Original article

Gender Influence on In-hospital Outcomes of Primary Percutaneous Coronary Intervention

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Abstract:

Background: Acute myocardial infarction (AMI) is one of the leading cause death and disability all over the world. But, there is a lack of data about the gender influence on in-hospital outcomes of primary percutaneous coronary intervention (pPCI) among Bangladeshi patients. This study was aimed to evaluate the clinical and angiographic differences and to compare their in hospital outcomes of pPCI between male and female patients.

Objective: To evaluate the gender influence on in-hospital outcome of primary PCI.

***Methods*: This was a prospective observational study of 90 patients with ST elevation myocardial infarction (STEMI) treated with pPCI in the Department of Cardiology, NICVD, Dhaka, Bangladesh from April 2019 to March 2020, followed from admission until hospital discharge or death. The patients were divided equally into two groups, group '! (female) and group a! (male).**

Result : A significant difference was observed for age (61.8±10.9vs.56.5±10.7 years; p=0.02), hypertension (66.7% vs. 42.2%; p=0.02), diabetes (68.9% vs. 44.4%; p=0.01), smoking (0.0% vs. 68.9%; p<0.001), obesity (BMI- 28.3±3.8 vs. 26.5±3.9; p=0.02), troponin I (14.89±20.48 vs. 8.25±7.92; p=0.04) and pain-to-door time (281.90±88.70 vs. 240.33±80.81 minutes; p=0.04). Female had angiographically greater frequency of multivessel disease and similar distribution of infarct related artery in relation to male. The success of the procedure was similar (91.1% vs. 97.8%; p=0.18). Overall, female experienced greater incidence of in-hospital adverse events in comparison to male (28.8% vs. 13.3%; p=0.03) and significantly higher rates of severe bleeding (11.1% vs.2.2%; p=0.03) and vascular access site complications (15.6% vs. 4.4%; p=0.04). Major adverse cardiac events (MACE) were higher among females in comparison to males (11.1% vs. 6.7%; p=0.45). Females experienced significantly higher rates of short-term net adverse clinical events (NACE) than males (20.0% vs. 8.8%; p=0.04). Female sex [odds ratio (OR) 1.94], age e"60 years (OR 1.59) and diabetes (OR 2.75) were identified as independent predictors of adverse in-hospital outcomes among STEMI patients undergoing pPCI.

Conclusion: Female sex presented with significantly more risk factors and experienced more in-hospital adverse outcomes than male in STEMI patients undergoing pPCI. They had significantly higher rates of NACE, largely driven by increased rate of major bleeding. Female sex was an independent predictor for the development of in-hospital adverse outcomes in STEMI patients undergoing pPCI.

Keywords : *Primary percutaneous coronary intervention, Gender influence, In-hospital outcome.*

(Bangladesh Heart Journal 2022; 37(1): 40-51)

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DOI: https://doi.org/10.3329/bhj.v37i1.60103

Introduction:

Cardiovascular diseases (CVD) are the leading cause of disease burden and deaths globally with the 2013. Global Burden of Disease (GBD) study estimating that CVD caused 17.3 million deaths globally each year[1].

Coronary artery disease (CAD) is an increasingly important medical and public health problem and is the leading cause of mortality in Bangladesh. Like other South Asians, Bangladeshis are unduly prone to develop CAD which is often premature in onset, follows a rapidly progressive course and angiographically more severe. The exact prevalence of CAD in Bangladesh is not known. Only a limited number of small-scale epidemiological studies are available. One recent review has estimated the prevalence of CAD in Bangladesh to be 4-6%. [2]

Estimates from the global burden of disease study suggests that by the year 2020 the South Asian part of the world (India, Pakistan, Bangladesh, Nepal) will have more individuals with atherosclerotic cardiovascular diseases than any other region[3]. It now accounted for 14.76% of all deaths[4].

IHD may be manifested clinically as either chronic stable angina or an acute coronary syndrome (ACS). ACS can be subdivided into ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI) and unstable angina (UA) [5].

Despite a significant decrease in mortality associated with cardiovascular disease in developed countries over the last decade acute myocardial infarction (AMI) continues to be a major cause of morbidity and mortality[6,7]. It generally occurs due to sudden occlusion of a coronary artery by formation of thrombus at the site of fissured or ruptured atherosclerotic plaque [8]. The major aspect of treatment of ST-elevation Myocardial Infarction (STEMI) is reperfusion of the infarct related artery.

