Prevalence of Metabolic Syndrome in Urban South Indian Population

C. Balaji[1*]

[1]*Department of General Medicine, Sree Balaji Medical College and Hospital, India.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

Because of changes in lifestyle, poor dietary habits, and obesity, the prevalence of non-communicable diseases such as hypertension, diabetes mellitus, and coronary artery disease is on the rise. The metabolic syndrome is a straightforward method for predicting the risk of diabetes and cardiovascular disease in the future. To compare the prevalence of metabolic syndrome in urban south Indian males and females and the prevalence of metabolic syndrome in various age groups above 20 years. To find out the most common metabolic abnormality among the study population and to find out specificity and sensitivity of any specific skin marker among the study population.

1. INTRODUCTION

Metabolic syndrome (MS) refers to a clustering of metabolic risk factors including central obesity, glucose intolerance, hyperinsulinemia, low HDL cholesterol, high triglycerides and hypertension .People with MS are twice as likely to die from, and three times as likely to develop, myocardial infarction (MI) or stroke compared to people without MS . They also have a five-fold greater risk of developing type 2 diabetes (if not already present). MS is increasingly being recognized as a risk factor for cardiovascular disease (CVD) and cardiovascular mortality [1]. Metabolic syndrome (MetS) is a serious epidemic in the twenty-first century. Non-communicable diseases

(NCDs) caused 39.5 million of the 56.4 million deaths worldwide in 2015 [1,2] of all these NCDs, MetS has been the global scourge [3]. It affects people of all ages, from adolescence to old age, regardless of gender, social background, race, or family history [4-6]. There is an overwhelming moral, medical, and financial responsibility to identify patients with MetS early, so that lifestyle modifications and treatment can help prevent diabetes and/or cardiovascular disease [7,8]. With this in mind, the goal of this study was to find out how common MetS and its components were among adults in their first three decades of life. People of this age are expected to take on the greatest amount of responsibility in their lives, despite the fact that their health is frequently disregarded [9,10]. It's worth noting that the majority of them are symptomless while having risk factors for a variety of NCDs.

2. MATERIALS AND METHODS

2.1 Study Population

This study was conducted m Sree Balaji Medical College, Chennai, Tamil Nadu during the period of August 2011 to August 2012. Total number of patients included in this study were 100. There were 50 males 50 females patients ranging from 20 years to 80 years.

2.2 Study Design

This study is a cross sectional study. This study is aimed to estimate the prevalence of metabolic syndrome.

2.3 Inclusion Criteria

Male and female patients of age > 20 years were selected.

2.4 Exclusion Criteria

1. History of Diabetes mellitus
2. History of Hypertension
3. History of Dyslipidemia
4. Pregnant women
5. History of smoking and alcohol

2.5 Study Design

Patients satisfying the criteria for our study were briefed about the study intention and consent obtained for collecting blood samples and taking

measurements. Basic demographic data collected.

2.6 Waist Circumference

The waist was measured using a non-stretchable fiber measuring tape. The subjects were asked to stand erect in a relaxed position with both feet together on a flat surface one layer of clothing was accepted. Waist girth was measured as the smallest horizontal girth between the costal margins and the iliac crests at minimal respiration

2.7 Fasting Blood Sugar and Lipids

After overnight 8 hours of fasting, 5 ml of venous blood sample was collected for estimating fasting blood sugar (mg/dl), Triglycerides (mg/dl) and HDL cholesterol (mg/dl) using enzymatic method.

2.8 Blood Pressure

In resting state sitting blood pressure (mmHg) was recorded with standard syphgmomanometer by ausculatatory method.3 readings at intervals of 30 minutes were taken and average recorded in the data proforma. Patients were advised not to take any beverages, heavy food or perform strenuous exercise.

2.9 Skin Markers

Clinical examination in search of common markers of metabolic syndrome like acanthosis, skin tags, psoriasis, and lipoatrophy was done.

3. RESULTS AND DISCUSSION

3.1 Independent Samples T-Test to Compare the Mean Values between Metabolic Syndrome and Non-Metabolic Syndrome Groups

Table 1 shows prevalence of metabolic syndrome is 48% among the study population. Mean age of the subjects who tested positive for metabolic syndrome is >50.

Table 2 shows mean FBS for subjects who tested positive for metabolic syndrome is 153.83 mg/dl.

