CLINICAL, E.C.G. AND ECHOCARDIOGRAPHIC PROFILE OF PATIENTS PRESENTING WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION (STEMI) IN A TERTIARY CARE INSTITUTE AT TAMILNADU, SOUTH INDIA

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ABSTRACT

BACKGROUND

Coronary Artery Disease (CAD) is the leading cause of morbidity and mortality worldwide. The prevalence of CAD and the incidence of Acute Coronary Syndrome (ACS) are very high among Indians. ST Elevation Myocardial Infarction (STEMI) is one of the major presentations of Acute Coronary Syndrome. The data regarding the clinical presentations of STEMI is still lacking in the majority rural population of INDIA.

MATERIALS AND METHODS

All patients who were admitted with features of Acute ST Elevation myocardial infarction (STEMI) from 1st January to 30th September 2018 were included and analysed retrospectively in this study. The demographic features, Cardiovascular risk factors, Clinical presentation, Serial E.C.G findings & the 2-D Echocardiographic features were analysed and correlated with the clinical and E.C.G findings.

RESULTS

Out of 236 patients admitted with features of Acute STEMI 184 (77.97%) patients were male and 52(22.03%) were female. The commonly affected age group was 40-60years of age (51.27%). The female patients with STEMI increased with advancing age. Type II diabetes mellitus was the most common modifiable risk factor (36.01%). Smoking (9.75%) and alcoholism (7.63%) contributed as significant risk factors for male. Chest pain was the most common presenting symptom (72.88%). Majority of patients 98(41.53%) presented between 12-24hours after the onset of chest pain. AWMI (51.27%) was more common than IWMI (46.19%). RV infarction occurred in 33% of patients with Acute IWMI. There were more patients with LVEF <40% in AWMI group (64.46%) and in non-thrombolysed patients (66.67%).

CONCLUSION

Most of the patients with STEMI were male in the 40-60years of age. There were more female patients with STEMI with advancing age (>65years). Diabetes mellitus and systemic hypertension were the most common risk factors for STEMI. AWMI was more common than IWMI. 33% of patients with IWMI had RVMI. LV dysfunction with LVEF < 40% was more common in AWMI and in non- thrombolysed patients. The mortality is high among elderly female with multiple risk factors and more extensive STEMI.

KEYWORDS

Coronary Artery Disease, Acute ST Elevation Myocardial Infarction, Coronary Risk Factors, LV Dysfunction.

HOW TO CITE THIS ARTICLE: Gopalakrishnan S, Govindharaju A. Clinical, ECG and echocardiographic profile of patients presenting with acute St Elevation Myocardial Infarction (STEMI) in a tertiary care institute at Tamilnadu, South India. J. Evid. Based Med. Healthc. 2018; 5(45), 3131-3136. DOI: 10.18410/jebmh/2018/638

BACKGROUND

Coronary Artery Disease (CAD) remains the leading cause of morbidity and premature mortality in both developed and developing countries alike. They are the number one cause of death Globally.[1] CAD burden is rising rapidly in India. The prevalence of CAD has risen from 1% in 1960 to 3% in 2003, 7% in 2011 to 14% in 2015 in Indian urban population.[2] CAD affects Indians 5-10 years earlier than any other community in the world.

Acute Coronary Syndromes (ACS) include Unstable Angina, Non-ST Elevation myocardial infarction (NSTEMI) and ST segment Elevation myocardial infarction (STEMI). The incidence of ACS are very high among Indians. Currently ST Elevation myocardial infarction (STEMI) comprises 25-40% of CAD presentation.[3,4] Many of the studies on STEMI were conducted in the URBAN population of India.[2]

The data regarding the clinical presentation of STEMI is still lacking in the majority population of Rural India. Hence we studied the clinical, E.C.G and Echocardiographic profile of patients admitted in Thanjavur Medical College,

Financial or Other, Competing Interest: None.
Submission 22-10-2018, Peer Review 25-10-2018,
Acceptance 28-10-2018, Published 31-10-2018.
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DOI: 10.18410/jebmh/2018/638

Thanjavur which is a tertiary referral center for nearly 5 adjacent districts around Thanjavur with largely rural and agricultural population.

