Prevalence Of Metabolic Syndrome In Acute Coronary Syndrome

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ABSTRACT
Globally, metabolic syndrome presents as one of the leading health problems associated with increased morbidity and mortality from cardiovascular disease. Studies suggest that little is known about the prevalence of metabolic syndrome in patients with acute coronary syndrome in Indian subcontinent. Hence, our study aimed to ascertain the prevalence of metabolic syndrome and its clinical and angiographic profile in patients with acute coronary syndrome in Northwest Indian population.

An observational study was conducted in the cardiology department of Pacific Medical College & Hospital, Rajasthan among 100 patients diagnosed with acute coronary syndrome for duration of one and half year. Demographic, clinical data, serum lipid profile, serum glucose was measured. Analysis was done using SPSS-23. The data were expressed as rates, ratios, proportions and mean ± standard deviation. The comparison of data was performed using Chi-square test/ Fisher's exact test, independent sample t-test. $p<0.05$ was considered statistically significant.

The prevalence of metabolic syndrome in acute coronary syndrome was found to be 65%. Among the components of metabolic syndrome, waist circumference >90 cm for males, fasting blood sugar, previously diagnosed cases of diabetes mellitus, hypertriglyceridemia, low HDL cholesterol were significantly higher in MS group. Raised fasting Blood Sugar and systemic hypertension resulted in higher mortality.

In the present study, metabolic syndrome was highly prevalent in acute coronary syndrome patients, with male predominance. Anthropometric measurements like waist circumference, waist-hip ratio, and BMI, which are easy clinical tools to identify obesity, should be routinely used in clinical practice.

1. INTRODUCTION

Coronary artery disease (CAD) is an emerging health problem in India. Approximately 12 million deaths annually in the Indian subcontinent are attributable to cardiovascular diseases (CVDs).[1] Approximately three-quarters (74%) of the deaths among Non-Communicable Diseases (NCD) were attributed to CVD.[2] The majority of NCD deaths occur in low and middle-income countries including India.[3]The term acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischemia and covers the spectrum of clinical conditions ranging from unstable angina (UA) to non-ST-segment elevation myocardial infarction (NSTEMI) to ST- segment elevation myocardial infarction (STEMI).[4]

Globally, metabolic syndrome (MS) presents as one of the leading health problems associated with increased morbidity and mortality from cardiovascular disease (CVD). It is referred by different terms such as syndrome X, insulin resistance syndrome, "deadly quartet" and obesity dyslipidemia syndrome.[5] It is characterized by the existence of more than one of the following five criteria. These include Waist Circumference (WC) >102 cm in men and >88 cm in women, high Blood Pressure (BP>130/85mmHg), high Triglyceride (TG>150mg/dl), high Fasting Blood Sugar (FBS>100 mg/dl), and low high-density lipoprotein (HDL<40 mh/dl in men and <50 mg/dl in women).[6] The estimates of the prevalence of MetS ranged from 21.3% to 32.8% among the participants in the Framingham Offspring Study and San Antonio Heart Study.[7]

A recent study in patients with established coronary artery disease or stroke showed that the prevalence of the metabolic syndrome correlated with the extent of vascular damage.[8] The link between MS and its components with CAD has been documented in many studies. Individual MS components are considered as an independent cardiac risk factor. More the number of components of MS in a patient, higher is the severity of CVD. Central obesity is more atherogenic as compared to peripheral obesity. Central obesity has strong association with dyslipidemia, diabetes, and increased risk of cardiovascular events. Insulin resistance posse as one of the main components of MS that affects the development of CAD. Diagnosis of MeS and its components in patients with CAD can influence results of programs for prevention and management of the disease. It will exacerbate the progression of CVD if left untreated. [9]

Worldwide, the metabolic syndrome is a major health problem associated with increased morbidity and mortality from cardiovascular disease (CVD). There are limited data available on the prevalence of MS in Indian population because of varied extent of urbanization, lifestyle patterns, and socioeconomic/cultural factors. Also, western studies suggest that MS is very commonly associated with coronary artery disease (CAD), but little is known about the prevalence of MS in patients with acute coronary syndrome (ACS) in Indian subcontinent. Hence, our study aimed to ascertain the prevalence of MetS and its clinical and angiographic profile in patients with ACS (specifically in NSTEMI and STEMI) in Northwest Indian population. This study was conducted with specific objectives to determine the prevalence of different components of the metabolic Syndrome andtheir association with acute hyperglycemia, arterialhypertension, abdominal Obesity, diabetes mellitus and atherogenic dyslipidemia among ACS patients and to elicit the prognostic role of metabolic syndrome components in ACS.

