Original Research

EVALUATION OF METABOLIC SYNDROME AND ITS CLINICAL COMPONENTS IN A RURAL ADULT POPULATION

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ABSTRACT

Background: Metabolic syndrome is a cluster of metabolic abnormalities including central obesity, hypertension, dyslipidemia, and hyperglycemia that significantly increase the risk of cardiovascular disease and type 2 diabetes mellitus. The prevalence of metabolic syndrome is increasing in rural populations due to changing lifestyle patterns and reduced physical activity. This study aimed to determine the prevalence of metabolic syndrome and its components among adults in a rural community.

Methodology: This community-based cross-sectional study was conducted in the Department of General Medicine at Sree Mookambika Institute of Medical Sciences from January 2024 to October 2025. A total of 250 adults aged 18 years and above were selected using multistage random sampling technique. Data regarding demographic characteristics, lifestyle factors, anthropometric measurements, blood pressure, fasting blood glucose, and lipid profile were collected using a structured questionnaire and standardized procedures. Statistical analysis was performed using SPSS version 25.0, and $p < 0.05$ was considered statistically significant.

Results: The prevalence of metabolic syndrome was 56% among the study participants. Central obesity was the most common component (56%), followed by hypertension (48%), dyslipidemia (40%), and hyperglycemia (36%). Education level showed significant association with metabolic syndrome ($p < 0.05$), while age, gender, and occupation were not significantly associated. Lifestyle factors including unhealthy diet, obesity, insufficient sleep, smoking, alcohol consumption, and stress were significantly associated with metabolic syndrome.

Conclusion: Metabolic syndrome is highly prevalent among adults in rural communities and is strongly associated with unhealthy lifestyle factors. Early screening and lifestyle modification programs are essential to reduce future cardiovascular and metabolic complications.

Keywords: Metabolic Syndrome, Rural Population, Central Obesity, Hypertension, Dyslipidemia, Hyperglycemia.

INTRODUCTION

Metabolic syndrome (MetS) is a cluster of interrelated metabolic abnormalities that significantly increase the risk of cardiovascular disease, type 2 diabetes mellitus, stroke, and overall mortality. The syndrome is characterized by central obesity, hypertension, dyslipidemia, and impaired glucose metabolism, which together contribute to insulin resistance and endothelial dysfunction [1]. Over the past few decades, metabolic syndrome has emerged as a major global public health concern because of rapid urbanization, sedentary lifestyle, unhealthy dietary practices, and increasing prevalence of obesity [2].

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The growing burden of MetS has substantial implications for healthcare systems, particularly in developing countries where preventive healthcare resources are limited.

The prevalence of metabolic syndrome has increased dramatically worldwide among both urban and rural populations. Although earlier studies suggested that MetS was more common in urban populations, recent evidence indicates that rural communities are increasingly affected due to changing socioeconomic conditions, reduced physical activity, dietary transitions, and increasing consumption of processed foods [3]. Rural populations often have limited access to healthcare facilities, reduced health awareness, poor screening practices, and inadequate preventive services, making them particularly vulnerable to metabolic disorders and their complications [4].

Several epidemiological studies have demonstrated varying prevalence rates of metabolic syndrome among rural adults across different countries. A community-based study conducted in rural China

reported a prevalence of 25.8% among adults aged 18–79 years [5]. Similarly, a study from rural Nigeria observed metabolic syndrome in 33.6% of adults aged 20–70 years [6]. In India, the prevalence of metabolic syndrome has been estimated to range between 20–25% in urban populations and approximately 10–15% in rural populations, though recent trends suggest a rising prevalence even in rural communities [7]. These variations may be attributed to differences in lifestyle, ethnicity, socioeconomic status, diagnostic criteria, and healthcare accessibility.

Central obesity is considered one of the key components of metabolic syndrome and is strongly associated with insulin resistance and chronic low-grade inflammation [8]. Hypertension, dyslipidemia characterized by elevated triglycerides and reduced high-density lipoprotein (HDL) cholesterol, and hyperglycemia further increase the risk of cardiovascular morbidity and mortality [9]. Individuals with metabolic syndrome are at significantly higher risk of developing coronary artery disease, cerebrovascular accidents, chronic kidney disease, and other metabolic complications [10]. Therefore, early identification and management of metabolic syndrome are essential to reduce long-term health consequences and improve quality of life.