The risk stratification of STEMI at the time of admission and at discharge from the hospital by clinical, E.C.G and Echocardiographic parameters accurately determine the outcome of patients with STEMI and helps in determining the Optimal Therapeutic Interventions and secondary preventive measures.

MATERIALS AND METHODS

Our retrospective study was conducted on patients admitted with clinical, E.C.G and Echocardiographic features of Acute ST Elevation infarction (STEMI) in the I.C.C.U of Department of Cardiology, Thanjavur Medical College, Thanjavur, India from 1st January 2018 to 30th September 2018.

The patients diagnosed with Acute ST Elevation myocardial infarction (STEMI) satisfying the following inclusion criteria were included in the study.

Inclusion Criteria

- Typical E.C.G Pattern
  a. ST segment elevation of > 0.1mv in atleast two consecutive limb leads (or) > 0.2mv in atleast two consecutive chest leads.
  b. Definite 'T' wave inversion and pathological evolution of Q waves (>0.04sec)
  c. New onset of L.B.B.B
- Elevated cardiac enzyme levels (Troponin T)

Exclusion Criteria

a. Unstable Angina
b. Non-ST Elevation MI
c. Old myocardial infarction

The clinical data studied include demographic features like diabetes mellitus, systemic hypertension, Dyslipidaemia, Tobacco Smoking (or) Chewing and alcohol consumption.

The presenting symptoms studied include Chest pain, Shortness of breath, Sweating, palpitation, Dizziness, Syncope, nausea/ vomiting and abdominal pain. The time of presentation of patient to the I.C.C.U from the onset of symptoms (Window period) and the KILLIPS CLINICAL CLASS of the patient were analysed.

The serial Electrocardiograms recorded by the computerized 12 channel E.C.G machine (BIONET) were analysed for ST segment elevation (or) depression, pathological Q waves, Tachy (or) Bradyarrhythmias and conduction disturbances. The regions of infarction were categorized into Anterior, Inferior (or) combined using standard AHA E.C.G criteria.

Echocardiography was performed on all patients with STEMI by consultant cardiologists using PHILIPS HD11XE and Aloka Prosound SSD 4000 Echocardiography systems within 24hours of admission of the patient to I.C.C.U and at the time of discharge. The data studied include regional wall motion abnormality suggestive ischemia (RWMA), LV and RV chamber dimensions, LV ejection fraction, Mitral regurgitation, LV clot, Pulmonary hypertension, Tricuspid regurgitation, RV function, Pericardial effusion, identification of ventricular septal rupture and ventricular aneurysm.

RESULTS

A total of 236 patients admitted with the features of Acute ST Elevation Myocardial Infarction (STEMI) in the I.C.C.U of Department of Cardiology at Thanjavur Medical College, Thanjavur from 1/1/2018 to 30/09/18 were studied retrospectively regardless of the therapeutic intervention they received.

Out of the 236 patients with STEMI 184(77.97%) patients were male and 52(22.03%) were female. Nearly 51.27% of patients were in the 40-60years age group. There were differences in the age of presentation of male and female patients. Among the male patients 102(55.43%) were in the 40-60years age group while 61(33.15%) were in the >60years age group. However, among female patients there were more patients (61.53%) in the >60 years age group than in the 40-60years age group (36.54%). Among <40 yrs. age group there were more male (11.41%) than female patients (1.92%) with STEMI. (Table 1)

Age in Years	Total	Percentage	Gender	
			Male	Female
<20	0	0	0	0
20-40	22	9.32%	21(11.41%)	1(1.92%)
40-60	121	51.27%	102(55.43%)	19(36.54%)
>60	93	39.41%	61(33.15%)	32(61.53%)

Table 1. Age & Gender Distribution of STEMI

Type II diabetes mellitus was the most common modifiable risk factor (36.01%) followed by Systemic Hypertension (22.88%) and Dyslipidaemia (20.34%)among overall patients with STEMI. Smoking (9.75%) and alcoholism (7.63%) were present as the additional risk factors for STEMI among male patients while they were not present among the female patients in our study. (Figure 1)