2. METHODOLOGY

A prospective observational study was conducted in the cardiology department of Pacific Medical College & Hospital, Rajasthan among the patients diagnosed and admitted with acute coronary syndrome (NSTEMI or STEMI) for duration of one and half year from 01 Jan2021 to 30 June 2022.

Sample size Calculation Sn = 66% [**Jain G et al.**[10]]
(1-Sn) = 34%
α = 5%
d= 7%
Sample Size Formula = $[Z^2 (1-\alpha/2) Sn(1-Sn)] / d^2$
=[1.96 x 66 x 34]/49
= 90
After adjusting 10% dropout rate, finally we have taken a total of 100 patients.

Inclusion criteria
Patients aged 18 years or more and first time diagnosed with ACS having STEMI and NSTEMI based on WHO Criteria

Exclusion criteria
Patients aged less than 18 years, with non-cardiac chest pain, with chronic stable angina and unstable angina, with prior CAD and history of coronary artery bypass graft or percutaneouscoronary interventions; Patients with chronic liver or kidney disease, neoplasm, acute infections, or majorsurgical interventions in last 6 weeks.

Study Tools and Instruments
- Semi-structured proforma 3 Socio-demographic and clinical history details
- ECG, 2D-echo, CAG
- Informed consent

Sampling methods
Hundred consecutive patients of acute myocardial infarction admitted to ICCU & Cardiology wards of Pacific Medical College & Hospital, Rajasthan, during the study period were included in the study after applying the inclusion and exclusion criteria. An informed consent with permission to use the total data for research purpose was collected from all willing participants. Demographic and clinical data were obtained from the clinical histories: age, sex, weight, height, previous atherosclerotic vascular disease (defined as previous coronary disease, stroke, or peripheral arterial disease), hypertension, diabetes mellitus, a sedentary lifestyle (defined as performing less than 30 min of moderate exercise 3 days per week), and previous lipid-lowering treatment.

Careful measurements of Waist Circumference (WC) and blood pressure were taken. Three measurements of BP were recorded at the time of entry if values were greater than or equal to 140/90 mmHg on an average. Any medications for hypertension were considered significant. Waist circumference was measured as suggested by the national health and nutritional survey. The height, weight and body mass index were measured. BMI was calculated by dividing body weight in kilograms by square of height in meters.

Serum lipid measurements were made from 5ml of blood collected in an SST gel vacutainer. Serum glucose measurements were made from 2 ml of blood collected in a Sodium Fluoride EDTA vacutainer. Peripheral venous blood samples were collected after an overnight fast for lipid profile (total cholesterol, High Density Lipoprotein Cholesterol (HDL-C), Low Density Lipoprotein Cholesterol (LDL-C) and triglycerides). *Enzymatic color test* was used to determine HDL-C, LDL-C, Total Cholesterol and Serum triglycerides.FBS (Fasting Blood Sugar) and PPBS (Post-prandial blood sugar) were calculated by *hexokinase (enzymatic UV) method*. The Liver function tests were analyzed by *homogenous enzymatic method*.

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Diagnosis of myocardial infarction (MI)
Based on WHO (Category A) Definition and Diagnostic criteria for MI (2008-09 revision)[11]
This definition is same as the ESC/ACC/AHA/WHF definition for MI
1. Typical rise and fall of biochemical markers of acute MI (Troponin-T, Serum CK-MB, Serum LDH, SGOT)-preferably Troponin

Plus at least one of the following:
a) Symptoms of ischemia (include various combinations of chest, upper extremity, jaw or epigastric discomfort with exertion or at rest; the discomfort usually lasts f20 min, oftenis diffuse, not localized, not positional, not affected by movement of the region and itmay be accompanied by dyspnea, diaphoresis, nausea or syncope);
b) ECG changes indicative of new ischemia [new ST-T changes or new left bundle branch block (LBBB)]
c) Development of pathological Q waves in the ECG
d) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

Diagnosis of Metabolic syndrome (MetS)
Diagnosed as per revised NCEP-ATP III criteria fulfilling three or more criteria of the following:[12]
1. Central Obesity: Waist Circumference $\geq$ 90 cm (male) or $\geq$ 80 cm (female) (as per the cut-off values of waist circumference for South Asians suggested by IDF)
2. Hypertriglyceridemia: Serum triglycerides$\geq$150 mg/dL (or) on specific medication
3. Low HDL-Cholesterol: < 40 mg/dL(male) or < 50 mg/dL(female), or on specific medication
4. Hypertension: Blood pressure $\geq$ 130 mm Hg (systolic) or $\geq$ 85 mm Hg (diastolic) or onspecific medication.
5. Fasting plasma glucose: $\geq$100 mg/dL or previously diagnosed type 2 diabetes.

