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Original Article

Primary Percutaneous Coronary Intervention of ST-segment Elevated Myocardial Infarction-Experiences in a Tertiary Care Hospital

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Key Words :
IHD, STEMI, Primary PCI.

Abstract:

Background: *Primary percutaneous coronary intervention (pPCI) is the preferred and established mode of treatment in ST elevated myocardial infarction (STEMI). Exact data on procedural outcome in patient undergoing primary PCI in our population is not well documented. We have carried out this study to see the prognosis, in-hospital, and 12-month survival outcome of our patients.*

Methods: *Patients were enrolled in the observational non-randomized prospective cohort between November 2017-Mar 2020, who were presented into our emergency department with acute onset of severe chest pain or angina with ECG evidenced acute ST elevated myocardial infarction. Total 182 patient (Female 14; Male 168) were enrolled in this study.*

Results: *Out of 182 patients, anterior MI were 47.8% (n=87) and inferior MI 50.5% (n=92) and lateral MI 1.6% (n=3). Presentation to ER from the onset of chest pain for female :123 min vs. male: 112 min and average door-to-balloon time were for female: 53 min vs. male: 50 min. Hospital admission of STEMI were more after 5 pm to next morning 9 am. Death were more in anterior STEMI than inferior STEMI. At presentation 10.4% (n=19) patents were in cardiogenic shock with STEMI, 42.1%(n=8) patients with anterior MI, 57.9% (n=11) in inferior MI group. Total, 15 (8.2%) patients died; 93.3% (n=14) within one week of primary PCI due to shock and poor LV function and subsequent development of LVF with arrhythmia and 6.7% (n=1) patient died 6 months after pPCI due to other cause.*

Conclusion: *In this prospective observational cohort study, we found that PCI is a good and effective treatment modality in treating STEMI patient with better myocardial salvage and avoidance of life-threatening complications. Our procedural success rate is 91.8% and patients are doing well with regular follow up at our OPD 12-months after primary PCI.*

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Introduction:

Coronary artery disease (CAD) is one of the leading causes of death worldwide with increasing incidences in this part of world.[1] Acute STEMI is the most lethal presentation of CAD with mortality ranges from 15-20%.[2] Acute STEMI accounted for 60% and 37% of ACS in India as per CREATE and Kerala ACS registries and associated with highest mortality.[3,4]

Primary PCI is the choice of reperfusion therapy for STEMI when performed at right time within 12 hrs of onset of symptoms, provided by experienced team or interventionist in a center with Cath lab facility.[5,6]

Reperfusion methods in treating STEMI have evolved over last several decades. In Late 1970, KP Rentrop performed the first invasive

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reperfusion therapy using mechanical recanalization during coronary angiography.[7] The first trial of intracoronary Streptokinase uses in the 1980 showed reduction of infarct size with decrease mortality.[8,9] In 1990 return of primary angioplasty in managing STEMI. Selection of an ideal reperfusion therapy, whether it be primary PCI, fibrinolysis or pharmacoinvasive are of paramount importance in the successful management of patients with STEMI.

Chosen reperfusion thrombolysis or PCI should establish in the first 12 hrs. from symptoms onset. In patient transferred to a PCI capable hospital, the delay should be maximum 120 mins after diagnosis made. When the delay is greater than 120 min, there is no benefit of primary PCI over thrombolysis.[10] Time to reperfusion with primary PCI has positive impact in terms of mortality and morbidity. Increasing door to balloon time to be related to increased mortality.

Bangladesh, a densely populated country, with many of the patient of ST-elevated MI died before reaching the hospital. Although, pharmacoinvasive reperfusion is the mainstay of treatment of acute ST-segment elevated Myocardial infarction (STEMI) patient, many of the center with Cath lab facilities are doing primary PCI. Our center, a tertiary care multidisciplinary hospital, doing primary PCI round the clock 24/7 days in a week.

Exact data, on procedural success, relationship to chest pain to presentation, door to balloon time, vessel or territory involvement with the mortality and morbidity not clearly known. Therefore, we have carried out the observation cohort study to see overall survival outcome of primary PCI in STEMI patients in our population.

Study Methods:

We conducted this prospective observational study, at our center, a tertiary care hospital opens round the clock 24/7 for primary PCI services for STEMI patient admitted from November 2017-Mar 2020. Patient were excluded if emergency cardiac surgery for STEMI related mechanical complications or patient on long peritoneal or hemodialysis or died during PCI or refused for primary PCI.

Definitions and Coronary Angiography- The diagnosis of acute myocardial infarction was based on clinical presentations, history of chest pain, increased cardiac biomarkers Troponin-I and 12-lead electrocardiogram findings.[5] Among these patients, the diagnosis of STEMI was made when their ECG shows acute ST elevation of at least 1 mm in two or more contiguous limb leads or 2 mm in precordial leads. The *pPCI* was defined when it is performed in patients within 12 hrs. of onset of STEMI. The culprit artery was determined with ECG changes with evidence of ST-elevation in the affected vascular territory, Echocardiographic wall motion abnormalities and angiographic findings by each operator. Complications like cardiogenic shock or need for IABP, need for emergent CABG, mechanical ventilation or heart failure episodes treated conservatively, clinically significant arrhythmia requiring pacemaker or major bleeding requiring blood transfusion and were excluded from study.

