JIOM Nepal. 2020 Dec;42(3):12-17.

Short Term Outcome of Acute ST Elevation Myocardial Infarction in a Tertiary Care Cardiac Center

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Submitted : Jul 14 , 2020
Accepted : Oct 3, 2020

ABSTRACT

Introduction

Acute ST Elevation Myocardial infarction (STEMI) is a cardiovascular emergency and is associated with significant adverse short and long-term outcome. The objective of this study was to determine the short-term outcome in terms of heart failure, myocardial reinfarction, stroke, hospital readmission and mortality in patients admitted with STEMI

Methods

It was a prospective observational study conducted at Manmohan Cardiothoracic Vascular and Transplant Center, Kathmandu from May 2014 to April 2015. All patients admitted with diagnosis of STEMI during study period were enrolled. Patients were treated on the basis of existing guidelines. Mode of management, adverse outcomes and mortality of patients during the study period were evaluated. The discharged patients were followed up for 30 days. Statistical analysis was performed with SPSS version 20. Ethical approval was taken from the Institutional Review Committee of Institute of Medicine.

Results

The median duration of presentation was 20 hours, and only 40% of the patients presented within 12 hours of symptom onset. Primary PCI was performed in 50 (33%), thrombolysis was performed in 29(19%) and conservative medical management was done in 72 (48%) patients. Overall outcome occurred in 52 (37.7%) patients. In hospital and 30 day mortality was 14 (9.2%) and 17 (11%) respectively. Heart failure was present in 28(18.5%), myocardial reinfarction 8 (5%), stroke 4 (2.6%), and hospital readmission was 18 (12%). Conservatively treated patients had significantly more adverse outcomes (p=0.02). More patients in conservatively managed group had hospital readmission. (p=0.04)

Conclusion

There were more overall adverse outcomes in conservatitley managed group which is mainly due to more hospital readmission.

Keywords: *Primary PCI, short term outcome, STEMI, thrombolysis*

INTRODUCTION

ST elevation myocardial infarction (STEMI) is a clinical syndrome defined by characteristic symptoms of myocardial ischemia accompanied by persistent elevation the ST segment on electrocardiograph (ECG) and subsequent release of biomarkers of myocardial necrosis.[1] Acute MI occurs when intra arterial thrombus propagates and completely occlude blood flow within the artery, resulting in ischemia and necrosis of cardiomyocytes distal to the obstruction.[2] Acute MI causes substantial morbidity and mortality worldwide.[3]

Management of STEMI is directed towards reperfusion therapy, either by thrombolysis or primary percutaneous coronary artery intervention (PPCI). PPCI is the best available option and various studies have shown that PPCI is better than thrombolysis in reducing cardiovascular mortality and morbidity.[4,5] If the patient presents after 12-24 hours of symptoms onset without ongoing pain or complications, they are usually kept in conservative medical management and percutaneous coronary intervention (PCI) can be planned later. Adverse outcomes are usually based on the mortality, myocardial reinfarction, heart failure, stroke and recurrent hospital admission. Among patients with STEMI enrolled in trials, approximate 30-day mortality rates were 13 percent with medical therapy alone, 6 to 7 percent with optimal fibrinolytic therapy,[6] and as low as 3 to 5 percent with primary percutaneous coronary intervention (PCI) when timely performed.[7]

In our country, there is limited data regarding the outcomes of acute STEMI. Few studies have been published which compare the early outcome of PPCI in acute STEMI.[8] Outcomes related to thrombolysis and conservative treatment is not well studied. So, the general objective of the study was to know the short-term adverse outcome in hospital and after hospital discharge up to 30 days in acute STEMI in all three PPCI, thrombolysis and conservatively managed groups. The specific objective was to determine the heart failure, myocardial reinfarction, stroke, recurrent hospital admission and mortality in these different groups.

METHODS

It was a prospective observational study conducted in Department of Cardiology, Manmohan Cardiothoracic Vascular and Transplant Centre (MCVTC), Maharajgunj, Kathmandu. Acute STEMI was diagnosed on the basis of third universal definition of myocardial infarction.[9] Study period was one year from May 2014 to April 2015. Adult patients above 18 years, both male and female, diagnosed and admitted as acute STEMI were enrolled in the study. Excluded patients were those who died in ER before initiation of proper treatment, and those with medical surgical illness that precluded treatment (acute CVA, severe sepsis, ongoing UGI bleed).

