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Original Article

To Evaluate The Association Of Components Of Metabolic Syndrome, Among The Acute Myocardial Infarction Patients.

Dr Kiran V Birari[1], Dr Mrs Mrinmayee R Sonawane[2], Dr Atul Sadashiv Baviskar[3*]

[1*]MD Medicine, Associate Professor, Department of Medicine, SMBT Institute of Medical Sciences and Research Centre Dhamangaon Nashik

[2]MD Medicine, Associate Professor, Department of Medicine SMBT Institute of Medical Sciences and Research Centre Dhamangaon Nashik

[3]MD Medicine, Associate Professor, Department of Medicine SMBT Institute of Medical Sciences and Research Centre Dhamangaon Nashik

***Corresponding Author:** Dr Atul Sadashiv Baviskar

*MD Medicine, Associate Professor, Department of Medicine SMBT Institute of Medical Sciences and Research Centre Dhamangaon Nashik, Email: abavikar98@gmail.com

Abstract:
Background: The metabolic syndrome is one of the major public health issues of this century. It is a constellation of physical conditions and metabolic abnormalities, commonly occurring together, that increases an individual's risk for development of type 2 diabetes mellitus and cardiovascular disease. If the current trend continues, the premature deaths and disabilities resulting from these conditions will increase the financial burden in developing countries, metabolic syndrome can lead to a buildup of plaque in the arteries, known as atherosclerosis. This is when fats, cholesterol, and other substances stick to the sides of the arteries. The arteries then become clogged and brittle. Blood clots form when the artery walls are damaged. A clot can cause a heart attack or stroke. These risk factors double your risk of the blood vessel and heart disease, which can lead to heart attacks and strokes. They increase your risk of diabetes by five times

Aim of this study: To Find the prevalence of metabolic syndrome with acute myocardial infarction in the study population.

Material and Methods: Total 161 patients fulfilling inclusion and exclusion criteria were enrolled. Patients diagnosed with acute myocardial infarction getting admitted during the study period and Patients above the age of 18 years were included. Detailed history taking and clinical examination was performed. As per Criteria for Metabolic syndrome according to IDF(International Diabetes Federation) 2009 definition, metabolic syndrome was defined as in total 161 cases. On these basis cases were divided into two groups as Group A (N=91): Patients of acute myocardial infarction with metabolic syndrome (Presence of ≥3 criteria) Group B (N=70): Patients of acute myocardial infarction without metabolic syndrome (Absence of ≥3 criteria).

Results:
Mean age was 59.49 ± 13.10. Result showed no statistical correlation between age grouping and metabolic syndrome occurrence Male cases were 108 (67 %) and female cases were 53 (33 %). Male to female ratio was 2.03:1. Result showed statistical correlation between gender and metabolic syndrome occurrence. Cases according to symptoms showed no statistical significance between two

groups for any symptom. Cases according to risk factor showed no statistical significance between two groups for addiction whereas statistical difference found for diabetes & hypertension in occurrence of metabolic syndrome. cases according to Type of MI AWMI type was found in total 88 (55 %) cases out of which 48 (30 %) were group A & 40 (25 %) were group B. Cases according to metabolic syndrome parameters Statistically significant difference found for FBS, SBP, DBP & WC between two groups. Cases according to ECHO findings showed statistically significant correlation between ejection fraction & metabolic syndrome occurrence which is interpreted as presence of metabolic syndrome with MI is altering ECHO findings

Conclusion: Association of metabolic syndrome with increased risk of adverse cardiovascular outcomes and morbidity is well established. However, controversy still remains concerning independent character of this association. In this study we have found that the metabolic syndrome is significantly associated with reduced ejection fraction in patients of MI. In addition, gender was also found as significant component in prevalence of metabolic syndrome in patients of MI.

Keywords: Metabolic syndrome, diabetes, hypertension, Myocardial Infarction (MI),

INTRODUCTION

In developed countries incidence and prevalence of coronary artery disease has been decreased significantly over the last three decades whereas it has been increased in the developing world. Cardiovascular disorders, particularly MI and heart failure, are estimated to affect 17.3 million people worldwide every year[1,2,3]. Myocardial infarction is classified into Type 1 to Type 5 based on etiology and pathogenesis[4].

