

## Original Research Article

# Assessment of incidence rate and prognosis of metabolic syndrome among acute myocardial infarction: a longitudinal study

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### ABSTRACT

**Background:** The Metabolic Syndrome (METS) is a specific clustering of cardiovascular risk factors in the same person (abdominal obesity, atherogenic dyslipidemia, elevated Blood Pressure (BP), Insulin Resistance (IR), and a proinflammatory state. A recent review of insulin resistance syndrome revealed a rapid escalation of this syndrome among Indians and the prevalence of predominant component of METS varies from region to region. Hence the present study was undertaken to assess the incidence of Metabolic Syndrome and prognosis of metabolic syndrome among acute myocardial infarction patients.

**Methods:** A longitudinal study was carried among Acute myocardial infarction patients, who were admitted to ICCU of Shri. B. M. Patil Hospital and Research Centre, Bijapur during November 2009 to March 2011. Sample size was calculated using the formula:  $n=4pq/L^2$ . Sample size required was 92. Descriptive statistics and Inferential statistics were used to analyse the results.

**Results:** The incidence rate of METS among AMI in our study was 48.7%. The complications were more common in METS group compared to those without METS groups. Recovery was better among those without METS group. There was a statistically significant association between complications and status of METS. The past history of DM was more common in METS. Hyperglycemia among the components of METS has strongest association with the outcome of death in patients of AMI.

**Conclusions:** The metabolic syndrome is a highly prevalent condition among the patients with acute myocardial infarction and has detrimental impact on outcome. Metabolic syndrome is also associated with a higher risk of severe heart failure and death.

**Keywords:** Acute myocardial infarction, Blood pressure, Cardiovascular diseases, Diabetes mellitus, Heart failure, Metabolic syndrome

### INTRODUCTION

Multifaceted etiology of Cardiovascular Diseases (CVD), especially coronary heart disease, has been recognized for a long time.<sup>1-3</sup> The increased risk of morbidity and mortality associated with the METS makes it essential that there is a clear understanding of the dimensions of this syndrome for the allocation of health care and research

resources and for other purposes.<sup>4</sup> A very consistent finding is that the prevalence of METS is highly age-dependent, in USA (National health and Nutrition examination surgery [NHANES III]) prevalence of METS increased from 7% in participants aged 20-29 years to 44% and 42% for those aged 60-69 years and at least 70 years respectively.<sup>5</sup> Of particular interest are the two Indian studies, which differed in their definition of obesity; one

study used obesity criteria that were suitable for Indians, while the others used the standard ATP III definition of obesity. Both studies used population-based samples writing the same age range but reported prevalence of 13% in Jaipur and 41% in Chennai.<sup>6,7</sup>

Interestingly, a third Indian study also from Chennai, reported a METS prevalence of 11.2% (using EGIR criteria), which was much closer to the prevalence reported for Jaipur than the other Chennai study. Therefore, even within the same ethnic population group it appears that there can be significant differences in the prevalence of both the individual factors that constitute the METS and the METS itself.<sup>8,9</sup> The prevalence of METS was found to be elevated in women who abstained from alcohol. Slight and moderate alcohol consumption has been found to be associated with low coronary heart disease risk possibly through beneficial alterations in HDL cholesterol and BP.<sup>10</sup> High prevalence of obesity and IR in urban Indian population is well known. A study from Chennai report 18.7% prevalence of IRS in upper socio-economic strata in south India, while it was 6.5% in the low socio-economic strata.<sup>11</sup> According to a recent study on south Indians, the prevalence of the METS (%) was estimated to be 23.2, 18.3 and 25.8 according to WHO, ATP III and IDF definitions respectively.<sup>12</sup> Further, certain communities in India (eg. Punjabi, Bhatia community) have inordinately high tendency to develop obesity, type 2 diabetes mellitus, and METS.<sup>13</sup>

The traditional risk factors all together account for approximately half of the risk of a first myocardial infarction, especially in the Asian Indian population. As a result, both incident and prevalent CVD will likely continue to increase in the next decades with significant socio-economic consequences.<sup>14</sup> However, very few studies have reported on the prevalence of IRS as a whole in the native Indian population based on epidemiological studies. This is particularly relevant as India has the maximum number of diabetes patients in any given country in the world.<sup>15</sup>

Early intervention of this METS with intensive lifestyle changes in the form of diet, exercise and pharmacotherapy can prevent the future development of CVD like myocardial infarction. Hence, this study is undertaken to identify and assess the incidence of METS in high risk group patients with myocardial infarction and to study the prognosis of myocardial infarction in patients with METS during hospital stay.