Fibrinolysis and primary PCI are the two options of reperfusion for the patient presenting with STEMI. There is strong evidence from randomized clinical trials that primary percutaneous coronary intervention (pPCI) is associated with lower mortality, as well as lower rates of recurrent AMI and intracranial bleeding, when compared to fibrinolytic therapy[9]. When pPCI is feasible, it is recommended for all patients with acute ST-elevation myocardial infarction (STEMI) who can undergo the procedure within 120 minutes of the first medical contact, performed by qualified professionals, provided that symptoms started within the last 12 hours.

Outcomes after primary PCI are variable and accurate risk stratification is the clinical importance in guiding the management of relatively high risk patient. Prasad et al.[10] found that the older age act as a predictor of major adverse cardiac events (MACE) after primary PCI for myocardial infarction. Patients with diabetes who receive primary PCI for STEMI are also at higher risk of mortality especially during hospitalization and the first year following the procedure[11]. In patients with myocardial infarction, high lipoprotein (a) levels have been found to be associated with adverse long-term result[12]. Shorter interval between the onset of myocardial infarction symptoms and primary PCI will lead to better result. The most favorable interval has been determined as 120 minutes[13].

Several studies have identified different characteristics of STEMI in men and women. Higher mortality is often observed in women, in addition to adverse clinical characteristics at a higher frequency than in men, such as older age, higher prevalence of cardiovascular risk factors, and more severe clinical presentation[14,15]. Moreover, longer delay in the care of women with STEMI has been reported, which could influence results, including patients undergoing pPCI[14] . After pPCI higher in-hospital mortality was observed among the female patients which was 23.5%, where in-hospital mortality among the male patients was 8.9%[16].

This study was aimed to evaluate the clinical and angiographic difference and to compare the in-hospital outcomes of pPCI between male and female patient and to obtain the independent predictors of in-hospital adverse outcomes.

Method:

This Prospective observational study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, April 2019 to March 2020 over a period of one year. Patients with STEMI coming within 12 hours of symptom onset and undergoing primary percutaneous coronary intervention (pPCI) during the time period at NICVD, were selected as study population. Patients with STEMI presenting after 12 hours of symptom onset or received fibrinolytic therapy or with old MI, LBBB, valvular heart disease, cardiomyopathy or having history of prior PCI or CABG or with any severe co-morbidities (eg. Renal disease, previous stroke, COPD, anaemia, malignancy, bleeding disorder) or with a life expectancy of less than one year were excluded from this study. A total of 90 patients with STEMI , based on inclusion and exclusion criteria, who underwent pPCI in NICVD were selected as study population. Study subjects were divided on the basis of

sex difference into two groups(Group I – Female sex and Group II – Male sex).

Informed written consent was taken from each patient before enrolment. ST elevated myocardial infarction was defined according to O'Gara et al[17].

Meticulous history and detailed clinical examination were carried out and recorded in patient's data collection sheet. Demographic data, such as, age, sex, BMI were noted. Troponin I, random blood sugar and serum creatinine were recorded. 12 lead resting ECG was done. Risks factors like, hypertension, diabetes mellitus, smoking status, dyslipidemia, family history of coronary artery disease were recorded. Complications after pPCI, like, bleeding, vascular access site complications, significant arrhythmia, cardiogenic shock, acute heart failure, cardiovascular death, post-procedural angina, length of hospital stay were also recorded.

All the patient underwent primary PCI in transfemoral access were prescribed and provided with guideline directed medication for acute myocardial infarction (e.g-aspirin, P2Y12 inhibitor, statin, opioid analgesic etc). Intervention was performed in infarct related artery and number of vessel involvement were also recorded. After completion of pPCI, post PCI follow up was given and ECG was done immediately after primary PCI. These patients were kept in coronary care unit under close observation with continuous ECG monitoring. Patients were followed up after 2 hours and 24 hours post PCI and every day thereafter until discharge. Any adverse in-hospital outcome was noted in these patients and managed adequately. 12 lead ECG, echocardiography, troponin I, CBC, Duplex study of vessels, CT scan of brain has been done in selected patients. In the event of any arrhythmia the attending nurses were instructed to keep a 12 lead ECG record and inform the attending physician. All the parameters were recorded in data collection sheet. Patients were monitored until discharge from hospital.