Type 1 is due to acute coronary atherothrombotic myocardial injury with plaque rupture. Type 2 is most common type encountered in clinical settings in which there is demand-supply mismatch resulting in myocardial ischemia. This demand supply mismatch can be due to multiple reasons including fixed stable coronary obstruction, tachycardia, hypoxia, stress, coronary vasospasm, coronary embolus and spontaneous coronary artery dissection (SCAD). Types 3 comprise patients with sudden cardiac death who succumb before troponin elevation. Types 4 and 5 are related to coronary revascularization procedures like Percutaneous Coronary Intervention (PCI) or Coronary artery Bypass Grafting (CABG). Acute thrombotic coronary event causes ST-segment elevation on a surface ECG when there is complete and persistent occlusion of blood flow. Coronary atherosclerosis and presence of high-risk thin cap fibroatheroma (TCFA) may result in sudden onset plaque rupture which results in changes in vascular endothelium resulting in cascade of platelet adhesion, activation and aggregation resulting in thrombosis formation[5,6]. Myocardial damage occurs as soon as the blood flow is interrupted hence timely management is necessary. Sudden onset acute ischemia can result in severe micro vascular dysfunction. The magnitude of the problem is evident when a study shows that 64% of the total deaths in 23 low-income countries are due to non-communicable diseases[7].

India has also fallen into this category, with an eccentric increase in urbanization and westernization; there has been an abrupt increase in NCDs (Non communicable diseases) like diabetes, and coronary artery diseases. Metabolic syndrome is a cluster of dysglycemia , obesity (especially central obesity), high blood pressure, low high-density lipoprotein cholesterol (HDL-C) and elevated triglyceride levels which has predisposed the patients to increased risk of CVD and stroke[8].

Metabolic syndrome has been called with different names such as “Syndrome X”, the “Deadly Quartet” and the “Insulin Resistance Syndrome” over the past few decades. Many organizations

such as the WHO, IDF and the NCEP-ATPIII has proposed different definitions, and many studies have been done comparing these definitions. Despite various definitions and criteria's the metabolic syndrome is an important predictor of future catastrophic events such as stroke and cardiovascular disease. It is a constellation of cardiovascular risk factors including obesity, abnormal glucose metabolism, hypertension and atherogenic dyslipidaemia[8,9].

Previous studies have shown that the presence of metabolic syndrome have negative impact on the prognosis of patients who survived acute myocardial infarction (AMI). On long follow up of these patients who had been treated in different ways have shown that treatment of metabolic syndrome certainly has influenced survival and the appearance of new unwanted events among these patients[10].

An association of metabolic syndrome with increased risk of adverse cardiovascular outcomes and morbidity is well established[11]. However, controversy remains regarding contribution of independent components. Previous studies have showed that metabolic syndrome is associated with an increased risk of cardiovascular mortality and re-infarction in patients with cardiovascular disease[12]. However, these studies are mostly focussed on patients with recent acute coronary syndrome(ACS). Thus, limited data exist regarding the association between metabolic syndrome and long-term all-cause morbidity among patients with stable coronary artery disease (CAD), especially among those who have not undergone prior coronary revascularization or recent ACS. With this perspective present cross sectional observation study was undertaken with an objective to study correlation of metabolic syndrome with acute myocardial infarction.

