Percutaneous Coronary Intervention InST Elevation Myocardial Infraction: Clinical Profile and Outcomes

Md. Tariqul Islam Khan[1], Mahadi Hassan[2], Koushik Bhowmick[3], Farhana Naznen[4], Md. Asad Alam[5]

[1]*Registrar, Department of Cardiology, Mymensingh Medical College Hospital, Bangladesh*

[2]*Junior Consultant, Department of Cardiology, National Institute of Cardiovascular Disease, Dhaka, Bangladesh*

[3]*Junior Consultant, Department of Cardiology, Upazilla Health Complex, Bhaluka, Mymensingh, Bangladesh*

[4]*Lecturer, Department of Physiology, Community Based Medical College, Bangladesh*

[5]*Assistant Registrar, Department of Cardiology, M Abdur Rahim Medical College Hospital, Dinajpur, Bangladesh*

*Corresponding Author: *Md. Tariqul Islam Khan, Registrar, Department of Cardiology Mymensingh Medical College Hospital, Bangladesh*

Abstract

Introduction: *An acute ST-elevation myocardial infarction (STEMI) is an event in which transmural myocardial ischemia results in myocardial injury or necrosis. The current 2018 clinical definition of myocardial infarction (MI) requires the confirmation of the myocardial ischemic injury with abnormal cardiac biomarkers. It is a clinical syndrome involving myocardial ischemia, EKG changes and chest pain.*

Objective: *To assess the percutaneous coronary intervention in ST elevation myocardial infraction: clinical profile and outcomes.*

Methods: *It is a retrospective, single centre study, performed at Department of Cardiology, Mymensingh Medical College Hospital, Bangladesh January to December 2023. Total of 150 patients meeting the inclusion criteria were included in the study. All patients who underwent PCI for STEMI were enrolled in this study. All the data were collected from hospital records and cath lab records. Two cardiac interventionists who were trained in interventional cardiology performed all procedures.*

Results: *Total of 150 patients were included. The average age was 57.39 yrs with youngest patient being 24 years old and oldest being 86 years old. About 13.3% (20) were less than 40 years of age. Most of the patients were male (75.5%).The commonest symptom was chest pain, present in 90% cases. The average time of presentation after symptom onset was 17.5 hours, earliest being 15 minutes. About 68.6% patients presented in less than 12 hours of symptoms onset, 18% presented 12-24 hours of symptoms onset and 13.3% patients presented late. Among the traditional cardiovascular risk factors, smoking was the commonest. Nearly 6.7% of the patients smoked while 38.6% were hypertensive, 31.3% diabetic, 3.3% had known dyslipidemia and 4.6% had family history of MI. 86% of patients presented in Killip class I while 5.3% patients presented in Killip class IV. Anterior wall STEMI was commonest accounting for 48% followed by Inferior wall, 46%.Angiography revealed SVD in 42%, DVD in 32%, TVD in 22.6%.Left Main Coronary Artery involvement was seen in 5 cases and 1, Left Main angioplasty was done. The mean time of presentation after onset of symptom/s was 17.5 hours. About 68.6% patients presented in less than 12 hours of symptoms onset, 18% presented at 12-24 hours of symptoms onset and 13.3% patients presented late. Primary PCI was done in 70.6% of patients. Almost all patients (98%) underwent coronary artery stenting with drug eluting stents. Multivessel PCI during index procedure was done in 7 patients. TIMI III flow following PCI was achieved in 90% cases. Average LVEF at discharge was 34.6%. There were 8 deaths, all after Primary PCI. There were 8 mortalities, all in Primary PCI group. In-hospital mortality rates for patients presenting with and without cardiogenic shock were 3.3% and 2.0% respectively. The overall mortality rate was 5.3%.*

Conclusion: *This study has reemphasized that PCI is effective in the management of STEMI cases in Bangladesh with improving mortality rates and decreasing complications. Minimizing the delayed presentation after the onset of symptoms should be one of the prime focuses for effective management of STEMI.*

Keywords: *Coronary Artery Disease, Percutaneous Intervention, ST elevation Myocardial infarction.*

