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RESEARCH ARTICLE
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A CROSS SECTIONAL STUDY OF PREVALENCE OF METABOLIC SYNDROME (AS PER DEFINITION OF NCEP-ATP3) IN PATIENTS ATTENDING TERTIARY CARE HOSPITAL IN COAL - CAPITAL OF INDIA, DHANBAD

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ABSTRACT

Background: This study was conducted to ascertain the prevalence of metabolic syndrome in patients undergoing treatment at a tertiary care facility in Dhanbad, India's coal capital, as determined by the NCEP-ATP III criteria.

Methods: Over the course of July to November, a cross-sectional observational study was carried out in Shaheed Nirmal Mahato Medical College, Dhanbad. Consecutive sampling was used to enroll 300 patients (≥18 years old) who were enrolled in both inpatient and outpatient departments. A pre-tested structured questionnaire, physical examination, and laboratory studies were used to gather data on sociodemographic, clinical, and biochemical parameters. The NCEP-ATP III criteria were used to diagnose metabolic syndrome. SPSS was used for the statistical analysis, and a p-value of less than 0.05 was deemed statistically significant.

Result: 32.7% of people had metabolic syndrome overall. Of the participants in the study, 46.7% were women and 53.3% were men. Females had a significantly higher prevalence (38.6%) than males (27.5%) ($p=0.04$). As people aged, the prevalence rose, reaching 52.2% in those over 60 ($p<0.001$). The most frequent abnormalities among the individual components were low HDL cholesterol (45.3%) and elevated blood pressure (49.3%), followed by abdominal obesity (40.7%), fasting hyperglycemia (38.7%), and hypertriglyceridemia (36.7%). There was no discernible link between metabolic syndrome and alcohol or tobacco use.

Conclusion: Metabolic syndrome is highly prevalent in this population, especially among females and older individuals. Early screening and lifestyle interventions are essential to reduce future cardiovascular and metabolic risks.

Keywords: Metabolic Syndrome, NCEP-ATP III, Prevalence, Obesity, Hypertension, Dyslipidemia, Insulin Resistance.

INTRODUCTION

Central obesity, dyslipidaemia, hypertension, and insulin resistance are all part of the MetS (Metabolic Syndrome), a group of risk factors that dramatically raises the risk of type 2 diabetes, cardiovascular disease, and death.[1] Because of sedentary lifestyles, poor diets, and urbanisation, its prevalence is increasing globally, especially in developing nations like India.[2] High triglycerides, low HDL cholesterol, and central obesity are all closely associated with a sedentary lifestyle. Approximately 75% of people with impaired glucose tolerance or type 2 diabetes also have MetS, which raises their risk of cardiovascular disease. Individuals with MetS are three times more likely to experience heart attacks or strokes and are twice as likely to die from cardiovascular events.

The main mechanism of MetS is thought to be insulin resistance, which is fueled by an excess of free fatty acids from adipose tissue. This contributes to heart disease and hypertension by interfering with the metabolism of glucose and encouraging the buildup of lipids in tissues.

MetS is defined by the NCEP-ATP III criteria, which are frequently applied in epidemiological research, as the existence of any three of the following five risk factors: high blood pressure, elevated fasting glucose, low HDL cholesterol, high triglycerides, and abdominal obesity.[3]

Depending on age, gender, socioeconomic status, and geographic location, the prevalence of MetS in India varies from 20% to 40%.[4,5] For eastern India, especially industrial and semi-urban regions like Dhanbad, there is, however, a dearth of data. Developing successful preventive measures requires an understanding of the burden of MetS in these areas.

MATERIALS & METHODS

The current hospital-based cross-sectional observational study was carried out in Shaheed Nirmal Mahato Medical College, Dhanbad, Jharkhand from July to November. A total of 300 patients who visited the hospital's inpatient and outpatient departments during the study period made up the study population. The study included patients who gave written informed consent and were at least 18 years old. Patients on long-term corticosteroid therapy or drugs that affect metabolic parameters, patients with chronic systemic illnesses (apart from those being assessed for metabolic syndrome parameters), pregnant women, and patients who were unwilling to give their consent were not included.

The standard formula for cross-sectional studies was used to calculate the sample size: $n = Z^2 \times p \times (1-p) / d^2$, where Z is the standard normal deviate (1.96 for 95% CI), p is the estimated prevalence of metabolic syndrome (estimated at 30% based on prior Indian studies), and d is the margin of error (5%). These computations yielded a minimum sample size of roughly. In the end, a slightly larger number of patients were enrolled using consecutive sampling to account for possible non-responses or incomplete data.