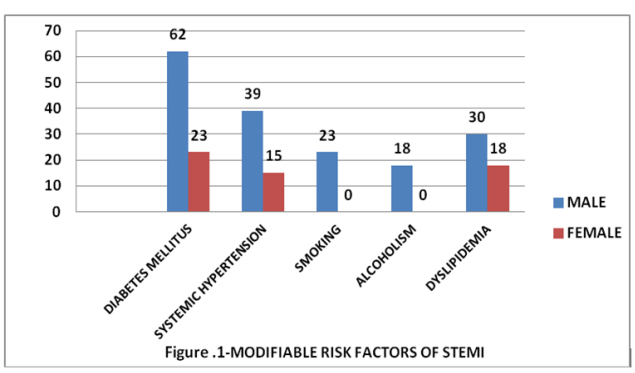

Figure .1-MODIFIABLE RISK FACTORS OF STEMI

Chest pain (72.88%) was the most common presenting symptom of STEMI followed by sweating (54.66%) difficulty in breathing (39.83%), Palpitation (27.97%), Dizziness (15.68%), Nausea / Vomiting (13.56%) and abdominal pain (6.78%).

The majority of patients 98(41.53%) presented to the I.C.C.U between 12-24hrs after the onset of chest pain followed by 65(27.54) >24hrs, 47(19.92%) between 6-12hours and 26(11.02%) between 0-6hours after the onset of symptoms. 48.72% of patients were in Killip's Class I, 33.05% in Class II, 8.47% in Class III and 9.75% in Class IV at the time of admission.

The study of electrocardiogram (E.C.G) among STEMI patients showed majority of infarction occurred in the Anterior wall 121(51.27%) than in Inferior wall 109(46.19%) of LV. Six patients (2.54%) had infarction involving both anterior and inferior walls of LV.

Among the 121 patients with Anterior wall MI, Anteroseptal MI was patients in 47.93% of cases followed by Extensive Anterior wall MI (44.62%), Isolated Anterolateral MI (3.13%), Isolated High lateral MI (2.48%), ASMI with High lateral MI (0.83%) and ASMI with Anterolateral MI (0.83%). (Figure 2)

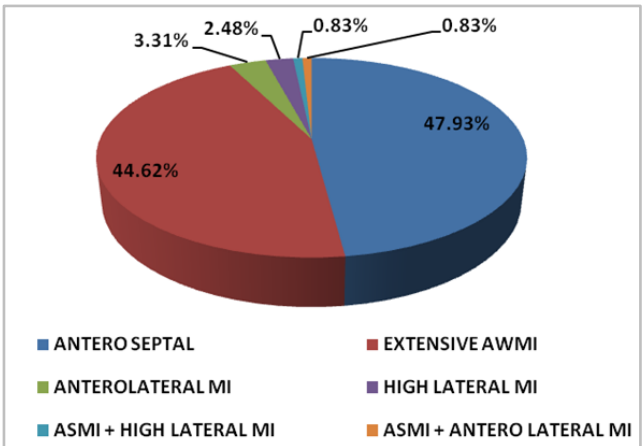

Figure.2- ECG TYPES OF ACUTE ANTERIOR WALL MI

Among the 109 patients with Inferior wall MI, Inferoposterior wall MI was present in 37 cases (33.95%). Right ventricular myocardial infarction (RVMI) was present in 33% of patients with IWMI as inferoposterior and RVMI (15.60%), Inferior and RVMI (13.76%) and Inferoposterolateral and RVMI (3.67%). (Figure 3)

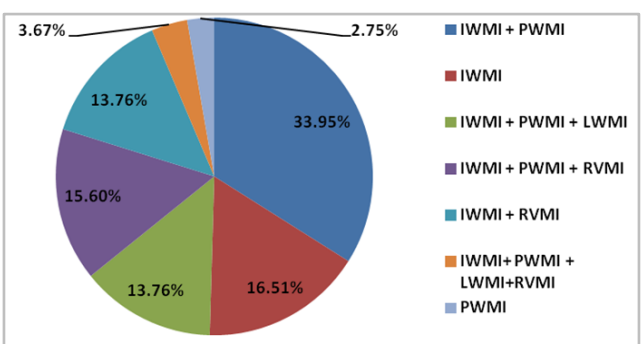

Figure.3-ECG TYPES OF ACUTE INFERIOR WALL MI

The Echocardiographic evaluation done within 24hours of acute STEMI showed Regional wall motion abnormality (RWMA) suggestive of anterior wall ischemia in all 121 patients with AWMI in the form of Hypokinesia (89.62%) and Akinesia (10.38%). Similarly, out of 109 patients with IWMI 87.16% had Hypokinesia and 12.84% had Akinesia as RWMA.

