Original Article

Study of association of each component of the metabolic syndrome with acute myocardial infarction

Pravin Rohidasrao Bhagat[1*], Shubhangi Virbhadra Swami[2]

{[1]Assistant Professor, Department of Medicine} {[2]Assistant Professor, Department of Pathology}
Government Medical College, Latur, Maharashtra, INDIA.
Email: drprbhagat10@gmail.com

Abstract

Aim and objective: To Study of association of each component of the metabolic syndrome with acute myocardial infarction. **Methodology:** Total 358 patients of MI were studied in a tertiary care institute. 163 patients were MET and 195 were NON MET. Data was collected regarding different components of MET. analysis was done to see the association of these components with acute MI. **Results:** Among the components of metabolic syndrome low HDL-cholesterol was the most prevalent (96.31%), high triglycerides (82.20%) was the next most prevalent. components of metabolic syndrome like fasting blood sugar, systolic blood pressure, diastolic blood pressure, HDL, TG, waist circumference were significantly affecting the acute **Discussion and Conclusion:** The risk of cardiovascular mortality increased proportionally with the number of metabolic components. cardiovascular disease patients with METS must be identified and managed aggressively to reduce both morbidity and mortality for what is in large part a preventable condition.

Key Words: metabolic syndrome, acute myocardial infarction.

[*]**Address for Correspondence:**
Dr. Pravin Rohidasrao Bhagat, Department of Medicine, Government Medical College, Latur, Maharashtra, INDIA.
Email: drprbhagat10@gmail.com
Received Date: 16/01/2017 Revised Date: 20/02/2017 Accepted Date: 15/03/2017

Access this article online

Quick Response Code:

Website: www.medpulse.in

DOI: 25 March 2017

INTRODUCTION

Metabolic syndrome (METS) is a specific clustering of cardiovascular risk factor in the same person (abdominal obesity, atherogenic dyslipidemia, elevated blood pressure (BP), insulin resistance (IR), a prothrombotic state and a proinflammatory state.[1] A recent review of insulin resistance syndrome revealed a rapid escalation of this syndrome among Indians and prevalence of predominant component of METS varies from region to region.[2] Studies have revealed the pathophysiology of this syndrome, with close to a six fold increase in cardiovascular mortality in those possessing this disorder.[3] Although it is clear that the presence of METS is associated with increase cardiovascular risk, the levels of associated risk have not been clearly defined. Different proposed definition would appear to result in different predictions of risk, and risk appears to differ according to which components of the proposed definitions are present.[4] This 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 increases in the next decades with significant socio-economic consequences.[5] hence this study was carried out to find association of components of met syndrome with acute myocardial infarction.

MATERIAL AND METHODS

This study was based on analysis of 358 patients admitted to the ICCU in our institute during a period from November 2011 to October 2013 after considering inclusion and exclusion criteria.

How to site this article: Pravin Rohidasrao Bhagat, Shubhangi Virbhadra Swami. Study of association of each component of the metabolic syndrome with acute myocardial infarction. *MedPulse – International Medical Journal.* March 2017; 4(3): 410-414. http://www.medpulse.in (accessed 27 March 2017).

Inclusion Criteria

A. All patients with acute MI diagnosed based on WHO criteria.
B. The NCEP-ATP III[6] definition was used for the diagnosis of Metabolic syndrome includes any three of following:

1. Central obesity : waist circumference > 102 cm (male) or femles >88 cm
2. Hypertriglyceridemia : triglycerides > 150 mg/dl
3. HDL cholesterol : <40 mg/dl (male) or <50 mg/dl (female)
4. Hypertension: blood pressure > 130 /85 mmHg
5. Fasting plasma glucose > 110mg/dl.

C. More than 18 years.

Exclusion criteria

A. Less than 18 years of age

B. Patients with coronary artery diseases who do not satisfy inclusion criteria for acute MI.

A final diagnosis MI was made in the presence of serial increases in serum biochemical markers of cardiac necrosis, has associated with typical ECG changes and/or typical symptoms as defined by the joint committee of the European society of cardiology and the American college of cardiology.[7] Data was collected using pre tested and validated questionnaire. It included history including symptoms, past history of DM, HTN, smoking, alcohol consumption. Blood pressure, height weight, waist circumference and BMI taken. Investigations like 12 lead ECG, cardiac enzymes, fasting blood sugar, lipid profile, 2 D Echo were done Acute MI was treated with or without thrombolytic therapy and standardized treatment. All the MI patients were followed up over a period of one week for the development of complications like Heart failure, Ventricular tachycardia /fibrillation, Bundle branch block, cardiac shock and Case fatality. Heart failure was defined according to Killips classification.[8] Statistical analysis was done using appropriate tests.

