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The prognosis of myocardial infarction (STEMI & NSTEMI) in patients with metabolic syndrome

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Abstract
A recent review of insulin resistance syndrome (IRS) revealed a rapid escalation of metabolic syndrome among Indians and that the prevalence of predominant component of metabolic syndrome varied from region to region in Indians. Studies on the pathophysiology of this syndrome revealed close to a six-fold increase in cardiovascular mortality. Standardized definition of MI and clinical outcome will be used. A final diagnosis of MI will be made in the presence of serial increases in serum biochemical markers of cardiac necrosis, associated with typical electrocardiographic changes and/or typical symptoms. 27.27% (20) of patients of MI with METS were obese (BMI ≥ 30kg/m2) compared to 2.74% (2) of the patients of MI without METS, which was statistically significant (p value <0.05). There was no significant difference in the other factors like use of thrombolytic therapy, LDL-C and the ST- elevation MI (STEMI) in both the groups.

Keywords: STEMI, NSTEMI, metabolic syndrome

Introduction
Multifaceted etiology of cardiovascular diseases (CVD), especially coronary heart disease, has been recognized for a long time [1].
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), a prothrombotic state and a proinflammatory state [2].
This syndrome has been recognized by various names for years, e.g., Athero-thrombogenic syndrome, Beer-belly syndrome, Cardiovascular syndrome, Chronic cardiovascular risk factor clustering syndrome, Deadly quartet, DysMETS, IR syndrome, Metabolic cardiovascular syndrome, METS, Multiple syndrome, Multiple METS, PluriMETS, Reaven's syndrome, Syndrome X, New world syndrome [3].
A recent review of insulin resistance syndrome (IRS) revealed a rapid escalation of metabolic syndrome among Indians and that the prevalence of predominant component of metabolic syndrome varied from region to region in Indians [4].
Studies on the pathophysiology of this syndrome revealed close to a six-fold increase in cardiovascular mortality [5].
Although it is clear that the presence of the metabolic syndrome (METS) is associated with increased cardiovascular risk, the levels of this associated risk have not been clearly defined. Different proposed definitions would appear to result in different predictions of risk, and risk appears to differ according to which components of the proposed definitions are present [6].
The increased risk of morbidity and mortality associated with the METS makes it essential that there be a clear understanding of the dimensions of this syndrome for the allocation of health care and research resources and for other purposes [7].
These 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 [8].
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 [9].
Early intervention of this METS with intensive life style 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 the incidence of predominant component of METS in patients with myocardial infarction and to study the prognosis of myocardial infarction in patients with METS during hospital stay and to correlate various components of metabolic syndrome with in-hospital prognosis of patients with acute myocardial infarction.

Methodology

Standardized definition of MI and clinical outcome will be used. A final diagnosis of MI will be made in the presence of serial increases in serum biochemical markers of cardiac necrosis, associated with typical electrocardiographic changes and/or typical symptoms as defined by the joint committee of the European society of cardiology and the American college of cardiology.

A detailed case history will be taken including the symptoms, past history of diabetes mellitus, hypertension (HT), smoking and alcohol consumption.

A careful physical examination will be done with special reference to resting blood pressure (BP), waist circumference (WC), Height and weight.

Blood pressure will be recorded in the following way with a standard sphygmomanometer:

Before the blood pressure measurement is taken, the individual should be seated quitely in a chair (not the exam table) with feet on the floor for 5 min in a private, quiet setting with a comfortable room temperature. At least two measurements will be taken. The centre of the cuff will be at the heart level, and the width of the bladder cuff will equal at least 40% of the arm circumference; the length of the cuff bladder will be enough to encircle atleast 80% of the arm circumference. The cuff will be inflated to 20-30mm above the pulse extinction, and the rate of deflation will be 2mmHg/s. Systolic blood pressure is the first of at least two regular "tapping" Korotkoff sounds, and diastolic blood pressure is the point at which the last regular Korotkoff sound is heard.

The BMI will be calculated using the formula BMI = Weight in kg/Height in m [2].

Waist circumference (WC) will be recorded in the following manner: "The subject will be standing and the examiner, positioned on the right of the subject, palpates the upper bone to locate the iliac crest. Just above the uppermost lateral border of right iliac crest, a horizontal mark is drawn, and then crossed with vertical mark on the midaxillary line. The measuring tape is placed in a horizontal plane around the abdomen at the level of this marked point on the right side of the trunk. The plane of the tape is parallel to the floor and the tape is snug, but does not compress the skin. The measurement is made normal minimal inspiration."

Patients with Metabolic syndrome

The NCEP - ATP III definition will be used for the diagnosis of Metabolic syndrome: includes any three or more of the following

- Central obesity : waist circumference > 102 cm (male) or > 88 cm (female),
- Hypertriglyceridemia : triglycerides ≥150 mg/dl or specific medication,
- HDL cholesterol : <40 mg/dl (male) or <50 mg/dl (female) or specific medication,
- Hypertension: blood pressure ≥130 mm systolic or ≥85 mm diastolic or specific medication,
- Fasting plasma glucose ≥100 mg/dl or specific medication or previously diagnosed Type 2 diabetes.

