the age-adjusted prevalence of MetS in Bangladesh, which is currently not available. Studies conducted in other countries showed variable MetS prevalence among HCPs (15%-44%).[20-22]

Male participants had relatively higher prevalence of MetS. This aligns with evidences indicating that South Asian men, especially those in sedentary occupations, tend to accumulate more visceral fat and exhibit higher rates of metabolic abnormalities than women.[23] Behavioral factors-such as higher smoking rates and lower engagement in health-promoting practices-may further explain this sex disparity. Their cardiometabolic risk starts even at younger ages, as supported by regional data, often beginning in twenties and thirties.[24] The sleep duration, screen time, and shifting duties were not observed to have negative impact on MetS prevalence of the study participants. More detail lifestyle assessment should be done in further studies.

Abdominal obesity was the most prevalent MetS component, present in 65.6% of participants. This agrees with evidence that central adiposity is a key driver of MetS in South Asians, often occurring without generalized obesity.[25] Moreover, the clustering of low HDL, high triglycerides, and elevated fasting glucose in nearly one-third of participants reflects the insulin-resistant phenotype characteristic of this population. Westernized lifestyles, physical inactivity, unhealthy diets, and work-related stress may contribute to these patterns.[26,27]

Most participants in the study had low levels of physical activity. The sedentary behavior observed is concerning and reflects a troubling global trend of HCPs neglecting their self-care.[28] Smoking was also more common,

though its combined effects with other cardiometabolic risks remain a serious public health issue.[29] Additionally, higher family income was associated with greater MetS prevalence, a pattern that may reflect unhealthy dietary habits and reduced physical activity commonly observed among urban, affluent groups. Recent research from Bangladesh and neighboring countries also observed that rising income is accompanied by lifestyle changes that increase the risk of MetS.[30]

These findings underscore the importance of implementing targeted wellness programs, conducting regular screenings, promoting physical activity initiatives, and establishing supportive workplace policies to address the growing prevalence of MetS among HCPs. However, this study has several limitations. Participants were recruited from a single tertiary care hospital by non-probability sampling, which may limit the generalizability of the findings. Additionally, we did not assess the prevalence of MetS in the general population for comparative purposes. The relatively small sample precludes reliable risk modeling and reduces precision and power to detect small differences; results should be interpreted as exploratory and descriptive and need to be confirmed in larger, preferably multicenter, studies. Future studies may also encompass measurement of cortisol, hypothalamic-pituitary-adrenal (HPA) axis, and insulin indices to better understand the stress levels and insulin resistance in this group. Despite these limitations, this study is among the few to examine the burden of MetS among HCPs in Bangladesh, providing evidence on key cardiometabolic risk factors within this relatively under-researched group. The findings underscore important trends that can guide targeted prevention and wellness programs for HCPs, a vital yet often overlooked population.

Conclusions

The study reveals a concerning prevalence of metabolic syndrome among young HCPs, highlighting the paradox of high health knowledge yet poor health practices within this population. High burden of low physical activity and central obesity underscores the need for targeted health promotion strategies, routine metabolic screening, and a supportive work environment to address modifiable risk factors and improve the long-term health of HCPs.

assay.

Conflict of interest
The authors have no conflicts of interest to disclose.

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This study was partly supported by a fund from BMU.

Data Availability
Any queries regarding this study should be directed to the corresponding author, and supporting data are available from the corresponding author upon reasonable request.

Ethical Approval
All procedures performed in this study involving human participants were conducted in accordance with the ethical standards and the 1964 Helsinki Declaration. Informed written consent was obtained from each of the participants included in the study. Ethical approval (R/N no: BSMMU/2023/9665, date: 15/07/2023) was obtained from the Institutional Review Board (IRB) of Bangladesh Medical University.

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