RESULTS

A total of 358 patients of acute MI admitted during the 2 year study period. We studied these patients by dividing into two groups as patients with METS (163) and patients with non METS (195) with the use of NCEP ATPIII criteria. The prevalence of METS was 45.53%. The mean age of presentation was 56.19±11.56 in METS and 54.82±10.94 in without METS groups. The difference between two groups for age was not statistically significant (p value 0.48). It was observed that out of 358 studied, 268 patients were males and 90 patients were females.

Table 1: Association of fasting blood sugar with acute MI

Sr. No.	FBS(mg/dl)	METS (N=163)	NON METS (N=195)	TOTAL (N=358)	ODDS RATIO	95% C.I.	P-VALUE
1.	≥ 110	126 (77.30%)	78 (40%)	204 (56.98%)	5.10	3.13-8.37	<0.0001, HS
2.	< 110	37 (22.70%)	117 (60%)	154 (43.02%)			
	TOTAL	163	195	358			

The FBS ≥110 was present in 77.30% (mean 163±2.89) of patients with METS and 40% (mean 137.54± 62.91) of those with non METS, which was statistically significant (p value <0.001)

Table 2: Association of SBP with acute MI

Sr. No.	SBP (mmHg)	METS (N=163)	NON METS (N=195)	TOTAL N(=358)	ODDS RATIO	95% C.I.	P-VALUE
1	≥130	110 (67.48%)	64 (32.82%)	174 (48.6%)			
2	<130	53 (32.52%)	131 (67.18%)	184 (51.4%)	4.34	2.66-6.78	<0.0001, HS
	TOTAL	163	195	358			

The SBP ≥130 mmHg was present in 67.48% (mean 138.18±25.53) of patients with METS and 32.82% (130.48±21.56) of those with non METS, which was statistically significant (p value <0.0001).

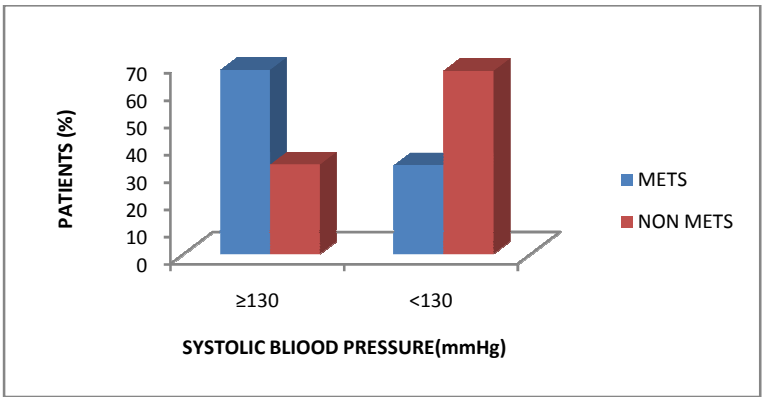

Table 3: Association of DBP with acute MI

SR.NO.	DBP(mmHg)	METS (N=163)	NON METS (N=195)	TOTAL (N=358)	ODDS RATIO	95% C.I.	P-VALUE
1	≥ 85	101 (61.95%)	60 (30.77)	161 (44.97%)			
2	< 85	62 (38.04%)	135 (69.23%)	197 (55.02%)	3.65	2.30-5.82	<0.0001, HS
	TOTAL	163	195	358			

The DBP ≥85 mmHg was present in 61.95% (mean 88.73±15.47) of patients with METS and 30.77% (82.17±9.41) of those without METS, which was statistically significant (p value <0.001)

Table 4: Association of total cholesterol with acute MI

Sr. No.	Total Cholesterol(Mg/Dl)	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P Value
1	≥ 200	55 (33.74%)	59 (30.26%)	114 (31.84%)			
2	<200	108 (66.26%)	136 (69.74%)	244 (68.16%)	1.17	0.73-1.87	0.48 NS
	TOTAL	163	195	358			

Total cholesterol ≥200 mg/dl was present in 33.74% (mean 189.12±48.32) of patients with METS and 30.26% (mean 186±49.94) of those with non METS, which was statistically not significant (p value 0.4808)

Table 5: Association of LDL with acute MI

Sr.No.	Ldl(Mg/Dl)	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P-Value
1	≥ 160	135 (82.82%)	158 (81.03%)	293 (81.84%)			
2	<160	28 (17.18%)	37 (18.97%)	65 (18.16%)			
	TOTAL	163	195	358	1.13	0.03-2.02	0.6606,NS

The LDL ≥160 mg/dl was present in 82.82% (mean 136.88±4.64) of patients with METS and 81.84% (mean 134.22±2.64) of those with non METS, which was statistically not significant.