PCI procedures:

A team of 24 hour on call interventional cardiology performed primary PCI according to standard clinical practice by using standard 6F guide catheter, guide wires, balloon catheters via the Radial and femoral routes. Patient received 5000-unit bolus of heparin, followed by an additional 2000 units during the procedure. Coronary stenting was performed with standard technique, contrast dose left to individual operator discretion. Further, smoothening was done by post-dilatation whenever required. Successful PCI was defined as a visually assessed less than 20-30% residual stenosis with TIMI III distal flow. IVUS was not done. After the *pPCI,* patients were shifted to CCU. Patient were pre-loaded with either Ticagrelor or clopidogrel along with Aspirin and loading and maintenance doses of GPIIb/IIIa receptor blocker abciximab.

Laboratory parameters

Serum Troponin-I and baseline ECG was done at presentation to ER. Other, routine biochemical test were measured by standard analyzer at our center.

Follow up: Patient was recommended to follow-up in cardiac OPD with ECG, Echo and biochemical test at 3, 6, 9 and 12-months interval. Follow-up data among different variables not included in the current study. Those who were not able to come to hospital were followed up over telephonic questionary of their post PCI status. Financial

expenditure is also a major issue to follow-up at regular interval to index or primary physician.

Statistics: Data represented mean ± sd. and percentage distribution. Statistical analysis to justify the clinical significances of the parameters or variables were not done.

Results:

Total 182 patients with STEMI were enrolled in this prospective observational study. Table I. shows patient profile. Out of 182 patients, female :14 (7.7%) vs. Male: 168 (92.3%). Among, these patient females were more obese (BMI: Female 27.1 ± 2.1 vs. male 25.8 ± 4.1) and developed CAD in advance age (Female 59.1 ± 13.5 years vs. Male 53.7 ± 10.5 years). Presentation to ER from the onset of chest pain for female :123 min vs. male: 112 min and average door-to-balloon time were for female: 53 min vs. male: 50 min.

Table II. Shows Pre and Post PCI Serum Troponin I levels, LVEF (%) and contrast used. Cardiac troponin was at presentation (male 3.2 vs. female 1.9) and raised after PCI (male 23.4 vs. female 18.3). Base line Troponin I was higher and LVEF was lower (<40%) in anterior MI, indicating the big area involved in anterior MI than Inferior and Lateral MI. Serum Troponin I level at presentation were for Female: 1.9 vs. Male: 3.2 and post PCI trop-I were for Female: 18.3 vs. Male: 23.4. Serum creatinine level were not much changed after STEMI PCI and averaged used contrast was less than 90 ml. Table III- Shows average size of stent used in different types of STEMI. Average diameter of stents was less than 3.5mm indicating small size vessel in this part of world. Stents used in Inferior wall MI was 3.2 mm, Anterior MI 3.0 mm and Lateral MI 2.6 mm. Table IV- Shows blood sugar, HbA1C and lipid profile and were higher in the studied population. FBS, HbA1C and S. Cholesterol levels were high in the studied group, indicating these are the common contributory factor for STEMI. Medication noncompliance may be the one of the important contributing factors.

Table-I

Demographic Profile of the patients (N=182).

	Female	Male
Age (yrs.)	59.0 ± 13.5	53.7 ± 10.6
BMI (kg/m^2)	27.1 ± 2.1	25.8 ± 10.4
SBP (mmHg)	124.0 ± 17.8	121.0 ± 2.3
DBP (mmHg)	73.2 ± 9.0	75.6 ± 10.5
No. of CAD Risk Factor	3.0 ± 1.0	3.0 ± 1.0
Duration of chest pain (min)	123.6 ± 46.1	112.4 ± 43.8
Door-to-Balloon time(min)	53.8 ± 17.6	50.2 ± 16.2

Data were presented as Mean ± SD

Table-II

Pre - and Post- PCI Serum Trop-I levels, LVEF (%) and amount of contrast used.

	Ant MI (n=86)	Inf MI(n=93)	Lat MI(n=3)
S. Troponin-I level (Pre) ng/ml	3.9 ± 6.3	2.3 ± 4.5	2.2 ± 2.5
S. Troponin-I level (post) ng/ml	20.7 ± 1.5	25.1 ± 24.1	3.9 ± 1.5
LVEF (%) Pre PCI	40.7 ± 5.9	46.7 ± 5.4	43.3 ± 2.8
LVEF (post Primary PCI)	42.4 ± 5.6	46.7 ± 5.3	42.5 ± 3.5
S. Creatinine (pre) mg/dl	1.23 ± 0.4	1.22 ± 0.4	1.33 ± .2
S. Creatinine (post)mg/dl	1.4 ± 0.8	1.25 ± 0.4	1.1 ± .1
Contrast (ml)	87.38 ±15.6	86.2 ± 14.9	75 ± 13.2

Data were presented as Mean ± SD

Table-III

Average size of Stents used during primary PCI.

