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PREVALENCE AND CORRELATION OF METABOLIC SYNDROME AMONG OBESE ADULT MEN IN COIMBATORE, TAMILNADU

Sathya Suba. R. D [1]*, Angeline Esther Preethi. S [2], Saravanan. T [3] and Senthil Kumar M [4]

[1]Research Scholar and Assistant Professor, Department of Foods and Nutrition, RVS College of Arts and Science, Coimbatore, Tamil Nadu. *Corresponding Author Email: sathyasuba@rvsgroup.com
[2] Head and Associate Professor, Department of Foods and Nutrition, RVS College of Arts and Science, Coimbatore, Tamil Nadu. Email: angeline@rvsgroup.com
[3] Professor and Head, Department of Internal Medicine, PSG Institute of Medical Sciences and Research Centre, Coimbatore. Email: dr_saravanan12@yahoo.co.in
[4] Director of Stat Works and Correspondent, Avatar Public School, Coimbatore. Email: statworks.in@gmail.com

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Abstract

Introduction: Metabolic Syndrome (MetS) rates are increasing, particularly among individuals who experience stress in the workplace. Several factors associated with this medical condition increase the risk of heart disease. The contributing factors include surplus abdominal fat, elevated blood pressure, heightened triglyceride levels, decreased HDL cholesterol levels, and increased fasting glucose levels. This study aimed to examine common metabolic syndrome in obese men from Coimbatore, Tamil Nadu. **Methodology**: This prospective interventional study enrolled 765 obese men. Following approval from the PSG Hospitals and the institutional Human Ethical Committee, along with obtaining oral informed consent from volunteers, data collection commenced for six months from February 2022. Statistical analyses were performed to evaluate the results. **Results**: This study included 765 participants, with a notable 74.2% prevalence of MetS ($p < 0.001$). Metabolic syndrome was strongly associated with high blood pressure, glucose levels, and unfavourable lipid profiles ($p < 0.001$). Furthermore, the study revealed that socio demographic variables, including age, education, occupation type, marital status, and religious affiliation, showed varying rates of MetS prevalence among the population examined. This highlights the complex interplay of the factors that contribute to its occurrence. **Conclusions**: This study highlights the increasing public health challenges posed by metabolic syndrome, even in regions like Tamil Nadu with economic constraints. These findings underscore the urgent need for evidence-based intervention to address this escalating health issue.

Keywords: Metabolic Syndrome, Prevalence, Obese Adults.

INTRODUCTION

Adulthood is a critical stage, marked by the attainment of full physical and cognitive development. In particular, men require a diverse array of nutrients to support various physiological functions, including optimal performance, tissue repair, and the regulation of bodily mechanisms. However, nutritional status is strongly influenced by dietary habits. Inadequate food intake can lead to malnutrition, which can have detrimental effects on physical health and well-being (1). In the contemporary rapid-paced way of life, marked by an unyielding chase for prosperity and achievement, metabolic syndrome has become a notable health issue because of its link to higher rates of illness and death, particularly from heart conditions and diabetes. India is grappling with the simultaneous challenges of infectious and chronic diseases; heart conditions, diabetes, and cancer stand out as significant factors in the overall health burden. (2).

Metabolic syndrome is a complex medical condition characterized by various physiological and biochemical irregularities including atypical lipid profiles, elevated

blood pressure, and resistance to insulin. (3). Diabetes, stroke, and heart-related disorders are more common in patients with metabolic syndrome. Globally, metabolic syndrome is thought to affect 20–25 percent of people and is a major risk factor for type 2 diabetes and cardiovascular illnesses. Alarmingly, projections suggest a substantial increase in diabetes cases, particularly in developing countries, such as India (4). The incidence of MetS in India varies from 11 to 56 percent, and is more prevalent in urban settings. Additionally, the incidence of this syndrome is increasing. The risk of developing metabolic syndrome is considerably increased by stress, inactivity, and abdominal obesity (5, 6). There are several methods to diagnose metabolic syndrome, including the guidelines from the National Cholesterol Education Program Adult Treatment Panel III (7), which are frequently utilized because of the straightforwardness of their measurements and laboratory results (8). Despite the importance of understanding the prevalence of MetS in different regions, studies in specific areas, such as those under investigation, remain limited. Therefore, this study was conducted to address this gap in knowledge and improve the understanding of MetS prevalence among obese adult males in Coimbatore, Tamil Nadu.

Objectıves:

This study examined the occurrence of metabolic syndrome in men between the ages of 35 and 55 years residing in Coimbatore, a significant industrial city in Tamil Nadu known for its high body mass index (BMI). Furthermore, this study explored the possible associations between MetS and various socio demographic factors within this group.

