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Original Research Article

THE EFFECT OF ACUTE MYOCARDIAL INFARCTION ON LONG TERM OUTCOME OF THE PATIENTS

Nithin Linga Reddy P[1], Karthik Reddy Mamidi[2], Yugandhar Tummala[3], Raviteja Raidu Makkapati[4]

[1]Assistant professor, Department of General Medicine, MediCiti institute of medical sciences, Hyderabad, Telangana, India.
[2]Professor, Department of General Medicine, Jawaharlal Nehru medical college, DMIMS, DU, Wardha, Maharashtra, India
[3]Assistant professor, Department of General Medicine, Malla Reddy institute of medical sciences, Hyderabad, Telangana, India.

ABSTRACT

Background: Coronary artery disease (CAD) is a major cause of death in India. Data on outcome of ST elevation Myocardial Infarction (STEMI) is scarce in the Indian population. The present study determined the characteristics, treatment and one-year outcome of ST elevation Myocardial Infarction in AVBRH, Sawangi, (Meghe), Wardha. **Materials and Methods:** The present study was carried out as a prospective study on 100 subjects with STEMI in the department of General Medicine from July 2014 to June 2015 and followed up for 1 year. Mortality at 1 year, its determinants and 1 year major adverse cardiac events were determined. **Result:** The subjects aged 55.89 + 13.70 years; males (76%). Angiography rate was 86%. In our study population, 13% were on sole medical management, 13% underwent Acute Reperfusion Therapy (ART), 55% underwent Interventions along with ART and 19% underwent only Intervention. At one year, mortality, Heart failure re-infarction and bleeding were 22%, 30%, 25% and 4% respectively. Main factors associated with mortality were diabetes (OR 5.12, 95% CI 1.84-14.22) and dyslipidemia (OR 2.975%, CI 1.04-8.06). **Conclusion:** STEMI population was younger than previously described. Mortality was higher in Medical management as compared to intervention group; moreover outcomes like mortality, Heart failure and Re-infarction were more in the first 6 months.

INTRODUCTION

Acute myocardial infarction (AMI) is one of the most common diagnosis in hospitalized patients in industrialized countries. The early (30-day) mortality rate from AMI is ~30%, with more than half of these deaths occurring before the stricken individual reaches the hospital. Although the mortality rate after admission for AMI has declined by ~30% over the past two decades, approximately 1 of every 25 patients who survives the initial hospitalization dies in the first year after AMI.[1]

Although randomized trials are the preferred method for assessing therapeutic modalities, useful information can also be gained from prospective registry data which demonstrate to what extent therapeutic measures like acute reperfusion therapy (ART) (thrombolysis or primary angioplasty) and invasive coronary procedures (ICP) (angiography, non primary angioplasty and coronary artery bypass grafting [CABG]) were implemented in daily practice in unselected AMI patients hospitalized in coronary care units (CCUs). Such an assessment on a national basis has seldom been conducted.[2-5]

The present study was to determine the clinical practice pattern of the use of thrombolysis, ICP and medical management of unselected patients with STEMI, in a prospective cross sectional study, and their impact on in-hospital complications and long-term (1- year) outcome in patients with acute myocardial infarction.

MATERIALS AND METHODS

Study Population: This was a prospective study which was conducted from July 2014 to June 2015. Total number of patients included in the study population was 136, out of which 36 patients were lost during the follow up after 1 year. Total number of patients included in the final study were 100 who were followed up via telephonic interview to look for various outcomes like mortality, Heart failure, Re-infarction. The institute has a specialized cardiac centre with coronary care unit (CCU), cardiac

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surgery facility and 2 state-of-the art cardiac catheterization laboratories performing high volume percutaneous coronary interventions (PCI).

Study protocol: The Inclusion criteria included all the patients with Acute STEMI presented within 7 days and all the all the patients with H/O MI more than 7 days or with h/o old MI or CAD were excluded. For the purpose of the study STEMI was defined as having 2 or more of following criteria.

(a). Central ischemic chest pain (described as retro-sternal pressure, pain, discomfort, or heaviness radiating to neck, jaw, left arm, or shoulder precipitated by exertion more than 20 min).

(b). Typical ischemic ECG changes: ST elevation in at least two contiguous leads, ≥0.2 mV in leads V1–V3 or ≥0.1 mV in all other leads; Established MI (in the absence of confounders) is indicated by any Q wave in leads V1–V3 or by Q waves of ≥1mm for ≥30 ms in two other contiguous leads; Presumed new left bundle branch block.

