

PREVALENCE OF METABOLIC SYNDROME IN ACUTE MYOCARDIAL INFARCTION PATIENTS IN A TERTIARY CARE HOSPITAL IN CHENNAI

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ABSTRACT: OBJECTIVES: To ascertain the prevalence of metabolic syndrome (MS) and to assess the association between the metabolic syndrome and its individual components- fasting blood sugar (FBS), blood pressure (BP), HDL cholesterol (HDL-C), triglyceride (TGL) and waist circumference(WC) and the frequency of its definitive components in patients with acute myocardial infarction. (AMI)

MATERIALS AND METHODS: This is a hospital based cross sectional study were 100 unselected patients with AMI categorized according to NCEP: ATP III 2001 CRITERIA were studied.

STATISTICAL ANALYSIS: Data was analyzed using the student's t test and chi-square test.

RESULTS: This study shows high prevalence of metabolic syndrome (53%) in patients with AMI. Hypertension (85%), Hyperglycemia (72%) and Dyslipidemia (70%) were found to be the most prevalent components of metabolic syndrome.

CONCLUSION: This study shows that there is a strong correlation between metabolic syndrome and AMI with Hypertension followed by Hyperglycemia having the highest positive predictive value among its components.

KEYWORDS: Metabolic Syndrome, Acute Myocardial Infarction, Cardiovascular Diseases.

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INTRODUCTION: The metabolic syndrome (MS) is a combination of interrelated metabolic abnormalities that significantly increase the risk of cardiovascular disease, and type 2 diabetes mellitus (DM).¹⁻⁶ its prevalence is increasing worldwide and is a serious public health problem. Each component of MS is individually associated with an increased risk of cardiovascular disease; however, whether MS leads to greater cardiovascular risk than the sum of its components remains a matter of debate.⁷ It has been suggested that the number of MS components may be more useful in predicting cardiovascular disease than MS itself,⁸ since cardiovascular risk increases as the number of components increases.⁹⁻¹¹ similarly, given the heterogeneity of MS, the impact of the possible combinations of its components on predicting cardiovascular risk has been investigated. In this sense, DM is the predominant risk factor associated with the development of ischemic heart disease.^{7,12}

Some studies have analyzed the prevalence of MS in patients with acute coronary disease, reporting an estimated prevalence of 41%-50% in Europe and the United States.^{8,13}

The definition of MS provided by the National Cholesterol Education Program-Adult Treatment Panel III (ATPIII) includes individuals with DM. It is known that DM strongly increases the risk of cardiovascular disease, and in fact is considered equivalent to having suffered a coronary event in terms of cardiovascular risk.^{14,15} Indians three times higher risk of developing Coronary Artery Disease (CAD) compared to Chinese and are 20 times more likely to die due to CAD compared to native black or white South Africans.^{16,17}

The SHARE study demonstrated that South Asians had higher prevalence of cardiovascular disease compared to Europeans and Chinese living in Canada.¹⁸ In India 2.78 million deaths are due to cardiovascular diseases, of which over 50% is due to CAD, making CAD the number one killer disease in our country.¹⁹ In Jaipur Heart Watch – 2 study conducted in 2002, prevalence of CAD was reported to be 8.2%.²⁰ Over 35 million diabetic patients live in India, making India the diabetic capital in the world. These numbers expected to double by the year 2030.²¹ Thus India faces the dangerous dual epidemic of diabetes and CAD. The major root of both epidemics lies in "Metabolic Syndrome". (MS)

Individuals with MS have two times higher risk for mortality due to myocardial infarction or stroke and three times as likely to develop, myocardial infarction compared to people without MS.²²

The relation of insulin resistance to cardiovascular risk, particularly CAD has been well established in many prospective studies in the West. In 1209 Finnish men aged 42- 60years, the 10-year CVD risk was increased 2.1 fold with the ATP III.²³

The same study found that the risk of death from CVD was increased by 2.63-2.96 times and the risk of death from any

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cause was increased 1.87-2.11 times with the presence of the MS. The MS alone predicted ~25% of all new-onset CVD.²³ The DECODE study reported that the presence of MS increased all-cause and CVD mortality by 1.2-2.8 times.²⁴ In the WOSCOPS (West of Scotland Coronary Prevention Study), MS defined by ATP III definition was associated with 1.8-fold increase in CHD risk.