Table 6: Association of HDL with acute MI:

Sr. No.	Hdl(Mg/Dl)	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P-Value
1	<40	157 (96.32%)	112 (57.44%)	269 (75.14%)			
2	>40	6 (3.68%)	83 (42.56%)	89 (24.86%)	19.39	8.08-55.87	<0.0001, HS
	TOTAL	163	195	358			

The HDL <40 mg/dl was present in 96.32% (mean 35.41±7.63) of patients with METS and 57.44% (40.42±6.15) of those with non METS, which was statistically significant (p value <0.0001).

Table 7: Association of TG with acute MI

Sr. No.	Tg(Mg/Dl)	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P-Value
1	≥ 150	134 (82.21%)	75 (38.46%)	209 (58.38%)			
2	<150	29 (17.79%)	120 (61.54%)	149 (41.62)			
	Total	163	195	358	7.39	4.39-12.55	<0.0001, Hs

The TG ≥150 mg/dl was present in 82.21% (mean 240.14±112.76) of patients with METS and 38.46% (157.45±47.22) of those with non METS, which was statistically significant (p value <0.001)

Table 8: Association of waist circumference with acute MI

Sr. No.	Wc(Cm)	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P-Value
1	>102 M >88 F	62 (38.03%)	29 (14.87%)	91 (25.41%)			
2	< 102 M <88 F	101 (62.76%)	166 (85.43%)	267 (74.58%)			
	Total	163	195	358	3.51	2.06-6.04	<0.0001, Hs

The WC>102cm for male and WC>88cm for female was present in 38.03% (mean 94.52±7.51) of patients with METS and 14.87% (91.30±5.33) of those with non METS, which was statistically significant (p value <0.001)

Table 9: Association of obesity with acute MI

Sr. No.	BMI In Kg/M^2	Mets (N=163)	Non Mets (N=195)	Total (N=358)	Odds Ratio	95% C.I.	P-Value
1	≥30	42 (25.77%)	07 (3.59%)	49 (13.69%)			
2	<30	121 (74.23%)	188 (96.41%)	309 (86.31%)	9.32	3.95-25.25	<0.0001, Hs
	Total	163	195	358			

The obesity with BMI ≥30kg/m^2 was present in 25.77% (mean 25.95± 3.77) of patients with METS compared to 3.59% (25.85± 5.64) of those with non METS, which was statistically significant (p value <0.001)

Table 10: Distribution of patients according to components of metabolic syndrome

PARAMETERS	METS	NON METS	P-VALUE
FBS	163±2.89	137.54± 62.91	<0.0001
SBP	138.18 ±25.53	130.48± 21.56	00.0021
DBP	88.73 ±15.47	82.17± 9.41	<0.0001
HDL	35.41± 7.63	40.42 ±6.15	<0.0001
WC	94.52± 7.51	91.30± 5.33	<0.0001
TC	189.12± 48.32	186.64± 49.94	0.6350
TG	240.14± 112.76	157.45± 47.22	<0.0001
LDL	136.88 ±4.67	134.22± 2.64	0.5172
BMI	25.95± 3.77	25.85± 5.64	0.8553

In our study, the mean FBS was 163± 28 mg/dl in patients with METS and 137.54± 62 mg/dl in the without METS group. The FBS >110 mg/dl was present in 77% of patients with metabolic syndrome in our study. This finding of FBS was consistent with the study of Zeller M[9] et al (2005) who found 81% of patients and mean value was 123mg/dl. But in Milani R[3] et al (2003) they found lower value of FBS with mean value of 111±26mg/dl as compare to our study. In our study, group of the METS patients had high FBS (163±28mg/dl) compared to other studies. This would be due to poor control of blood sugar in our study patients and also irregularities in the treatment by the patients. Low HDL-C was the most prevalent individual component in both the groups (96.31% and 68.71%). The mean values were lower in the METS group (35.4±7.63) than without METS (40.42± 6.15). These findings were consistent with the study of Zeller M[9] et al (2005) in which low HDL-C was present in 80%. In the study of Schwartz G[10] et al in 2005, they reported 88% of patients with low HDL-C. This low HDL-C may be due to high TGs which lead to decreased production and also increased clearance HDL-C from the circulation.[11,12] High TG level was the next major component. We found 82.20% of patients with METS and the mean value was 240.14±112.76 in our study. In the study of Zeller M[9] et al, they reported 57% of patients had high value of TG. There were 43% of patients with high TG in the study of Ninomiya[13] et al in 2004. The serum TG was also found to be very high in the our study (240±112mg/dl) compared to the other studies which may be related to the Indians have high percentage of body fat and low muscle mass.[14] Additionally insulin resistance also reduces the concentration of lipoprotein lipase in the peripheral tissues.[11] Nevertheless, high TG is an excellent reflection of the insulin resistant condition and is one of the important criteria for diagnosis of the METS.[11] Hypertension was found about 67% of patients with metabolic syndrome with mean value of 138.18±25.53/88.73±15.47mmHg. There was variation in this finding in each study. In the study of Zeller M[9] et al (2005) the incidence of HT was 81%. Also, Schwartz G[10] et al in 2005 had described 90% of patients were hypertensive. In contrast, 48.2% of incidence of HT was present in the study of Ninomiya[13] et al in 2004. In hypertensive subjects, the metabolic syndrome amplifies cardiovascular risk associated with high BP, independent of the effect of several traditional cardiovascular risk factors.[15] Waist Circumference was the minor component in both the groups but was also found to be statistically significant in our study. WC ≥ 102cm in males and ≥ 88cm in females were present in 38.03% of patients with metabolic syndrome with mean value of 94.52±7.51.This value of WC was lower than the other studies. In the study of Zeller M[9] et al (2005), this value of WC was 79%. Similarly Schwartz G[10] et al in 2005, they found 76% of patients had high value of WC in the patients of metabolic syndrome. The mean value of WC was 102±12cm was present in Milani R[3] et al (2003). The WC was less in the present study (mean 94) compared to the other studies. This may be related to the adult Asian Indians, along with the other ethnic groups, have different anthropometric characteristics compared with others. Metabolic abnormalities contributing to cardiovascular risk factors are detectable at a lower WC in Asians