	Stent Diameter (mm)	Stent Length (mm)
Anterior STEMI	3.0 ± 0.4	29.8 ± 11.1
Inferior STEMI	3.2 ± 0.7	30.2 ± 11.4
Lateral MI	2.6 ± 0.3	23.6 ± 2.1

Data were presented as Mean ± SD

Table-IV

Average Biochemical parameters of the studied population.

	Ant MI	Inf MI	Lat MI
Blood Sugar (mmol/L)	9.4 ± 3.8	8.2 ± 2.2	10.6 ± 5.1
HbA1C %	8.2 ± 2.2	7.1 ± 1.6	8.6 ± 2.1
TC (mg/dl)	179 ± 63	172 ± 54	261 ± 93
TG (mg/dl)	174 ± 181	151 ± 75	457 ± 333
HDL (mg/dl)	35 ± 9.1	38 ± 27	44 ± 14
LDL (mg/dl)	113 ± 50	109 ± 51	142 ± 45
VLDL (mg/dl)	141.2 ± 61.9	137 ± 51.6	
Athero Index	5.5 ± 2.6	5.2 ± 1.7	7.2 ± 4.4

Data were presented as Mean ± SD

Fig. 1. Shows the percentage distribution of CAD risk factors. Fig 2. Shows the distribution of incidence of MI, Primary PCI MI and death. Chest pain to presentation; out of hours 5 pm to 9 am were 75.5% (n=132) and peak hour 9 am to 5 pm 27.5% (n=50). Fig 3. Shows the percentage Shock, Sepsis, CHB, Cardiac Arrest and staged PCI. At presentation 10.4% (n=19) patents were in cardiogenic shock with STEMI, 8 (42.1%) patients with anterior MI, 11 (57.9%) in inferior MI group. Total 14 patient died after primary PCI, 6 (4.4%) in inferior MI group on same day, 8 (5.8%) were in anterior MI group. Admission with sepsis in 4 (2.2%), cardiac arrest in 4 (2.2%) patients. Total, 15 (8.2%) patients died; 14 (93.3%) within one week of primary PCI due to shock and poor LV function and subsequent development of LVF with arrhythmia and 1 (6.7%) patient died 6 months after pPCI due to other cause. Fig 4. Shows percentage distribution of Types of MI on ECG evidence and angiographic vessel involvement. Territory wise involvement of vessel; in anterior MI: LAD 85 (8.87%), LM-LAD 1 (1.2%), inferior MI group: RCA 70 (75.3%), LCX 21 (22.6%), LAD 2 (2.1%), in lateral MI LCX 2 (66.7%), Diagonal 1 (33.3%). Fig 5. Shows number of vessels and stents used. Total 184 stents deployed in 184 territory; 2 patient has double stent in same territory. Fig. 6. Shows percentage distribution of types of MI, PCI, and staged PCI. According to the involvement of myocardium infarction, STEMI diagnosis of Anterior MI were 47.3% (n=86) and Inferior MI 51.1% (n=93) and Lateral MI 1.6% (3). Among the Inf MI group: only Inferior MI 77%(n=72), Inferior-Post-lateral MI 20.4% (n=19), Inferior MI with RV infarction 2.2%(n=2). Fig. 7 shows the [percentage distribution of stented vessel territory. Fig. 8 shows the percentage distribution of different stents used. Among the common uses stent: Everolimus 53.8%(n=99), Sirolimus 22.3% (n=41), Zotarolimus 19.3%(n=35), Sirolimus with EPC 4.9% (9).

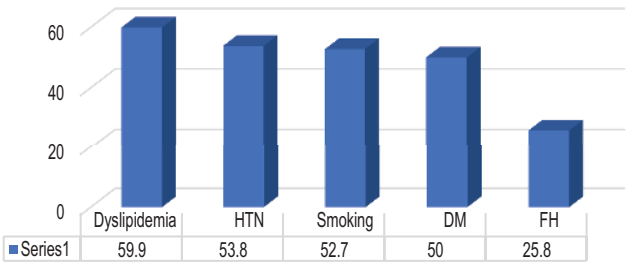

Fig.-1: *Percentage distribution of CAD risk factors.*

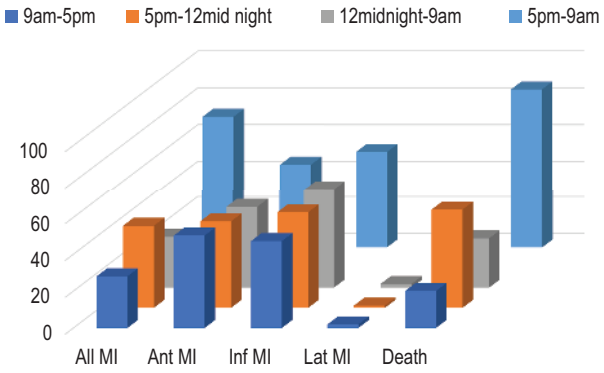

Fig.-2: *Percentage distribution of inidence of MI, Primary PCI and death in different time.*