Informed consent was taken from all patients. The Institutional Ethical Review Committee of Institute of Medicine approved the study.

All eligible acute STEMI patients were enrolled in the study. Presenting symptoms, general physical examination, and baseline investigations along with cardiac enzymes, ECG and echocardiography was performed at admission. Risk factors were determined on the basis of history and investigations.

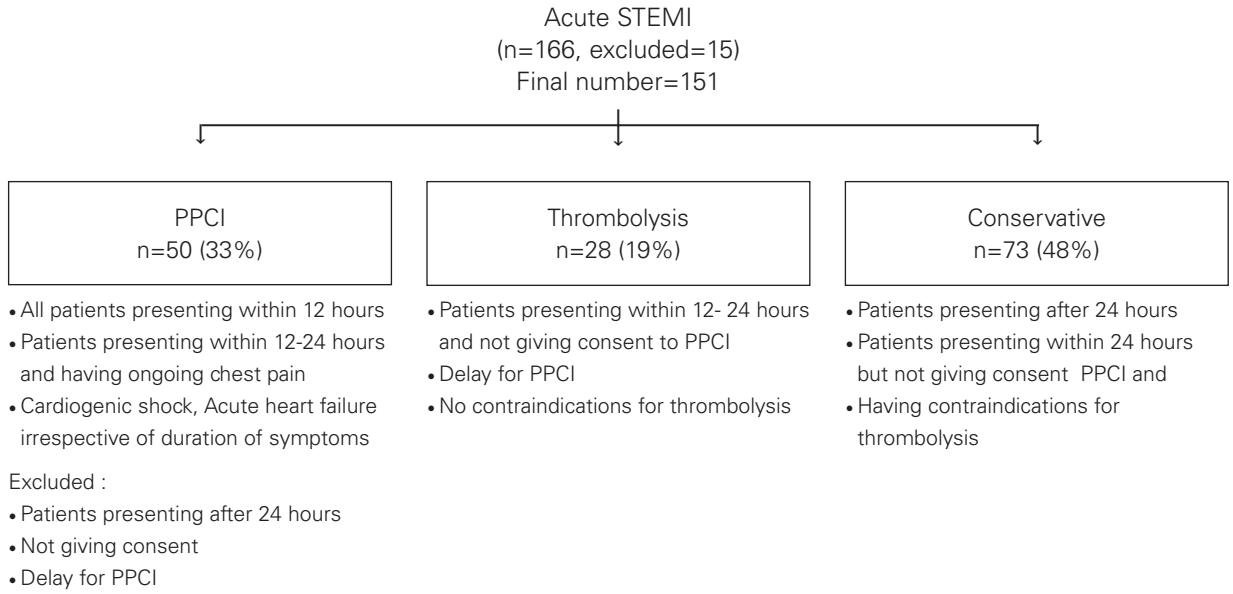

Fig 1. Plan of management of STEMI patients

Address of the patient was subdivided into those inside or outside Kathmandu valley.

Patients were managed according to the guidelines given by ACC/AHA in 2013.[10] Depending upon the time duration at which patients presented, there were three groups of patients- Primary PCI, Thrombolysis and Conservatively managed group. (Fig 1)

Non fatal outcome included heart failure, stroke, myocardial reinfarction and hospital readmission. Myocardial reinfarction was considered when ST elevation ≥0.1 mV recurs, or new pathognomonic Q waves appear, in at least two contiguous leads, when associated with ischemic symptoms for 20 min or longer.[9] Heart failure was defined as from crepts in chest, with S3 and raised JVP, to frank pulmonary edema.[11] Stroke was defined as a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than vascular origin.[12] Fatal outcome included in hospital and 30 day mortality. Overall adverse outcome was said to be present, if anyone of the fatal or nonfatal outcome occurred.

Depending upon the clinical status and requirement, some patients were followed up after 1-2 weeks, and all patients were called upon at 30 days after discharge. Those patients who didn't come for follow up, telephone call was made to know regarding their status. If mortality had occurred, it was noted with likely cause of death.