(c). Characteristic rise of cardiac biomarkers (CKMB, TROPONIN- I).

Each of the selected patients were examined for risk factors for CVD by a structured questionnaire. The risk factors studied were age, gender, smoking habits, diabetes, hypertension, family history of early CVD, BMI, W/H ratio. Patients were also asked to provide medical reports which resulted in their referral to the hospital. For the diagnosis of Acute MI, patients were clinically assessed for angina, ECG changes (to look for STEMI) & biomarkers like CKMB were investigated.

The mode of treatment was noted which could be only medical management (dual anti platelets, statins etc.). Acute reperfusion therapy (thrombolysis), Interventions (PTCA/CABG). Primary angioplasty facility is not available in our hospital as it is a tertiary rural centre and cardiologists are not available during off time. Thrombolysis was done by Inj. Streptokinase 1.5 million IU in all the patients of study population. Elective PCI was done in cath-lab ICU by Cardiologists posted in the department of Cardiology which is attached to AVBRH and CABG was done in cardiovascular thoracic surgery (CVTS) department done by surgeons which is also attached to AVBRH.

Statistical Analysis: Statistical analysis was done by using descriptive and inferential statistics using chi square test and student's paired t test. The software used in the analysis was SPSS 17.0 version, Graph Pad Prism 6.0 version and EPI-INFO 6.0 version and $p < 0.05$ is considered as level of significance.

RESULTS

Total number of patients included in the final study were 100 who were followed up via telephonic interview to look for various outcomes like mortality, Heart failure, Re- infarction. The results are as follows:

Table 1: Cardiovascular Risk factors of STEMI patients among Medical Management group and Interventions group

Characteristics	Medical Management(n=26)	Interventions (n=74)	$\aleph$2-value	p- value
Age(yrs)*1	20(76.92%)	58(78.38%)	0.02	0.16
BMI >22.5	23(88.46%)	39(52.70%)	29.45	0.0001
Waist-Hip Ratio*2	18(69.23%)	43(58.11%)	2.61	0.10
Risk Factors				
DM	17(65.38%)	21(28.37%)	11.18	0.001
Hypertension	12(46.15%)	27(36.49%)	0.27	0.38
Dyslipidemia	9(34.62%)	15(20.27%)	2.17	0.14
Prior Angina	3(11.54%)	17(22.97%)	1.57	0.21
Prior H/O Stroke/TIA*3	2(7.69%)	4(5.41%)	0.17	0.67
Tobacco	9(34.62%)	28(37.84%)	0.08	0.77

*1AGE: Age of males >45 Years and Females of Age >55 Years was considered as a risk factor for Acute MI in our study population.

*2W/H Ratio> 0.9 in males and W/H ratio in females > 0.85 was considered as risk factor for Acute MI in our study population.

*3TIA: Transient Ischemic Attack

[Table 1] shows cardiovascular risk factors of the patients among Medical Management group and Interventions group. In our study population BMI > 22.5 and DM were significantly more in the Medical management group when compared to the Interventions group. BMI >25 was present in 23 patients (88%) in Medical Management when compared to 39(53%) in the Interventions group, this difference was statistically significant with $2\aleph$-value of 29.5 and P=0.0001. Number of patients with DM were 17(65%) in the Medical Management when compared to 21(28.4%) in the Interventions group, this difference was statistically significant with $2\aleph$-value of 11.18 and P= 0.001.
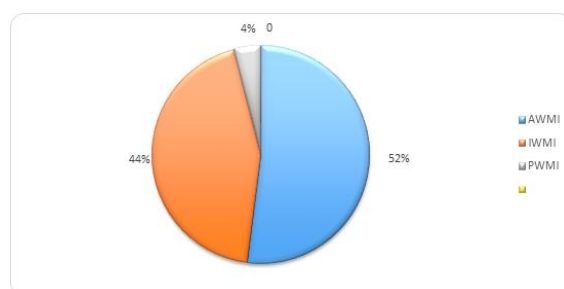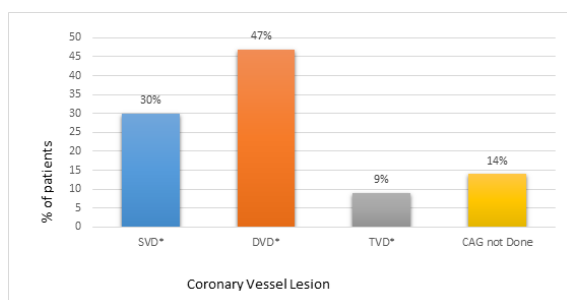

Figure 1: Distribution of patients according to Anatomical site of infarction

Other cardiovascular risk factors like age in Males>45 and females>55 yrs, W/H Ratio >0.9,

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HTN, Dyslipidemia, Prior Angina, Prior H/o stroke, tobacco were not significantly different among patients of Medical management group and Intervention group.

