Original Research Article

ST elevated myocardial infarction: clinical manifestation and outcomes of thrombolysis in a tertiary care hospital

Ravishankar M. S.[1], Harish Kumar S.[2]*

[1]Department of General Medicine, BGS Global Institute of Medical Sciences, Bangalore, Karnataka, India
[2]Department of General Medicine, SDUMC, Kolar, Karnataka, India

*Correspondence:
Dr. Harish Kumar S.,
E-mail: Statisticsclinic2018@gmail.com

ABSTRACT

Background: Acute myocardial infarction has reached enormous proportion in the developing countries and it is speculated that atherosclerotic heart disease will replace infectious disease as the leading cause of death in India. It has been shown that the thrombolytic therapy is underutilized. So, the study was taken to study the clinical manifestations and outcome of thrombolytic therapy in STEMI.

Methods: The study was conducted for a period of 18 months in a tertiary care centre during which 100 cases of STEMI admitted to ICCU were included in the study, after fulfilling the inclusion criteria for thrombolysis, data related to clinical profile and outcome of thrombolysis was collected. SPSS 16 was used to analyse the data. Descriptive statistics like proportions mean and SD were computed.

Results: Incidence of STEMI was high among subjects in the age group 51-60 years. Males were more affected (72%). Smoking, hypertension, hyperlipidemia and diabetes mellitus were the most common risk factors. Chest pain (92%) was the most common symptom. Majority (56%) were admitted within 6 hours of onset of symptoms. Anterior wall infarction was most common type of myocardial infarction. Majority (82%) were admitted in either Killips I/II class. Left Ventricular failure and Arrhythmias were most common complication. 64% patients had objective evidence in a form of ECG with ST-T resolution (>50%) between 1-6 hours, 18% between 6-24 hours and 18% patients had no significant resolution even after 24 hours. Echocardiography showed good left ventricle function (LVEF >45%) in 70% and 30% of the patients showed reduced ejection fraction (LVEF<45%). Mortality was seen in 8% of cases.

Conclusions: Smoking, hyperlipidemia, diabetes mellitus and hypertension were most important risk factors for MI in the study. Coronary pain relief was most frequent and early marker of reperfusion. The ST segment elevation resolution has been widely accepted as most reliable objective criteria of coronary reperfusion. Hence ST segment resolution is regarded as a marker of salvaged myocardium by post-thrombolytic reperfusion. Early reperfusion of the ischaemic myocardial tissue with thrombolytic therapy decreases the morbidity and mortality.

Keywords: Acute myocardial infarction, Coronary artery disease, Ischemic heart disease, ST elevation myocardial infarction, Streptokinase

INTRODUCTION

Myocardial infarction is a well-known clinical entity. It is one of the most fatal diseases which are worldwide in distribution, affecting all races and nationalities. Because myocardial infarction may strike any individual during the most productive years, it can have profound deleterious, psychological and economic ramifications. Despite impressive studies in the diagnosis and management over the past 4 decades, acute MI continues

to be major public health problem in the industrialized world and is becoming an increasing important problem in developing countries. With a decline in infectious disease related death accompanied by accelerated economic development and life style change promoting atherosclerosis, developing countries especially India are expected to experience a sharp increase in ischemic heart disease and acute myocardial infarction (AMI). Given the wide disparity of available resources to treat AMI in developing countries, major efforts are needed to strengthen primary prevention programmes at community level.[1,2]

Management of acute MI is fairly standardized now. Thrombolytic therapy in the golden (0-3hrs) hours is still a gold standard treatment for acute myocardial infarction (AMI) when instituted at the earliest reducing mortality and morbidity. Multicentric thrombolytic therapy trial shows 18% reduction in short term and 25% reduction in long term mortality has been observed.[3]

Thrombolytic therapy in golden hours is still the Gold Standard treatment for STEMI, when instituted at the earliest in reducing mortality and morbidity. All available evidence has shown that thrombolytic therapy is underutilized in patients with STEMI, because of hesitancy in prescribing a fibrinolytic agent.[2] Hence this study was done with the objective to evaluate clinical manifestations of STEMI and outcome of thrombolytic therapy in STEMI.

METHODS

Cross sectional study on 100 myocardial infarction patients fulfilling inclusion and exclusion criteria admitted in ICCU, under Department of Medicine in a tertiary care institute were included in the study. All patients presenting to ICCU, with Chest pain consistent with acute myocardial infarction of less than 12 hours duration from onset along with any of the following ECG changes, ST ↑≥1 mm in ≥ two contiguous limb leads, ST↑≥2mm in ≥ two contiguous precordial leads and New onset Left bundle branch block. Exclusion criteria, patients with acute coronary syndrome without ST elevation, H/O active internal bleeding, H/O Bleeding disorder, Internal neoplasm or head injury, Suspected aortic dissection, Pregnancy and H/O Hemorrhagic or non-hemorrhagic CVA.