Table 3 shows mean systolic blood pressure for subjects who tested positive for metabolic syndrome is 137.79 mmHg.

Table 1. Prevalence of metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
AGE	Yes	48	54.77	10.846	1.390	0.168
	No	52	51.69	11.266		

Table 2. Mean FBS for subjects who tested positive for metabolic syndrome

Variables	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
	Yes	48	153.83	55.635	4.046	<0.001
FBS	No	52	113.90	41.359		

Table 3. Systolic blood pressure for subjects who tested positive for metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
SYS-BP	Yes	48	137.79	20A26	5.362	<0.001
	No	52	117.35	17.689		

Table 4. Mean diastolic blood pressure for subjects who tested positive for metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
DIAS-BP	Yes	48	89.71	8.137	5.783	<0.001
	No	52	79.35	9.642		

Table 4 shows mean diastolic blood pressure for subjects who tested positive for metabolic syndrome is 89.71 mmHg.

Table 5 shows mean triglycerides for subjects who tested positive for metabolic syndrome is 163.65 mg/dl.

Table 6 shows mean HDL-cholestrol for subjects who tested positive for metabolic syndrome is 40.98 mg/dl.

Table 7 shows mean waist circumference for subjects who tested positive for metabolic syndrome is 88.54 cms.

Table 5. Mean triglycerides for subjects who tested positive for metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
TGL	Yes	48	163.65	27.108	7.377	<0.001
	No	52	129.52	18.689		

Table 6. Mean HDL-cholestrol for subjects who tested positive for metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
HDL-CH	Yes	48	40.98	5.188	2.334	0.022
	No	52	43.65	6.180		

Table 7. Waist circumference for subjects who tested positive for metabolic syndrome

Variable	Metabolic syndrome	N	Mean	Std. Dev	t-Value	P-Value
Waist Circumference	Yes	48	88.54	9.592	3.511	0.001
	No	52	82.48	7.625		

3.2 Pearson Chi-Square Test to Compare the Proportions

Table 8 shows prevalence of metabolic syndrome in men is 46% and in women is 50% among the study population.

Table 9 shows high fasting blood sugar in >61.3% subjects who tested positive for metabolic syndrome. Only 8% of those who tested positive had normal FBS.

Table 10 shows hypertriglyceridemia in >88.1% subjects who tested positive for metabolic syndrome. Only 19% of those who tested positive had normal TGL.

Table 11 shows increased waist circumference m >90.9% subjects who tested positive for metabolic syndrome.

Table 12 shows high blood pressure in >83.3% subjects who tested positive for metabolic syndrome.

Table 8. Prevalence of metabolic syndrome in men

SEX	Metabolic syndrome				Total		x^2- Value	P- Value
	Yes		No					
	N	%	N	%	N	%		
Male	23	46.0	27	54.0	50	100.0		
Female	25	50.0	25	50.0	50	100.0	0.160	0.689
Total	48	48.0	52	52.0	100	100.0		

Table 9. High fasting blood sugar

FBS level	Metabolic syndrome				Total		X^2-Value	P-Value
	Yes		No					
	N	%	N	%	N	%		
Abnormal	46	61.3	29	38.7	75	100.0		
Normal	2	8.0	23	92.0	25	100.0	21.37	<0.001
Total	48	48.0	52	52.0	100	100.0		

Table 10. Metabolic syndrome at TGL level

TGL level	Metabolic syndrome				Total		X^2-Value	P-Value
	Yes		No					
	N	%	N	%	N	%		
Abnormal	37	88.1	5	11.9	42	100.0	46.64	<0.001
Normal	11	19.0	47	81.0	58	100.0		
Total	48	48.0	52	52.0	100	100.0		

Table 11. Increased waist circumference

Waist Circumference level	Metabolic syndrome				Total		x^2-Value	P-Value
	Yes		No					
	N	%	N	%	N	%		
Abnormal	20	90.9	2	9.1	22	100.0	20.81	<0.001
Normal	28	35.9	50	64.1	78	100.0		
Total	48	48.0	52	52.0	100	100.0		

Table 12. Metabolic syndrome at BP level

BP level	Metabolic syndrome				Total		X^2-Value	P-Value
	Yes		No					
	N	%	N	%	N	%		
Abnormal	35	83.3	7	16.7	42	100.0		
Normal	13	22.4	45	77.6	58	100.0	36.22	<0.001
Total	48	48.0	52	52.0	100	100.0		