comparison with Caucasians, suggesting that NCEP ATP III criteria might under estimate the prevalence of METS in Asians.

CONCLUSION

The risk of acute MI increased proportionally with the number of metabolic components of metabolic syndrome like fasting blood sugar, systolic blood pressure, diastolic blood pressure, HDL, TG, waist circumference.

REFERENCES

1. Third report of the National Cholesterol Education Program (NCEP) Expert panel on Detection, Evaluation, and Treatment of high blood cholesterol in adults (Adult Treatment Panel III) Final report. Circulation 2002; 106: 3146-3421.
2. Yajnik CS. The insulin resistance epidemic in India: fetal origins, later lifestyle or both? Nutr Rev 2001; 59: 1-9.
3. Milani RV, Lavie CJ. Prevalence and profile of metabolic syndrome in patients following acute coronary events and effects of therapeutic life style change with cardiac rehabilitation. Am J Cardiol 2003; 92(1): 5054.
4. Haffner SM. The metabolic syndrome: Inflammation, Diabetes mellitus, and Cardiovascular disease. Am J Cardiol 2006; 97(suppl): 3A-11A.
5. Munjal YP, Sarena A. Metabolic syndrome: Assessing Cardiometabolic risk, Chapter 50: In YP Munjal, Post-graduate medicine (Recent Advances in Medicine): JP Publishers: 2007; XXI: 461.
6. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert panel on Detection, Evaluation, and Treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA 2001; 285: 2486-97.
7. Alpert JS, Thygesan K, Antman E, Bassand JP. Myocardial infarction redefined: a consensus document of the Joint European society of Cardiology/American college of cardiology committee for the redefinition of myocardial infarction. J Am Coll Cardiol 2000; 36:959-69.
8. Hardai D, Topol EJ, Califf RM, Berger PB, Holmes DR Jr. Cardiogenic shock complicating acute coronary syndrome. Lancet 2000; 356:749-56.
9. Zeller M, Gabriel P, Ravisy J, Laurent Y, Manifican LJ, Hullier et al. Prevalence and impact of metabolic syndrome on hospital outcomes in acute myocardial infarction.
10. Schwartz, Szarek M. Olsson A, Sasiela W, Relation of characteristics of metabolic syndrome to short-term prognosis and effects of intensive statin therapy after acute coronary syndrome. Diabetes Care 2005;28:2508-13.
11. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet 2005; 365:1415-28.
12. Murakami T, Michelagnoli S, Loughi R, et al. Triglycerides are major determinants of cholesterol esterification/ transfer and HDL remodeling in human plasma. Arterioscler Thromb Vas Biol 1995; 15: 1819-28.
13. Ninomiya JK, L'Italien G, Criqui MH, Whyte JL, Gamst A, Chen RS. Association of the metabolic syndrome with history of myocardial infarction and stroke in the third national health and nutrition examination survey. Circulation 2004; 109: 42-46.
14. Isomaa B, Almgreen P, Tuomi T, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care 2001; 24: 683-9.
15. Schillaci G, Pirro M, Vaudo G, Gemelli F, marchesis, Porcellatic et al. Prognostic value of the metabolic syndrome in essential hypertension. J Am Coll Cardiol 2004; 43(10): 1817-22.

Source of Support: None Declared
Conflict of Interest: None Declared