Structured proforma was used to collect data with respect to history, clinical examination and thrombolysis. A twelve lead E.C.G. was recorded immediately after admission and four right precordial leads were recorded when right ventricular infarction was suspected. Patients were connected to bed side cardiac monitor for 48 hours. E.C.G. was repeated subsequently each day and additional E.C.G was taken as and when arrhythmias appeared. Routine blood and urine investigations, serum cardiac enzymes, blood urea, serum Creatinine, blood sugar, lipid profile, serum electrolytes and chest - X ray

were done for all patients. 2D-Echocardiography was done within 24hrs of admission. Evaluation of hemodynamic status was done daily by monitoring pulse, BP, JVP, cyanosis, urinary output and auscultation of cardia and lungs. Sample size was estimated by using the hospital statistics, 10,000 patients were admitted in Department of Medicine of them 360 patients were diagnosed to have ACUTE STEMI. Hence a proportion of 3.6% was used, with confidence interval of 95% and 5% permissible error, sample size required was 56 cases. However, during 18 months 100 subjects were recruited in to the study. Informed consent and institutional ethical clearance was obtained prior to the start of the study.

Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 16 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. p value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

Acute myocardial infarction was common in the age group of 51-60 years (36%), followed by 61 to 70 years (28%).

Table 1: General profile of subjects admitted to ICCU with STEMI.

		Count (n=100)	Percentage
Age (years)	31-40	06	6%
	41-50	24	24%
	51-60	36	36%
	61-70	28	28%
	> 70	06	6%
Gender	Male	72	72%
	Female	28	28%
Risk factors	Smoking	50	50%
	Hypertension	48	48%
	Hyperlipidemia	35	35%
	Diabetes mellitus	42	42%
	Obesity	16	16%
	Family history of IHD	10	10%
Symptoms	Chest pain	92	92%
	Sweating	50	50%
	Breathlessness	22	22%
	Palpitations	16	16%
	Nausea/ vomiting	12	12%
	Giddiness	10	10%
	Pain abdomen	02	2%
Time of hospitalization	< 6 hours	56	56%
	7-12 hours	44	44%

Table 2: Clinical profile of subjects with STEMI.

			Count (n=100)	Percentage
Killip classification		I	48	48
		II	34	34
		III	08	08
		IV	10	10
Site of myocardial infarction	Anterior Wall (n=58)	Anteroseptal	32	58
		Anterolateral	16	
		Ext. Ant. wall MI	10	
	Interior wall (n=36)	Inferior wall MI	24	36
		Inferior wall with right ventricle infarction	08	
		Inferolateral MI	04	
	Anterior and Inferior wall MI (n=2)		02	2
	Miscellaneous	New onset LBBB	02	2
		Posterior Infarction	02	2

Male to female ratio 2.57:1, 72% of cases were males and females were 28%. Chest pain (92%) was the most common symptom at the time of presentation followed by sweating (50%) and breathlessness (22%) (Table 1). Mean duration of "door to needle time" of present study was 6.5 hours. 56% of patients were thrombolysed within first 6 hours and 44% were thrombolysed in 7 to 12 hours. Majority of patients (82%) admitted were either in Killip's I / II classification (Table 2).

Table 3: Complications among STEMI subjects.

Complications	Count	Percentage
Left ventricular failure	55	55
Arrhythmias	45	45
Post infarction angina	20	20
Cardiogenic shock	12	12
Death	08	08
Bleeding manifestation	02	02
Reinfarction	02	02

Table 4: Outcome of thrombolysis among STEMI subjects.

		Count	Percentage
Thrombolysis	<6 hrs	56	56
	7-12 hours	44	44
Subjective improvement	Relief in symptoms (30 min to 24 hours)	80	80
	No relief	20	20
Objective improvement (ST-T resolution in ECG)	1 to 6 hours	64	64
	6 to 24 hours	18	18
	No resolution after 24 hours	18	18
ECHO	Ejection fraction >45% with minimal regional wall hypokinesia	70	70
	Ejection fraction <45% with dyskinesia	28	28
	LV apical clot	2	2
CAG	Single vessel disease	45	64.3
	Double vessel disease	15	21.4
	Triple vessel disease	6	8.6
	Normal coronaries	4	5.7
Outcome	Recovered	92	92
	Mortality	8	8

Anterior wall infarction (58%) was the commonest MI, followed by inferior wall (36%). Right ventricle infarction is commonly associated with inferior wall myocardial infarction.