The 2D-Echo evaluation of LV systolic function by the measurement of LVEF among patients with Anterior wall MI showed nearly 52.89% of patients had moderate LV systolic dysfunction (EF-30-40%), 28.93% had mild LV systolic dysfunction (EF-40-55%) and 11.57% had severe LV systolic dysfunction (EF<30%). The LV systolic function was normal in 6.61% of cases. (Figure 4)

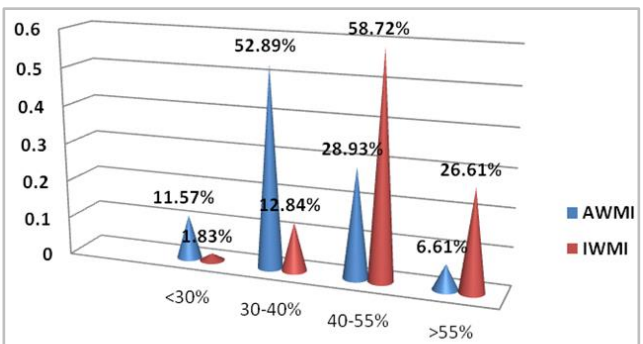

Figure.4 - LV SYSTOLIC FUNCTION (LVEF) IN STEMI

The assessment of LV systolic dysfunction by LVEF among patients with Inferior wall MI showed 58.72% of patients had mild LV systolic dysfunction (EF-40-55%), 12.84% had moderate LV systolic function (EF-30-40%) and only 1.83% had severe LV systolic dysfunction (EF<30%). The LV systolic function was normal in 26.61% of cases.

The colour doppler Echo evaluation showed the presence of Mitral regurgitation in 163 (69.07%) of patients with STEMI in our study. Out of these 163 patients with MR 88 (37.29%) had AWMI and 75(31.78%) had IWMI.

In our study 161 patients (68.22%) received Thrombolysis whereas 75 patients (31.78%) did not receive Thrombolysis for the management of Acute STEMI. Delayed presentation to the hospital was the main reason for not receiving thrombolysis in these patients. Nearly 66.67% of patients who did not receive thrombolysis had moderate to severe LV dysfunction (EF<40%) while only 31.06% of patients who received thrombolysis had EF<40% (Figure 5).

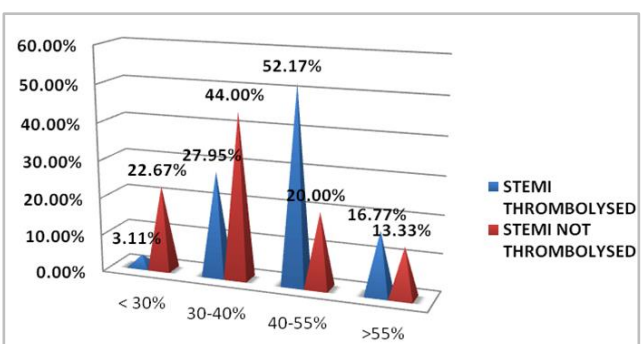

Figure.5 - LVEF AND STATUS OF THROMBOLYSIS

Out of the 236 patients 5(2.12%) patients died during their Hospital stay. All of them were above 65years of age. Among the 5 patients 4 were female and 1 was a male, 3 cases were thrombolysed and 2 cases didn't receive thrombolysis. 4 patients had Inferoposterior and RVMI while one had extensive AWMI. Cardiogenic shock was the cause of death in 3 cases while ventricular fibrillation and cardiac asystole contributed to the death in each of the remaining two cases.

DISCUSSION

Coronary artery disease (CAD) is the leading cause of mortality and morbidity worldwide.[5] The prevalence of CAD and the incidence of Acute Coronary Syndrome (ACS) are very high among Indians. The rising incidence of ACS in Indians may be related to the changes in life style, the westernization of food practices, the increasing prevalence of modifiable risk factors like diabetes mellitus and genetic factors.[6,7]

In our present study 77.97% were male and 22.03% were female with a male to female ratio of 3.5:1. This is in accordance with numerous studies that have shown a male preponderance for CAD. Lerner et al had reported 60% of all coronary events were in male patients.