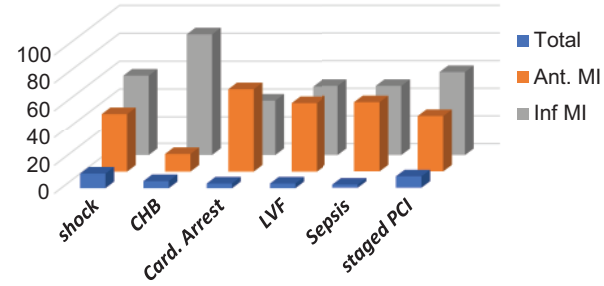

Fig.-3: *Percentage distribution of Shock, Sepsis, CHB, Cardiac Arrest and staged PCI.*

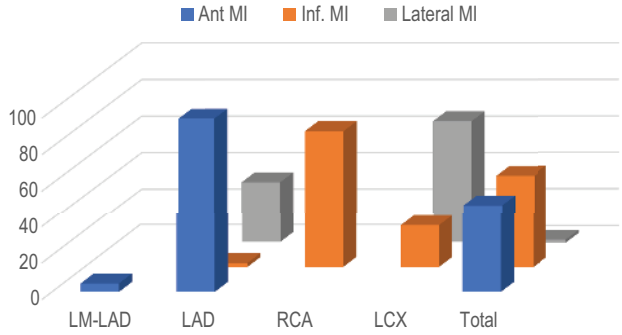

Fig.-4: *Percentage distribution Types of MI on ECG evidence and angiographic vessel involvement.*

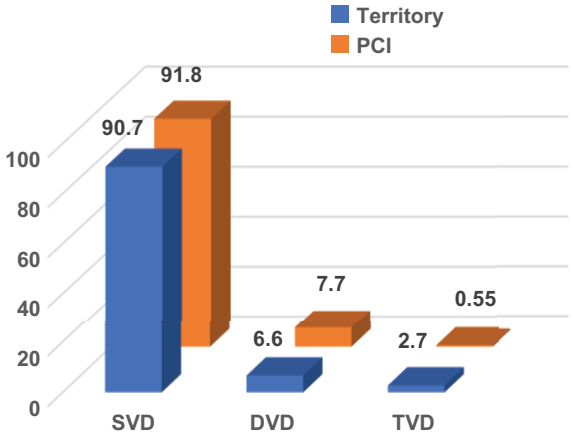

Fig.-5: *Percentage distribution of number of vessels involved and stents deployed*

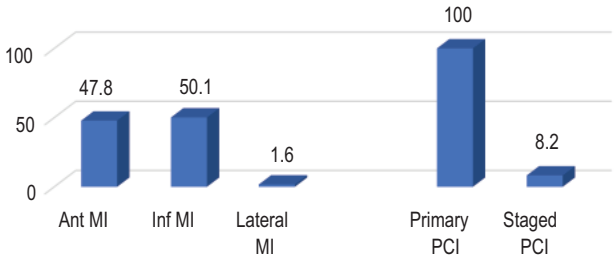

Fig.-6: *Percentage distribution of MI, primary PCI and Staged PCI*

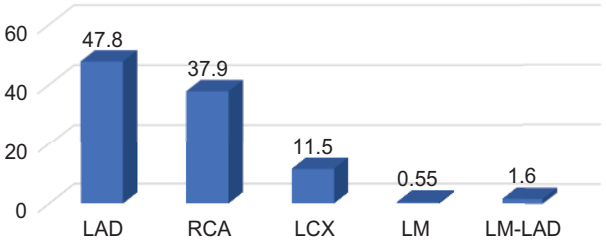

Fig.-7: *Vessel Territory wise percentage distribution of stents used*

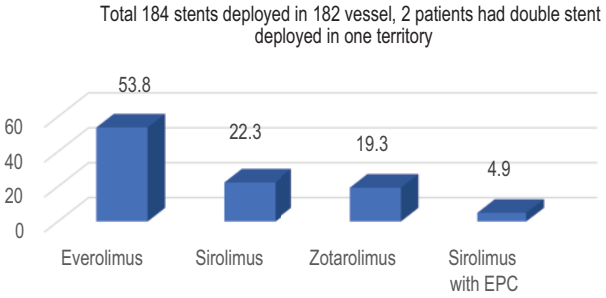

Fig.-8: *Percentage distribution of different stents used*

Discussion:

Achieving rapid reperfusion is an essential step in the management of ST-segment Elevated MI. Although primary PCI is the preferred option, specially were Cath lab facilities available. Alternately, fibrinolysis as a part of Pharmacoinvasive approach followed by rapid CAG with PCI when necessary offer a reasonable alternative, when primary PCI impossible.