1. INTRODUCTION

An acute ST-elevation myocardial infarction (STEMI) is an event in which transmural myocardial ischemia results in myocardial injury or necrosis [1]. The current 2018 clinical definition of myocardial infarction (MI) requires the confirmation of the myocardial ischemic injury with abnormal cardiac biomarkers [2]. It is a clinical syndrome involving myocardial ischemia, EKG changes and chest pain.In developing countries, however, AMI frequently occurs at a younger age, approximately one decade earlier than that reported in developed countries [3]. The Middle East has one of the highest percentages (11%) of adults who develop STEMI for the first time before the age of 40 years [4]. In comparison, the rate in North America is 4%, Western Europe is 2.7%, and Africa is 9.7% [5].The cause of this abrupt disruption of blood flow is usually plaque rupture, erosion, fissuring or dissection of coronary arteries that results in an obstructing thrombus. The major risk factors for ST-elevation myocardial infarction are dyslipidemia, diabetes mellitus, hypertension, smoking, and family history of coronary artery disease [3,5]. Myocardial infarction in general can be classified [5] from Type 1 to Type 5 MI based on the etiology and pathogenesis. Type 1 MI is due to acute coronary atherothrombotic myocardial injury with plaque rupture. Most patients with ST-segment elevation MI (STEMI) and many with non-ST-segment elevation MI (NSTEMI) comprise this category. Type 2 MI is the most common type of MI encountered in clinical settings in which is there is demand-supply mismatch resulting in myocardial ischemia. This demand supply mismatch can be due to multiple reasons including but not limited to presence of a fixed stable coronary obstruction, tachycardia, hypoxia or stress. However, the presence of fixed coronary obstruction is not necessary. Other potential etiologies include coronary asospasm, coronary embolus, and spontaneous coronary artery dissection (SCAD). Previous cardiovascular studies have shown that elderly patients were less likely to receive evidence-based therapies and had higher mortality rate [6,7].There was also marked variation in the clinical care of the elderly with acute coronary syndromes (ACS) [17,18]. In addition, limited data are available on the delivery of health care and clinical outcomes of elderly patients with cardiovascular disease in the South-East Asia region. Patients should be asked about the characteristics of the pain and associated symptoms, risk factors or history of cardiovascular disease, and recent drug use [8]. Risk factors for an ST-elevation myocardial infarction include age, gender, family history of premature coronary artery disease, tobacco use, dyslipidemia, diabetes mellitus, hypertension, abdominal obesity, sedentary lifestyle, a diet low in fruits and vegetables, psychosocial stressors [9]. Cocaine use can cause an ST-elevation myocardial infarction regardless of risk factors [8, 9] History of known congenital abnormalities can be helpful [10].

2. MATERIALS & METHODS

It is a retrospective, single centre study, performed at Department of Cardiology, Mymensingh Medical College Hospital, Bangladesh January to December 2023. Total of 150 patients meeting the inclusion criteria were included in the study. All patients who underwent PCI for STEMI were enrolled in this study. All the data were collected from hospital records and cath lab records. Two cardiac interventionists who were trained in interventional cardiology performed all procedures.

Inclusion Criteria

- STEMI
- Less than 12 hours
- Cardiogenic shock or acute severe heart failure irrespective of time delay
- Evidence of ongoing ischemia 12-24 hours after symptom onset

Exclusion Criteria

- Patient who underwent thrombolysis or medical management for STEMI and those who did not provide written consent.

All patients presenting with Acute STEMI were counseled about the treatment modalities in emergency (ER). As most of the patents now can afford Primary PCI under the coverage of funds provided by the Government of Bangladesh and our centre, and with clear outcome benefits of Primary PCI over thrombolysis, almost all patients presenting with STEMI were taken for Primary PCI if indicated. Those who did not give written informed consent for Primary PCI or chose medical management or thrombolysis were excluded from this study. Those patients presenting late were taken for elective PCI after hospital admission. For Primary PCI, patients were given loading doses of Asprin (300 mg), Clopidogrel

(600mg) and Rosuvastatin (20 mg) at ER. At cath lab, access for PCI was determined by the primary operator. Most of the cases were successfully performed via radial approach. Intravenous IV Unfractionated Heparin 10000 units was given after diagnostic CAG to maintain ACT of more than 300 seconds during procedure. Temporary pacemaker was inserted via femoral route whenever indicated. Thrombosuction was done in cases with high thrombus burden. Predilatation with a non complaint balloon was done for most of the cases followed by stenting. Only Drug Eluting Stents (DES) was used. In cases where stenting was not feasible, plain balloon angioplasty was done. Post dilatation with a non-compliant balloon was done as a routine unless stents were deployed with high pressure with no obvious unexpanded stent struts were visible. After PCI, all patients were transferred to cardiac care unit (CCU).

3. RESULTS

Total of 150 patients were included. The average age was 57.39 yrs. with youngest patient being 24 years old and oldest being 86 years old. About 13.3% (20) were less than 40 years of age. Most of the patients were male (75.4%).