A pre-designed, pre-tested, semi-structured questionnaire was used to collect data. It asked about medical history, family history, lifestyle factors like smoking, alcohol use, and physical activity levels, as well as demographic data like age, sex, occupation, and socioeconomic status. Every participant underwent a comprehensive clinical examination that included blood pressure, waist circumference, height, and weight measurements. The formula for calculating BMI (Body Mass Index) was weight (kg) divided by height (m^2) squared. Using a standard sphygmomanometer, blood pressure was measured twice at five-minute intervals. The average value was then used for analysis.

Following an overnight fast of at least 8–10 hours, fasting blood samples were taken in order to measure the lipid profile, which includes HDL (High-Density Lipoprotein) cholesterol and triglycerides, as well as fasting blood glucose. The NCEP-ATP III (National Cholesterol Education Program Adult Treatment Panel III) criteria were used to diagnose metabolic syndrome. These criteria state that abdominal obesity (waist circumference >102 cm for men and >88 cm for women), serum triglycerides ≥150 mg/dL, HDL cholesterol <40 mg/dL for men and <50 mg/dL for women, blood

pressure ≥130/85 mmHg, and fasting blood glucose ≥110 mg/dL are all considered indicators of metabolic syndrome.[3]

The Institutional Ethics Committee granted ethical approval for the study. Prior to being included in the study, each participant gave written, informed consent, and data confidentiality was upheld at all times. Microsoft Excel was used to enter the gathered data, and SPSS version was used for analysis. The data was summarised using descriptive statistics like means, standard deviations, and percentages. The relationships between continuous and categorical variables were ascertained using the independent t-test and the chi-square test, respectively. Statistical significance was defined as a p-value of less than 0.05.

RESULT

The present study included a total of 300 patients attending the tertiary care hospital in Dhanbad. The mean age of the study population was 45.3 ± 12.5 years, ranging from 18 to 75 years. Out of the total participants, 160 (53.3%) were males and 140 (46.7%) were females. Based on the NCEP-ATP III criteria, metabolic syndrome was diagnosed in 98 patients, resulting in an overall prevalence of 32.7% in the study population.

When analyzed component-wise, abdominal obesity was present in 40.7% of the participants, hypertriglyceridemia was seen in 36.7%, low HDL cholesterol was observed in 45.3%, elevated blood pressure was noted in 49.3%, and fasting hyperglycemia was present in 38.7% of the participants. The prevalence of metabolic syndrome was higher among females (38.6%) compared to males (27.5%), and this gender difference was statistically significant ($p = 0.04$). The prevalence also increased with advancing age, with 12.5% in the 18–30 years group, 28.4% in the 31–45 years group, 40.3% in the 46–60 years group, and 52.2% in individuals older than 60 years, showing a statistically significant association between age and metabolic syndrome ($p < 0.001$). Among lifestyle factors, 35.7% of smokers and 42% of alcohol consumers were found to have metabolic syndrome, though these associations were not statistically significant. The mean waist circumference of the study participants was 94.8 ± 11.2 cm and the mean systolic and diastolic blood pressures were 134.6 ± 16.5 mmHg and 84.2 ± 10.4 mmHg, respectively. The mean fasting blood glucose was 112.5 ± 25.6 mg/dL, mean triglycerides were 172.4 ± 52.3 mg/dL, and mean HDL cholesterol was 38.7 ± 9.6 mg/dL.

Variable	**Mean ± SD / n (%)**
Age (in years)	45.3 ± 12.5
Gender	
- Male	160 (53.3%)
- Female	140 (46.7%)
Waist Circumference (cm)	94.8 ± 11.2
Systolic BP (mmHg)	134.6 ± 16.5
Diastolic BP (mmHg)	84.2 ± 10.4
Fasting Blood Glucose (mg/dL)	112.5 ± 25.6
Triglycerides (mg/dL)	172.4 ± 52.3
HDL Cholesterol (mg/dL)	38.7 ± 9.6

Table 1: Baseline Characteristics of Study Participants (N = 300)

Component	**n (%)**
Abdominal Obesity	122 (40.7%)
Hypertriglyceridemia	110 (36.7%)
Low HDL Cholesterol	136 (45.3%)
Elevated Blood Pressure	148 (49.3%)
Fasting Hyperglycemia	116 (38.7%)

Table 2: Prevalence of Individual Components of Metabolic Syndrome

Age Group (in years)	n	Metabolic Syndrome Present n (%)
18 – 30	40	5 (12.5%)
31 – 45	88	25 (28.4%)
46 – 60	124	50 (40.3%)
> 60	48	25 (52.2%)
Total	300	**98 (32.7%)**