METHOD

Study Framework:

A hospital-based observational study was conducted to explore the incidence and correlation of metabolic syndrome among obese adult males in Coimbatore, Tamil Nadu, with the aim of determining the magnitude of this syndrome and its possible links to diverse elements.

Participants:

The study included 765 obese men who were recruited from the outpatient services of General Medicine and the Cardiac Outpatient Ward, chosen because of their obesity-related health concerns. Eligibility for the study was determined by being a male adult between the ages of 35 and 55 years and having a body mass index (BMI) that falls within the obesity range (BMI ≥ 25 kg/m^2). Exclusion criteria were applied to Individuals with mental disabilities, AIDS, cancer, or any other significant medical conditions were excluded, ensuring a focused sample for the study.

Ethical Approval and Consent:

The PSG Institute of Medical Sciences and Research's Institutional Human Ethical Committee granted ethical approval, confirming the study's compliance with the ethical guidelines and standards. Before enrolment, all participants provided written informed consent, indicating their voluntary decision to participate in the study once they were thoroughly briefed on their goals and methodologies. This ensured that ethical considerations were prioritized and participants' rights were respected throughout the research process.

Data Collection:

Participants' body weights were recorded on an adult scale, with individuals dressed barefoot in lightweight clothing and not wearing shoes or socks. The height of the participants was gauged using a stadiometer while they stood with their feet touched. The weight in kilograms and height in meters squared were divided to determine the user's body mass index. Furthermore, waist circumference was recorded using an inch tape placed midway between the bottom rib and the upper hip bone, taken after the subject exhaled. An aneroid sphygmomanometer was used to measure blood pressure while the subjects were seated, with three consecutive readings spaced one minute apart for accurate evaluation. For biochemical testing, blood was collected after a 12-hour overnight fast using venipuncture and then tested for serum lipid and glucose levels. Metabolic syndrome was identified based on the guidelines of the NCEP ATP III, 2005. Diagnosis was made when participants exhibited three or more of the following indicators: blood pressure greater than 130/85 mmHg, waist circumference > 102 cm for men (or 88 cm for women), fasting triglyceride levels > 150 mg/dL, fasting HDL cholesterol levels less than 40 mg/dL for men (or less than 50 mg/dL for women), and fasting glucose levels exceeding 100 mg/dL (7).

Data Analysis:

Statistical assessments were performed to examine the study outcomes. Descriptive statistical methods were used to outline the demographic and clinical profiles of study participants. Comparative analysis was then performed to assess variations between individuals diagnosed with MetS and those without MetS, utilizing suitable statistical tests, such as t-tests or chi-square tests, as applicable. Correlations were analyzed to explore possible associations between the various variables identified in the study.

RESULTS

In this study of 765 individuals, 568 (74.2 %) were diagnosed with metabolic syndrome based on the criteria established by the NCEP ATP III guidelines. (Figure 1). Moreover, a study by Kavitha et al. (2015) indicated that among 300 samples exhibiting increased waist circumference with three or more criteria met, 247 were identified as having metabolic syndrome[9]. Together, these results highlight the considerable prevalence of metabolic syndrome among the populations examined.

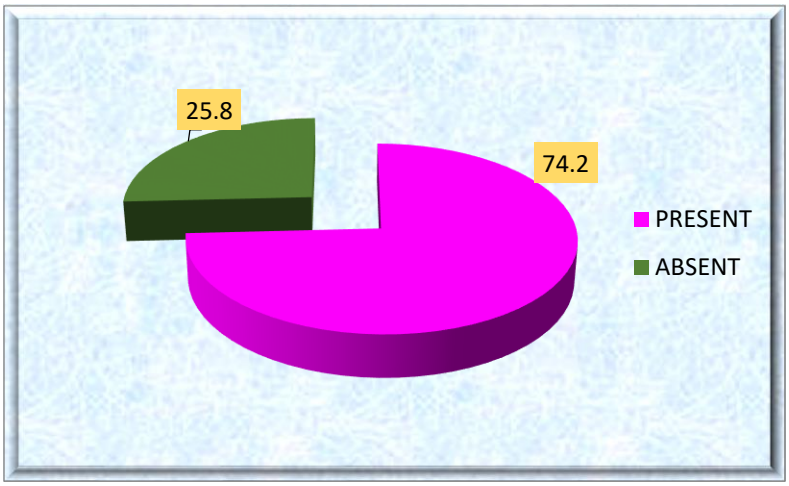

Figure 1: Incidence of Metabolic Syndrome (n=765)

Table 1: Socio demographic profile of the respondents in relation to metabolic syndrome.

