



PREVALENCE OF METABOLIC SYNDROME AND ITS LIFESTYLE CORRELATES AMONG ADULTS ATTENDING A TERTIARY CARE HOSPITAL

Dr Anilkumar Talikoti^{1*}, Dr Smita Hordi²

^{1*}Assistant Professor SSIMS, Davengere, Karnataka. Email: talikotias@gmail.com

²Government Medical officer, Gulbarga. Email: smitaatalikoti@gmail.com

Abstract

Background

Metabolic syndrome (MetS) is a cluster of interrelated metabolic abnormalities that significantly increase the risk of cardiovascular disease and type 2 diabetes mellitus. Rapid urbanization, sedentary lifestyle, and unhealthy dietary practices have contributed to a rising burden of MetS in India, necessitating early identification and prevention strategies. The main was to estimate the prevalence of metabolic syndrome among adults attending a tertiary care hospital and to assess its association with selected lifestyle factors.

Materials and Methods

A hospital-based cross-sectional study was conducted among **100 adults aged ≥18 years** attending a tertiary care hospital. Data on sociodemographic characteristics and lifestyle factors were collected using a structured questionnaire. Anthropometric measurements, blood pressure, and fasting biochemical parameters were recorded. Metabolic syndrome was diagnosed using the modified NCEP ATP III criteria. Data were analyzed using descriptive statistics and the Chi-square test, with a p-value <0.05 considered statistically significant.

Results

The prevalence of metabolic syndrome was 41%. Elevated blood pressure (60%) and abdominal obesity (52%) were the most common components. Metabolic syndrome was more frequent among females (45.2%) than males (37.9%), though the difference was not statistically significant. A sedentary lifestyle showed a significant association with metabolic syndrome ($p = 0.02$), while smoking and alcohol consumption showed higher prevalence without statistical significance.

Conclusion

Metabolic syndrome was highly prevalent among adults attending the tertiary care hospital and was significantly associated with sedentary lifestyle. Early screening and lifestyle modification interventions at healthcare facilities are essential to reduce future cardiometabolic complications.

Keywords: Metabolic syndrome, prevalence, lifestyle factors, tertiary care hospital, NCEP ATP III

Introduction

Metabolic Syndrome (MetS) is defined as a cluster of interrelated metabolic abnormalities that include central obesity, elevated blood pressure, dyslipidemia in the form of hypertriglyceridemia and reduced high-density lipoprotein cholesterol, and impaired glucose tolerance or insulin resistance. The coexistence of these metabolic disturbances acts synergistically to significantly increase the risk of cardiovascular disease (CVD), type 2 diabetes mellitus (T2DM), and all-cause mortality, thereby posing a major public health concern worldwide [1,2]. In recent decades, the global prevalence of

MetS has increased substantially, largely driven by rapid urbanization, reduced physical activity, unhealthy dietary patterns, and a rising prevalence of overweight and obesity [3]. Evidence from the Global Burden of Disease Study 2010 highlights that modifiable lifestyle-related risk factors now account for a considerable proportion of morbidity and mortality in both developed and developing countries, reflecting a major epidemiological shift towards non-communicable diseases (NCDs) [3,5]. India is currently experiencing a similar epidemiological transition, with an increasing burden of metabolic syndrome across both urban and semi-urban populations. Studies have reported that the prevalence of MetS in urban Indian adults ranges from 25% to 35%, while relatively lower but still substantial prevalence has been observed in rural areas. These variations are influenced by regional differences in ethnicity, lifestyle behaviours, socioeconomic status, and the diagnostic criteria applied [4,5]. Evidence from different regions of India, including studies conducted in Himachal Pradesh, has demonstrated a high prevalence of MetS even among newly diagnosed hypertensive patients, emphasizing its growing public health importance [6].

Early detection of metabolic syndrome is of paramount importance, as timely lifestyle interventions and appropriate pharmacological management can prevent or delay the progression to cardiovascular disease and diabetes-related complications. The modified National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria are widely accepted for diagnosing MetS and are particularly useful in routine clinical practice and resource-limited healthcare settings [4]. Despite its increasing clinical relevance, there remains a paucity of recent, region-specific data on the prevalence and associated risk factors of metabolic syndrome in tertiary care hospital settings in India. Hospital-based studies provide an opportunity to identify high-risk individuals who frequently access healthcare services but may remain undiagnosed in the community. Therefore, the present study was undertaken to determine the prevalence of metabolic syndrome and to assess its associated lifestyle and clinical risk factors among adults attending a tertiary care hospital, with the aim of informing targeted preventive and management strategies in high-risk populations [1,3,6].