Diagnosis of Unstable angina
Defined as angina pectoris with at least 1 of the following 3 features: [10]
1. Pain at rest (or with minimal exertion),
2. New-onset severe angina (i.e., within 1 month), and occurring with a crescendo pattern.
3. NSTEMI and unstable angina have similar presentation and management and their distinction is based on the measurement of myocardial injury biochemical indices. Patients with unstable angina were not included in the study group, as it is a subjective and ambiguous diagnosis which can vary with the treating physician and history of the patients.

Statistical analysis
Data were recorded in a predesigned and pretested proforma. The data was coded and entered Microsoft Excel Worksheet. The categorical data was expressed as rates, ratios, and proportions and the continuous data was expressed as mean ± standard deviation. Analysis was done using SPSS-23 and Microsoft Excel 2010. Percentage, mean, and correlation were used in the analysis.The comparison of categorical data was performed using Chi-square test / Fisher's exact test andthe comparison of continuous data was done using independent sample t-test. $p<0.05$ was considered statistically significant.

3. RESULTS AND OBSERVATIONS
The prevalence of metabolic syndrome in acute coronary syndrome was found to be 65.0%

Figure 1: Prevalence of Metabolic Syndrome in Acute MI

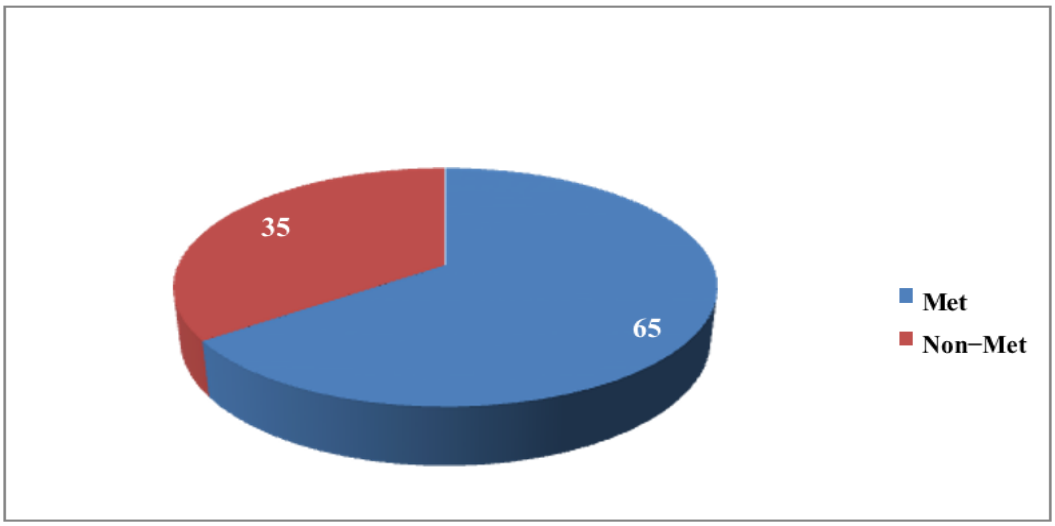


Table 1: Distribution based on socio-demographic, clinical history and anthropometric characteristics among MI with MS and MI without MS (N=100)

Variables		MI with MS (n=65)	MI without MS (n=35)	Total	p-value
Age (years)	41-50	8 (12.3)	13 (37.1)	21 (21.0)	0.022
	51-60	26 (40.0)	8 (22.9)	34 (34.0)	
	61-70	18 (27.7)	10 (28.6)	28 (28.0)	
	>70	13 (20.0)	4 (11.4)	17 (17.0)	
	Mean± SD	59.74 ± 10.89	57.51 ± 11.15	58.96±10.98	0.048
Gender	Male	50 (76.9)	20 (57.1)	70 (70.0)	0.040
	Female	15(23.1)	15 (42.9)	30 (30.0)	
Symptoms*	Chest Pain	61 (93.8)	34 (97.1)	95 (95.0)	0.471
	Shortness of Breath	49 (75.4)	26 (74.3)	75 (75.0)	0.904
	Sweating	43 (66.2)	19 (54.3)	62 (62.0)	0.244
	Vomiting	18 (27.7)	6 (17.1)	24 (24.0)	0.239
	Syncope	6 (9.2)	0 (0.0)	6 (6.0)	0.064
	Palpitations	18 (27.7)	10 (28.6)	28 (28.0)	0.926
Hypertension	Present	34 (52.3)	5 (14.3)	39 (39.0)	<0.001
	Absent	31 (47.7)	30 (85.7)	61 (61.0)	
Family History	Present	25 (38.5)	8 (22.9)	33 (33.0)	<0.001
	Absent	40 (61.5)	27 (77.1)	67 (67.0)	
Chronic smoker	Present	43 (66.2)	19 (54.3)	62 (62.0)	0.244
	Absent	22 (33.8)	16 (45.7)	38 (38.0)	
Chronic alcoholic	Present	9 (13.8)	11 (31.4)	20 (20.0)	0.036
	Absent	56 (86.2)	24 (68.6)	80 (80.0)	
Body Mass Index (BMI)	≤25	17 (26.2)	27 (77.1)	44 (44.0)	<0.001
	>25	48 (73.8)	8 (22.9)	66 (66.0)	
	Mean± SD	27.66±2.53	23.82±1.57	25.74±2.05	<0.001