MATERIAL AND METHODS:

Present study is a Prospective Cross Sectional observation study.Total 161 patients fulfilling inclusion and exclusion criteria were enrolled. Who were attending the General Medicine Department at at tertiary care hospital., from 2020 to 2022. Details of the study was explained to all patients in their own language and written informed consent was obtained from all. Detailed history taking and clinical examination was performed. Details like age, gender, symptoms, risk factor and type of MI was noted in each case in case record form (CRF). Fasting Blood Glucose (FBG), Serum Triglyceride and High-density lipoprotein (HDL) cholesterol was advised in each case. As per **Criteria for Metabolic syndrome** according to IDF(International Diabetes Federation) 2009 definition, metabolic syndrome was defined as in total 161 cases. On these basis cases were divided into two groups as

A. **Group A (N=91):** Patients of acute myocardial infarction with metabolic syndrome (Presence of ≥3 criteria)
B. **Group B (N=70):** Patients of acute myocardial infarction without metabolic syndrome (Absence of ≥3 criteria)

STATISTICAL ANALYSIS:

Data collected compiled in MS EXCEL Sheet 2018. Analysis of Data is done by SPSS Software Version 2.0. Qualitative data tabulated in the frequency and percentage form. Quantitative data tabulated in the form of Mean and Standard deviation. Chi-square test and paired T test has been used to test the proportions in association. P value <0.05 was considered statistically significant. Both Qualitative and Quantitative data represented in the form of visual impression like Bar Diagram, Pie Diagram. Microsoft word and Excel have been used to generate graphs, tables etc

RESULTS:

Cases according to Age. Majority of cases i.e. 82 (51 %) were of age >60 years followed by 64 (40 %) cases from 41 to 60 years. Mean ± SD of age was 59.49 ± 13.10. Result showed no statistical correlation between age grouping and metabolic syndrome occurrence **(P=0.945) (Table1).** Male cases were 108 (67 %) and female cases were 53 (33 %). Male to female ratio was 2.03:1. Result showed statistical correlation between gender and metabolic syndrome occurrence.**(P=0.007) (Table 2).** Chest Pain was present in total 138 (86 %) cases in which 74 (46 %) were group A and 64 (40 %) were group B. Breathlessness was present in total 78 (48 %) cases in which 49 (30 %) were group A and 29 (18 %) were group B. Sweating was present in total 58 (36 %) cases in which 34 (21 %) were group A and 24 (15 %) were group B. Result showed no statistical significance between two groups for any symptom **(Graph 1).** Cases according to risk factor. Smoking was present in total 59 (37 %) cases in which 35 (22 %) were group A and 24 (15 %) were group B. Alcoholism was present in total 76 (48 %) cases in which 46 (29 %) were group A and 30 (19 %) were group B. Diabetes Mellitus was present in total 96 (59 %) cases in which 84 (52 %) were group A and 12 (7 %) were group B. Hypertension was present in total 93 (58 %) cases in which 82 (51 %) were group A and 11 (7 %) were group B. Result showed no statistical significance between two groups for addiction whereas statistical difference found for diabetes & hypertension in occurrence of metabolic syndrome **(Table 3). C**ases according to Type of MI. AWMI type was found in total 88 (55 %) cases out of which 48 (30 %) were group A & 40 (25 %) were group B. ALMI type was found in total 4 (2 %) cases out of which 4 (2 %) were group A & 0 (0 %) were group B. ASMI type was found in total 12 (7 %) cases out of which 8 (5 %) were group A & 4 (2 %) were group B. IWMI type was found in total 55 (35 %) cases out of which 30 (19 %) were group A & 25 (16 %) were group B. PWMI type was found in total 2 (2 %) cases out of which 1 (1 %) were group A & 1 (1 %) were group B **(Graph 2).** Cases according to metabolic syndrome parameters. Mean ± SD of TG(mg/dl) was 143 ± 55.1 in group A & 147 ± 57.9 in group B. Mean ± SD of HDL (mg/dl) was 38.2 ±10.3 in group A & 38.21 ± 12.16 in group B. Mean ± SD of FBS (mg/dl) was 122.93 ± 25.54 in groupA & 147 ± 57.9 in group B. Mean ± SD of SBP (mm of Hg) was 137.19 ± 10.93 in group A & 124.47 ±11.9 in group B. Mean ± SD of DBP (mm of Hg) was 87.05 ± 6.45 in group A & 75.5 ± 8.38 in groupB. Mean ± SD of WC (cm) was 96.96 ± 5.91 in group A & 81.50 ± 10.43 in group B. Statisticallysignificant difference found for FBS, SBP, DBP & WC between two groups**(Table 4).**Cases according to ECHO findings. Normal (50 to 75 %) ejectionfraction was found in 50 (31 %) group A cases & 59 (37 %) group B cases whereas Abnormal (<50%) ejection fraction was found in 41 (26 %) group A cases & 11 (6 %) group B cases. Result showed statistically significant correlation between ejection fraction & metabolic syndrome occurrence whichis interpretated as presence of metabolic syndrome with MI is altering ECHO findings **(P=0.00007) (Taable 5).**