In our present study, we found that inferior wall STEMI was more 51.1% (n=93), followed by Anterior wall STEMI 47.3%(n=86) and Lateral wall STEMI 1.6%(n=3). Single vessel disease and single vessel *pPCI* is the commonest in this present study. LAD (47.8%) is the most common stented vessel of STEMI PCI followed by RCA (37.9%) and LCX, (11.5%) whereas LM (0.55%) and LM-LAD

(1.6%). Among the different drug eluting stent (DES) used, Everolimus (53.8%), Sirolimus (22.3%), Zotarolimus (19.3%0 and Sirolimus with EPC coating (4.9%). We found that in STEMI patient with Anterior wall MI, has greater release of Troponin-I level both pre- and post-PCI, along with low LV Ejection fraction indicated greater myocardial damage than Inferior wall and Lateral wall MI. In addition, poorly controlled Diabetes Mellitus as indicated by higher HbA1C and higher lipid levels in Anterior STEMI patients with high atherogenic Index, indicated that DM and Dyslipidemia plays key role in the development of MI in our population.

Early and complete (TIMI grade 3 flow) infarct-related artery (IRA) patency and prompt myocardial salvage are of paramount importance to improve the clinical outcomes of STEMI patient.[11] According to current guidelines primary PCI for restoring epicardial coronary blood flow to the IRA is the mainstay of therapy for STEMI patients.[5] As demonstrated previously, compared with TIMI grade 0-2 flow, patients with spontaneous reperfusion (SR) have smaller infarct size better preserved Left ventricular function and more favorable prognosis after successful pPCI.[12] Major threat to SR patients without primary PCI is reocclusion as persistent residual stenosis might be the sources of plaque rupture or thrombosis.

Many factors might contribute to success of STEMI percutaneous coronary intervention. Chest pain to door time, door to balloon, type stent used, different comorbidities are important and key determinant of stent patency and the risk of stent thrombosis. LV dysfunction, long term diabetes, renal impairment and the amount of contrast used all has impact on procedural success and survival outcome.

Chest pain to presentation in ED is an important predictor of survival outcome. In our present study we found that average time to presentation was less than 120 min from the onset of chest pain. As we found 72.5% patient were admitted in off pick hour, when city traffic was not that much, many are admitted after 5 pm to 9 am next day. Only, 27.5% (50) patients of the studied population admitted in pick hour (9 am to 5 pm). Door to balloon time is an important clinical determinant of better reperfusion and preserve large myocardium from damage after infarction. Symptom onset or "chest pain to Emergency Department presentation" and "door to balloon time" may be an important determinant of successful PCI in STEMI patient. In our study, average time of symptom onset to presentation was 113 min and door to balloon time was 50 min. Since approximately, 72.5 % patient admitted in off pick hour and primary PCI team move quickly to attend the patient. Door to balloon time is dependent on several variables, such as time to obtain access, time to engage the coronary artery and time to place the balloon at lesion.

McNamara et al.[19] has demonstrated that time to primary PCI with longer door to balloon time was associated with increased in-hospital mortality in STEMI patients. Efforts has been given to reduce door to balloon time for all STEMI patients undergoing primary PCI. The use of single universal diagnostic catheter (Terumo Tiger) for initial angiography lessens at least one catheter exchange and hence decreases the diagnostic procedure time. Symptom onset to door time also needs to consider for successful PCI, especially our city in Dhaka, huge traffic congestion is a big drawback in reducing symptom onset to door time. Also, especially for female patient, most are not working and depends on family decision. So, this may also increase or delay to hospital admission from the onset of chest pain. Our overall socio-economic and financial status may be an important key determinant for many of the patient not to avail the Pharmacoinvasive or primary PCI, rather conservative management.

In our present study no major or acute life threatening periprocedural bleeding or post procedural hematoma noted. Although, some of the author documented periprocedural bleeding are common and occur in up to 5% of cases performed in patients with acute coronary syndrome[13] and an important risk factor for better in-hospital outcome after successful STEMI PCI, including 30-day mortality, re-infarction and stroke.[14] Patient with STEMI undergoing primary PCI are at highest risk for the development of access site bleeding complications.[15] A significant proportion of bleeding is related to the access suite and trans-radial approach has been shown to reduce access site bleeding complications.[16] Now a days,

trans radial PCI is frequently being used by interventionist.[17] Despite the safety advantages, during the learning curve the procedure duration using trans radial PCI is longer than transfemoral in STEMI. Primary PCI by using radial approach provides similar door to balloon times to femoral approach and lower access site complications.[18] In our present study, only a few numbers of cases have done by using Radial approach, major bleeding was not noted through femoral route of intervention.

PCI of LM stem in STEMI is really challenging for interventionist, as this group of patients represents with higher rate of cardiogenic shock. It has reported that concurrent LM and non-LM PCI has worse outcome than isolated LM PCI in STEMI setting. [20] We have only 3 patients presented with anterior STEMI with shock and has angiographic LM-LAD disease. Two patients died and one survived after PCI. Published data on critical LM lesions in STEMI, has increasingly been managed invasively, more often with PCI than CABG.[21]