*[Frequency (percentage)], *Multiple responses,*

The majority of the cases were in the age group 51 to 60 years in MI with MS (40.0%) whereas in MI without MS group majority were in the age group of 41-50 years (37.1%). The mean age was significantly higher in MS group (59.74±10.89) compared to non-MS group (57.51±11.15) years. The proportion of MI with MS was significantly higher among males (76.9%). Overall, the frequently reported symptom was chest pain (95.0%), followed by shortness of breath (75.0%). Presence of hypertension was significantly higher in MS group (52.3%). There was no significant difference of tobacco smoking history among the group, However, chronic alcoholism was significantly low among the MS group (86.2%). Cases with BMI greater than 25 were significantly higher in the MS group (73.8%). [Table 1]

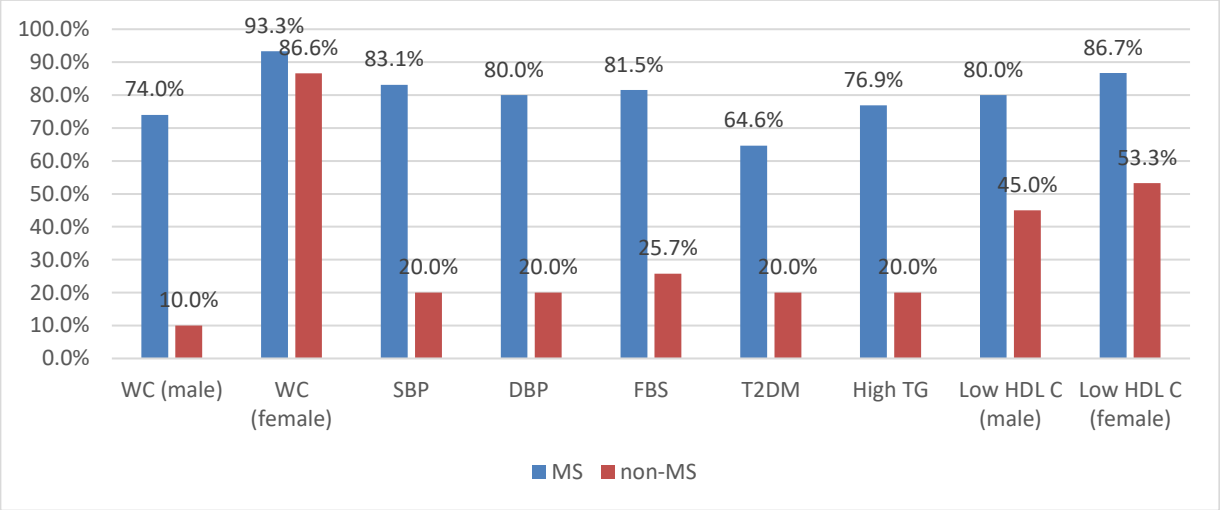
Table 2: Comparison of components of metabolic syndrome among patients of MI with MS and without MS (N=100)