DISCUSSION

Metabolic syndrome is a constellation of cardiovascular risk factors consisting obesity, abnormal glucose metabolism, hypertension and dyslipidemia[13-14]. Prevalence of metabolic syndrome is increasing coincidently with increasing levels of obesity related to sedentary lifestyles and poor nutrition habits. Association of metabolic syndrome with increased risk of adverse cardiovascular outcomes and morbidity is well established. However, controversy remains regarding independent character of this association. Recent studies have shown that metabolic syndrome is associated with an increased risk of re-infarction in patients with MI[15-16]. In present study Mean ±SD of age was 59.49 ± 13.10. Result showed no statistical correlation between age grouping and metabolic syndrome occurrence, the results are similar with a study by Arwa Younis et al (2016)[17] they found patients with the metabolic syndrome were slightly younger compared to patients without Metabolic syndrome. Andrew Mente et al (2010)[18] in their study found Subjects who had MS were older. By

age groups, the association between metabolic syndrome and MI was stronger among younger compared with older subjects. S. Pandey et al (2009)[19] in their study found among AMI patients.

In our study male cases were 108 (67 %) and female cases were 53(33 %). Male tofemale ratio was 2.4:1. Arwa Younis et al (2016)[17]in their study found patients with the Metabolic syndrome were slightly younger, with a malepredominance compared to patients without Metabolic syndrome. S. Pandey et al (2009)[19] in their study found Females were affected more than males. Uppin AM et al (2020)[20] in their study found males (67%) being predominant as compared to females in Metabolic syndrome prevalence.

In present study Chest Pain was present in total 138 (86 %) cases in which 74 (46 %) were group A and 64 (40 %) were group B. Result showed no statistical significance between two groups for any symptom In similar study by Uppin AM et al (2020)[20] they found 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 %).There was not much difference among those with metabolic syndrome and without metabolic syndrome. Whereas, breathlessness and syncope were more common metabolic syndrome compared to those without metabolic syndrome

In present study Smoking was present in total 59 (37 %) cases in which 35 (22 %) were group A and 24 (15 %) were group B. Result showed no statistical significance between two groups for addiction whereas statistical difference found for diabetes & hypertension in occurrence of metabolic syndrome In similar study by John K. et al (2004)[21] they found association of HTN withMI/stroke was of borderline Significance. With respect to smoking, both current and past smoking were associated with significantly elevated odds of combined MI/stroke and MI. Uppin AM et al (2020)[20] in their study found past h/o DM was more common in metabolic syndrome compared to those without metabolic syndrome.

In present study AWMI type was found in total 88 (55 %) cases out of which 48 (30%) were group A & 40 (25 %) were group B. In similar study by Milan B. Lovic et al (2018)[22] they found anterior infarct in 87 (40.09 %) cases in patients with Metabolic syndrome and 133 (45.86 %) in patientswithout Metabolic syndrome. P value was 0.195. Infarct artery LAD present in 88 (40.55%) cases in patients with Metabolic syndrome and 134 (46.21 %) without MetabolicSyndrome.

In our study the findings of Metabolic syndrome parameters were in similar with study by John K. et al (2004)[21] they found low HDL-C was significantly associated with MI and MI/stroke but not with stroke alone. Low HDL-C was significantly associated with MI/stroke in men but not in women. Among the componentconditions, only abdominal obesity (high WC) was not independently related to prevalentdisease. Arwa Younis et al (2016)[17] in their study found LDL levels were higher in the Metabolic syndrome group vs. those without Metabolic syndrome (156 * 36 vs. 154 * 33, $p < 0.001$). S. Pandey et al (2009)[19]in their study found among the components of the metabolic syndrome, the triglyceride level had the highest positive predictive value (62%) for AMI, and was followed by fasting blood glucose levels (55%), decreasedHDL-C levels (51.5%), waist circumference (34.14%), and blood pressure (33%). UppinAM et al (2020) [20] in their study found Low HDL-C was the major component in both thegroups.