Socio Demographic factor	Values	MetS present (N= 568) N (%)	MetS absent (N=197) N (%)	Significance
Age (in years)	36 - 40	86(68.8)	39(31.2)	χ2=8.998 P=0.029
	41 - 45	84(78.5)	23(21.5)	
	46 - 50	80(66.1)	41(33.9)	
	51 - 55	318(77.2)	94(22.8)	
Education	Primary School	2 (66.7)	1(33.3)	χ2=2.427 P=0.787
	Middle School	37(77.1)	11(22.9)	
	High School	197(71.3)	79(28.7)	
	Diploma	66(76.7)	20(23.3)	
	Graduate	202(74.8)	68(25.2)	
	Professional Degree	64(78)	18(22)	
Occupation	Senior Officials & Managers	15(83.3)	3(16.7)	χ2=9.509 P=0.301
	Professionals	53(77.9)	15 (22.1)	
	Technicians and Associate Professionals	166(76.9)	50(23.1)	
	Clerks	12(70.6)	5(29.4)	
	Shop & Market Sales Workers	252(71.2)	102(28.8)	
	Skilled Agricultural	17(60.7)	11(39.3)	
	Craft & Related Trade Workers	27(79.4)	7(20.6)	
	Machine Operators	15(88.2)	2(11.8)	
	Elementary Occupation	11(84.6)	2(15.4)	
Socio economic status *	Upper middle II	272(76)	86(24)	χ2=1.052 P=0.305
	Lower middle III	296(72.70)	111(27.30)	
Marital status	Married	564(74.4)	194(25.6)	χ2=1.330 P=0.722
	Widowed	1(50)	1(50)	
	Divorced	1(50)	1(50)	
	Separated	2(66.7)	1(33.3)	
Religion	Hindu	518(73.4)	188(26.6)	χ2=4.069 P=0.131
	Muslim	29(87.9)	4(12.1)	
	Christian	21(80.8)	5(19.2)	

*"Updated modified kuppuswamy SES" scale 2021

The incidence of metabolic syndrome (MetS) differed among various age categories within the study group. Among those aged 36-40 years, 68.8% had MetS, and 31.2% were absent. In the 41-45 age groups, 78.5% had MetS compared to 21.5% who were absent. Similarly, in the 46-50 age groups, 66.1% had MetS, and 33.9% were absent. Among those aged 51-55 years, 77.2% had MetS and 22.8% were absent. Educational attainment also showed variability in the prevalence of MetS. Among respondents with primary school education, 66.7% had MetS and 33.3% were absent. With regard to middle school education, 77.1% had MetS, whereas 22.9% did not. Similarly, among high school-educated individuals, 71.3% had MetS and 28.7% were absent. Among diploma holders, 76.7% had MetS, while 23.2% were absent. Among graduates, 74.8% had MetS and 25.2% were absent. Those with professional degrees

exhibited 78% MetS and 22% were absent. Occupationally, the prevalence of MetS varies across categories. Senior officials and managers had 83.3% MetS present, with 16.7% absent, while professionals had 77.9% MetS present, compared with 22.1% absent. Technicians and associate professionals had 76.9% MetS present and 23.1% absent, and clerks had 70.6% MetS present and 29.4% absent. Shop and market sales workers accounted for 71.2% of MetS, whereas 28.8% were absent. Skilled agricultural workers exhibited 60.7% MetS and 39.3% were absent. Crafts and related trade workers accounted for 79.4% of MetS, with 20.6% being absent. Machine operators had 88.2% MetS present compared to 11.8% absent, whereas individuals with elementary occupations had 84.6% MetS present and 15.4% absent. For instance, the “Updated modified kuppuswamy SES” scale 2021 shows that individuals classified under upper-middle II socioeconomic status had a prevalence of 76% MetS, while those under lower-middle III SES had 72.7% MetS. Marital status showed variability in metabolic syndrome (MetS) prevalence among study participants. Among married individuals, 68.4% had MetS, while 25.6% were absent. For widowed individuals, 50% had MetS compared with 50% who were absent. Similarly, 50% of divorced individuals had MetS, with 50% being absent. Among the separated individuals, 66.7% had MetS, compared to 33.3% who were absent. Religion also plays an important role in MetS prevalence. Among Hindus, 73.4% had MetS and 26.6% were absent. In contrast, 87.9% of the Muslims had MetS, whereas 12.1% did not. Among Christians, 80.8% had MetS and 19.2% were absent.