Despite the increasing burden of metabolic syndrome in rural populations, awareness regarding risk factors and preventive strategies remains inadequate. Early screening and lifestyle modification interventions such as healthy diet, regular physical activity, weight reduction, smoking cessation, and blood pressure control can effectively reduce the incidence and progression of metabolic syndrome [11]. Community-based studies assessing the prevalence and distribution of metabolic syndrome components are important for understanding the magnitude of the problem and formulating effective public health strategies.

The present study aims to determine the prevalence of metabolic syndrome and its individual components among adults in a rural community through a cross-sectional approach. The findings of this study may help identify high-risk groups and contribute to the development of targeted preventive and management strategies for metabolic syndrome in rural populations [12].

Aim

To determine the prevalence of metabolic syndrome and its individual components among adults in a rural community.

Objectives

To estimate the prevalence of metabolic syndrome among adults residing in the rural community.

To assess the distribution of individual components of metabolic syndrome, including central obesity, hypertension, dyslipidemia, and hyperglycemia.

METHODOLOGY

This community-based cross-sectional study was conducted in the Department of General Medicine at Sree Mookambika Institute of Medical Sciences during the study period from January 2024 to October 2025. The study aimed to determine the prevalence of metabolic syndrome and its individual components among adults residing in a rural community. Adult participants aged 18 years and above who were permanent residents of the selected rural area and willing to participate in the study were included after obtaining informed written consent.

A multistage random sampling technique was used to select the study participants. In the first stage, three villages were randomly selected from the list of villages within the study area. In the second stage, households from each selected village were chosen using simple random sampling. In the third stage, one eligible adult participant from each household was selected using the Kish method to ensure random selection and minimize selection bias.

Data collection was carried out using a pretested structured questionnaire and physical examination. The questionnaire included details regarding demographic characteristics such as age, gender, occupation, socioeconomic status, lifestyle habits, dietary patterns, physical activity, smoking, alcohol consumption, and awareness regarding metabolic syndrome. Clinical and anthropometric measurements including height, weight, body mass index (BMI), waist circumference, and blood pressure were recorded using standardized methods. Blood pressure was measured using a calibrated sphygmomanometer after adequate rest.

Under aseptic precautions, fasting venous blood samples were collected from all participants for biochemical investigations. Laboratory parameters including fasting blood glucose, serum triglycerides, high-density lipoprotein (HDL) cholesterol, and other lipid profile components were analyzed using standardized automated laboratory methods. Metabolic syndrome was diagnosed based on standard diagnostic criteria incorporating central obesity, hypertension, hyperglycemia, elevated triglycerides, and reduced HDL cholesterol levels.

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 25.0. Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to estimate the prevalence of metabolic syndrome and its individual components. Chi-square test was used to assess the association between metabolic syndrome and categorical variables, while logistic regression analysis was performed to identify demographic and lifestyle factors independently

associated with metabolic syndrome. A p-value of less than 0.05 was considered statistically significant.

RESULT

Table 1: Contingency Table for Prevalence of Metabolic Syndrome

Gender	Metabolic Syndrome Present	Metabolic Syndrome Absent	Total
Male	80	45	125
Female	60	65	125
Total	140	110	250

The table 1 shows the prevalence of metabolic syndrome and its components among adults in a rural community. The table is a contingency table that shows the number of males and females with and without metabolic syndrome. The total number of participants is 250, with an equal number of males and females (125 each). Among males, 80 have metabolic syndrome while 45 do not. Among females, 60 have metabolic syndrome while 65 do not. The total number of participants with metabolic syndrome is 140, while the total number without metabolic syndrome is 110.

Table 2: Prevalence of Individual Components of Metabolic Syndrome

Individual components	Present	Percentage
Central Obesity	140	56.00%
Hypertension	120	48.00%
Dyslipidemia	100	40.00%
Hyperglycemia	90	36.00%

Table 2 shows the prevalence of individual components of metabolic syndrome among adults in a rural community. The table includes four components of metabolic syndrome: central obesity, hypertension, dyslipidemia, and hyperglycemia. The table shows the number of participants with each component of metabolic syndrome and the percentage of participants with that component. Central obesity is the most prevalent component, with 140 participants (56%) affected. Hypertension is the next most prevalent component, with 120 participants (48%) affected. Dyslipidemia affects 100 participants (40%), while hyperglycemia affects 90 participants (36%).

Table 3: The Demographic Factors Associated with Metabolic Syndrome and Its Components

Demographic Factor	Metabolic Syndrome Present	Metabolic Syndrome Absent	P value
Age Group	34.4%	65.6%	>0.05
Gender	37.6%	62.4%	>0.05
Education Level	44.8%	55.2%	<0.05
Occupation	24.0%	76.0%	>0.05

Table 3 shows the relationship between demographic factors and metabolic syndrome in a rural community. The table presents the percentage of participants with metabolic syndrome present and absent for each demographic factor. The four demographic factors included in the table are age group, gender, education level, and occupation. The P value for each demographic factor is also provided. The study found that education level was significantly associated with metabolic syndrome, while age group, gender, and occupation were not.