The aim of the present study was to determine the prevalence of MS and the frequency of its definitive components in patients with acute myocardial infarction in Sri Ramachandra Medical Centre a tertiary care medical college hospital in Chennai. Metabolic syndrome was diagnosed by using NCEP ATP III criteria.

MATERIALS AND METHODS: This hospital based cross-sectional study was done in Department of Medicine, SRMC. 100 consecutive patients admitted with acute myocardial infarction diagnosed as per WHO criteria were included in the study.

All patients were thoroughly evaluated with a detailed history and appropriate investigations were done. Metabolic syndrome in subjects was diagnosed as per NCEP: ATP III 2001 criteria. Blood samples for fasting blood glucose were taken after eight hours of overnight fasting, 48 hrs. after hospital admission. Blood samples for lipid profile were taken the following morning (Within 24 hrs. of admission).

When assessing lipid profile, falsely low HDL concentrations may be observed in the presence of acute-phase reactants, as may occur after an ACS. In order to mitigate this effect, blood samples were extracted within the first 24 hours after the cardiovascular episode if no blood test had been performed previously, since decreased HDL and triglyceride levels are of little relevance during this period.^{25,26}

Patient were diagnosed as metabolic syndrome if they have three of the following five NCEP: ATP III 2001 criteria; abdominal obesity (Waist circumference >102cm in male and >88cm in female), high triglyceride levels (>150mg/dl), low HDL-C levels (<40mg/dl in male and <50mg/dl in female), elevated fasting blood glucose (>110mg/dl) and high blood pressure (Systolic/diastolic blood pressure >130/85). Data were analyzed and interpreted using the student's t test and the chi-square test.

DISCUSSION:

Baseline Characteristics: Total of 100 patients with acute coronary syndrome was studied. 70 patients were males and 30 patients were females. Age groups were near normally distributed with sample mean being 57.10 years.

Maximum number of patients (53%) was in the age group 40 to 60 years. The youngest patient being 32 years and oldest being 85 years. Mean age of females being 60.16 and mean age for males is 55.78.

CONCLUSION:

- The present study shows a high prevalence of MS (53%) in patients with acute myocardial infarction, with higher prevalence among males (62.3%) than females (37.7%).

- The most prevalent components of the MS were hypertension; hyperglycemia and dyslipidemia. Among the individual components of metabolic syndrome, it is observed in this study that the decreasing order of prevalence is Hypertension 85%, impaired fasting Glucose/Diabetes 72%, Dyslipidemia-(high TGL- 70% and low HDL – 66%) and increased waist circumference 42%.
- As the prevalence of metabolic syndrome is already high and increasing exponentially due to sedentary life styles a preventive strategy is urgent need of the hour for our country which is facing a twin epidemic of diabetes and coronary artery disease.

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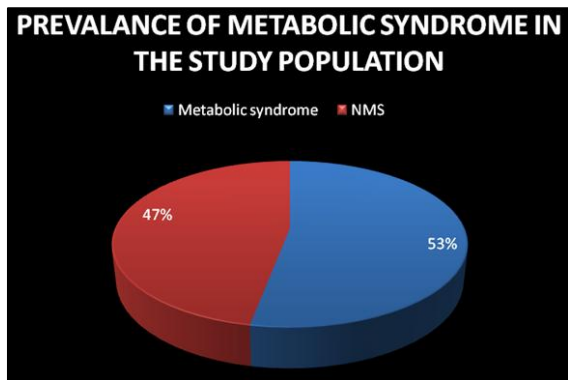


Fig. 1

	Cases
Metabolic Syndrome	53
NMS (Non-metabolic syndrome)	47

Table 1: Prevalance of Metabolic Syndrome in the Study Population

PREVALANCE OF INDIVIDUAL RISK FACTORS IN METABOLIC SYNDROME (Figure 2, Table 2)

Among the individual components of metabolic syndrome, it is observed in this study that the decreasing order of prevalence is Hypertension 85%, impaired fasting Glucose/diabetes 72%, dyslipidemia-(High TGL- 70% and low HDL - 66%) and increased waist circumference 42% in a total of 53 metabolic syndrome cases. (Figure 2, Table 2).