Left ventricular failure 55% and Arrhythmias 45% were the most common complication following AMI in present study. Other complications observed are post infarction angina, cardiogenic shock and death in 8% of patients. Bleeding manifestations like hemoptysis was seen in 2% cases during thrombolysis (Table 3).

- Outcome of thrombolysis: Out of 100 patients 56 cases were thrombolysed within 6 hours and 44 cases between 7-12 hours after the onset of typical symptoms.
- Subjective: Within first 24 hours of thrombolysis 80 of the total cases showed relief of symptoms like chest pain, sweating, dyspnea in a time range 30 minutes to 24hours (average 2 hours). 20 cases didn't show much relief in symptoms.
- Objective: 64 patients had objective evidence in a form of ECG with ST-T resolution (>50%) between 1-6 hours and 18 between 6-24 hours. 18 patients didn't have significant resolution even after 24 hours.
- Echocardiography: All patients under went 2-D ECHO within 24 hours. 70 (70%) patients had good left ventricle function and ejection fraction of more than 45% with minimal regional wall hypokinesia. 30 (30%) patients had reduced left ventricle function (dyskinesia) and ejection fraction were less than 45%. 2 patients had LV apical clot.
- Coronary angiography (optional): CAG was done in 70 patients. 45 patients had single vessel disease, 15 had double vessel disease, 6 patients had triple vessel disease and 4 patients had normal coronaries (Table 4).

Mortality was seen in 8 cases. Significantly higher mortality rates were observed among males (6 cases) with extensive anterior wall MI (5 cases) infarction, associated with Diabetes mellitus, smoking, age >60 year and higher Killip class IV at admission.

Significant association was observed between outcome and time of thrombolysis, ST-T resolution in ECG, ejection fraction and no of vessels involved in CAG and there was no significant association between outcome and gender distribution i.e. mortality was high among those who underwent thrombolysis at 7-12 hours (87.5%), those who had no resolution in ECG after 24 hours (87.5%), those with ejection fraction <45% (75%) and those with triple vessel disease in CAG (75%) (Table 5).

Table 5: Association between outcome among STEMI subjects and various parameters.

		Recovered (n=92)		Mortality (n=8)		p value
Gender	Male	66	71.7%	6	75%	0.843
	Female	26	28.3%	2	25%	
Time of Thrombolysis	<6 hrs	55	59.8%	1	12.5%	0.009*
	7-12 hours	37	40.2%	7	87.5%	
ST-T resolution in ECG	1 to 6 hrs	64	69.5%	0	0%	<0.001*
	6 to 24 hrs	17	18.5%	1	12.5%	
	No resolution after 24 hrs	11	12%	7	87.5%	
Ejection Fraction	>45%	68	73.9%	2	25%	0.003*
	<45%	24	26.1%	6	75%	
CAG (n=70)	Single vessel disease	44	70.9%	1	12.5%	<0.001*
	Double vessel disease	14	22.5%	1	12.5%	
	Triple vessel disease	0	0%	6	75%	
	Normal coronaries	4	6.6%	0	0%	

DISCUSSION

CVD accounts for approximately 12 million deaths annually and to the common cause of death globally. Since past 3 decades there is considerable decline in incidence and prevalence of CAD in the industrialized western world, where as the incidence is increasing in the developing world. The Asian Indians, whether living in their own country or elsewhere have much higher incidence of CAD as compared to all other ethnic groups. CAD among Asian Indians has been found to be more severe, diffuse and associated with serious complications and increasing mortality at a younger age.[4,5]

Many epidemiological studies have identified certain risk factor, which increases the susceptibility of an individual to the morbidity and mortality of acute myocardial infarction. Acute myocardial infarction resulting from an interplay of these risk factors, some modifiable the others non-modifiable, produce many a time a crippling and devastating effect on the moral and quality of life of an individual, not to speak of the resultant increased

mortality. Early salvage of myocardial tissue by reperfusion with thrombolytic agents improves the morbidity and prevents early mortality, as per worldwide multi centric well-controlled trails. The risk factors and clinical manifestations of STEMI present in 100 patients have been discussed, with the outcome of thrombolytic therapy in all of them.[6-9]