[Figure 1] Shows distribution of study population according to anatomical site of Infarction. Anterior wall MI was the most common anatomical site involved 52% followed by Inferior wall MI (44%) followed by posterior wall MI (4%).Number of patients with AWMI in the study population were 52. Number of patients with IWMI were 44. Number of patients with PWMI were 4.

Figure 2: Distribution of patients according to involvement of number of coronary vessels:

Figure 2 shows distribution of patients according to involvement of number of coronary vessels. Out of the total patients, CAG was done in 86 individuals. CAG could not be done in other patients due to financial problems of the patients. Majority of patients had involvement of DVD (47%) followed by SVD (30%) followed by TVD (19%)
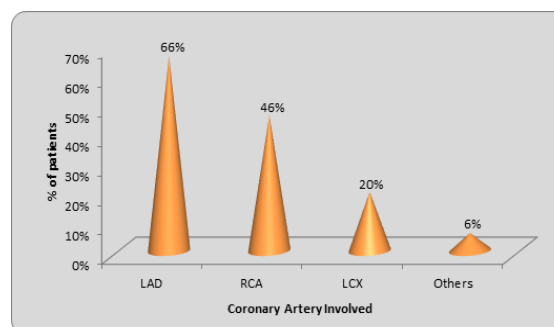
Figure 3: Distribution of patients according to the coronary artery involved

[Figure 3] shows distribution of patients according to coronary artery involved. Majority number of patients had involvement of LAD branch (66) followed by RCA (46) followed by LCX (20), other branches were involved in 6 % of patients which included left main stem branch or OM1 branch.

Table 2: Outcome of patients with STEMI:

Outcomes	Outcome at 6 months	Between 6-12 months	Total Outcome at 12 months	א2-value	p-value
Mortality	16(72.7%)	6(27.3%)	22	6.60	0.036,S
Recurrent Angina	29(78.3%)	8(21.7%)	37	24.14	0.0001,S
Re-Infarction	17(68%)	8(32%)	25	7.53	0.023,S
Heart Failure	17(56.6%)	13(43.4%)	30	9.87	0.007,S
Bleeding	4(100%)	0	4	4.11	0.12,NS

[Table 2] shows outcome of patients with STEMI. Various outcomes studied were mortality, recurrent angina, Re- infarction, Heart failure and bleeding. Number of patients with outcomes like mortality, Recurrent angina, Re- infarction and Heart failure were significantly more in the first 6 months.

Table 3: Outcome of STEMI in DM versus non DM patients

	DM(n=38)	Non DM(n=62)	א2-value	p-value
Mortality	15(39.47%)	7(11.29%)	20.91	p=0.0001,S
Heart Failure	19(50%)	11(17.74%)	22.82	p=0.0001,S
Re infarction	18(47.37%)	7(11.29%)	31.47	p=0.0001,S

[Table 3] shows outcome of STEMI in DM versus non DM patients. In our study, outcomes like mortality, Heart failure and Re-infarction were significantly more in patients with DM.

Table 4: Association of different treatment modalities with mortality in patients of STEMI

MODE of RX	DEAD (n=22)	ALIVE (n=78)	OR	95% CI
b) Medical RX (n=26)	11(42%)	15(58%)	4.20	1.53-11.51
d) Intervention (n=74)	11(15%)	63(85%)	0.23	0.08-0.65

[Table 4] shows Association of different treatment modalities with mortality in patients of STEMI. In our study, patients who were on Medical Management were significantly associated with Mortality when compared to patients who underwent interventions(PTCA/CABG).

DISCUSSION

The results of the present study are discussed in detail under the following headings.
1. Characteristics of STEMI Patients
2. Modes of Treatment of patients with STEMI
3. Outcome of STEMI patients in association with different treatment modalities.
4. Cardiovascular Risk Factors and their Association with outcomes of STEMI patients.

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5. Outcome of STEMI in association with Diabetes Mellitus patients.