The observation is similar to studies by Kim et al.²⁹ and Ana Jover et al.³⁰ where it showed the hyperglycemia and low HDL levels were the most prevalent components of MS, followed by hypertension in both the cohorts. MS increases cardiovascular risk and each of its components is associated with an increased risk of cardiovascular disease. Recent studies have shown that MS does not increase cardiovascular risk more than the sum of its components. Some works have suggested that the number of markers of MS can be more useful than MS itself in predicting cardiovascular disease, and that the risk of cardiovascular disease increases as the number of MS components increases.^{10,11}

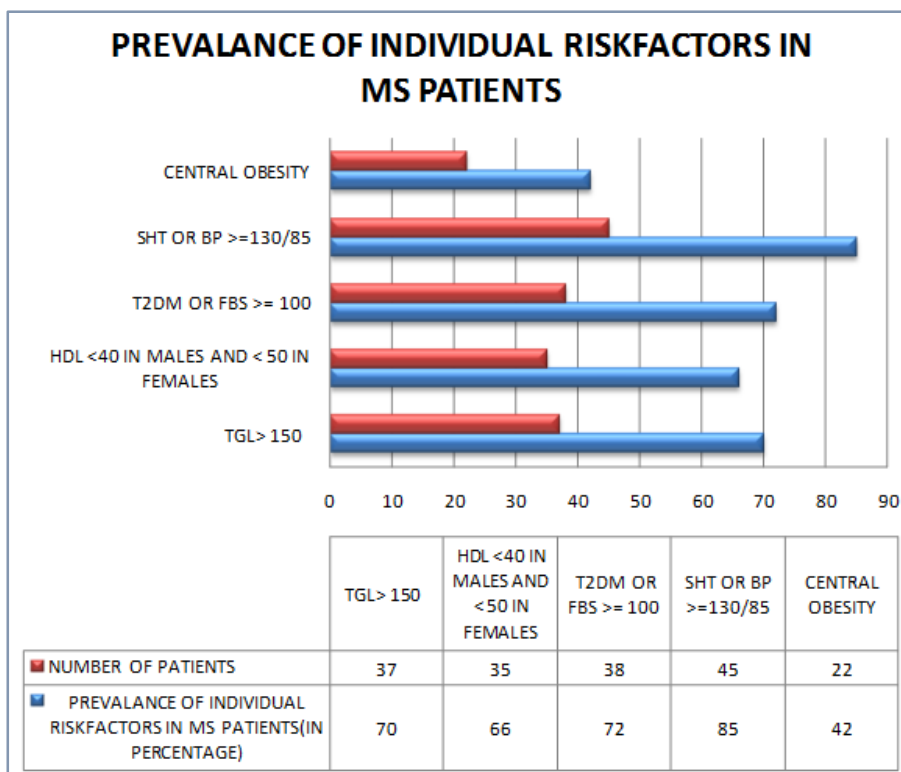


Fig. 2

	PREVALANCE OF INDIVIDUAL RISKFACTORS IN MS PATIENTS (IN PERCENTAGE)	NUMBER OF PATIENTS
TGL > 150	70%	37
HDL <40 IN MALES AND < 50 IN FEMALES	66%	35
T2DM OR FBS >= 100	72%	38
SHT OR BP >=130/85	85%	45
CENTRAL OBESITY	42%	22

Table 2: Prevalance of Individual Risk Factors in MS Patients

AGE DISTRIBUTION IN CAD PATIENTS

(Figure 3, Table 3)

In this study, it is observed that the number of coronary Artery disease patients increase as the age advances. But no statistical significance (p- value=0.279) was noted between the various age groups with metabolic syndrome when compared to those without metabolic syndrome.

The mean age of an Asian Indian patient suffering a myocardial infarction is only 50 years.25% of all MIs in this population occur under the age of 40 years. This observation is supported by studies of Sumita et al.³¹ John E. Morley et al.³² and Melissari et al.³³ Pandey et al.³⁴ which showed the greater incidence of coronary artery disease with advancing age.

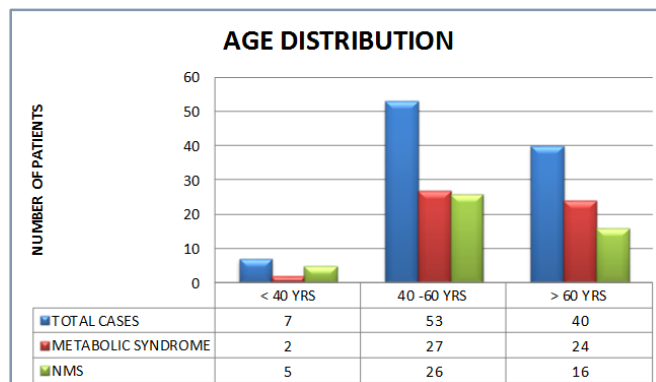


Fig.3

		Age			Total	
		20 - 39	40 - 59	> 60		
Metabolic syndrome	Present	Count	2	27	24	53
		% within Metabolic syndrome	3.8%	50.9%	45.3%	100.0%
	Absent	Count	5	26	16	47
		% within Metabolic syndrome	10.6%	55.3%	34.0%	100.0%
Total		Count	7	53	40	100
		% within Metabolic syndrome	7.0%	53.0%	40.0%	100.0%