## METHODS

This study was carried among Acute myocardial infarction patients, who were admitted to ICCU of Shri. B. M. Patil Hospital and Research Centre, Bijapur from November 2009 to March 2011. Sample size was calculated using the formula:  $n = \frac{4pq}{L^2}$  Where  $p$  = prevalence rate of metabolic syndrome 41% (2),  $Q = 1 - p$ ,  $L$  = allowable error at 25% and at 5% risk. Hence Sample size required was 92.

Descriptive statistics like Mean, Standard Deviation, Bar chart as well as Inferential statistics like Chi square test and Z statistics were used to analyses the results. Ethical clearance was obtained from institutional Ethical committee before the commencement of research and written informed consent was taken from the participants.

### Inclusion criteria

- In this study was Acute myocardial infarction patients age above 18 years who were admitted to ICCU of Shri. B. M. Patil Hospital and Research Centre, Bijapur during November 2009 to March 2011.

### Excluded criteria

- While those Patients with non-cardiac chest pain Patients with stable/ unstable angina were excluded from the study.

The study has been carried out on patients who presented with acute myocardial infarction within 24 hrs. All subjects were interviewed as per the prepared proforma followed by clinical examination. Diagnosis of myocardial infarction based on WHO (2000) criteria. Estimation of RBS, FBS, Echocardiography and Follow up of patients was done with reference to course in hospital; till patient gets discharged or till death.

## RESULTS

A total of 197 cases were admitted during the study period from November 2009 - March 2011, out of which 96(48.7%) had METS. The incidence rate of METS among AMI in this study was 48.7%. The mean age of the study participants was 55.5 years with the males (67%) being predominant as compared to females. Majority (86.29%) of patients presented with chest pain followed by sweating (41.62%). The other symptoms presented includes Vomiting (36%), breathlessness (26%) and palpitation (18%). Whereas cough with sputum and syncope was seen among 6% and 5% individuals. There was not much difference among those with METS and without METS. Whereas, breathlessness and syncope were more common in METS compared to those without METS (Table No 1).

All the complications were more common in METS group compared to those without METS groups. Recovery was more common in without METS group compared to those with METS. Calculated value of Chi square is 49.02 whereas tabled value for 3 digits of freedom and 1% level of significance is 11.345. Since calculated value > tabled value at  $p < 0.05$ : there is association between complications and status of METS (Table 1).

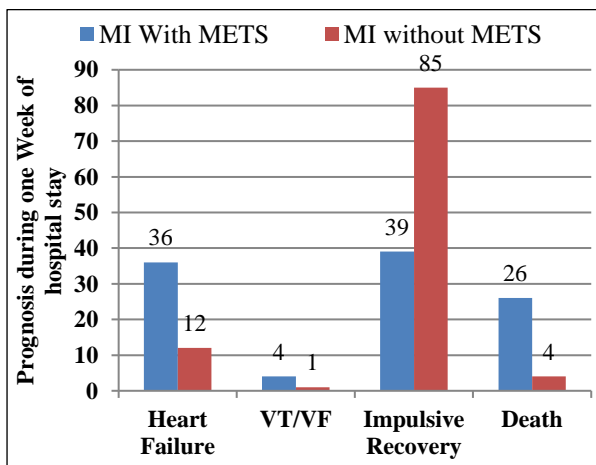
The past h/o DM was more common in METS compared to those without METS. Low HDL-C was the major component in both the groups. Calculated value of Chi square is 26.88 whereas tabled value for 4 degrees of freedom at  $p < 0.05$  is 13.27. Since calculated value > table

value at  $p < 0.05$  the association is very high between components of METS and status of METS (Table 1). All the components of METS had values greater than those without METS and are statistically significant except for the HDL-C which are same in both the groups.

All the complications were more common in METS group compared to those without METS groups. Recovery was more common in without METS group compared to those with METS (Table 1).