The common age of presentation of STEMI was between 40-60years of age (51.27%) in our study. A large south Asian study reported that the mean age for myocardial infarction among over all south Asian patients was 53+11.4years.[8] The number of female patients with STEMI had increased with advancing age from 36.54% at 40-60yearsof age to 61.53% at >60 years of age) in our study. The loss of protective effect of oestrogen in post-menopausal woman may contribute to the increased incidence of STEMI in them with advanced age. Among young STEMI patients (<40years) there were more male (11.41%) than female patients (1.92%) in our study.

The vasodilatory action of oestrogen may be responsible for the protective effect of CAD in premenopausal woman.[9] Alexander. K et al reported that with progressively older age, patients with ACS are more likely to be female from 30% below the age 65 to 62% over the age 85years.[10] Thus gender and cardiovascular risk reverses past age 65. In a statistical study by AHA, the prevalence of cardiovascular diseases increased in female as the age advances.[11]

Type II diabetes mellitus was the most common modifiable risk factor (36.01%) in our study. There was a highly significant association between diabetes and STEMI among Asians in a study conducted among Asians and Europeans in United Kingdom.[12] There is increased risk of cardiovascular disease in diabetes patients as documented in Framingham study. Diabetes is associated with a two to three-fold increase in the likelihood of developing CVD, this increase being higher in woman than in men.[13,14] In our study 44.23% of female STEMI patients had Diabetes while it was 33.70% among male patients. The INTERHEART study has shown that the population attributable risk (PAR) for diabetes is 12.3%.[15]

Systemic hypertension was the second most common risk factor (22.88%) in our study. The Framingham and other epidemiological studies demonstrated that systolic and diastolic blood pressure have a continuous, independent, graded and positive association with cardiovascular outcomes.[16] Hypertension was significantly associated with STEMI in different studies in south Asia. Birnbaum et al had found hypertension as a risk factor in 28% 0f patients in his study. According to the INTERHEART study, PAR for hypertension was 23.4%.[15]

Smoking (9.75%) and alcoholism (7.63%) contributed as significant CAD risk factors for male patients in our study. The Framingham study along with the Albany cardiovascular Health Center Study demonstrated that smokers were at increased risk of MI (or) sudden death.[17] Smoking causes an average of 7 years earlier MI than non-smokers. Smokers are likely to have twice the chances of infarction than non-smokers. The INTERHEART STUDY has shown that PAR for current and former smoking is 36.4% and for alcohol is 13.9%.[15] The regular consumption of alcohol is not found to be protective for AMI in south Asians.

Chest pain was the most common presenting symptoms (72.88%) followed by sweating (54.66%) in our study. Atypical symptoms like abdominal pain, dizziness and syncope were observed in higher age group as shown in a comparative study of Acute MI in elderly and non- elderly in India.

Anterior wall was the most common site of infarction (51.27%) in our study. Anterior wall MI was the common site of infraction in studies reported by Govinda Adhikari et al from Nepal[18] and Singh P.S et al from India.[19] Among patients with Anterior wall MI, 47.93% of cases had Anteroseptal MI (A.S.MI) while 44.62% had Extensive Anterior wall MI. Patients with Anterior wall MI have worse prognosis with increased incidence of complications and death than Inferior wall MI as reported by various studies.[20] Inferior wall MI (IWMI) was present in 46.19% of patients with STEMI in our study. Among the patients with IWMI 33% of patients had RVMI along with IWMI in our study. A study from a major center in KERALA, India reported that among their patients with STEMI 50% had Inferior wall MI and 43.97% had Anterior wall MI and of those with IWMI, 47.06% of cases had associated RV infraction.[21] Sharma. M et al reported that the ECG markers of prognosis in STEMI patients are Anterior wall STEMI carries a higher risk of mortality than Inferior wall STEMI and IWMI with RVMI has worse prognosis than those without RV involvement.[22] The 2D Echocardiography done within 24hours of admission can predict the patients at high risk, can diagnose mechanical complication and LV dysfunction and aid in the treatment and in determining the prognosis of patients with Acute STEMI.[22] Various studies have shown that Echocardiography correlates well with the clinical events and electrocardiography in AMI.[23,24]

In our study out of 121 patients with AWMI, Regional wall motion abnormality (RWMA) suggestive of ischemia was observed in the form of Hypokinesia (89.62%) and Akinesia (10.38%) in the corresponding segments of LV by 2D Echo.