Materials and Methods

A hospital-based, cross-sectional study was conducted in the Department of General Medicine of a tertiary care hospital in India

Study Population

The study included adult patients aged 18 years and above attending the outpatient and inpatient departments of the hospital during the study period. A total of 100 participants were enrolled in the study.

Inclusion Criteria

- Adults aged ≥ 18 years
- Patients willing to participate and provide written informed consent

Exclusion Criteria

- Pregnant women
- Patients with previously diagnosed coronary artery disease, stroke, or chronic kidney disease
- Critically ill patients unable to provide consent
- Patients with known endocrine disorders affecting metabolic parameters

Data Collection

Data were collected using a pre-designed and pre-tested structured questionnaire. Information regarding sociodemographic characteristics (age, sex), lifestyle factors (physical activity, dietary habits, smoking status, alcohol consumption), and medical history was recorded.

Anthropometric and Clinical Measurements

Weight was measured using a calibrated weighing scale, and height was measured using a stadiometer. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2). The waist circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Blood pressure was measured using a standardized sphygmomanometer after the participant had rested for at least five minutes in a seated position.

Biochemical Investigations

After an overnight fast of at least 8–10 hours, venous blood samples were collected to estimate:

- Fasting plasma glucose
- Serum triglycerides
- High-density lipoprotein (HDL) cholesterol
- All biochemical parameters were analyzed in the hospital's central laboratory using standard enzymatic methods.

Diagnostic Criteria for Metabolic Syndrome

Metabolic syndrome was diagnosed using the modified National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria. Participants were considered to have metabolic syndrome if three or more of the following five criteria were present:

- Waist circumference >102 cm in men or >88 cm in women
- Serum triglycerides ≥ 150 mg/dL
- HDL cholesterol <40 mg/dL in men or <50 mg/dL in women
- Blood pressure $\geq 130/85$ mmHg or on antihypertensive medication
- Fasting plasma glucose ≥ 100 mg/dL or known diabetes mellitus

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. The Categorical variables were expressed as frequency and percentage. The continuous variables were presented as mean $\pm$ standard deviation. The Chi-square test was used to assess associations between categorical variables. A p-value < 0.05 was considered statistically significant.

Results:

A total of 100 adult participants were included in the present hospital-based cross-sectional study. The mean age of the study population was 46.3 ± 11.2 years, with participants distributed across all adult age groups. The largest proportion belonged to the 31–45 years (34%) and 46–60 years (30%) age groups. Males constituted 58% of the study population, while 42% were females (Table 1). A sedentary lifestyle was observed in 48% of participants, while 52% reported moderate to heavy physical activity. Mixed dietary habits were common (72%), and lifestyle risk behaviours such as smoking and alcohol consumption were present in 29% and 34% of participants, respectively. The overall prevalence of metabolic syndrome, as defined by the modified NCEP ATP III criteria, was found to be 41% (Table 2). Among the individual components of metabolic syndrome, elevated blood pressure was the most prevalent abnormality, observed in 60% of participants, followed by abdominal obesity (52%), elevated triglycerides (48%), elevated fasting plasma glucose (46%), and low HDL cholesterol (44%). Among those diagnosed with metabolic syndrome ($n = 41$), the majority (78%) had exactly three components, while 22% had four or more components. Gender-wise analysis showed a higher prevalence of metabolic syndrome among females (45.2%) compared to males (37.9%); however, this difference was not statistically significant ($p = 0.42$) (Table 3). A significant association was observed between sedentary lifestyle and metabolic syndrome, with 54.2% of sedentary individuals affected compared to 28.8% among non-sedentary participants ($p = 0.02$). Although a higher prevalence of metabolic syndrome was noted among smokers (51.7%) and alcohol

consumers (50.0%) compared to their counterparts, these associations did not reach statistical significance ($p = 0.08$ and $p = 0.09$, respectively).

Discussion

The present hospital-based cross-sectional study revealed a high prevalence of metabolic syndrome (41%) among adults attending a tertiary care hospital. This finding underscores the growing burden of cardiometabolic risk factors in clinical settings and aligns with the increasing trend of metabolic syndrome reported in India and other developing countries undergoing rapid epidemiological transition. The prevalence observed in the present study is comparable to that reported by Kumar and Sagar, who documented a prevalence of 41% among adults attending a tertiary care hospital in Telangana using the modified NCEP ATP III criteria [1]. Similar prevalence rates ranging from 25% to 45% have been reported in other Indian hospital-based studies, depending on the population characteristics and diagnostic criteria used [6–8]. These findings collectively indicate that metabolic syndrome has emerged as a significant public health problem among adults seeking healthcare services. In the present study, elevated blood pressure (60%) was the most common component of metabolic syndrome, followed by abdominal obesity (52%), elevated triglycerides (48%), elevated fasting plasma glucose (46%), and low HDL cholesterol (44%). This pattern is consistent with findings reported in previous Indian and international studies, where hypertension and central obesity were the predominant metabolic abnormalities [1,9,10]. The high prevalence of elevated blood pressure may reflect poor lifestyle practices, stress, and delayed diagnosis or suboptimal control of hypertension in the community.