Table 13. low HDL-cholestrol in >61.7% subjects who tested positive for metabolic syndrome

HDL-CH level	Metabolic syndrome						x2-Value	P-Value
	Yes		No		Total			
	N	%,	N	%,	N	%		
Abnormal	37	61.7	23	38.3	60	100.0		
Normal	11	27.5	29	72.5	40	100.0	11.22	0.001
Total	48	48.0	52	52.0	100	100.0		

Table 14. HDL-cholestrol normal vs abnormal in men and women

HDL-CH Level	SEX				Total		x2-Value	P-Value
	Male		Female					
	N	%	N	%	N	%		
Abnormal	20	40.0	40	80.0	60	60.0		
Normal	30	60.0	10	20.0	40	40.0		
Total	50	100.0	50	100.0	100	100.0	16.67	<0.001

Table 15. 30 out of 48 patients who tested positive for metabolic syndrome had acanthosis

ACANTHOSIS	Metabolic syndrome		Total
	Yes	No	
Yes	30	3	33
No	18	49	67
Total	48	52	100

Table 13 shows low HDL-cholestrol in >61.7% subjects who tested positive for metabolic syndrome.

3.3 Sensitivity Analysis

Obesity (particularly truncal obesity), physical inactivity, cholesterol-raising foods, ageing, and hereditary factors have all been identified as contributing factors to metabolic syndrome [11]. The frequency of metabolic syndrome increases with age, as does the prevalence of physical inactivity, obesity, and HDL cholesterol, according to the current study. As a result, the contributing causes of this syndrome are universal. The age-adjusted prevalence of metabolic syndrome in the US population has been reported to be 24.8 % [12].

This matches the age-adjusted prevalence found in the current study (25.8 %). The prevalence of metabolic syndrome was similar in men and women in the US study, whereas women have a much higher incidence of metabolic syndrome in the current study. This appears to be owing to Indian women having a disproportionately high prevalence of low HDL cholesterol (91.5%) when compared to women in the United States (40.3 %). Reddy et al. [13] from Delhi (North India) and Krishnaswami [14] from

Vellore previously showed high prevalence of low HDL cholesterol in India (South India). In a South Indian urban population, mean HDL cholesterol was 37.5 ± 11.9 mg/dl (0.96 ± 0.5 mmol/l) in urban males and 40.1 ± 10.9 mg/dl (1.01 ± 0.5 mmol/l) in rural women, which is close to the mean HDL cholesterol of 40.5 F 8 mg/dl (1.04 ± 0.4 mmol/l) in men and 40.0 ± 9 mg/dl (1.05 ± 0.6).

Recent studies in India have found an increase in numerous metabolic disorders in the general population, with urban areas seeing higher rates than rural areas. Malhora et al. [15] looked at 2964 people in a rural north Indian community who were between the ages of 16 and 70. In an urban north Indian slum, Mishra et al. [16] investigated 532 participants (170 men, 362 women). Insulin resistance was found in 18.5–22.5 percent of the women in a study of 80 women. Insulin resistance was found to be linked to body fat, central obesity, hypertension, and hypercholesterolemia.

4. CONCLUSION

Prevalence of metabolic syndrome is 48% among the study population. This is a higher prevalence rate compared to previous studies carried out in India few years back reflecting that

prevalence of this syndrome is probably increasing. Hence there is a need to create awareness among patients about existence of metabolic syndrome and its rising prevalence and also among doctors in primary and tertiary centres to look for metabolic syndrome.

Prevalence was found to be slightly higher among women who could probably be attributed to sedentary lifestyle in urban areas. Increased waist circumference was found to be the most common abnormality and fasting hyperglycemia the least common abnormality among the subjects who tested positive for metabolic syndrome. More than half the subjects had low HDL-cholestrol values irrespective of their sexes. Females had lower HDL-cholestrol than men among the study population. Association of low HDL-cholesterol with increased cardiovascular morbidity and mortality is well known. This explains the need to adopt methods to raise the HDL-cholestrol in patients at risk. Acanthosis nigricans was the most common skin marker in subjects with metabolic syndrome. It is a simple skin marker that can help to look for metabolic syndrome. Acanthosis nigricans has moderate sensitivity and high specificity for metabolic syndrome.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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