Statistical analysis was performed with SPSS version 20. For demographic profile, frequency and percentage distribution were obtained for each variable. Data were expressed as mean+ SD for continuous variables and as percentage for categorical variables. For continuous variables, differences between groups were compared with independent t-test. Chi-square test was used to detect linear association between type of treatment and adverse outcome. A two sided p value of <0.05 was considered statistically significant.

RESULTS

There were total of 166 patients presented to MCVTC Emergency room (ER) with diagnosis of acute STEMI, and 151 patients were included in the study who fit in inclusion criteria.(Fig 1) The mean age was 59.0 ±13 years. (Table 1) The mean age for male was 58.35±13 years and female was 60.42±12 years. The minimum age of presentation was 29 years and maximum age was 84 years. There were 103(68%) male and 48(32%) female. Majority of the patients 88(58%) were from inside Kathmandu valley, and 63(42%) patients were from outside Kathmandu valley.

Table 1. Baseline characteristics of patients: demographics, risk factors, complications and management

Variables	Mean/ Frequency
Age	59.0±13
Male	58.35±14
Female	60.42±12
Age≥65 years	44 (29%)
Sex	
Male	103 (68%)
Female	48 (32%)
From outside Kathmandu valley	63 (42%)
Referred from other center	106 (70%)
Median duration of presentation	20 hours
Inside Kathmandu valley	12 hours
Outside Kathmandu valley	28 hours
Presentation	
Within 12 hours	60 (40%)
Within 24 hours	87 (58%)
Hypertension	105 (70%)
Diabetes mellitus	43 (28%)
Dyslipidemia	9 (45.7%)
Prior CVA	6 (4%)
Renal Dysfunction	11 (7.3%)
Prior CAD	4 (2.6%)
Alcohol	34 (22.5%)
Smoking	82 (54.3%)
LV ejection fraction ≤40%)	72 (48%)
Wall involvement	
Anterior wall	84 (56%)
Inferior wall	67 (44%)
Killip Class	
I	98 (65%)
II	29 (19%)
III	9 (6%)
IV	15 (10%)
Treatment received	
Primary PCI	50 (33%)
Thrombolysis	28 (19%)
Conservative management	72 (48%)

The most common risk factors were hypertension (70%), Smoking (54%) and dyslipidemia (45.7%). The overall median duration of presentation was 20 hours. For inside Kathmandu valley, median duration of presentation was 12 hours, while that for outside Kathmandu valley was 28 hours. Among 151 patients, 61(40%) patients presented within 12 hours, and 87(58%) patients presented within 24 hours.

Table 2: Non fatal and fatal outcomes in each of the management group

Outcome	Reperfusion		Conservative management	Total	p-value
	PPCI	Thrombolysis			
Heart Failure	7 (14%)	5 (18%)	16 (22%)	28 (18.5%)	0.40
Reinfarction	1 (2%)	1 (3.5%)	6 (8.2%)	8 (5%)	0.15
Stroke	0 (0%)	1 (3.6%)	3 (4.1%)	4 (2.6%)	0.40
Hospital readmission	2 (4%)	3 (11%)	13 (18%)	18 (12%)	0.04
Death	7 (14%)	1 (3.5%)	9 (12%)	17 (11%)	0.30
Overall outcomes	11 (22%)	8 (28.5%)	33 (45%)	52 (34.4%)	0.02

Anterior wall involvement 84(56%) was more as compared to Inferior wall 67(44%). Majority of the patients presented in Killip Class I (65%), followed by Killip Class II(19%), Killip Class IV (10%) and Killip Class III (6%).

Total of 50(33%) patients received Primary PCI, 29(19%) patients received Thrombolysis, and 72 (48%) patients received conservative management. (Fig 2) Among 61 patients who presented within 12 hours, 37(60%) patients underwent primary PCI, 23 (38%) patients underwent thrombolysis and 1 patient was kept under conservative management. Among 87 patients who presented within 24 hours, 47(54%) patients underwent primary PCI, 28 (32%)patients underwent thrombolysis and 12 (14%) patients were kept under conservative management. Drug eluting stents (DES) was kept in 39(78%) patients, bare metal stents (BMS) was kept in 7(14%) patients and simply balloon angioplasty was done in 4(8%) patients. Streptokinase was given as thrombolytic agent in 16 (57%)patients, while tenecteplase was given in 12 (43%) patients.