Table 2: Differences in biochemical parameters between individuals with and without metabolic syndrome (N=765)

Attributes	Affected (n=568)		Not affected (n= 197)		Data Insights
	Mean	SD	Mean	SD	p-value
Systolic blood pressure	130.73	11.40	123.73	13.27	< 0.001
Diastolic blood pressure	89.94	10.22	84.18	10.80	< 0.001
Fasting Glucose	133.15	44.04	119.27	41.95	< 0.001
Post prandial	181.74	73.57	154.62	61.89	< 0.001
cholesterol	157.61	40.60	156.50	36.94	0.736
Triglycerides	163.30	65.01	124.52	25.87	< 0.001
HDL level	38.05	7.57	47.13	10.38	< 0.001
LDL level	108.40	34.98	106.28	31.29	0.452

A comparison between individuals affected and unaffected by MetS yielded several significant findings. Yet, participants diagnosed with metabolic syndrome showed significantly elevated levels of both systolic and diastolic blood pressure in comparison to those not affected (systolic blood pressure: 130.73 mmHg vs. 123.73 mmHg; diastolic blood pressure: 89.94 mmHg vs. 84.18 mmHg, with p-values < 0.001 for both). Moreover, fasting glucose levels were considerably higher in participants with metabolic syndrome than in those without it (133.15 mg/dl compared to 119.27 mg/dl, $p < 0.001$). Furthermore, individuals with metabolic syndrome demonstrated significantly elevated postprandial cholesterol (181.74 vs. 154.62 mg/dl, $p < 0.001$) and triglyceride levels (163.30 vs. 124.52 mg/dl, $p < 0.001$) levels compared to those without metabolic syndrome. Significantly, those diagnosed with metabolic syndrome presented lower levels of HDL cholesterol than unaffected individuals (38.05 mg/dl vs. 47.13 mg/dl, $p < 0.001$). In contrast, there was no significant difference in the LDL cholesterol levels between the two groups ($p = 0.452$). These findings underscore the link between metabolic syndrome and multiple clinical indicators, emphasizing the

need for comprehensive management strategies to address cardiovascular risk factors effectively.

DISCUSSION

The outcomes of this investigation underscore the mounting concern surrounding metabolic syndrome (MetS) among obese men in Coimbatore, Tamil Nadu. MetS presents a substantial health threat within this demographic with a prevalence of 74.21 %. This prevalence is in line with national patterns, and emphasizes the pressing need for targeted interventions to address this escalating public health issue. Moreover, variations in the occurrence of MetS were observed across different socio demographic categories, such as age group, educational background, type of employment, marital status, and religious beliefs. Older age brackets exhibit a higher prevalence of MetS, underscoring the significance of age-related risk factors for disease onset. Gupta et al. and Sharma et al. indicated an age-related increase in MetS prevalence, highlighting notable disparities (10, 11). Similarly, Kaushal et al. revealed that the highest incidence of MetS was among individuals aged 35-54, showing a significant difference (12). Educational attainment and occupational status were also linked to MetS prevalence, with certain groups showing heightened susceptibility, particularly those with lower educational levels. However, Kaushal et al., found no association between MetS occurrence and education in the urban areas of Agra. The relationship between employment status and the occurrence of MetS did not show significant results when evaluated using chi-square tests, consistent with the results reported by Kaushal et al. Marital status and religion also emerged as factors, with married individuals and Muslims exhibiting a higher prevalence of MetS than other groups. Similar findings were noted by Venugopal et al., although the statistical link between religious affiliation and MetS has not yet been definitively proven (13). This study revealed a significant correlation between MetS and various clinical and socio-demographic factors. Among those diagnosed with MetS, there were notably higher average values for blood pressure, fasting blood sugar, and serum triglyceride levels than among those without MetS. These findings highlight the link between MetS and cardiovascular risk factors, and the need for comprehensive management strategies to alleviate adverse health consequences.

CONCLUSION

This study underscores the considerable occurrence of metabolic syndrome, found in 74.21% of obese adult males in Coimbatore, Tamil Nadu. Significant associations between MetS and elevated blood pressure, glucose levels, and unfavourable lipid profiles were identified. Moreover, the prevalence of MetS exhibited differences when analyzed against socio demographic attributes such as age, educational attainment, professional background, marital status, and religious beliefs. Urgent evidence-based interventions are needed to address this public health challenge effectively, especially in economically constrained regions, such as Tamil Nadu. Targeted strategies for prevention and management can be developed by recognizing the complexity of the factors that influence the prevalence of MetS. Overall, this study offers an important perspective on how MetS contributes to decreasing cardiovascular risk factors.

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Conflict of Interest: None

Financial Support: self

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