In present study Normal (50 to 75 %) ejection fraction was found in 50 (31 %) group A cases & 59 (37 %) group B cases whereas Abnormal (<50 %) ejection fraction was found in 41 (26 %) group A cases & 11 (6 %) group B cases. similar study by Milan B. Lovis et al (2018)[22] they found mean ‡ SD of EFLV (%)as 49.67‡9.55 in patients with metabolic syndrome and 49.51=10.14 in patients without metabolic syndrome

CONCLUSION

Set of metabolic and physiological risk factors linked with cardiovascular disease(CVD) is defined as metabolic syndrome or insulin resistance syndrome or syndrome X.Combination of study of cardiovascular disease (CVD) and metabolic syndrome isreceiving increased attention amongst physicians nowadays. Association of metabolic syndrome with increased risk of adverse cardiovascular outcomes and morbidity is well established However, controversy still remains concerning independent character of this association. the clinical importance of the metabolic syndrome in patients of MI as a significant risk factor for cardiovascular disease which needs to be paid attention with development of strategies for controlling this syndrome and its component conditions.

Table 1: Distribution of Cases according to Age

Sr.No.	Agegroup (Years)	Group AN (%)	Group B N (%)	Total N (%)	P value
1	18 to 20	0 (0 %)	0 (0 %)	0 (0 %)	0.945 (NS)
2	21 to 40	8 (5 %)	7 (4 %)	15 (9 %)	
3	41 to 60	37 (23 %)	27 (17 %)	64 (40 %)	
4	> 60	46 (29 %)	36 (22 %)	82 (51 %)	
Total		91 (57 %)	70 (43 %)	161 (100 %)	

Table 2: Distribution of Cases according to Gender

Sr. No.	Gender	Group A N (%)	Group B N (%)	Total N (%)	P value
1	Male	69 (43 %)	39 (24 %)	108 (67 %)	0.007 (S)
2	Female	22 (14 %)	31 (19 %)	53 (33 %)	
Total		91 (57 %)	70 (43 %)	161 (100%)	

Graph 1: Distribution of Cases according to symptoms

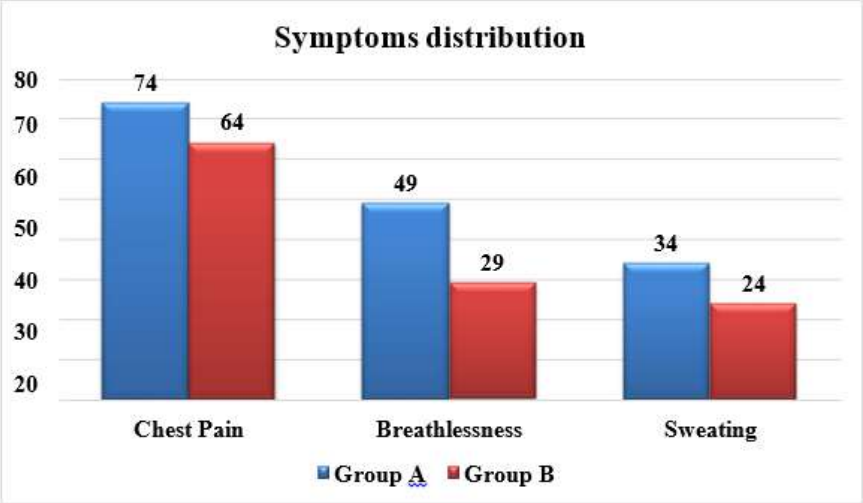

Table 3: Distribution of Cases according to risk factor

Sr.No.	Risk Factor	Group A N (%)	Group B N (%)	Total N (%)	Odds Ratio	P value
1	Smoking	35 (22 %)	24 (15 %)	59 (37 %)	1.19	0.585 (NS)
2	Alcoholism	46 (29 %)	30 (19 %)	76 (48 %)	1.36	0.33 (NS)
4	Diabetes Mellitus	84 (52 %)	12 (7 %)	96 (59 %)	58.0	<0.0001 (S)
5	Hypertension	82 (51 %)	11 (7 %)	93 (58 %)	48.86	<0.0001 (S)