Table 3: Age Distribution in CAD Patients
(P-VALUE =NOT SIGNIFICANT)

SEX DISTRIBUTION IN CAD PATIENTS

(Figure 4, Table 4)

The current study shows the males (70%) show higher prevalence of coronary event than female (30%) patients. Similarly in patients with metabolic syndrome higher prevalence were found in males (62.3%) than females (37.7%). Though there is no statistical significance to the sex distribution in terms of metabolic syndrome was noted (p-value=0.73).

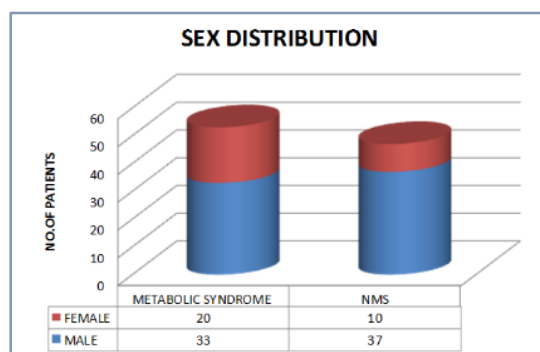


Fig. 4

		Gender		Total	
		Female	Male		
Metabolic syndrome	Present	Count	20	33	53
		% within Metabolic syndrome	37.7%	62.3%	100.0%
	Absent	Count	10	37	47
		% within Metabolic syndrome	21.3%	78.7%	100.0%
Total		Count	30	70	100
		% within Metabolic syndrome	30.0%	70.0%	100.0%

Table 4: Sex Distribution in CAD Patients
(P-VALUE =NOT SIGNIFICANT)

PREVALENCE OF METABOLIC SYNDROME IN DIABETIC & NON DIABETIC:

(Figure 5, 6, Table 5) In the study population 32% were diabetic and the prevalence of metabolic syndrome among those diabetes was 72% (Figure 5, 6). This clearly shows the higher prevalence of metabolic syndrome among diabetics. There is clear association between metabolic syndrome and diabetes which is statistically significant (p=0.001). Which has also been reported by Benghazi et al.³⁵

		DM		Total
		Yes	No	
Metabolic syndrome	Present	23	30	53
	% within Metabolic syndrome	43.4%	56.6%	100.0%
Absent	Count	9	38	47
	% within Metabolic syndrome	19.1%	80.9%	100.0%
Count		32	68	100
% with Metabolic syndrome		72%	28%	100.0%

Table 5: Metabolic syndrome VS DM
(P- VALUE SIGNIFICANT =0.001)

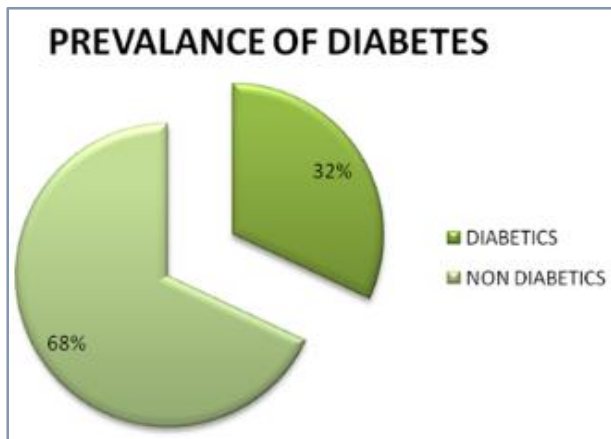


Fig. 5

PREVALENCE OF METABOLIC SYNDROME IN HYPERTENSIVE AND NON HYPERTENSIVES:

(Figure 7, 8) (Table 6): The study shows prevalence of hypertension being 34% (Figure 7, 8) and a clear higher prevalence of metabolic syndrome among hypertensive (74%). There is a clear association between metabolic syndrome and hypertension as shown statistically (p-value=0.003), which has also been reported by Kjeldson et al.³⁶