Table 3: Prevalence of Metabolic Syndrome by Age Group

Gender	n	Metabolic Syndrome Present n (%)
Male	160	44 (27.5%)
Female	140	54 (38.6%)
Total	**300**	**98 (32.7%)**

Table 4: Gender-Wise Prevalence of Metabolic Syndrome

Factor	n	Metabolic Syndrome Present n (%)
Smoking	70	25 (35.7%)
Non-Smoking	230	73 (31.5%)
Alcohol Use	50	21 (42%)
Non-Alcohol Use	250	77 (30.8%)

Table 5: Association with Lifestyle Factors

DISCUSSION

This study found a 32.7% prevalence of metabolic syndrome among patients attending a tertiary care hospital in Dhanbad, closely aligning with reports from other regions of India. Sawant et al. reported a similar prevalence of 31.6% in an urban Mumbai population,[6] while Pandit et al. found 34.8% in Gujarat.[7] These findings underscore the growing burden of metabolic syndrome across diverse Indian settings.

In comparison, higher prevalence rates have been reported in South India. The CURES study by Deepa et al. documented a prevalence of 41% in Chennai,[4] while Mohan et al. reported 47.2% in urban Chennai residents.[8] These regional differences may be attributed to variations in study populations, lifestyle factors, socioeconomic status, urbanization levels, and diagnostic criteria used.

A significant gender difference was observed in the current study, with females showing a higher prevalence (38.6%) than males (27.5%), which was statistically significant. This is consistent with earlier Indian studies,[9,10] and may result from increased central obesity, hormonal changes during menopause, and lower physical activity among women.[11] Age also showed a strong association, with metabolic syndrome increasing progressively with age and peaking at 52.2% in those over 60 years. This trend has been documented by Gupta et al. and Misra et al., who noted that aging is associated with higher insulin resistance, altered lipid metabolism, and increased adiposity, all of which elevate the risk for metabolic syndrome.[2,5,12,13] Among the syndrome's components, low HDL cholesterol (45.3%) and elevated blood pressure (49.3%) were the most prevalent. These findings are in agreement with other Indian studies, indicating that hypertension and dyslipidemia are major contributors to the syndrome's prevalence in the population.[14] Although alcohol use was slightly more common than smoking, neither lifestyle factor showed a significant association with metabolic syndrome in this study. This may be due to underreporting, cultural variability, or the limitations of cross-sectional analysis.

Overall, the high prevalence of metabolic syndrome in this semi-urban population highlights the urgent need for early identification, lifestyle interventions, and public health education. Targeted strategies focusing on diet, exercise, and routine screening are particularly important in industrial

towns like Dhanbad, where occupational stress and sedentary lifestyles may increase cardiometabolic risk.[15] Large-scale population-based studies are needed to explore region-specific risk factors and implement preventive public health measures.

Metabolic syndrome, as defined by the NCEP-ATP III criteria in *Harrison's Principles of Internal Medicine (21st Edition, Chapter 408)*, includes a combination of central obesity, dyslipidemia, hypertension, and impaired fasting glucose—factors closely linked to insulin resistance. This cluster significantly raises the risk of cardiovascular disease and type 2 diabetes.

Our study in a tertiary care hospital in Dhanbad, an urban industrial area, reflects a high prevalence of metabolic syndrome, aligning with the global trend highlighted in Harrison. Urban lifestyle, poor diet, and occupational stress likely contribute to this burden. Harrison also emphasizes that early detection and lifestyle modification can reverse many components of the syndrome, underlining the importance of proactive screening and intervention in high-risk populations like ours.[16]

CONCLUSION

Using NCEP-ATP III criteria, the current study reveals a high prevalence of metabolic syndrome (32.7%) among patients undergoing treatment at a tertiary care hospital in Dhanbad, Jharkhand. The prevalence rose steadily with age and was much higher in females. The most common abnormalities among the individual components were low HDL cholesterol and elevated blood pressure. The results highlight the rising prevalence of metabolic syndrome, which is a result of urbanisation, changes in lifestyle, and occupational factors, even in semi-urban and industrial areas like Dhanbad. Preventing long-term complications like type 2 diabetes mellitus, cardiovascular disease, and stroke requires early detection and thorough management of metabolic syndrome components through lifestyle modifications, public health education, and routine screening. To better understand the risk factors and create region-specific preventive measures, large-scale, population-based studies are necessary.

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