1. Characteristics of STEMI Patients

The mean age of our study population was 55.89+13.70 years which was much lower as compared to western studies. Asian population have high rates of coronary artery disease (CAD), which also occurs at an earlier age, with 50% of all heart attacks occurring in patients <55 years old and 25% in those <40 years old.[6] This could be due to the fact that many patients had long duration of undetected and uncontrolled Hypertension and DM.

Majority of our study population were males (76%) while females were (24%), similarly Gottlieb et al,[7] in their study of 999 patients, mean age was 63+12 years. In their study, 72% of the patients were males and 28% were females which was similar to our study. Widimsky et al,[8] in their study of 850 patients, mean age was 64+13 years . In their study males were 71% and females were 29%.

PS Singh et al,[9] in their study of 200 patients, 75% were male patients which was similar to our study. So this suggests that males are more prone for CAD as compared to females. This may be due to higher incidence of cardiovascular disease risk factors like tobacco use in males (43%) as compared to females (16.5%) and this difference was statistically significant (p= <0.0001, S).

In our study population, majority of patients had AWMI (52%) compared to IWMI in 44% of patients, similarly Sahni et al,[10] in their study among patients with STEMI, most common location of the infarct was AWMI (51.16%) followed by IWMI (23.25%). Likewise, Jose and Gupta,[11] has also reported AWMI in 57%, IWMI in 39.1% and in study by Kumar et al,[12] most common type of MI was AWMI. Involvement of anterior wall MI is one of the high risk factor for poor outcome in patients with STEMI.[13]

In our study population, CAG was done in 86 individuals. All the patients were of STEMI and hence had significant stenosis. Majority of the patients had DVD involvement (55%) while 35% of patients had SVD and 10 % of patients had TVD, whereas Petr Kala et al,[14] in their study of 3814 patients, majority of patients had TVD involvement (34%) followed by SVD in 31% and DVD in 28% of patients.

In our study population the odds of death in patients with DVD was almost 6 times more when compared to patients with SVD and the odds of death in patients with TVD was 14.5 times more when compared to patients with SVD. This was similar to the study done by Yabe T et al,[15] which concluded that prognosis of patients with MI in TVD was poor due to impaired LVEF secondary to involvement of higher number of vessels.

In our study population, majority number of patients had involvement of LAD branch (66) followed by RCA (46) followed by LCX (20). AWMI was the most common type of MI, hence LAD was more commonly involved in our study population. other branches like left main stem branch or OM1 branch were involved in 6 % of patients.

Similarly Petr Kala et al,[14] in their study of 3814 patients, majority number of patients had involvement of LAD branch (37%) followed by involvement of RCA in 30% and LCX in 17%. S Rathore et al,[16] in their study of 43,801 patients, majority of patients had involvement of RCA (60%) followed by LAD in 55% followed by LCx in 33.33%, Left main stem was involved in 2.7% of patients.

2. Modes of Treatment of patients with STEMI:

In our study population, major proportion (74%) of patients underwent interventions (PTCA/CABG). Most of these patients (68%) were thrombolysed prior to Intervention. Number of patients who were on medical management were 26 (26%), out of which 13 patients (13%) received thrombolysis with inj streptokinase.

In the study by Isezue et al,[17] 53.3% of patients underwent interventions, 20.3% were thrombolysed and 16.1% received sole medical therapy which was nearly similar to our study.

3. Outcome of STEMI patients in association with different treatment modalities:

In our study, at the end of 1 year, mortality were significantly higher in patients with Medical management group (42%) compared to patients who underwent interventions (15%). R. Anderson et al,[18] in their study of 1572 Acute MI patients, total number of deaths in the conservative management was 61(7.8%) when compared to 52 (6.6%) in intervention group which was statistically not significant (p=0.35), this lower percent of deaths in this study could be due to the availability of advanced procedures like primary angioplasty in their study. Similarly, Isezue et al,[17] in their study found that the total number of deaths were 37 (2.5%) which was much lower than our study, Similarly, Denis Xavier et al(19) in their study found that the 30-day outcomes for patients with STEMI were death (8•6%), re-infarction (2•3%) which was much lower than our study. The lower incidence of death in previous studies could be due to the fact that they have included all the patients of ACS and as primary angioplasty was commonly done.

In our study population, the odds of death in patients with conservative management was 4.2 times more than the patients who underwent interventions with OR of 4.20 and 95% CI of 1.53-11.51 which was statistically significant.