Many of the acute STEMI patient has angiographic multivessel disease. PCI of STEMI Patient presenting with angiographic multivessel disease is challenging to interventionist as many of the patient landed into Cath lab in out of hours, when emergent full supporting staffs not available and some of the lesions are complex and carries a lot of procedural risk. Doing PCI of infarct related artery (IRA) along with non-culprit vessel in same sitting is debatable. Guidelines has changed several times. Sometimes, recommending doing non-IRA in same sitting and some are recommending the IRA only and staged for non-IRA in later sittings. It is estimated that 40-65% of the patients presenting with STEMI have multivessel disease (MVD), which has been associated with worse clinical outcomes as compared to single vessel disease.[22,23] With the advent of technical improvement in the coronary intervention, evolution of noble drug eluting stents, DAPT, intravascular imaging, FFR, OCT and active discussion regarding the safety of multivessel PCI have been undertaken into consideration to do in same sitting when indicated. In the analysis of HORIZON-AMI trial, recommended a deferred angioplasty strategy of nonculprit lesions should remain the standard approach in STEMI patients undergoing primary PCI, as multivessel PCI may be associated with a greater hazard for mortality and stent thrombosis.[24]

In our present study, 8.2% (n=15) patient had staged PCI for non-infarct related artery in later sitting.

STEMI with shock is really a life-threatening condition and complex interventional procedure which needs individual's expertise to deal with. In our present study 10.4% (n=19) patient, more in inferior wall MI vs. anterior wall MI (n=11 vs n-8) admitted with STEMI and Shock. In nonshock STEMI trial, ACC/AHA and European Society of Cardiology guidelines support primary PCI of infarct related artery, with PCI of non-culprit vessel in a later date.[25,26] In 2013 American College of Cardiology Foundation/ American Heart Association (ACC/AHA) guidelines for the patient with ST-segment elevation MI give a class IIIB recommendation (harm) for PCI of a non-culprit artery at the time of primary PCI in same sitting.[5] The 2014 European Society of Cardiology (ESC/ EACTS) guidelines,[27] however, give class IIb recommendation for immediate revascularization of nonculprit artery in select patient. Later, Bangalore S et al.,[28] demonstrated that in STEMI patients, immediate or staged complete revascularization results in significant reduction in major adverse cardiovascular events driven largely by reduction in repeat revascularization with no firm evidence for the reduction in death or myocardial infarction when compared with culprit only revascularization. In recent published article in JAMA, that multivessel PCI in STEMI patient, has worst outcome and suggest harm with this strategy. [29]

As we know both acute and sub-acute stent thrombosis are key determinant of long-term survival outcome of STEMI patient undergoing PCI. Type of stent is one of the key factors,[30] as drug eluting stents have been shown to significantly reduce the rate of restenosis and target lesion revascularization.[31] Concerns has raised about the long-term safety of DES in treating STEMI patient. The use of new generation DES in STEMI patients undergoing primary PCI is safe in short and long term follow up, with a lower risk of early/ late stent thrombosis.[32] Among the studied patient, re-look CAG done in 4.9%(n=9) patients, stent patent

in 77.8% (n=7) patients. Total 1.1% (n=2) had CABG done after three months of Primary PCI due to restenosis.

As we knew, platelet activation is increased in STEMI patient.[33] Moreover, a delay in arterial healing has been recognized at the culprit site in STEMI patient compared with patient treated for stable angina.[34] PCI in STEMI patient is therefore associated with a higher risk of stent thrombosis.[35]

In our present study, 15 (8.2%) patients died, 14 within one week and one after six months. Shock is one of the important contributory factors in death and associated in anterior MI in 9 (60%) and inferior MI 6 (40%). Death among patient undergoing primary PCI is not an uncommon phenomenon. Literature published mortality >7% at 1 year in STEMI patient. In the first 7 days relatively high risk of death about 3.4% mainly due to cardiogenic shock, cerebral anoxia after cardiac arrest and malignant arrhythmias.[36] We found Complete Heart block is mostly associated in Inferior MI, one patient died in CHB group associated with Shock. Patient who survived the acute phase of STEMI treated with primary PCI have an excellent late cardiac prognosis.[37]

Limitations of the study: This is an observational prospective cohort study only. Data were analyzed as mean ± sd. and percentage distribution of different variables. Among the different variables, no comparative statistical analysis was done.

Conclusion:

In this prospective observational cohort study, we found that PCI is a good and effective treatment modality in treating STEMI patient with better myocardial salvage and avoidance of life-threatening complications. Our procedural success rate is 91.8% and patients are doing well with regular follow up at our OPD 12-months after primary PCI.

Future perspective:

Acute ST-Segment elevation Myocardial Infarction (STEMI) is a life-threatening emergency, needs early intervention either by pharmacotherapy by fibrinolysis and shift to Cath lab facility for rescue or elective PCI or primary PCI in a center with Cath lab facilities. Thus, to offer better myocardial salvage and avoid life threatening arrhythmia or failure. In Bangladesh, many centers Cath lab facilities available and doing primary PCI in STEMI patient. We do not have national data on how many STEMI patient underwent coronary angiography and how many has primary PCI done. We need to form a common authority regarding STEMI management and set a common protocol with database. So, we all can work together with better integrity for the patient to alleviate symptoms and complication and thus to reduce the mortality and improve morbidity.

Conflict of Interest - None.