The commonest symptom was chest pain, present in 90% cases. The average time of presentation after symptom onset was 17.5 hours, earliest being 15 minutes. About 68.6% patients presented in less than 12 hours of symptoms onset, 18% presented 12-24 hours of symptoms onset and 13.3% patients presented late. Among the traditional cardiovascular risk factors, smoking was the commonest. Nearly 6.7% of the patients smoked while 38.6% were hypertensive, 31.3% diabetic, 3.3% had known dyslipidemia and 4.6% had family history of MI. 86% of patients presented in Killip class I while 5.3% patients presented in Killip class IV. Anterior wall STEMI was commonest accounting for 48% followed by Inferior wall, 46%.Angiography revealed SVD in 42%, DVD in 32%, TVD in 22.6%.Left Main Coronary Artery involvement was seen in 5 cases and 1, Left Main angioplasty was done.

Table 1. *Baseline Characteristicsof study population (N=150)*

Variables	N	%
Sex		
Male	113	75.4%
Female	37	24.6%
Duration of symptoms		
Less than 12 hours	103	68.6%
12 to 24 hours	27	18%
More than 24 hours	20	13.3%
Risk factors		
Diabetes Mellitus	47	31.3%
Hypertension	58	38.6%
Smoking	101	67.3%
Dyslipidemia	5	3.3%
Family h/o of CAD	7	4.6%
Presenting symptoms:		
Chest pain	135	90%
Shortness of breath	39	26%
Nausea/vomiting	58	38.6%
Abdominal pain	15	10%
Near syncope/syncope	12	8%

Table 2. *Diagnosis and Management Strategies of study population (N=150)*

	N	%
Killip class		
Class I	129	86%
Class II	10	6.6%
Class III	3	2%
Class IV	8	5.3%
Diagnosis:		
Anterior wall STEMI	72	48%
Inferior wall STEMI	69	46%
Posterior wall STEMI	7	4.6%

Lateral wall STEMI	2	1.3%
Procedure:		
Primary PCI (PPCI)	106	70.6%
Elective PCI	18	12%
LVEF at discharge	52	34.6%
Duration of hospital stay (days)	9	6%

Table 3. *Diagnosis by Number of Vessels Involved (N=150)*

	N	**%**
SVD	63	42
DVD	48	32
TVD	34	22.6
LM Disease	4	2.6
Normal Coronaries	1	0.6

Table 4. *Culprit Vessel for STEMI (N=150)*

	N	%
LAD	85	56.6
RCA	38	25.3
LCX	16	10.6
Other	11	7.3

In all cases, wire could be crossed over the lesion. Only 4 cases out of 150 cases underwent plain balloon angioplasty due to the nature of lesion and vessels. While in all other cases, except for 1 patient with normal coronary arteries, DES was deployed. Thrombosuction because of excess thrombus burden was done in 25(16.6%) cases. TIMI III flow was reestablished in 81.3% cases and TIMI II in 2% cases.

Table 5. *Types of Coronary Intervention (N=150)*

	N	**%**
Stenting (DES)	122	81.3
Thrombosuction and stenting	25	16.6
Plain Balloon Angioplasty	3	2

There were total of 7 deaths all during or after Primary PCI. 12 patients presented in cardiogenic shock, out of which 5 died. The commonest complication after PPCI was heart failure, occurring in 19 cases. The second most common complication was heart block requiring temporary pacemaker insertion in 17 cases. 1 patient needed a permanent pacemaker for persistent complete heart block. Post MI pericarditis/pericardial effusion developed in 10 patients, all of which resolved with conservative management. 3 patients developed access site complications in the forms of hematoma, AV fistula and pseudoaneurysm respectively. There were 4 cases of Transient ischemic stroke after PPCI, all the patients recovered their neurological function. VT/VF was encountered in 8 cases during hospital stay. 6 patients had developed LV apical clot in follow up, all had anterior wall MI. There were 2 cases of coronary artery dissection caused by guiding catheter which were managed immediately with stenting. 1 patient presented with subacute stent thrombosis in follow up. Acute Kidney Injury (Pre-renal and Contrast Induced Nephropathy) was seen in 10 cases (6.6%) but none of the patients required hemodialysis after PPCI. Average hospital stay was 7.6 days. Average LVEF at discharge was 44.73%.