Heart failure was present in 28(18.5%) patients, myocardial reinfarction in 8(5%) patients, stroke in 4(2.6%) patients, hospital readmission in 18(12%) patients and death in 17(11%) patients. (Table 2)

There were 7(14%) patients in primary PCI group, 5(18%) in thrombolysis group and 16(22%) in conservatively managed group that had heart failure.

One (2%) patient in primary PCI group, 1(3.5%) in thrombolysis group and 6(8.2%) in conservatively managed group had myocardial reinfarction. No stroke occurred in primary PCI group. One (3.6%) in thrombolysis group and 3(4.1%) in conservatively managed group had stroke. Two (4%) patients in primary PCI group, 3(11%) in thrombolysis group and 13(18%) in conservatively managed group had hospital readmission for various causes during 30 days of MI. Overall adverse outcome occurred in 52(34.4%) patients. Eleven (22%) patients in primary PCI group, 8(28.5%) in thrombolysis group and 33(45%) in conservative management group had major adverse outcome. As compared to reperfusion therapy, there were significantly more overall adverse outcome in conservatively managed group(p=0.02). This was largely driven by increased hospital readmission in conservatively managed group, whereas there was no significant difference of other outcomes in both reperfused and conservatively managed group.

There were total of 17(11%) thirty-day deaths. Seven (14%) in primary PCI group, 1(3.5%) in thrombolysis group and 9(12%) in conservatively managed groups had death. Three patients expired after hospital discharge, while in hospital mortality was 14(9.2%). There were more deaths in woman 10(20.8%) as compared to man 7(6.8%). About 53% of patients who presented in shock expired,

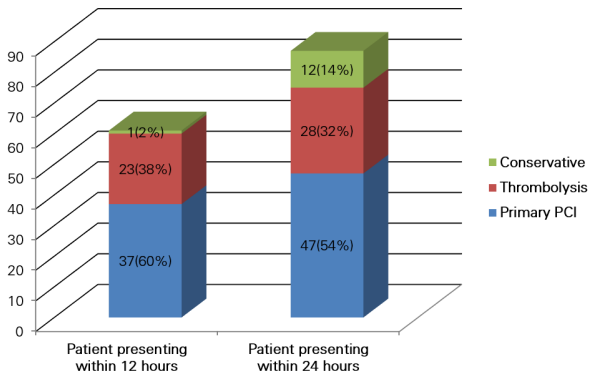

Fig 2. Management of patients presenting within window period

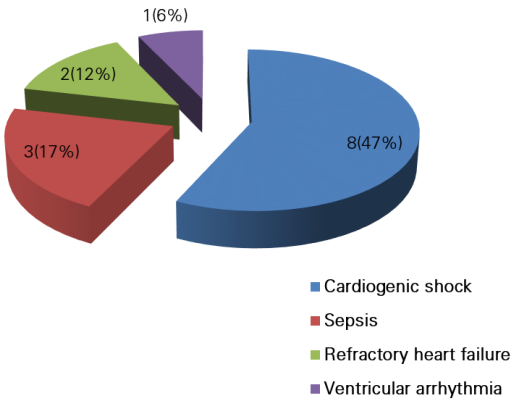

Fig 3. Causes of in-hospital death

which was the most common cause of death (Figure 3). While excluding patients in shock, the mortality was 6.6%.

DISCUSSION

The mean age of the patients was similar to other international studies.[13-15] The gender difference of more male patients is seen not only in Nepal, but internationally.[7,13,14] The incidence of CAD in female is less than male probably due to the protective role of estrogen in premenopausal woman, but its incidence increases as the age progresses and it is the leading cause of death in women.[16]

One of the striking features about risk factors was high prevalence of smoking. About 54.3% of patients were current smoker. High prevalence of smoking was present in other studies in Nepal also. In western Nepal, it was about 80%[15] while in Kathmandu it was about 60%.[8] In NCDR registry in the USA, smoking was present in 31%.[7] As smoking is the major risk factor for CAD, and its high prevalence in our country, every effort should be done to help people quit smoking not only to reduce the risk of CAD but also to reduce the risk of pulmonary diseases and malignancy.