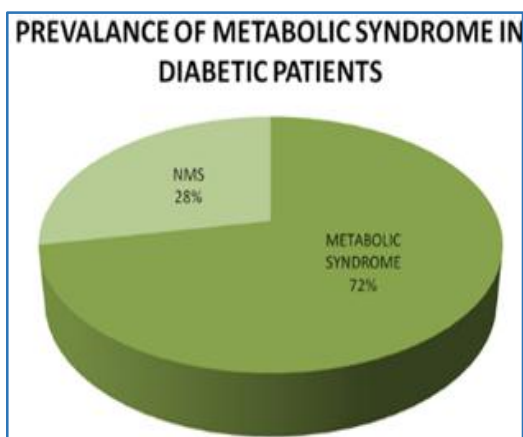


Fig. 6

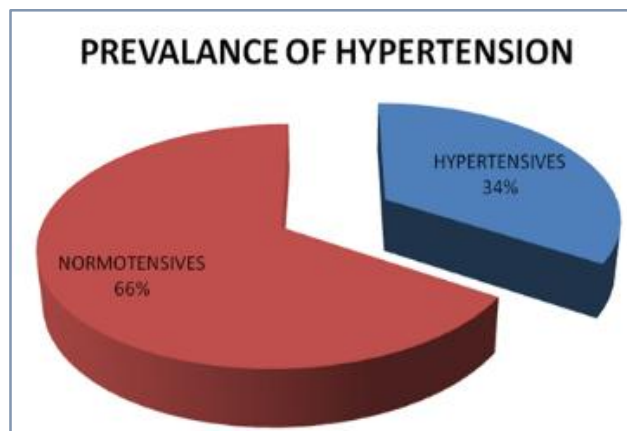


Fig. 7

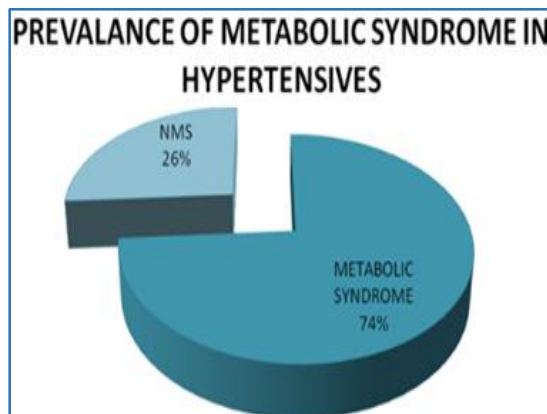


Fig. 8

			SHT		Total
			Yes	No	
Metabolic syndrome	Present	Count	25	28	53
		% within Metabolic syndrome	47.2%	52.8%	100.0%
	Absent	Count	9	38	47
		% within Metabolic syndrome	19.1%	80.9%	100.0%
		Count	34	66	100
		% within Metabolic syndrome	74%	26%	100.0%

Table 6: Metabolic syndrome VS SHT
(P- VALUE SIGNIFICANT =0.003)

PREVALENCE OF METABOLIC SYNDROME IN SMOKERS:

(Figure 9, 10). (Table 7): The study shows the prevalence of smoking is 35% (Figure 8, 9). The prevalence of metabolic syndrome in smokers is 46% compared with 54% with non-metabolic syndrome. Thus no statistically association is found between metabolic syndrome and smoking (p-value=0.284)