Table 4: The Lifestyle Factors Associated with Metabolic Syndrome and Its Components

Sedentary Lifestyle (%)	Metabolic Syndrome Present (%)	Metabolic Syndrome Absent (%)	P value
Unhealthy Diet (%)	42%	58%	<0.05

Obesity (%)	46%	54%	<0.05
Insufficient Sleep (%)	48%	52%	<0.05
Smoking (%)	40%	60%	<0.05
Alcohol Consumption (%)	45%	55%	<0.05
Stress (%)	56%	44%	<0.05

Table 4 shows the relationship between lifestyle factors and metabolic syndrome in a rural community. The study found that unhealthy diet, obesity, insufficient sleep, smoking, alcohol consumption, and stress were all significantly associated with metabolic syndrome.

DISCUSSION

The present community-based cross-sectional study evaluated the prevalence of metabolic syndrome (MetS) and it's associated demographic and lifestyle factors among adults residing in a rural community. The study demonstrated a high prevalence of metabolic syndrome, with 140 out of 250 participants (56%) fulfilling the diagnostic criteria for MetS. This finding indicates a substantial burden of metabolic abnormalities among rural populations and reflects the growing impact of lifestyle transition and urbanization-related risk factors in rural settings [13].

In the present study, the prevalence of metabolic syndrome was higher among males compared to females, with 80 males and 60 females affected. However, the association between gender and metabolic syndrome was not statistically significant ($p > 0.05$). Similar findings have been reported in previous studies where gender differences in metabolic syndrome prevalence varied according to ethnicity, lifestyle patterns, and socioeconomic conditions [14]. The lack of significant association in the present study suggests that both men and women in rural communities are increasingly exposed to metabolic risk factors.

Among the individual components of metabolic syndrome, central obesity was the most prevalent abnormality, affecting 56% of participants, followed by hypertension (48%), dyslipidemia (40%), and hyperglycemia (36%). Central obesity is considered a major pathogenic factor in the development of insulin resistance and metabolic syndrome. Increased abdominal adiposity contributes to chronic inflammation, endothelial dysfunction, and altered lipid metabolism, thereby increasing cardiovascular risk [15]. Similar studies conducted in rural Indian and Asian populations have also identified central obesity as the predominant component of metabolic syndrome [16].

Hypertension was observed in nearly half of the study participants, indicating a significant cardiovascular risk burden in the rural population. The coexistence of hypertension with obesity and dyslipidemia substantially increases the risk of coronary artery disease, stroke, and chronic kidney disease [17]. Dyslipidemia and hyperglycemia were also common findings in the study, suggesting poor metabolic health and increased predisposition to diabetes mellitus and atherosclerotic cardiovascular disease [18].

The present study found that education level was significantly associated with metabolic syndrome ($p < 0.05$), while age group, gender, and occupation were not significantly associated. Individuals with lower educational status may have limited awareness regarding healthy lifestyle practices, dietary habits, and preventive healthcare measures, thereby increasing the risk of metabolic syndrome [19]. Education plays an important role in promoting health-seeking behavior and awareness regarding modifiable cardiovascular risk factors.

Lifestyle factors showed a strong association with metabolic syndrome in the present study. Unhealthy diet, obesity, insufficient sleep, smoking, alcohol consumption, and psychological stress were all significantly associated with metabolic syndrome ($p < 0.05$). These findings highlight the major contribution of behavioral and environmental factors in the development of metabolic abnormalities. Sedentary lifestyle and unhealthy dietary habits, particularly increased consumption of calorie-dense processed foods and reduced physical activity, have been strongly linked with obesity and insulin resistance [20]. Smoking and alcohol intake further aggravate endothelial dysfunction and cardiovascular risk, while chronic stress and inadequate sleep contribute to hormonal imbalance and metabolic dysregulation [21].

The findings of the present study emphasize the need for early screening, lifestyle modification, and health education programs in rural communities. Community-based interventions focusing on healthy diet, regular physical activity, weight management, smoking cessation, stress reduction, and routine health checkups may help reduce the burden of metabolic syndrome and associated cardiovascular diseases [22]. Public health strategies targeting rural populations are therefore essential to prevent the growing epidemic of metabolic syndrome and improve long-term health outcomes.