Similarly, among 109 patients with IWMI 87.16% had hypokinesia and 12.84% had Akinesia as RWMA.

There were more patients (64.46%) with Moderate to Severe LV systolic dysfunction with LVEF <40% in Anterior wall MI group than in Inferior wall MI (14.67%). On the other hand, 26.6% of IWMI patients had Normal LVEF while only 6.61% of AWMI had the same. This LV systolic dysfunction was noted with increasing severity in AWMI than in IWMI. Moderate to severe LV systolic dysfunction (EF <40%) was noted more (66.67%) in patients who were not thrombolysed than in patients (31.06%) who were thrombolysed in our study.

Most of the in- hospital mortality in STEMI depends of the severity of LV dysfunction.[25] The risk of sudden cardiac death after MI is increased by the development of post infarct heart failure.[26] A left ventricular ejection fraction (LVEF) less than 40% was an independent mortality predictor in the MULTICENTER post infarction research group in the 1980s.[27] The Canadian Assessment of Myocardial Infarction (CAMI) study also found that LVEF less than 40% appears to be responsible for an increase in post MI risk.[28]

In our study 69.07% of patients with Acute STEMI had Mitral regurgitation (MR). Various studies have shown that MR develop in about 14-26% of patients with STEMI. Cardiogenic shock was present in 23(9.75%) cases in our study. More extensive MI in the form of Extensive AWMI, RVMI with IWMI, Inferior with AWMI were the major contributors of cardiogenic shock in our study.

Out of the 236 patients 5(2.12%) patients died during their stay in the I.C.C.U. Among the 5 patients 4 were female and 1 was a male and all of them were above 65years of age. The cause of death was cardiogenic shock in 3 cases, Ventricular fibrillation in 1 case and cardiac a systole in 1 case. 4 patients had Inferoposterior and RVMI and 1 had extensive AWMI.

In a comparative study between elderly and young MI, mortality was on the higher side in the elderly group. In PURSUIT Trial among STEMI patients, in hospital mortality increased exponentially as a function of age from 1.9% among patients age <40years to 31.9% among patients older than 80years. In GUSTO-1 trial, 30-day mortality following STEMI increased from 3% in patients < 65years of age to 19.6% in patients 75 to 85 years of age and to 30.3% in patients > 85years of age. Age and LV dysfunction are the most powerful predictors of in hospital and 30day mortality in various studies.[29]

Limitations

Our analytical study reflects a single tertiary care institute retrospective observation. It is not a population-based study. This may result in more that one bias. The clinical follow up details of the patients were not available. Though E.C.G and Echocardiography are important for diagnosis and management of STEMI, coronary angiography was not done in our study.

CONCLUSION

Majority of patients presented with Acute STEMI were male. The commonest age group of presentation of STEMI is between 40-60 yrs. of age. The number of female patients with STEMI increased with increasing age. Chest pain and sweating are the most common presenting symptoms of STEMI. Type II diabetes mellitus and systemic hypertension were the most common modifiable factors for STEMI in both genders. Smoking and alcoholism significantly contributed to the risk factors of male patients with STEMI. Most of the patients arrived between 12-24 hrs. after onset of symptoms. Anterior wall MI was the most common type of infarction. Right ventricular myocardial infarction (RVMI) was present in 33% of patients with Inferior Wall MI. LV systolic dysfunction with increasing severity was observed in AWMI than in IWMI. The severe LV systolic dysfunction was present with increased frequency in patients who didn't receive thrombolysis than who received it. Ischemic mitral regurgitation was present in 68.83% of patients with Acute STEMI. Advanced age, multiple risk factors, extensive infarction and severe LV systolic dysfunction were the major contributors of in-hospital mortality for Acute STEMI.

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