

# Study of Association between Metabolic Syndrome and Acute Myocardial Infarction.

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## Abstract

**Introduction:** Cardiovascular disease (CVD) is commonest cause of death worldwide. Globally, CVD is responsible for 30% of all deaths which includes approximately 40% among high-income countries and close to 28% among middle and low-income countries. Metabolic syndrome is associated with increased risk of CVD and is characterised by clustering of various risk factors.

**Aim:** To study the occurrence of metabolic syndrome in patients with acute myocardial infarction.

**Materials/Methods:** A cross-sectional study was carried in a tertiary care hospital of western Uttar Pradesh, India College name . Ninety-eight patients of acute myocardial infarction admitted to Intensive Cardiac Care Unit of the hospital were included in the study. Revised NCEP-ATP III criteria was used to diagnose metabolic syndrome. A predesigned proforma was used for data collection. Laboratory reports of the patients were collected and analysed. Data was analysed using Statistical Package for Social Sciences, version 21 (SPSS Inc., Chicago, IL).

**Results:** More than half (58.1%) in our study had Metabolic syndrome. The average age of patients with metabolic syndrome was lower (51.3 years) than those without syndrome (56.4 years). On comparison between two groups, various parameters especially triglycerides & HDL levels as well as waist circumference were significantly different.

**Conclusion:** Our study revealed an extremely high incidence of metabolic syndrome in acute MI. Therefore, patients of acute MI should routinely be screened for metabolic syndrome and managed or advised accordingly to prevent future attacks. Anthropometric measurements like waist circumference and lipoprotein levels in blood are simple measures to detect metabolic syndrome in early phase.

**Keywords:** Cardiovascular disease, Metabolic syndrome, National Cholesterol Education Program, Adult Treatment Panel-III, World Health Organisation

## Introduction

Currently cardiovascular disease (CVD) is commonest cause of worldwide responsible globally for 30% of all deaths (approximately 40% in high-income and nearly 28% among middle and low-income countries) [1].

All over the world, a declining trend in physical activity coupled with increased consumption of total caloric has led to an epidemic of obesity. If intensification of these risk factor incidence continues, age-adjusted CVD mortality rates

will continue to climb in forthcoming years [2].

The term *metabolic syndrome* that has been used extensively with increasing trend of CVD in recent time is characterised by clustering of various risk factors. In 2001, this issue was addressed by *National Cholesterol Education Program (NCEP) Adult Treatment Panel-III (ATP III)* [3].

The criteria of metabolic syndrome given by NCEP-ATP III in the year 2001, was based on measurements of blood lipids, waist circumference, blood pressure and fasting blood glucose [4]. This definition differed from that given by World Health Organisation (WHO) as it was more focused on CVD risk & its primary prevention. It also emphasized on root causes like overweight, physical inactivity, obesity, and genetic factors [5].

Early intervention with lifestyle changes (as diet modification and increased physical activity) and

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pharmacotherapy slows the progression of CVD. As community-based interventions can promote healthy lifestyle in a larger population, health education of physicians plays a pivotal role in this mammoth task.

### Aim & Objective

To evaluate occurrence of various parameters of metabolic syndrome in patient with acute myocardial infarction.

### Materials and Methods

This observational cross-sectional study was carried in a tertiary care hospital of western Uttar Pradesh, India College name. Ninety-eight patients of acute myocardial infarction admitted to intensive cardiac care unit (ICCU) were included in the study after a written informed consent. The study was approved by the Institutional Ethical Committee.

The criteria for Acute Myocardial Infarction [1] used was rise and/or fall of cardiac biomarker values (preferably cardiac troponin T & I) with at least one value above the 99<sup>th</sup> percentile upper reference limit (URL) and with at least one of the following:

- Symptoms of myocardial ischemia (include various combinations of chest, upper extremity, jaw or epigastric discomfort with exertion or at rest; the discomfort usually lasts equal or less than 20 min, often is diffuse, not localized, not positional, not affected by movement of the region and it may be accompanied by dyspnoea, diaphoresis, nausea or syncope) or
- New or presumed new significant ST-segment T-wave (ST-T) changes or new left bundle branch block (LBBB) or
- Development of pathologic Q waves in the electrocardiogram (ECG) or
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality or
- Identification of an intracoronary thrombus by

angiography.