Variables		MI with MS (n=65)	MI without MS (n=35)	Total	p-value
Waist Circumference (Male) (n=70)	≤90	13 (26.0)	18 (90.0)	31 (44.3)	<0.001
	>90	37 (74.0)	2 (10.0)	39 (55.7)	
	Mean± SD	94.87±7.30	85.58±5.45	90.23±6.38	<0.001
Waist Circumference (Female) (n=30)	≤80	1 (6.7)	2 (13.4)	3 (10.0)	0.543
	>80	14 (93.3)	13 (86.6)	27 (90.0)	
	Mean± SD	89.98±9.71	79.77±9.40	84.88±9.56	<0.001
Systolic BP (mm Hg)	≤130	11 (16.9)	28 (80.0)	39 (39.0)	<0.001
	>130	54 (83.1)	7 (20.0)	61 (61.0)	
	Mean± SD	147.48±19.78	125.54±16.93	136.51±18.36	<0.001
Diastolic BP (mm Hg)	≤85	13 (20.0)	28 (80.0)	41 (41.0)	<0.001
	>85	52 (80.0)	7 (20.0)	59 (59.0)	
	Mean± SD	89.98±9.71	79.77±9.40	84.88±9.56	<0.001
Fasting Blood Sugar (mg/dl)	≤100	12 (18.5)	26 (74.3)	38 (38.0)	<0.001
	>100	53 (81.5)	9 (25.7)	62 (62.0)	
	Mean± SD	164.05±58.00	103.26±33.99	133.66±46.00	<0.001
Diabetes Mellitus	Present	42 (64.6)	7 (20.0)	49 (49.0)	<0.001
	Absent	23 (35.4)	28 (80.0)	51 (51.0)	

Triglycerides (mg/dL)	**≤150**	15 (23.1)	28 (80.0)	43 (43.0)	<0.001
	>150	50 (76.9)	7 (20.0)	57 (57.0)	
	Mean± SD	181.98±51.17	127.14±26.33	154.56±37.75	<0.001
HDL-C (male) (mg/dl) (n=70)	**≤40**	40 (80.0)	9 (45.0)	49 (70.0)	<0.001
	>40	10 (20.0)	11 (55.0)	21 (30.0)	
HDL-C (female) (mg/dl) (n=30)	**≤50**	13 (86.7)	8 (53.3)	21 (70.0)	<0.001
	>50	2 (13.3)	7 (46.7)	9 (30.0)	
HDL-C	**Mean± SD**	35.65±8.65	44.49±10.88	40.07±9.77	<0.001

[Frequency (percentage)], HDL-C: High Density Lipoprotein-Cholesterol

Among the components of metabolic syndrome, waist circumference >90 cm for males was significantly higher in MS group (74.0%) compared with non-MS group (10.0%). No significant difference for >80 cm among females was observed between the groups, however, the mean waist circumference for females was significantly higher in MS group. (89.98 cm). Systolic and diastolic hypertension was frequently seen in MS group. Fasting blood sugar was significantly higher (>100 mg/dl) among the MS group. Additionally, previously diagnosed cases of diabetes mellitus were significantly higher in MS group (64.6%). Hypertriglyceridemia was more commonly reported in MS group 76.9%). Low HDL cholesterol was significantly higher in MS group among males (80.0%) and females (86.7%). [Table 2, Figure 2]



WC: Waist Circumference, SBP: Systolic Blood pressure, DBP: Diastolic Blood Pressure, FBS: Fasting Blood Sugar, T2DM: Type 2 Diabetes Mellitus, TG: Triglycerides, HDL C: High Density Lipoprotein Cholesterol.

Figure 2: Comparison of components of metabolic syndrome among patients of MI with MS and without MS

Table 3: Comparison of cardiac characteristics among patients of MI with MS and without MS (N=100)

Variables		MI with MS (n=65)	MI without MS (n=35)	total	p-value
Total Cholesterol (mg/dL)	**≤200**	29 (44.6)	25 (71.4)	54 (54.0)	0.010
	>200	36 (55.4)	10 (28.6)	46 (46.0)	
	Mean± SD	208.40±36.68	177.89±42.27	182.09±39.48	0.022
LDL cholesterol (mg/dl)	**Mean± SD**	140.65±31.15	111.09±38.59	125.87±34.87	<0.001
Diagnosis	**STEMI**	52 (80.0)	21 (60.0)	73 (73.0)	0.032
	NSTEMI	13 (20.0)	14 (40.0)	27 (27.0)	
2D ECHO	**EF (>50.0%)**	13 (20.0)	21 (60.0)	34 (34.0)	<0.05
	EF (35-50%)	30 (46.2)	6 (17.1)	36 (36.0)	0.004
	EF (<35.0%)	6 (9.2)	2 (5.7)	8 (8.0)	0.536
	Mitral regurgitation	12 (18.5)	5 (14.3)	17 (17.0)	0.596
	Aortic regurgitation	4 (6.2)	1 (2.9)	5 (5.0)	0.470
Cardiac dysfunction	**No LV dysfunction**	29 (44.6)	27 (77.1)	56 (56.0)	<0.001
	LV dysfunction	36 (55.4)	8 (22.9)	44 (44.0)	
Fibrinolytics	**STK**	27 (41.5)	16 (45.7)	43 (43.0)	0.189**
	TNK	9 (13.8)	1 (2.9)	10 (10.0)	
	Rt-PA	0 (0.0)	1 (2.9)	1 (1.0)	
	Non-thrombolysed	29 (44.6)	17 (48.6)	46 (46.0)	
Outcome	**Discharged**	47 (72.3)	35 (100.0)	82 (82.0)	<0.001**
	Died	18 (27.7)	0 (0.0)	18 (18.0)	