Table 6. *Complications and In-Hospital Mortality Rates after PCI (N=150)*

	N	%
Heart failure	19	12.6
Heart block	17	11.3
Post MI pericarditis/ pericardial effusion	10	6.6
Ventricular arrhythmias	8	5.3
LV clot	6	4
TIA/stroke	4	2.6
Access site complication	3	2
Radial artery	1	0.6

AV fistula	1	0.6
Femoral artery	4	2.6
Pseudoaneurysm	1	0.6
Hematoma	1	0.6
Bleeding (retroperitoneal)	2	1.3
Coronary Artery Dissection (iatro- genic)	2	1.3
Permanent Pacemaker Insertion	1	0.6
Stent thrombosis (subacute)	1	0.6
In hospital mortality		
Primary PCI	7	4.6
Cardiogenic shock	5	3.3
Non-cardiogenic shock	3	2.0
Elective PCI	0	0.0

4. DISCUSSION

PCI was a therapeutic option far from reach to general population till recent past in our country. But now, with the development of health infrastructures, trained manpower and health awareness among the general population, it has become feasible for most of the patients in the country. In our study, all patients were taken for PPCI rather than thrombolysis because of the superiority in outcomes with PPCI. In this study, average age of patients was 57.39 years. This finding is similar to the previous studies done in our country [9,10]. Total of 150 patients were included. The average age was 57.39 yrs with youngest patient being 24 years old and oldest being 86 years old. About 13.3% (20) were less than 40 years of age. Most of the patients were male (75.5%).

The commonest symptom was chest pain, present in 90% cases. The average time of presentation after symptom onset was 17.5 hours, earliest being 15 minutes. About 68.6% patients presented in less than 12 hours of symptoms onset, 18% presented 12-24 hours of symptoms onset and 13.3% patients presented late. Among the traditional cardiovascular risk factors, smoking was the commonest. The traditional cardiovascular risk factors like hypertension, diabetes and smoking were dominant in our country as well. The percentage of patients diagnosed as hypertensive was lower (38.6%) than other studies in our country. The percentage of diabetes (31.3%) was similar to other studies. While 67% of our patients were current or former smoker, this varied from 34% to 76.47% in other studies [9,10,11]. One of the major determinants of outcome in MI is the time interval between onsets of symptom to revascularization. In our study, the average time of presentation was 17.5 hours after the symptom onset. While the average time for patients taken for PPCI was 7.6 hours. In the previous study, this was about 8 hours [11].Our study showed that nearly 30% of our patients presented after 12 hours of symptoms onset. The reasons for this may be due to delay in diagnosis, the time lost during referral from non-PCI capable centres, time delay in transport which is inevitable owing to the poor infrastructure and geographical condition of the country and lack of awareness in general population about the benefits of early revascularization in STEMI. Of these 30% patients, 21% patients underwent PPCI, as per recommendations in guidelines [12]. Anterior wall STEMI was commonest accounting for 48% followed by Inferior wall, 46%. Angiography revealed SVD in 42%, DVD in 32%, TVD in 22.6%. Left Main Coronary Artery involvement was seen in 5 cases and 1, Left Main angioplasty was done. LAD was the commonest culprit vessel as in other studies. Multivessel disease was present in 64.6% cases, consistent with international data [13].Radial artery was preferred choice of vascular access for PPCI i.e nearly 85%. This was in vast contrast to previous study performed in our centre in which only femoral access was used [11]. Radial access was associated with lower access site complications, more patient comfort after the procedure and early mobilization. Only 1 patient had developed AV fistula in radial group while 1 patient had groin site hematoma, 1 had femoral artery pseudoaneurysm and 2 had retroperitoneal bleed in femoral access group. There were 8 mortalities, all in Primary PCI group. In-hospital mortality rates for patients presenting with and without cardiogenic shock were 3.3% and 2.0% respectively. The overall mortality rate was 5.3%. The mortality rate of cardiogenic shock patients is comparable to the previous study done at SGNHC, Bangladesh [2]. The mortality rate in patients without cardiogenic shock and overall mortality rate are similar to the studies conducted in India [14,15]

and international registry [16,17]. Acute mitral regurgitation following a myocardial infarction is most commonly due to ischemic papillary muscle displacement, left ventricular dilatation, or rupture of the papillary muscle of chordae [18]. In ST-elevation myocardial infarction, the degree of mitral regurgitation is usually severe and associated with a 30-day survival of 24% [19].There are few limitations of this study. First, it is a single centre retrospective study. And second is the lack of data on long term outcomes.

5. CONCLUSION

This study has reemphasized that PCI is effective in the management of STEMI cases in Bangladesh with improving mortality rates and decreasing complications. Minimizing the delayed presentation after the onset of symptoms should be one of the prime focuses for effective management of STEMI.

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