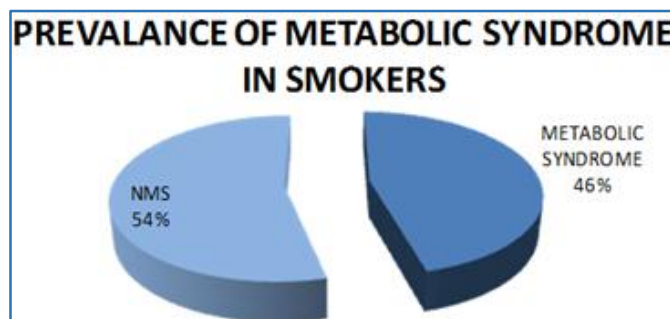


Fig. 10

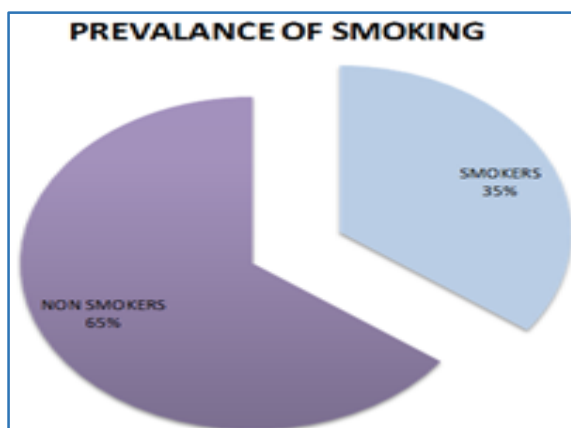


Fig. 9

			Smoking		Total
			Yes	No	
Metabolic syndrome	Present	Count	16	37	53
		% within Metabolic syndrome	30.2%	69.8%	100.0%
	Absent	Count	19	28	47
		% within Metabolic syndrome	40.4%	59.6%	100.0%
Total		Count	35	65	100

Table 7: Metabolic syndrome VS Smoking (P-VALUE =NOT SIGNIFICANT)

PREVALANCE OF METABOLIC SYNDROME AMONG ALCOHOLICS:

(Figure 11, 12) (Table 8): This study showed prevalence of alcohol consumption among 33% of study population. The prevalence of metabolic syndrome among the alcoholics is 39% (non-metabolic group 61%). There is no statistical

significance (p-value=0.056) between alcoholism and metabolic syndrome in the background of acute myocardial infarction. Mathew Freiberg et al shows that mild to moderate alcohol consumption is associated with lower prevalence of MS with a favorable influence on lipids, waist circumference and fasting Insulin.³⁷



Fig. 11

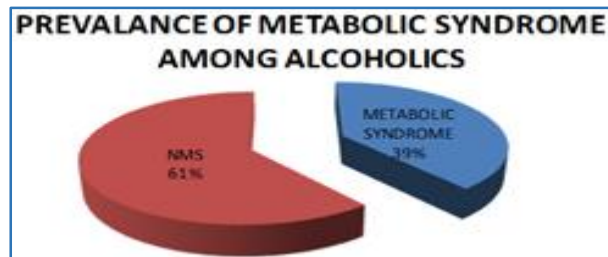


Fig. 12

			Alcohol		Total
			Yes	No	
Metabolic syndrome Present	Count	13	40	53	
	% within Metabolic syndrome	24.5%	75.5%	100.0%	
Absent	Count	20	27	47	
	% within Metabolic syndrome	42.6%	57.4%	100.0%	
Total	Count	33	67	100	

Table 8: Metabolic syndrome VS Alcohol (P-VALUE =NOT SIGNIFICANT)

PREVALANCE OF METABOLIC SYNDROME IN PATIENTS WITH POSITIVE FAMILY HISTORY:

(Figure 13, 14) (Table 9): The study showed less prevalence of positive family history 27% in the study population but a higher prevalence of metabolic syndrome 63% among those with positive family history, but no statistically significance was noted (p-value=0.225).

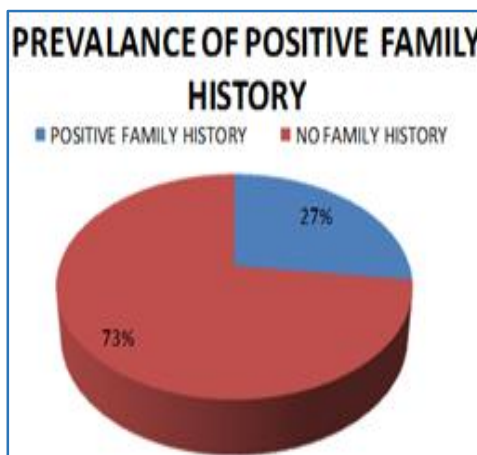


Fig. 13

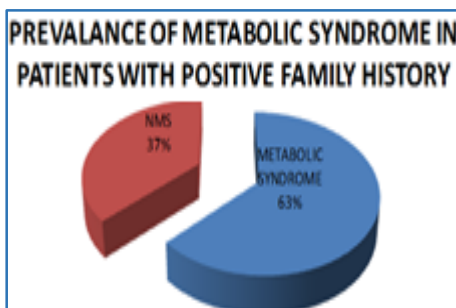


Fig.14

			Family History		Total
			Yes	No	
Metabolic syndrome	Present	Count	17	36	53
		% within Metabolic syndrome	32.1%	67.9%	100.0%
	Absent	Count	10	37	47
		% within Metabolic syndrome	21.3%	78.7%	100.0%
Total		Count	27	73	100