[Frequency (percentage)], EF: Ejection Fraction, LDL: Low Density Lipoptotein, STEMI: ST elevation myocardial

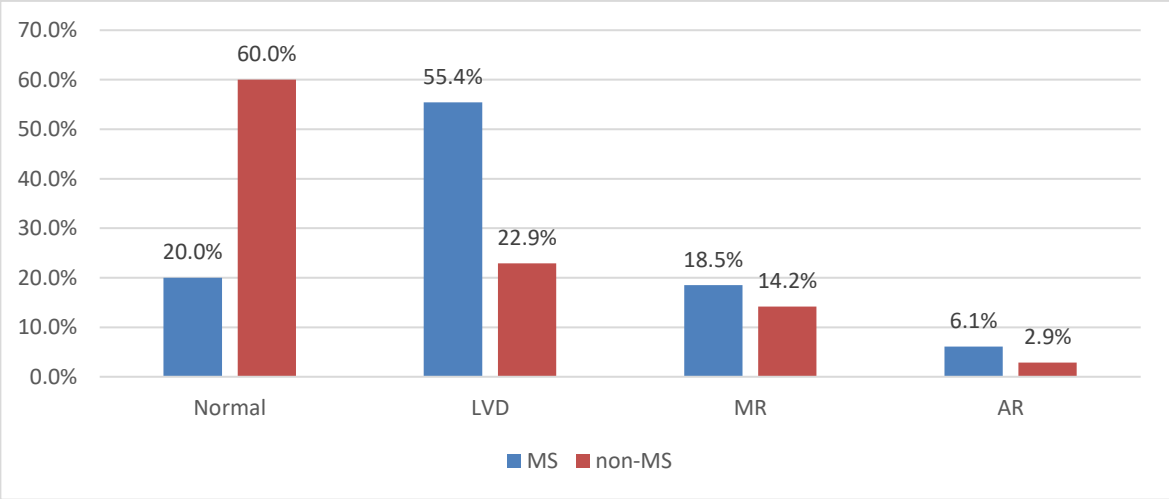
infarction, NSTEMI: Non-ST elevation Myocardial Infarction, STK: Streptokinase, TNK: Tenecteplase, Rt-PA: Alteplase

Total cholesterol was significantly higher in MS group (55.4%) along with the mean LDL cholesterol (140.65 mg/dl) compared to non-MS group (111.09 mg/dl). MS group had a higher proportion of STEMI compared to non-MS group (80.0% vs 60.0%). Preserved EF was frequently reported in non-MS group (60.0% vs 20.0%). Left ventricular dysfunction was significantly higher in MS group (55.1% vs 22.9%). Mortality was significantly higher in MS group (27.7% vs 0.0%), [Table 3].

Table 4: Prevalence of components of Metabolic syndrome (N=100)

Variables		Frequency	Percentage (%)
MI without MS (n=35)	**0**	5	14.3
	1	16	45.7
	2	14	40.0
MI with MS (n=65)	**3**	25	38.5
	4	28	43.1
	5	12	18.5

In metabolic syndrome group, it was found that four component combination was prevalent in 43.1% followed by three components (38.5%) and five components combination (18.5%). Among non-metabolic syndrome group, majority (45.7%) of them had a single component, followed by a combination of two components (40.0%). [Table 4, Figure 3]



LVD: Left Ventricular Dysfunction, MR: Mitral Regurgitation, AR: Aortic Regurgitation

Figure 3: Left ventricular dysfunction, mitral valve, and aortic valve abnormality among metabolic and non-metabolic syndrome cases (N=100)

Table 5: Effect of components of metabolic syndrome on the outcome of cases (N=100)