The overall median duration of presentation or prehospital time (PHT) delay in this study was 20(1 to 120) hours which is high. The percentage of patients presenting within 12 hours of symptoms onset is 40% and those presenting within 24 hours is 58%. The median PHT is 3.5 hours (1.2 to 15.2 hours) in the USA and 2.5 hours (1.5 to 8.7 hours) in the United Kingdom, 4.4 hours (1.8 to 13.3 hours) in South Korea and 4.5 hours (2.0 to 16.3 hours) in Japan.[17] As earlier the reperfusion is performed better is the short and long term result,4 effort should be directed to decrease the prehospital delay, which is markedly longer as compared to other countries. Studies have shown that patient may not perceive the acute symptoms, may not recognize the severity and importance of symptom, and there might be delay for call for help; so health care providers and policymakers should address in these areas to decrease the prehospital delay.[18]

Sixty percent of patients received PPCI and 38% of the patients received thrombolysis who presented within 12 hours of symptoms onset. Fifty four percent of patients received PPCI and 32% patients received thrombolysis who presented within 24 hours. This is similar to that of other countries. In National Cardiovascular Data Registry (NCDR) of the USA, primary PCI was performed in 83% and thrombolysis was performed in 12% and overall reperfusion therapy was performed in 93% of STEMI patients.[7] Similarly, in European registry, PCI was performed in 61% and thrombolysis was performed in 33 %, and overall reperfusion therapy was performed in 94% of patients.[19] This shows we are providing reperfusion therapy to those who presented within window period similar to that of western world. The median door to balloon time (DBT) was 100 (40 to 180) minutes, and the mean DBT was 97.6(±32) minutes, which is comparable to that of other studies.[7]

Overall heart failure was present in 28(18.5%) patients. Occurrence of heart failure varies across the world. In Kerala registry in India, heart failure was present in 2.7%, [14] in GRACE study 18%, [20] and in European registry 16.8%.[19] Slight increase in heart failure might be due inclusion of patients who were managed conservatively. Myocardial reinfarction occurred in 8(5%) patients. One (2%) patient in primary PCI group, 1(3.5%) in thrombolysis group and 6(8.2%) in conservatively managed group had myocardial reinfarction. In the RIKS-HIA study done in Swedish population, reinfarction occurred in 2% in PCI group and 3.4% in thrombolysis group.[21] So the occurrence of reinfarction is slightly high when all groups are taken together but is similar to western world when taken separately for PCI and thrombolysis. Stroke occurred in 4(2.6%) overall patients but no stroke occurred in primary PCI group similar to other studies.[14, 19]

Hospital readmissions are a quality of care indicator. After hospital discharge, hospital readmission is one of the factor leading to increased morbidity and mortality. There was rehospitalization in 18(12%) patients but only two (4%) patients in primary PCI group, which is similar to that of other studies.[22]

Out of 17 deaths in the study period, 14(9.2%) were inhospital deaths and 3 were on follow up. Out of 15 patients who have presented in Killip Class IV, 8 (53%) patients expired. Similar high mortality was seen in patients with STEMI presenting in cardiogenic shock.[23,24] While excluding patients in shock, the mortality was 6.6%. In Indian CREATE study, 30 day mortality was 9%,[13] and in GRACE study 8%[25] and in Hospital in Kerala study 8.2%.[14] This shows that overall mortality is slightly higher than other studies. The reason behind this may be due to the fact that many patients in our study were kept in conservative management while majority of the patients in other studies underwent reperfusion therapy. Patient presentation was also quite late, and studies have shown that earlier the perfusion, better is the outcome.[26,27] The high mortality in PCI group can be explained by studies showing high mortality in patients presenting in cardiogenic shock.[28] There was more mortality in female. Several other studies have also shown female sex as a predictor of adverse cardiovascular outcome.[29] More adverse outcome and mortality in female is found to be later age of presentation than men, lesser use of primary PCI and presence of more comorbid conditions.[30]

Overall adverse outcomes were significantly more in conservatively managed group (p=0.02), which was mainly because of significant more hospital readmissions in conservatively managed group (p=0.04). Whereas, there was no significant difference of outcomes in other variables between two groups. This can be explained by small sample size, low number of event rates as well as short duration of study period.

The study was limited to one center. Sample size was small. The individual event rates were also less because of small sample size. The patients who expired at ER and who refused admissions were not included in the study.

CONCLUSION

Overall adverse cardiovascular outcome as well as recurrent hospital admission is higher in conservatively managed group.

CONFLICT OF INTEREST

None declared.

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