References:

1. Fox K. Management of acute coronary syndromes. Variations in practice and outcome. Findings from the Global Registry of Acute Coronary Events (GRACE). *Eur Heart J*. 2002;23(15):1177-1189. doi:10.1053/euhj.2001.3081
2. Canto J. The Association of Sex and Payer Status on Management and Subsequent Survival in Acute Myocardial Infarction. *Arch Intern Med*. 2002;162(5):587. doi:10.1001/archinte.162.5.587
3. Xavier D, Pais P, Devereaux P et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. *The Lancet*. 2008;371(9622):1435-1442. doi:10.1016/s0140-6736(08)60623-6
4. Mohanan P, Mathew R, Harikrishnan S et al. Presentation, management, and outcomes of 25 748 acute coronary syndrome admissions in Kerala, India: results from the Kerala ACS Registry. *Eur Heart J*. 2012;34(2):121-129. doi:10.1093/eurheartj/ehs219
5. O'Gara P, Kushner F, Ascheim D et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. *J Am Coll Cardiol*. 2013;61(4):e78-e140. doi:10.1016/j.jacc.2012.11.019
6. Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC), Steg PG, James SK, et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J*. 2012;33(20):2569-2619. doi:10.1093/eurheartj/ehs215
7. Rentrop K, Blanke H, Karsch K et al. Acute myocardial infarction: Intracoronary application of nitroglycerin and streptokinase. *Clin Cardiol*. 1979;2(5):354-363. doi:10.1002/clc.4960020507
8. Selection of reperfusion therapy for individual patients with evolving myocardial infarction. *Eur Heart J*. 1997; 18(9):1371-1381. doi:10.1093/oxfordjournals. eurheartj. a015461

9. Simoons ML, Vos J, Tijssen JG et al. Long-term benefit of early thrombolytic therapy in patients with acute myocardial infarction: 5 year follow-up of a trial conducted by the Interuniversity Cardiology Institute of The Netherlands. *J Am Coll Cardiol*. 1989;14(7):1609-1615. doi:10.1016/0735-1097(89)90003-x

10. Ibanez B, James S, Agewall S et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the task force for the management of acute myocardial in patients presenting ST segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018; 39(2): 119-177. doi.org/10.1093/eurheartj/ehx393

11. Zeymer U, Huber K, Fu Y, et al. Impact of TIMI 3 patency before primary percutaneous coronary intervention for ST-elevation myocardial infarction on clinical outcome: results from the ASSENT-4 PCI study. *Eur Heart J Acute Cardiovasc Care*. 2012;1(2):136-142. doi:10.1177/2048872612447069

12. Christian TF, Milavetz JJ, Miller TD, Clements IP, Holmes DR, Gibbons RJ. Prevalence of spontaneous reperfusion and associated myocardial salvage in patients with acute myocardial infarction. *Am Heart J*. 1998;135(3):421-427. doi:10.1016/s0002-8703(98)70317-5

13. Moscucci M, Fox KA, Cannon CP, et al. Predictors of major bleeding in acute coronary syndromes: the Global Registry of Acute Coronary Events (GRACE). *Eur Heart J*. 2003;24(20):1815-1823. doi:10.1016/s0195-668x(03)00485-8

14. Rao SV, Eikelboom JA, Granger CB, Harrington RA, Califf RM, Bassand JP. Bleeding and blood transfusion issues in patients with non-ST-segment elevation acute coronary syndromes. *Eur Heart J*. 2007;28(10):1193-1204. doi:10.1093/eurheartj/ehm019

15. Rao SV, Ou FS, Wang TY, et al. Trends in the prevalence and outcomes of radial and femoral approaches to percutaneous coronary intervention: a report from the National Cardiovascular Data Registry. *JACC Cardiovasc Interv*. 2008;1(4):379-386. doi:10.1016/j.jcin.2008.05.007

16. Verheugt FW, Steinhubl SR, Hamon M, et al. Incidence, prognostic impact, and influence of antithrombotic therapy on access and nonaccess site bleeding in percutaneous coronary intervention. *JACC Cardiovasc Interv*. 2011;4(2):191-197. doi:10.1016/j.jcin.2010.10.011

17. De Carlo M, Borelli G, Gistri R, et al. Effectiveness of the transradial approach to reduce bleedings in patients undergoing urgent coronary angioplasty with GPIIb/IIIa inhibitors for acute coronary syndromes. *Catheter Cardiovasc Interv*. 2009;74(3):408-415. doi:10.1002/ccd.22008

18. Pancholy S, Patel T, Sanghvi K, Thomas M, Patel T. Comparison of door-to-balloon times for primary PCI using transradial versus transfemoral approach. *Catheter Cardiovasc Interv*. 2010;75(7):991-995. doi:10.1002/ccd.22425

19. McNamara R, Wang Y, Herrin J et al. Effect of Door-to-Balloon Time on Mortality in Patients With ST-Segment Elevation Myocardial Infarction. *J Am Coll Cardiol*. 2006;47(11):2180-2186. doi:10.1016/j.jacc.2005.12.072

20. Pedrazzini G, Radovanovic D, Vassalli G et al. Primary Percutaneous Coronary Intervention for Unprotected Left Main Disease in Patients With Acute ST-Segment Elevation Myocardial Infarction. *JACC: Cardiovascular Interventions*. 2011; 4(6): 627-633. doi:10.1016/j.jcin.2011.04.004