**Table 1: Factors determining METS.**

	Component	MI with METS		MI without METS		Total	
		N = 96	%	N=101	%	N=197	%
Sex	Males	59	61.46	73	72.28	132	67.01
	Females	37	38.54	28	27.72	65	32.99
Symptoms	Chest pain	82	85.42	88	87.13	170	86.29
	Sweating	41	42.71	41	40.59	82	41.62
	Breathlessness	29	30.21	23	22.77	52	26.40
	Cough/sputum	5	5.21	7	6.93	12	6.09
	Palpitation	17	17.71	20	19.80	37	18.78
	Vomiting	34	35.42	37	36.63	71	36.04
	Syncope	6	6.25	4	3.96	10	5.08
	Past H/o DM	29	30.21	12	11.88	41	20.81
	Past H/o HT	21	21.88	19	18.81	40	20.30
Risk Factors	Current smoker	37	38.54	22	21.78	59	29.94
	Alcohol	17	17.71	30	29.70	47	23.86
	Family H/o CAD	14	14.58	8	7.92	22	11.17
	Heart failure	35	36.46	12	11.88	54	27.41
	VT/VF	4	4.17	1	0.99	5	2.54
Prognosis in one week of hospital stay	Impulsive recovery	37	38.54	86	85.15	123	62.44
	Death	25	26.04	4	3.96	29	14.72



**Figure 1: Prognosis during one week of hospital stay.**

Calculated value of Chi square is 49.02 whereas tabled value for 3 digits of freedom and 1% level of significance is 11.345. Since calculated value  $>$  tabled value at  $p < 0.05$ : there is association between complications and status of METS. Hyperglycemia among the components of METS has strongest association with the outcome of death in patients of AMI. Impulsive recovery was seen among MI

patients without METS as compared to MI patients with METS (Figure 1).

**DISCUSSION**

In the present study, which included 197 cases of acute MI, METS was present in 96 cases (48.73%). This result are comparable to various studies where the incidence of METS in MI ranged between 30% to 58%. 16-20 The findings suggest that METS, as defined by the NCEP ATP III criteria, is very common among patients with acute MI, because almost 1 in 2 patients had METS and that is associated with advanced coronary artery vascular damage.

This high incidence may be related to the vascular damage in METS by oxidative stress, endothelial dysfunction and pro-inflammatory state.<sup>21</sup> In the present study age incidence was more between the age group 51-65 years (47.9 in METS group and 36.3% in without METS group). There was no difference in mean age of presentation between the two groups. (55 vs. 54 years).

Various studies suggest that the peak age of incidence of METS was 57-67 years. (16-20) There is early incidence of METS in Acute MI patients in the present study

compared to the other studies which can be attributed to rapid nutritional and lifestyle transition in Indians.<sup>13</sup>

In the present study the males predominated in both the groups (61.46% in METS group and 72.28% in without METS group). This result is comparable with the previous studies where males presented with higher METS as compared to females.<sup>16,18-20</sup>

Comparison between the two groups indicates that patients with METS were more likely to be a male, which was consistent with the other studies. There was no difference in the 2 groups in presenting symptoms except that a greater number of patients with METS had breathlessness and syncope (30.21% and 6.25% as compared to 22.77% and 3.96% without METS).

In the present study past history of diabetes mellitus was more in METS (30.21%) patients compared with no METS (11.88%) the results are similar to studies where history of DM was significantly associated with METS.<sup>19,20</sup> However, there was no difference in hypertension, alcohol consumption and family h/o CAD. The heart failure (36.4%) is the predominant complication in the present study and is statistically significant. Other complications like VT/VF (4%) and death (26%) were also common and are statistically significant. This result is comparable to a study carried out by Zeller et al where heart failure was major complication followed by VT/VF and death.<sup>19</sup>

In the acute MI patient's presence of METS was associated with about 4 times more chances of complications including death compared to those without METS. This may be related to the more advanced vascular damage associated with the presence of METS in patients who manifest vascular disease like CAD, which may worsen the prognosis.<sup>22</sup> METS also represent a cluster of several risk factors, each of which may be involved in this poor outcome.

One of the main result of our study is that, the increased risk of development of heart failure and death in patients with METS had strongest association with hyperglycemia (25.17%) among the various components of METS measured several days after the index event which was very high in the present study compared to other studies. People with METS have at least 2-fold increase in cardiovascular events and a much poorer prognosis following the event. The METS more strongly predicts the coronary heart disease and cardiovascular disease mortality than its components.<sup>23</sup> The increased in hospital death rate observed in the METS may be resulted mainly from the increased incidence of heart failure.<sup>22</sup>

## CONCLUSION

The metabolic syndrome is a highly prevalent condition among the patients with acute myocardial infarction and has detrimental impact on outcome Metabolic syndrome is

also associated with a higher risk of severe heart failure and death.

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