Variables		Survive (n=82)	Death (n=18)	p-value
Waist circumference (Male) (n=70)	**≤90**	4 (7.0%)	0 (0.0%)	0.325
	>90	53 (93.0%)	13 (100.0%)	
Waist circumference (Female) (n=30)	**≤80**	3 (12.0%)	0 (0.0)	0.414
	>80	22 (88.0)	5 (100.0%)	
Fasting Blood Sugar	**≤100**	37 (45.1%)	1 (5.6%)	0.002
	>100	45 (54.9%)	17 (94.4%)	
Systolic Blood Pressure	**≤130**	37 (45.1%)	2 (11.1%)	0.007
	>130	45 (54.9%)	17 (88.9%)	
Diastolic Blood Pressure	**≤85**	39 (47.6%)	2 (11.1%)	0.004
	>85	43 (52.4%)	17 (88.9%)	
Triglycerides	**≤150**	38 (46.3%)	5 (27.8%)	0.150
	>150	44 (53.7%)	13 (72.2%)	
High Density Lipoprotein-Cholesterol (Male)	**≤100**	39 (68.4%)	10 (76.9%)	0.546
	>100	18 (31.6%)	3 (23.1%)	
High Density Lipoprotein-Cholesterol (Female)	**≤150**	17 (68.0%)	4 (80.0%)	0.593
	>150	8 (32.0%)	1 (20.05)	

It was found that there was 100% mortality among males and females with raised waist circumference associated with central obesity, however, the difference observed among the groups was not statistically significant. Fasting Blood Sugar >100 mg/dl resulted in 94.4% mortality. Systemic hypertension (Systolic blood pressure >130mmHg and diastolic blood pressure >85mmHg) resulted in 88.9% mortality.

4. DISCUSSION

The metabolic syndrome (MS), a serious health issue that affects people all over the world. MS is a collection of risk factors that has been shown to raise the chance of developing CVD. It will exacerbate the progression of CVD if left untreated. A recent study from the United States reported the prevalence of MS to be around 22.9%.[13] Various population-based studies were conducted in India too, to quantify the same and the results ranged from 10 to 35%[14,15] Central obesity is more atherogenic as compared to peripheral obesity.[16] In the above context this present study was undertaken to determine the prevalence of metabolic syndrome in acute coronary syndrome.

Prevalence of Metabolic syndrome and Demographic Profile

In our present study the overall prevalence of MS was 65.0%. **Sinha SK et al.**[17] reported prevalence of MS as 37.65%. **Zeller M et al.**[18] in their study of among STEMI patients found that 46.0% fulfilled criteria for MS. **Al-Aqeedi RF et al.**[19] reported a prevalence of MS as 63.0%.

Danciu et al.[20] and **Pandey et al.**[21] reported still lower prevalence of MS in ACS (26% and 26.19%, respectively). The mean ages for MI with MS and MI without MS were 59.74±10.89 and 57.51±11.15 years respectively, which was significantly higher in MI with MS. Males (76.9%) had considerably greater rates of MI with MS than females (57.1%). **Sinha SK et al.**[17] reported mean age as 58.68 ± 5.6 years, with the preponderance of males (71.6%) in MS. However, contrasting findings were reported by **Jain G et al.**[22] where metabolic syndrome was more prevalent in females (82.4%) than in male patients (57.6%) with ACS. **Zaliunas R et al.**[23] reported prevalence of 70.2% and 52.6% MS in females and males respectively.

Symptoms

Majority of the cases had chest pain in both the groups followed by Shortness of Breath and Sweating. Similar to our findings **Paliwal HP et al.**[24] reported the most common symptom atpresentation was chest pain (85.89 %). The second most common symptom in the metabolic syndrome and non-metabolic syndrome group was sweating (64.86%) and shortness of breath (62.5%), respectively.

Prevalence of various components of metabolic syndrome

The five elements of MS i.e., hypertriglyceridemia, low HDL cholesterol, raised blood pressure, raised fasting blood sugar, and a higher waist circumference have a possible effect on cardiovascular disease outcome and were examined in this study. We discovered that abnormal blood glucose and cholesterol metabolism are significant variables that may contribute to a poor prognosis of cardiovascular disease.

Diabetes mellitus was found to be significantly high (64.6%) in MI with Metabolic Syndrome than MI without Metabolic Syndrome (20.0%). Hypertension was in significantly higher (52.3%) in MI with Metabolic Syndrome than MI without Metabolic Syndrome (14.3%). Waist Circumference was also significantly higher in the metabolic syndrome patients. In the current study it was found that cases with BMI greater than 25 kg/m^2 were significantly higher in the metabolic syndrome cases (73.8%). In the present study triglycerides significantly higher in MS group (181.98±51.17 vs 127.14±26.33 mg/dl). Total cholesterol was observed as 208.40±36.68 mg/dl in MS and 177.89±42.27 mg/dl in non-MS group. Our findings suggested cases with higher fasting blood sugar, triglycerides and total cholesterol were significantly higher in MS group, 81.5% for fasting blood sugar and 76.9% for triglycerides and 55.4% for total cholesterol. Similarly, low HDL cholesterol was higher in the MS group.