21. Corti R, Toggweiler S. PCI in acute left main disease: a paradigm shift or a new reality?. *Eur Heart J*. 2009;30(19):2295-2296. doi:10.1093/eurheartj/ehp354

22. Sorajja P, Gersh B, Cox D et al. Impact of multivessel disease on reperfusion success and clinical outcomes in patients undergoing primary percutaneous coronary intervention for acute myocardial infarction. *Eur Heart J*. 2007;28(14):1709-1716. doi:10.1093/eurheartj/ehm184

23. Muller D, Topol E, Ellis S, Sigmon K, Lee K, Califf R. Multivessel coronary artery disease: A key predictor of short-term prognosis after reperfusion therapy for acute myocardial infarction. *Am Heart J*. 1991;121(4):1042-1049. doi:10.1016/0002-8703(91)90661-z

24. Kornowski R, Mehran R, Dangas G et al. Prognostic impact of staged versus "one-time" multivessel pci in acute st-segment elevation myocardial infarction: long-term analysis from the HORIZONS-AMI trial. *J Am Coll Cardiol*. 2011; 57(14):E1653. doi:10.1016/s0735-1097(11)61653-7

25. Kushner F, Hand M, Smith S et al. 2009 Focused Updates: ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (Updating the 2004 Guideline and 2007 Focused Update) and ACC/AHA/SCAI Guidelines on Percutaneous Coronary Intervention (Updating the 2005 Guideline and 2007 Focused Update). *J Am Coll Cardiol*. 2009;54(23):2205-2241. doi:10.1016/j.jacc.2009.10.015

26. Van de Werf F, Bax J, Betriu A et al. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation: the Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction of the European Society of Cardiology. *Eur Heart J*. 2008; 29(23):2909-2945. doi:10.1093/eurheartj/ehn416

27. Windecker S, Kolh P, Alfonso F et al. 2014 ESC/EACTS Guidelines on myocardial revascularization. *EuroIntervention*. 2015; 10(9):1024-1094. doi:10.4244/eijy14m09_01

28. Bangalore S, Toklu B, Wetterslev J et al. Complete versus culprit-only revascularization for St-segment elevation myocardial infarction and multivessel disease. *Circ Cardiovasc Interv* 2005; e02142. Doi:10.1161/CIRcInterv 114.002142

29. Khera R, Secemsky EA, Wang Y et al. revascularization Practices and Outcomes in Patients with Multivessel

Coronary Artery Disease Who Presented with Acute Myocardial Infarction and Cardiogenic Shock in the US, 2009-2018; *JAMA Intern Med*. Published online August 24, 2020. doi:10.1001/jamainternmed.2020.3276

30. Daemen J, Tanimoto S, García-García H et al. Comparison of Three-Year Clinical Outcome of Sirolimus- and Paclitaxel-Eluting Stents Versus Bare Metal Stents in Patients With ST-Segment Elevation Myocardial Infarction (from the RESEARCH and T-SEARCH Registries). *Am J Cardiol*. 2007;99(8):1027-1032. doi:10.1016/j.amjcard.2006.11.070

31. Morice M, Serruys P, Sousa J et al. A Randomized Comparison of a Sirolimus-Eluting Stent with a Standard Stent for Coronary Revascularization. *New England Journal of Medicine*. 2002;346(23):1773-1780. doi:10.1056/nejmoa012843

32. Sarno G, Lagerqvist B, Nilsson J et al. Stent Thrombosis in New-Generation Drug-Eluting Stents in Patients With STEMI Undergoing Primary PCI. *J Am Coll Cardiol*. 2014;64(1):16-24. doi:10.1016/j.jacc.2014.04.022

33. Campo G, Valgimigli M, Gemmati D et al. Value of Platelet Reactivity in Predicting Response to Treatment and Clinical Outcome in Patients Undergoing Primary Coronary Intervention. *J Am Coll Cardiol*. 2006;48(11):2178-2185. doi:10.1016/j.jacc.2005.12.085

34. Nakazawa G, Finn A, Joner M et al. Delayed Arterial Healing and Increased Late Stent Thrombosis at Culprit Sites After Drug-Eluting Stent Placement for Acute Myocardial Infarction Patients. *Circulation*. 2008; 118(11):1138-1145. doi:10.1161/circulationaha. 107. 762047

35. Luscher T, Steffel J, Eberli F et al. Drug-Eluting Stent and Coronary Thrombosis. *Circulation*. 2007; 115(8): 1051-1058. doi:10.1161/circulationaha.106.675934

36. Doost Hosseiny A, Moloi S, Chandrasekhar J, Farshid A. Mortality pattern and cause of death in a long-term follow-up of patients with STEMI treated with primary PCI. *Open Heart*. 2016; 3(1):e000405. doi:10.1136/openhrt-2016-000405

37. Nielsen P, Maeng M, Busk M et al. Primary Angioplasty Versus Fibrinolysis in Acute Myocardial Infarction. *Circulation*. 2010;121(13):1484-1491. doi:10.1161/circulationaha.109.873224