A patient was considered to have metabolic syndrome as per revised NCEP-ATP-III criteria.

Data was collected in pre-tested, pre-designed, semi-structured proforma. Patients of acute MI were divided into two groups based on presence or absence of metabolic syndrome. Comparative analysis was done among the two groups. Data analysis was done using SPSS version 21 software. Statistical Significance has been considered as p value less than 0.05.

### Observations & Results

Out of 98 patients who presented with acute MI (myocardial infarction), 57 patients were having metabolic syndrome with an incidence of 58.16% in our study (Table 1).

**Table 1: Incidence of Metabolic Syndrome**

Patients	n (%)
Patients with metabolic syndrome	57(58.16)
Patients without metabolic syndrome	41(41.84)
Total Patients with Acute Myocardial Infarction	98(100)

As shown in Table 2, the average of patient presenting with myocardial infarction having metabolic syndrome was lower (51.3 years) than those without metabolic syndrome (56.4 years). The mean age among these two groups was significantly different as results shown on t-test ( $t=2.0460$ ,  $p=0.0435$ ).

Also, lower age groups were seen with metabolic syndrome, 60% younger than 54 years as compared to only 40% older than 54 years. But this difference was not significantly different as shown by chi-square value ( $\chi^2=4.6002$ ;  $p=0.467$ ).

However, there were no significant association between metabolic syndrome in patients of AMI and gender ( $p=0.616$ ). In our study, among gender-wise distribution of cases of MI in MS and without MS was almost similar.

**Table 2: Age - Wise Incidence of Metabolic Syndrome in Acute MI**

Age Group (Years)	With Metabolic Syndrome (Group A) n (%)	Without Metabolic Syndrome (Group B) n (%)	Total n (%)	Results
< 44 yrs	14(24.6)	6(14.6)	20(20.4)	$\chi^2 = 4.6002$ $p=0.467$
45-54 yrs	20(35.1)	11(26.8)	31(31.6)	
55-64 yrs	14(24.6)	14(34.2)	28(28.6)	
> 65 yrs	9(15.7)	10(24.4)	19(19.4)	
TOTAL	57(100)	41(100)	98(100)	
Mean± SD	51.3 ± 12.1 yrs.	56.4 ± 12.2yrs.		

**Table 3: Relationship of Serum Triglycerides with Acute MI and Metabolic Syndrome**

Serum Triglycerides (mg/dl)	Group A n (%)	Group B n (%)	p-value
150 mg/dl or more	27(47.4)	2(4.9)	$\chi^2 = 20.6642,$ $p < 0.001$
Less than 150 mg/dl	30(52.6)	39(95.1)	
<b>Total</b>	57(100)	41(100)	

**Table 4 : Association of Low Hdl-C with Acute MI and Metabolic Syndrome in Males**

HDL-C (mg/dl)	Group A n (%)	Group B n (%)	p-value
40 mg/dl or more	11(22.9)	24(66.7)	$\chi^2 = 16.2,$ $p < 0.001$
Less than 40 mg/dl	37(77.1)	12(33.3)	
<b>Total</b>	48	36	

**Table 5: Association of Low Hdl-C With Acute MI and Metabolic Syndrome in Females**

HDL-C (mg/dl)	Group A n (%)	Group B n (%)	p-value
50 mg/dl or more	2(22.22)	1(20)	Chi-square value= 0.0094 p value=0.923
Less than 50 mg/dl	7(77.78)	4(80)	
<b>Total</b>	9	5	