Jain G et al.[22] reported patients with MS had hypertension (87.9%) as compared to non-hypertensive patients (12.1%), while 83.3% had diabetes mellitus. **Sinha SK et al.**[17] **reported** the prevalence of the individual components of MetS as 47.5% abdominal obesity, 63.1% hypertension, 46.7% diabetes mellitus. **Prasad SB et al.**[25] reported high prevalence of MS (54.0%) in the population driven by high rates of obesity, hypertension, new impaired fasting glucose, and dyslipidemia. **Uppalakal B et al.**[26] reported 28.0% of the total patients were overweight and 12.0% were obese. In the study by **Prasad SP**[27] mean BMI was 29.7 kg/m^2. **Kumar N et al.**[28] in their study found 16.7% prevalence of obesity. **Jain G et al.**[22] reported 65.2% had abnormally raised TG levels, 48.5% had abnormally low HDL-cholesterol level. **Paliwal HP et al.**[24] reported most prevalent component of metabolic syndrome was low HDL-C (89.2%) followed by increased fasting blood sugar (85.13%), increased serum triglycerides (81.1%), hypertension (75.7%), and elevated waist circumference (74.3 %).

Comparison of past literature for the prevalence of components of metabolic syndrome.

Study	FBS > 100 g/dl	BP > 130/85 mm Hg	TG > 150 mg/dl)	Low HDL-C	Increased WC
Zeller M et al.[18]	66.5%	78.6%	-	-	-

Al-Aqeedi et al.[19]	89.8%	40.4%	61.7%	94.1%	81.8%
Ninomiya et al.[29]	-	48.2%	43.2%	45.0%	51.0%
Pandey S et al.[21]	77.2%	95.45%	59.1%	77.2%	63.6%
Paliwal HP et al.[24]	85.1%	75.7%	81.1%	89.9%	74.3%
PresentStudy	**81.5%**	**76.9%**	**55.4%**	**81.5%**	**66.0%**

Outcome of In Hospital cases of MI

In the present study it was found that cases with MS had higher mortality (72.3%) compared to the non-MS group, where no mortality was observed. **Pandey S et al.**[21] in their study reported that in-hospital fatality was higher among those with the MS than those without the syndrome. **Isomaa B et al.**[30] also reported that the MS was associated with an increased case fatality rate.. In addition, the report of a prior study done by **Zeller et al.**[18] showed a significant association between MS and severe in-hospital heart failure among patients hospitalized with acute myocardial infarction.

Effect of components of metabolic syndrome on the outcome of cases

It was found that raised fasting blood sugar, raised systolic and diastolic blood pressure was significantly associated with a higher mortality rate. **Pandey S et al.**[21] reported raised triglyceride levels showed the greatest positive predictive value (62%), followed by fasting blood glucose (55%), while blood pressure had the lowest positive predictive value among the individual components of the MS. This suggests that elevated triglyceride levels are linked to increased morbidity and might increase death.

As hypothesized, the present study evaluated the prevalence of components of MS and its relation in developing acute coronary syndrome during the prognosis during the hospital stay. Majority of MS cases were discharged 72.3% whereas 27.7% died who developed acute coronary syndrome. The strength of the present study was that the data was analyzed based on consent proforma and this study would help future research on metabolic syndrome cases. However, there were a few limitations to the study. Firstly, the need for written informed consent may have resulted in the lack of enrollment of dying, unconscious, or intubated patients, and therefore may have resulted in enrollment bias toward lower risk among patients with myocardial infarction. However, in-hospital case fatality rate observed in our study population, which is very similar to the case fatality rates reported in current registries of acute myocardial infarction, which suggests that this potential bias had little impact on our results. Secondly, not all confounders can be accounted for nor were all possible variables measured at enrolment. Thirdly, we have no data regarding clinical events and clinical management after the screening period.

CONCLUSION AND RECOMMENDATIONS

In the present study, metabolic syndrome was highly prevalent in acute coronary syndrome patients, with male predominance. Thus, ischemic heart disease should be examined often for metabolic syndrome. Acute coronary syndrome patients had diabetes mellitus and hypertension as the common metabolic syndrome components. Most had more than three metabolic syndrome components. Thus, if metabolic syndrome is detected, its causes should be thoroughly examined. Those with a family history of type 2 diabetes or early cardiovascular disease should be screened and prompt management should be taken. This study found various modifiable and reversible factors that early lifestyle and pharmacological interventions may reduce metabolic syndrome in acute coronary syndrome patients. Anthropometric measurements like waist circumference, waist-hip ratio, and BMI, which are easy clinical tools to identify obesity, should be routinely used in clinical practice. To reduce acute coronary syndrome, metabolic syndrome or any of its components, aggressive patient education and prompt primary and secondary prevention should be deployed.

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