The data obtained from the study were analyzed and significance of differences was estimated by using statistical methods. Continuous variables was expressed as mean value ± standard deviation and compared using unpaired student's t-test or chi-squared test. Categorical variables were presented as frequency and percentages and analyzed using Pearson's chi-square test or Fisher's exact test, as appropriate. Logistic regression analysis was performed to adjust for the potential confounders in predicting the relation between gender difference and short-term outcome of primary PCI. Univariate logistic regression analysis was performed to specify the odds ratio (OR) for overall adverse in hospital outcomes. Multivariate logistic regression analysis was performed to determine the independent predictors of adverse in-hospital outcome. Variables yielding p values <0.05 in univariate analysis was selected for multivariable model. Statistical significance has assumed if p 0.<05 throughout the study. Statistical analysis was carried out by using SPSS software version 16.0.

The study protocol was approved by the Ethical Review Committee of NICVD. Informed consent was taken from each patient or near relatives. Confidentiality was maintained strictly and the patient had the right to withdraw himself/herself from the study at any time during the study period. Data was collected in an approved data collection form.

Results And Observations:

In this study, a total of 90 patients of STEMI were selected as study population and 45 patients were considered as group I (female sex) and 45 patients were considered as group II (male sex). The main objective of the study was to evaluate the gender influence on in-hospital outcomes of primary percutaneous coronary intervention.

Table-I

Comparison of the study patients according to age (N=90)

Age in years	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
≤49	8	17.8	10	22.2	18	20.0	
50 – 59	10	22.2	12	26.7	22	24.4	
60 – 69	19	42.2	13	28.9	32	35.6	
≥70	8	17.8	10	22.2	18	20.0	
Mean ± SD	61.8±10.9		56.5±10.7		59.2±11.1		0.02[s]
Range (min – max)	(40 – 80)		(38 – 73)		(38 – 80)		

Group I = Female patients with acute STEMI, Group II= Male patients with acute STEMI
s = Significant (p<0.05), P value reached from unpaired t-test

Here, the most of the study patients were in 60 - 69 years of age in group I (42.2%) and group II (28.9%) respectively followed by 50-59 years of age in group I (22.2%) and (26.7%) in group II respectively. The mean age was found 61.8±10.9years in Group I and 56.5±10.7years in Group II which was significantly (p=0.02) higher in group I in unpaired t-test. The mean age of the total study patients was 59.2±11.1 years.

Here, hypertension and diabetes mellitus were significantly higher in group I (p = 0.02 and 0.01 respectively) , whereas smoking was significantly higher in group II (p value <0.001). Other variables not reached significant difference between two group.

Here, clinical parameters between two groups of study population shows no significant differences. It indicates two group of study subjects were nearly homogenous.

Table-II

Distribution of patients according to risk factors (N=90)

Risk factors	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Smoking	0	0.0	31	68.9	31	34.4	<0.001^{s}
Smokeless tobacco	4	8.9	3	6.7	7	7.8	0.69^{ns}
Hypertension	30	66.7	19	42.2	49	54.4	0.02^{s}
Diabetes mellitus	31	68.9	20	44.4‘	51	56.7	0.01^{s}
Dyslipidaemia	28	62.2	24	53.3	52	57.8	0.39^{ns}
Family history of CAD	17	37.8	18	40.0	35	38.9	0.82^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value reached from Pearson’s chi square test and Fisher’s exact test (for cell frequency <5).

Table-III

Distribution of study patients by body mass index (BMI) (N=90)

BMI (kg/m^2)	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Normal (18.5-24.9)	10	22.2	19	42.2	29	32.2	
Overweight (25-29.9)	21	46.7	17	37.8	38	42.2	
Obese (30-39.9)	14	31.1	9	20.0	23	25.6	
Mean ± SD	28.3±3.8		26.5±3.9		27.4±3.9		0.02^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
s = Significant (p<0.05)
P value reached from unpaired t-test

The mean BMI of group I and group II were 28.3±3.8 vs. 26.5±3.9 kg/m^2 and the difference of mean BMI between the groups was statistically significant (p=0.02).