Acute MI will be treated with or without thrombolytic therapy and standardized treatment. All the MI patients will be followed up over a period of one week for the development of complications namely Heart failure, Ventricular tachycardia/fibrillation, Recurrent MI, Stroke and Case fatality. Heart failure will be defined according to Killip`s classification.

Results

There were 38 (50.66%) cases of heart failure among patients of MI with METS compared to 18 (24.00%) cases of heart failure among patients of MI without METS, and the difference was statistically significant.

Table 1: Heart Failure

Complication	MI With METS		MI Without METS		Total		P value
	N =75	%	N =75	%	N =150	%	
Heart failure	38	50.66	18	24	55	36.66	<0.001

Table 2: Case Fatalities.

Complication	MI With METS		MI Without METS		Total		P value
	N =75	%	N =75	%	N =150	%	
Case fatality.	19	25.33	11	14.66	29	19.33	0.02 S

There were 19 (25.33%) deaths among patients of MI with METS compared to 11 (14.66%) deaths among patients of MI without METS, and the difference was statistically significant.

Table 3: Ventricular Tachycardia / Ventricular Fibrillation (Vt/Vf).

Complication	MI With METS		MI Without METS		Total		P value
	N =75	%	N =75	%	N =150	%	
VT/VF	7	9.33	6	8	13	8.66	0.58

7 (9.33%) patients of MI with METS developed Ventricular tachycardia/Ventricular fibrillation (VT/VF) compared to 6 (8%) patients of MI without METS but the difference was not statistically significant.

There were 3 (4%) cases of recurrent myocardial infarction (recurrent MI) in patients of MI with METS compared to 2 (2.66%) cases of recurrent MI in patients of MI without METS and the difference was not statistically significance.

Table 4: Stroke

Complication	MI With METS		MI Without METS		Total		P value
	N =75	%	N =75	%	N =150	%	
Stroke	1	1.33	0	0	1	0.66	0.53

Only one case MI with METS developed stroke during one-week hospital stay and none developed stroke in patients of MI without METS. The difference was not statistically significant.

Table 5: Other Factors

Other factors	MI With METS		MI Without METS		Total		P Value
	N=75	%	N =75	%	N =150	%	
Obesity (BMI ≥ 30kg/m2)	20	27.27	2	2.74	22	14.80	<0.001
Serum cholesterol (≥240mg/dl)	14	18.75	12	15.93	26	17.31	0.830
LDL-C >160mg/dl	20	26.70	16	20.87	36	23.74	0.567
Thrombolysis	15	19.88	18	23.7	33	22.00	0.350
STEMI	53	71.02	54	71.42	107	71.22	0.246

27.27% (20) of patients of MI with METS were obese (BMI ≥ 30kg/m2) compared to 2.74% (2) of the patients of MI without METS, which was statistically significant (p value <0.05). There was no significant difference in the other factors like use of thrombolytic therapy, LDL-C and the ST-elevation MI (STEMI) in both the groups.

Discussion

Heart failure (50.66%) and case fatality (25.33%) were the predominant complications in the present study and were statistically highly significant. Other complications were less common and were not statistically significant.

Table 6: In Hospital Prognosis of MI (1 Week)

Complications	Zeller *et al.* [10]	Present study
Heart failure	41.7%	50.66%
Ventricular tachycardia/fibrillation.	11.7%	9.33%
Recurrent MI	9.37%	4.00%
Stroke	1.7%	1.33%
Case fatality	10 %	25.33%

In the patients of acute MI presence of METS was associated with about 4 times (odds ratio 3.8, p value <0.001 significant) more chances of complications including case fatality compared to those without METS. This may be related to the more advanced vascular damage associated with the presence of METS in these patients which manifests with vascular diseases like CAD, which may worsen the prognosis. METS also represents 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 in patients of MI with METS appears to be related primarily to fasting hyperglycemia, which was very high in the present study compared to other studies.

The presence of DM and HTN which are associated with diastolic/systolic heart dysfunction, abnormal myocardial substrate metabolism resulting in increased free fatty acid metabolism, and impaired blood flow to the non-infarcted myocardium are the potential factors explaining the higher incidence of heart failure.

METS was associated with unfavorable outcome in terms of all cause mortality. A recent study in India has shown the importance of insulin resistance as a risk factor for carotid artery intima/media thickness and indirect marker of atherosclerosis.

People with METS had 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 individual components [11].

The increased case fatality rate observed during 1week of hospital stay in the METS may have resulted mainly from the increased incidence of heart failure [12].

Conclusion

During one week of hospital stay there were significantly more deaths and heart failure among patients of MI with METS compared to patients of MI without METS (50.66% and 25.33% vs. 24% and 14.66%). Though the number of patients who developed other complications (Recurrent MI, VT/VF and Stroke) were more in patients of MI with METS when compared to patients of MI without METS, The difference was not statistically significant.

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