Graph 2: Distribution of cases according to Type of MI

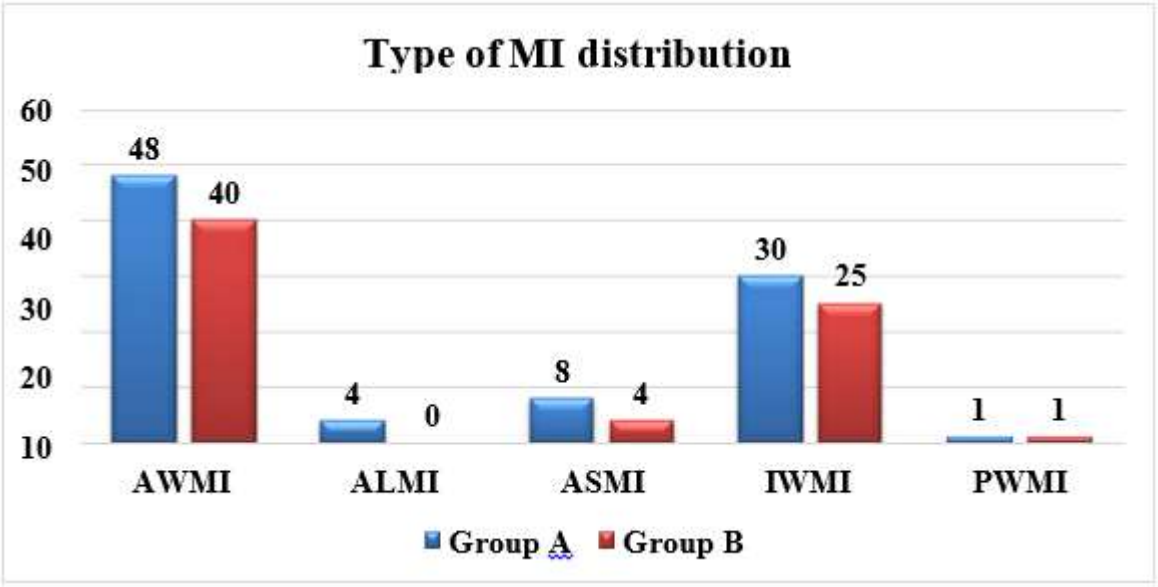

Table 4: Distribution of Cases according to metabolic syndrome parameters

Sr. No.	Metabolic syndrome parameters	Group A Mean ± SD	Group B Mean ± SD	t value	P value
1	TG (mg/dl)	143 ± 55.1	147 ± 57.9	0.44	0.65
2	HDL (mg/dl)	38.2 ± 10.3	38.21±12.16	0.006	0.99
3	FBS (mg/dl)	122.93±25.54	147 ± 57.9	3.54	0.0005
4	SBP (mm of Hg)	137.19±10.93	124.47±11.9	-7.042	<0.0001
5	DBP (mm of Hg)	87.05 ± 6.45	75.5 ± 8.38	-9.884	<0.0001
6	WC (cm)	96.96 ± 5.91	81.50±10.43	-11.88	<0.0001

Table 5: Distribution of Cases according to ECHO findings

Sr. No.	Ejection Fraction	Group A N (%)	Group B N (%)	Total N (%)	P value
1	Normal (50 to 75 %)	50 (31 %)	59 (37 %)	109 (68 %)	0.00007(S)
2	Abnormal (<50 %)	41 (26 %)	11(6 %)	52 (32 %)	
Total		91 (57 %)	70 (43 %)	161 (100%)	

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