In our study population, number of patients with outcomes like mortality, Recurrent angina, Re-infarction and Heart failure were significantly more in the first 6 months. Out of the total 22 deaths, 16(72%) occurred in the first 6 months which was statistically significant (p=0.035). Out of the 37 total patients who had recurrent angina, 29 (78%) had recurrent angina at 6 months which was found to be statistically significant (p= 0.0001). Out of the 25 total patients who had re-infarction, 17 (68%) had re-infarction at 6 months which was found to be

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statistically significant (p= 0.023) Out of the 30 total patients who had Heart Failure, 17 (56%) had Heart Failure at 6 months which was found to be statistically significant (p= 0.007).

Similarly, Widimsky et al,[8] in their study of 850 patients, outcomes studied were death, Re- infarction and Stroke. In their study, all the outcomes were significantly more in the 30 day follow up when compared to follow up at 5 years.

Since most of these patients were poor, less likely to get evidence-based treatments, and hence had greater mortality. Reduction of delays in access to hospital and provision of affordable treatments could reduce morbidity and mortality.

4. Cardiovascular Risk Factors and their Association with outcomes of STEMI patients:

The prevalence of cardiovascular risk factors in our study population revealed that Hypertension (39%), DM (38%) and tobacco exposure (37%) were the major risk factors. Similarly Denis Xavier et al,[19] in their study found that the three most common risk factors for ACS were smoking (40%), high blood pressure (38%), and diabetes (30%) .

Similarly, Widimsky et al,[8] in their study of 850 patients, the major risk factors were hypertension (48%) followed by DM (24).

Gottlieb et al,[6] in their study of 999 patients, the major risk factors were Hypertension (41%), DM (24%) followed by Dyslipidemia (21%) which was similar to our study.

PS Singh et al,[9] in their study of 200 patients, the major risk factors were tobacco exposure (65%), hypertension (33%) and DM (16%).

In our study population, patients with risk factors like DM and dyslipidemia were significantly associated with mortality. Peter H stone et al,[20] in their study of 500 Acute MI patients, 85 were DM and 415 were non DM patients. In their study, cumulative 4 year mortality rate was also higher in the diabetic group (25% versus 14.5% which was statistically significant, p = 0.01,S). The factors responsible for the increased incidence of adverse outcomes among diabetic patients may be related to an acceleration of the atherosclerotic process, diastolic left ventricular dysfunction associated with diabetic cardiomyopathy or other unidentified unfavorable processes.[19]

In our study population, the odds of death among STEMI with diabetes were 5 times more than non-diabetic patients with OR of 5.12 and 95% CI was 1.84-14.22 which was statistically significant. The odds of death among STEMI with dyslipidemia patients were 2.9 times more than patients without dyslipidemia with OR of 2.9 and 95% CI of 1.04-8.06 which was statistically significant.

5. Outcome of STEMI in association with Diabetes Mellitus patients:

In our study, outcomes like mortality, Heart failure and Re-infarction were significantly more in patients with DM. The odds of death among STEMI with diabetes were 5 times more than non-diabetic patients with OR of 5.12 and 95% CI was 1.84-14.22 which was statistically significant. Whereas Tom Briffa et al,[21] in their study found that the odds of death among STEMI with DM were 2.5 times more than non- DM patients (HR= 2.49, 95%CI= 2.12-2.93) which was statistically significant (p= 0.0001). whereas Macin SM et al,[22] in their study of 206 DM patients, a total of 78 (36%) had evidence of Heart failure while 128 patients (20%) had no evidence of heart failure which was statistically significant. The factors responsible for the increased incidence of adverse outcomes among diabetic patients may be related to an acceleration of the atherosclerotic process, diastolic left ventricular dysfunction associated with diabetic cardiomyopathy or other unidentified unfavorable processes.[19]

CONCLUSION

The present study was conducted to estimate the long term outcome in patients with STEMI treated with different modalities and to correlate the association of Cardiovascular risk factors with outcomes.

- Mortality was higher in Medical management as compared to Intervention group, moreover outcomes like mortality, Heart failure and Re-infarction were more in the first 6 months.
- Our study population was relatively younger than previously described in India, male patients were more common than females. AWMI was the most common type and LAD was the most commonly involved coronary artery.
- In our study population. Diabetes Mellitus (DM), Hypertension and smoking were leading risk factors of STEMI. DM and dyslipidemia were significantly associated with mortality.

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