Table-IV

Comparison clinical parameters between two groups (N=90)

Clinical statistics	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Heart Rate /min	79.8±13.9	82.4±15.0	81.1±14.4	0.40^{ns}
Systolic Blood pressure (mmHg)	126.4±18.7	123.3±15.4	122.9±16.5	0.21^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05)
P value reached from unpaired t-test

Table-V

Biochemical status of the study patients (N=90)

Biochemical statistics	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Plasma glucose mmol/L	10.4±3.1	8.2±2.8	9.3±2.9	0.34^{ns}
Creatinine mg/dl	1.09±0.34	1.13±0.32	1.11±0.33	0.65^{ns}
Troponin I ng/ml	14.89±20.48	8.25±7.92	11.57±15.76	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value was reached from unpaired t-test

The mean plasma glucose and troponin I level were higher in group I, whereas the mean creatinine level was higher in group II, but only the mean troponin I level reached significantly higher in group I patients compared to group II patients (14.89±20.48 vs. 8.25±7.92) with significant difference (p=0.04).

Among the study patients, 80% patients were found heart failure in the class I, 11.1% patients were in class II and 4.4% patients were in both of class III and IV. In terms of Killip-Kimball classification of heart failure, there was no significant difference between two groups.

The mean duration of chest pain to door time and chest pain to balloon time were observed significantly higher in group I than in group II (281.90±88.70 vs. 246.33±80.81 min, p=0.04 and 359.77±80.83 vs 312.00±76.02 min, p =0.02 ; respectively).

Table VI

Distribution of study patients by Killip-Kimball class of heart failure (N=90)

Killip-Kimball class	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
I	34	75.6	38	84.4	72	80.0	0.29^{ns}
II	7	15.6	3	6.7	10	11.1	0.18^{ns}
III	2	4.4	2	4.4	4	4.4	1.00 ^{ns}
IV	2	4.4	2	4.4	4	4.4	1.00 ^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05)
P value was reached from chi square and Fisher's exact test.

Table VII

Comparison of the study patients by duration of chest pain (N=90)

Duration of chest pain (min)	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Pain to door time	281.90±88.70	240.33±80.81	261.1±92.42	0.04^{s}
Pain to balloon time	359.77±80.83	312.00±76.02	335.89±90.73	0.02^{s}
Door to balloon time	77.87±9.12	71.67±8.42	75.81±7.56	0.12^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value reached from unpaired t-test

Table-VIII

Distribution of patients according to the number of diseased vessel by coronary angiography (N=90)

No. of diseased Vessels	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Single	9	20.0	15	33.3	24	26.7	0.15^{ns}
Double	18	40.0	14	31.1	32	35.6	0.37^{ns}
Triple	18	40.0	16	35.6	34	37.8	0.66^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from chi square test
ns= Not significant (p>0.05)

Between two group, the vessel involvement among the study patients were almost similar with statistically insignificant difference (p>0.05).

The study shows that involved vessels among the two group of patients were almost similar with statistically insignificant difference (p>0.05).

Here, it was found that the number of stents were almost identically distributed between the study groups with no significant difference.

The mean diameter and mean stent length were not reaching the significant difference between group II and group I (2.91±0.22 vs. 2.80±0.19 mm, p=0.07 and 26.61±5.11 vs. 25.24±5.07 mm, p=0.09 ; respectively).

Table-IX

Distribution of patients according to infarct related artery (IRA) in coronary angiography(N=90)

Vessels	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
LAD	21	46.7	22	48.9	43	47.8	0.83^{ns}
LCX	7	15.6	8	17.8	15	16.7	0.77^{ns}
RCA	17	37.8	15	33.3	32	35.6	0.65^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value was reached from chi square test; ns= Not significant (p>0.05)

Table-X

Distribution of patients according to number of stents(N=90)

No. of stents	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
1	40	88.9	38	84.4	78	86.7	0.54^{ns}
2	5	11.1	6	13.3	11	12.2	0.74^{ns}
3	0	0.0	1	2.2	1	1.1	0.31^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from chi square test Fisher's exact test (for cell frequency <5); ns= Not significant (p>0.05)

Table XI

Distribution of patients by characteristics of deployed stents in the target vessels (N=90)