Table 9: Metabolic syndrome VS Family History
(P-VALUE =NOT SIGNIFICANT)

ECG CHANGES IN STUDY POPULATION:

(Figure15, 16) (Table 10, 11): Among 100 patients, 27% had anterior wall mi changes; 33% had inferior wall mi changes; 24% had antero septal mi changes, 7% had extensive anterior wall mi changes, 9% had Inferior Wall/posterior wall mi changes.

Higher prevalence of metabolic syndrome was noted IWMI/PWMI 89% followed by anterior wall myocardial infarction 78%. Inferior wall mi and antero septal and extensive anterior wall changes were noted more in non-metabolic syndrome group.

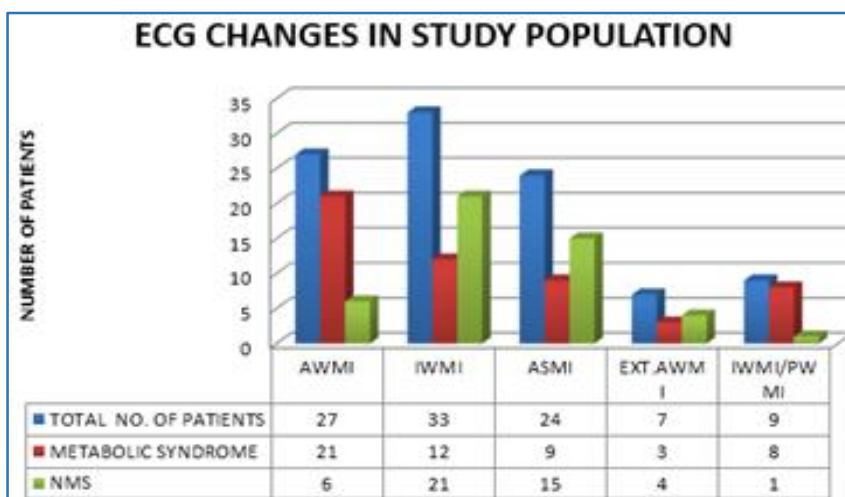


Fig. 15

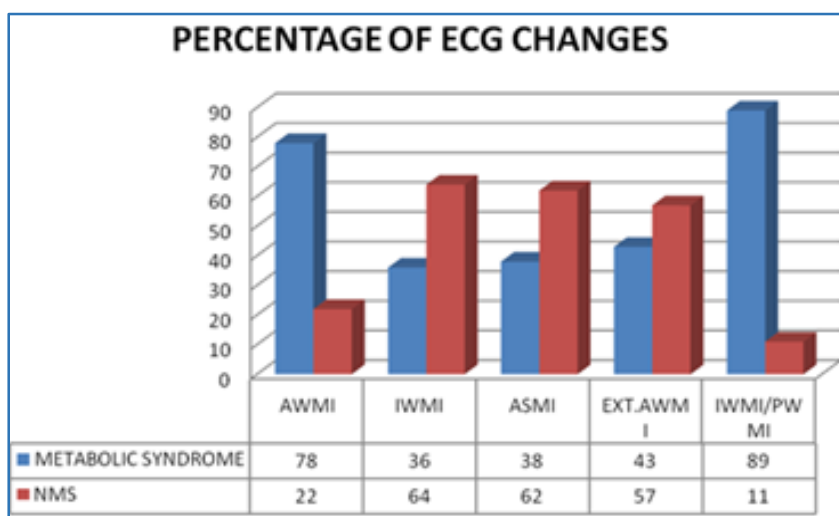


Fig. 16

	TOTAL NO. OF PATIENTS	METABOLIC SYNDROME	NMS
AWMI	27	21	6
IWMI	33	12	21
ASMI	24	9	15
EXT.AWMI	7	3	4
IWMI/PWMI	9	8	1
Table 10: Prevalence of AMI			

	METABOLIC SYNDROME	NMS
AWMI	78%	22%
IWMI	36%	64%
ASMI	38%	62%
EXT.AWMI	43%	57%
IWMI/PWMI	89%	11%
Table 11: Percentage of Prevalence of AMI		