Age is one of the strongest non-modifiable risk factor for acute myocardial infarction. In present study minimum age was 36 years and the maximum age was 75 years. Mean age of patients presenting with STEMI in present study is 57 years and is consistent with studies by Misiriya KJ et al and Hanania G et al, 65 years and 59 years respectively.[10,11] It is well established that females have a lower incidence of acute myocardial infarction than males; this is especially being true in pre-menopausal females. In the present study there were 72% males and 28% females. The sex distribution was consistent with studies by Misiriya KJ et al (males 79% and females 21%), Hanania G et al (males 73% and females 27%) and Gupta et al 12 (males 81% and females 19%).[10,11]

Hypertension has been established unequivocally as a risk factor for AMI. Diabetes mellitus doubles the occurrence of AMI in men and triple to quadruples the incidence in women. Among diabetic's coronary artery disease is the single commonest cause of death, accounting for 50% of death. Smoking is one of the most important modifiable risk factors for MI. The incidence of acute myocardial infarction in smokers is at least two times greater than in non-smokers, as reported in various studies. Obesity as emerged as an independent risk factor in the Framingham study. Hyperlipidemia is one of the most extensively studied risk factor. In Framingham study the risk of developing acute myocardial infarction was approximately six-fold higher in whose serum cholesterol exceeds 200 mgs%. In the present study 48% of patients were hypertensive, 42% were diabetics, 50% were smokers, 16% were obese and 35% had hyperlipidemia.

Misiriya KJ et al, observed that 29% had Hypertension, 23% had diabetes mellitus, 29% had hyperlipidemia.[10] Hanania G et al observed that 40% had hypertension, 21% had diabetes mellitus, 24% were smokers, 16% had obesity and 40% had hyperlipidemia.[11] Gupta et al observed that 29% had Hypertension, 13.08% had diabetes mellitus, 33% were smokers and 31.7% had hyperlipidemia.[12] Dwivedi S et al observed that 59.1% were smokers and 33.3% had obesity.[13]

The commonest symptom in the present study was chest pain (92%). In the studies of Parameshwara et al and Gupta et al chest pain was present in 77% and 81.8% of the cases respectively.[14] Dyspnoea was present in 22%, Gupta et al observed that 24.9% presented with dyspnea.[12]

In the present study acute anterior wall MI was the most common MI in 58% patients, 36% patients had inferior wall MI and 8% patients had inferior wall with RVMI. Majority (82%) were admitted in Killip class I or II. Misiriya KJ et al and Hanania G et al in their studies observed that most common MI was anterior wall MI in 43% and 39% respectively and Killip class of I and II was seen in 85% and 78% of subjects.[10,11]

In the present study 56% of subjects were thrombolysed within 6 hours and 44% between 7-12 hours after the onset of symptoms. The rationale for thrombolytic therapy in patients of evolving myocardial infarction is to reopen an occluded coronary artery.

Coronary pain relief is the most frequent and early marker of reperfusion. The ST segment elevation (STE) resolution has been widely accepted as most reliable objective criteria of coronary reperfusion, ST segment elevation in electrocardiogram represents coronary insufficiency. Hence ST segment resolution is regarded as a marker of salvaged myocardium by post-thrombolytic reperfusion.[14-18]

Within 24 hours of thrombolysis, 80% of the subjects showed relief in chest pain. Average time for relief was 2 hours and 64% of patients had objective evidence of improvement in the form of ST - T resolution (>50%) in ECG within 1-6 hours, 18% within 6-24 hours and 18 patients had no significant resolution after 24 hours. Jajoo U et al study in central India observed that 78% of patients had relief from chest pain following thrombolysis with average time from thrombolysis being 3 hours and 70% had ST-T resolution within 24 hours and average time of 3 hours after thrombolysis.[19] In the present study Mortality was seen in 8% of subjects. Misiriya KJ et al and Hanania G et al observed 11% and 9% mortality.[10,11]

Analytical or interventional study design would have helped in identifying independent risk factors, efficacy of treatment for STEMI.

CONCLUSION

Study concluded that smoking, hyperlipidemia, diabetes mellitus and hypertension were most important risk factors for MI in the study. Early reperfusion of ischemic myocardial tissue with appropriate thrombolytic agent will reduce the morbidity and mortality significantly. Outcome of STEMI was significantly associated with Time of thrombolysis, ST-T resolution in ECG, Ejection fraction and no of vessels involved in CAG.

Recommendations

The study recommends for early reperfusion of STEMI subjects with thrombolytic agent in settings were Primary PCI is not available. Primary Prevention and control measures for modifiable risk factors such as smoking,

obesity, HTN, DM, obesity and hyperlipidemia to be reinforced.

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