Gender-wise analysis revealed a higher prevalence of metabolic syndrome among females (45.2%) compared to males (37.9%), although the difference was not statistically significant. Similar female predominance has been reported in studies by Ezeala et al. and other authors, which may be attributed to hormonal changes, particularly during peri-menopausal and post-menopausal periods, along with lower physical activity levels among women [11]. However, the lack of statistical significance suggests that both genders are almost equally vulnerable to metabolic syndrome in hospital-attending populations. A significant association was observed between sedentary lifestyle and metabolic syndrome, with more than half of sedentary individuals affected (54.2%) compared to non-sedentary participants. This finding reinforces the well-established role of physical inactivity in the pathogenesis of insulin resistance, central obesity, and dyslipidemia [3,12]. Similar associations have been documented in studies conducted in India and other low- and middle-income countries, highlighting sedentary behaviour as a key modifiable risk factor [1,12]. Although higher prevalence of metabolic syndrome was observed among smokers and alcohol consumers, these associations did not reach statistical significance. Nonetheless, previous evidence suggests that smoking contributes to insulin resistance, dyslipidemia, and endothelial dysfunction, while excessive alcohol intake may worsen metabolic parameters. The lack of statistical significance in the present study may be due to the relatively small sample size.

Conclusion

The present study demonstrated a high prevalence of metabolic syndrome among adults attending a tertiary care hospital, with elevated blood pressure and central obesity being the most common components. A sedentary lifestyle showed a significant association with metabolic syndrome, highlighting the role of modifiable risk factors. Routine screening and early lifestyle-based interventions at the hospital level are essential to reduce the future burden of cardiovascular disease and type 2 diabetes mellitus.

Limitations

This study was limited by its hospital-based, cross-sectional design, which restricts generalizability and precludes causal inference. The relatively small sample size and reliance on self-reported lifestyle information may have influenced the observed associations.

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Table 1. Sociodemographic and Lifestyle Profile of the Study Population (n = 100)

Variable	Category	Number (n)	Percentage (%)
Age group (years)	18–30	18	18.0
	31–45	34	34.0
	46–60	30	30.0
	>60	18	18.0
Mean age ± SD (years)	—	46.3 ± 11.2	—
Sex	Male	58	58.0
	Female	42	42.0
Physical activity	Sedentary	48	48.0
	Moderate/Heavy	52	52.0
Dietary pattern	Mixed	72	72.0
	Vegetarian	28	28.0

Smoking status	Smoker	29	29.0
	Non-smoker	71	71.0
Alcohol consumption	Yes	34	34.0
	No	66	66.0

Table 2. Prevalence of Metabolic Syndrome and Its Components (NCEP ATP III Criteria) (n = 100)

Parameter	Number (n)	Percentage (%)
Metabolic syndrome present	41	41.0
Metabolic syndrome absent	59	59.0
Components of Metabolic Syndrome		
Abdominal obesity	52	52.0
Elevated blood pressure	60	60.0
Elevated triglycerides	48	48.0
Low HDL cholesterol	44	44.0
Elevated fasting glucose	46	46.0
Number of components among MetS cases (n = 41)		
Exactly 3 components	32	78.0
≥4 components	9	22.0

Table 3. Association of Sociodemographic and Lifestyle Factors with Metabolic Syndrome (n = 100)

Variable	Category	MetS Present n (%)	MetS Absent n (%)	p-value
Sex	Male (n=58)	22 (37.9)	36 (62.1)	0.42
	Female (n=42)	19 (45.2)	23 (54.8)	
Physical activity	Sedentary (n=48)	26 (54.2)	22 (45.8)	0.02
	Non-sedentary (n=52)	15 (28.8)	37 (71.2)	
Smoking	Smoker (n=29)	15 (51.7)	14 (48.3)	0.08
	Non-smoker (n=71)	26 (36.6)	45 (63.4)	
Alcohol use	Yes (n=34)	17 (50.0)	17 (50.0)	0.09
	No (n=66)	24 (36.4)	42 (63.6)	