**Table 6: Relationship of Waist Circumference with Acute MI and Metabolic Syndrome in Males**

Waist Circumference (cm)	Group A n (%)	Group B n (%)	p-value
90 cm or more	35(72.9)	8(22.2)	Chi Square test =21.1; $p < 0.001$
Less than 90 cm	13(27.1)	28(77.8)	
<b>Total</b>	48	36	

**Table 7: Relationship of Waist Circumference and Metabolic Syndrome with Acute MI in Females**

Waist Circumference (cm)	Group A n (%)	Group B n (%)
80 cm or more	9(100)	4(80)
Less than 80 cm	0(0)	1(20)
<b>Total</b>	9	5

**Table 8: Complications during 1 Week Of Hospital Stay**

Complications	Group A n (%)	Group B n (%)	Chi-Square test value	p-value
Heart Failure	20(35)	14(34.1)	0.0093	0.923
Rales	18(31.6)	15(36.6)	0.2676	0.605
Other Complications	19(33.3)	15(36.6)	0.1113	0.739

Statistically significant correlation was noted between serum triglycerides > 150 mg per dl and metabolic syndrome with acute MI patient ( $p < 0.001$ ) as shown in Table 3.

Statistically significant correlation was noted between HDL <40 mg/dl and metabolic syndrome with acute MI in male patients ( $p < 0.001$ ) as shown in Table 4 with no such correlation in female patients as seen in Table 5.

Table 6 shows significant correlation between increased waist circumference and metabolic syndrome with acute myocardial infarction in male patients ( $p < 0.001$ ). However, in females 100% subjects with waist circumference of 80 cm or more belong to MI with metabolic syndrome in contrast to 80% in those without Metabolic syndrome as shown in Table 7.

Both groups i.e., those with metabolic syndrome and those without metabolic syndrome, group A and B respectively had statistically similar incidence of complications (all  $p$ -values are more than 0.05) as shown in Table 8. There was a mortality of 3.5% patients in metabolic group against 2.4% in without metabolic syndrome group.

The incidence of low HDL cholesterol level, fasting blood sugar >100 mg per dl, increased triglyceride (>150mg/dl), increased systolic blood pressure (>130mmHg), increased diastolic blood pressure (>85mmHg) & elevated waist circumference were 73.7%, 98.2%, 47.4%, 35.1%, 29.8%, 77.2% respectively in patients of acute MI with metabolic syndrome.

## Discussion

Our findings show that metabolic syndrome is common in patients who presented with myocardial infarction (MI). Similar trend was noted in a recent study published in the year 2018 by Oz TK et al [6], where the incidence of metabolic syndrome was nearly 46.8%.

Age distribution similar to our study was also seen by Levantesi G. [7] and Pandey S et al [8]. Decreased mean age in patients of MI with metabolic syndrome in contrast to MI without metabolic syndrome groups was found in their studies.

Incidence of raised triglycerides (TG >150mg/dl) similar to that in our study (47.4%) goes in line with Ninomiya et al [9] (43.2%) and Pandey S et al [8] (59.09%).

Low HDL cholesterol incidence of 77.1% in males and 55.6% in females as seen in our study was similar to that of Pandey S et al [9] (77.2%) and Schwartz G. et al [10] (88%).

The incidence of increased waist circumference (e"90 cm for males, e" 80 cm in females) was 72.9% in males and 100% in females of our study which is slightly lower than with Al-Aqeedi et al [11] (81.8%) may be attributable to racial differences.

In our study, 35% patients of MI with metabolic syndrome had heart failure, comparable to that shown by Zeller M et al [12] (41/7%). In 2017, Bhagat PR et al [13] also revealed similar results in their study. However, there was no statistical correlation of early complications i.e., heart failure, rales, death during hospital stay among two groups – with or without metabolic syndrome.

## Conclusion

Our study demonstrates a high incidence of metabolic syndrome in patients with acute MI suggesting a role of its routine screening. Early detection of signs and symptoms of metabolic syndrome by physicians with proper management can reduce the future risk of myocardial infarction. Lifestyle changes (exercise and dietary habits) should be encouraged from a young age preferably at the level of school.

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