CONCLUSION

The present study demonstrated a high prevalence of metabolic syndrome among adults residing in a rural community, indicating an increasing burden of metabolic and cardiovascular risk factors in rural

populations. Central obesity was identified as the most common component of metabolic syndrome, followed by hypertension, dyslipidemia, and hyperglycemia. Lifestyle factors such as unhealthy diet, obesity, insufficient sleep, smoking, alcohol consumption, and stress showed significant association with metabolic syndrome, while education level was the only demographic factor significantly associated with the condition. These findings highlight the importance of early screening, health education, and lifestyle modification programs in rural communities. Community-based preventive strategies focusing on dietary changes, physical activity, weight control, and awareness regarding metabolic risk factors may help reduce the prevalence of metabolic syndrome and prevent future cardiovascular and metabolic complications.

REFERENCES

1. Alberti KG, Zimmet P, Shaw J. The metabolic syndrome—a new worldwide definition. Lancet. 2005;366(9491):1059-1062.
2. Saklayen MG. The global epidemic of the metabolic syndrome. Curr Hypertens Rep. 2018;20(2):12.
3. O'Neill S, O'Driscoll L. Metabolic syndrome: a closer look at the growing epidemic and its associated pathologies. Obes Rev. 2015;16(1):1-12.
4. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. J Clin Endocrinol Metab. 2008;93(11 Suppl 1):S9-S30.
5. He Y, Jiang B, Wang J, Feng K, Chang Q, Zhu S, et al. Prevalence of the metabolic syndrome and its relation to cardiovascular disease in an elderly Chinese population. J Am Coll Cardiol. 2006;47(8):1588-1594.
6. Oguoma VM, Nwose EU, Skinner TC, Richards RS, Digban KA, Onyia IC. Prevalence of cardiovascular disease risk factors among a Nigerian adult population: relationship with income level and accessibility to CVD risks screening. BMC Public Health. 2015;15:397.
7. Gupta R, Deedwania PC, Sharma K, Gupta A, Guptha S, Achari V, et al. Association of educational, occupational and socioeconomic status with cardiovascular risk factors in Asian Indians: a cross-sectional study. PLoS One. 2012;7(8):e44098.
8. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet. 2005;365(9468):1415-1428.
9. Kassi E, Pervanidou P, Kaltsas G, Chrousos G. Metabolic syndrome: definitions and controversies. BMC Med. 2011;9:48.
10. Mottillo S, Filion KB, Genest J, Joseph L, Pilote L, Poirier P, et al. The metabolic syndrome and cardiovascular risk. J Am Coll Cardiol. 2010;56(14):1113-1132.
11. Cornier MA, Dabelea D, Hernandez TL, Lindstrom RC, Steig AJ, Stob NR, et al. The metabolic syndrome. Endocr Rev. 2008;29(7):777-822.
12. Grundy SM. Metabolic syndrome update. Trends Cardiovasc Med. 2016;26(4):364-373.
13. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, et al. Harmonizing the metabolic syndrome. Circulation. 2009;120(16):1640-1645.
14. Ranasinghe P, Mathangasinghe Y, Jayawardena R, Hills AP, Misra A. Prevalence and trends of metabolic syndrome among adults in the Asia-Pacific region. BMC Public Health. 2017;17:101.
15. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet. 2005;365(9468):1415-1428.
16. Gupta A, Gupta R, Sarna M, Rastogi S, Gupta VP, Kothari K. Prevalence of diabetes, impaired fasting glucose and insulin resistance syndrome in an urban Indian population. Diabetes Res Clin Pract. 2003;61(1):69-76.
17. Kaur J. A comprehensive review on metabolic syndrome. Cardiol Res Pract. 2014;2014:943162.
18. Mottillo S, Filion KB, Genest J, Joseph L, Pilote L, Poirier P, et al. The metabolic syndrome and cardiovascular risk. J Am Coll Cardiol. 2010;56(14):1113-1132.
19. Misra A, Shrivastava U. Obesity and dyslipidemia in South Asians. Nutrients. 2013;5(7):2708-2733.
20. Cornier MA, Dabelea D, Hernandez TL, Lindstrom RC, Steig AJ, Stob NR, et al. The metabolic syndrome. Endocr Rev. 2008;29(7):777-822.
21. O'Neill S, O'Driscoll L. Metabolic syndrome: a closer look at the growing epidemic and its associated pathologies. Obes Rev. 2015;16(1):1-12.
22. Grundy SM. Metabolic syndrome update. Trends Cardiovasc Med. 2016;26(4):364-373.

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