Characteristics	(Group I) n=45	(Group II) n=45	(Total) n=90	p value
	Mean±SD	Mean±SD	Mean±SD	
Stent diameter in mm	2.80±0.19	2.91±0.22	2.88±0.21	0.07^{ns}
Stent length in mm	25.24±5.12	26.61±5.11	25.78±5.44	0.09^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from unpaired t-test
ns = Not significant (p>0.05)

Table-XII

Procedural outcome of the study patients according to TIMI flow before and after PCI (N=90)

TIMI flow	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Before PCI							
0	24	53.3	22	48.9	46	51.1	0.32^{ns}
1	21	46.7	21	46.7	42	46.7	1.00^{ns}
2	0	0.0	2	4.4	2	2.2	0.17^{ns}
3	0	0.0	0	0.0	0	0.0	
After PCI							
0	0	0.0	0	0.0	0	0.0	
1	0	0.0	0	0.0	0	0.0	
2	8	17.8	2	4.4	10	11.1	0.04^{s}
3	37	82.2	43	95.6	80	88.9	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns= Not significant (p>0.05), s= Significant (p<0.05); p value reached from chi-square test and Fisher's exact test (for cell frequency <5)

The above table shows that before PCI TIMI flow grade 0 and 1were majority patients in both groups. After PCI TIMI flow grade 3 was in majority Group II and Group I (95.6% vs. 82.2%, p=0.04).

After pPCI, complications were more commonly developed in group I than group II, of which vascular access site complications and bleeding were significantly higher in group I than group II ((15.6% vs. 4.4% and 11.1% vs. 2.2% ; respectively).

The above table explains that angiographic success and procedural success in group-I 93.3% and 91.1%. On the contrary, angiographic success and procedural success in group-II were 95.5% and 93.3. Difference of above parameters between two groups is insignificant (p>0.05).

Overall outcome defined as the presence of any one cardiovascular related complication. It was found that composite / overall outcome (28.8 % vs 13.3 %, p= 0.03) and overall net adverse clinical events were significantly higher in group I patients compared to group II patients (20.0% vs 8.8%, p=0.04).

The mean duration of hospital stay (in days) was more in group I than group II patients and it was reached statistically significant (p=0.03).

Here, it was found that the out of all above mentioned variables, only of the 3 variables, ageee60 years, diabetes mellitus and female gender were found to be the significant predictors of adverse in-hospital outcome with ORs being 1.59, 2.75 and 1.94 respectively. So, it concluded that female sex was also an independent predictor for the development of in-hospital outcome together with age and diabetes mellitus.

Table-XIII

Distribution of the patients according to in-hospital adverse outcomes (N=90)

Outcomes variables	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Cardiogenic shock	5	11.1	4	8.9	9	10.0	0.72^{ns}
Heart failure	5	11.1	4	8.9	9	10.0	0.72^{ns}
Vascular access site complications	7	15.6	2	4.4	9	10.0	0.04^{s}
Bleeding	5	11.1	1	2.2	6	6.7	0.03^{s}
Significant arrhythmia	4	8.9	2	4.4	6	6.7	0.40^{ns}
Stroke	0	0.0	0	0.0	0	0.0	
Re-infarction	4	8.9	3	6.7	7	7.8	0.69^{ns}
Cardiovascular death	4	8.9	3	6.7	7	7.8	0.69^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns= Not significant (p>0.05), s= Significant (p<0.05)
p value reached from chi-square test and Fisher's exact test (for cell frequency <5)

Table-XIV

Distribution of the study patients by angiographic and procedural success (N=90)

Procedure results	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Angiographicsuccess	42	93.3	43	95.5	85	94.4	0.30^{ns}
Procedural success	41	91.1	42	93.3	83	92.2	0.18^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from Fisher's exact test (for cell frequency <5)
ns= Not significant (p>0.05)

Table-XV

Comparison of patients by overall outcomes (N=90)

Outcomes	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Composite/overall	13	28.8	6	13.3	19	21.1	0.03^{s}
Overall MACE	5	11.1	3	6.7	8	8.8	0.45^{ns}
Overall NACE	9	20.0	4	8.8	13	14.4	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
MACE= Major adverse cardiac events, NACE= Net adverse clinical events
p value reached from chi square test
s = Significant (p<0.05), ns = Not significant (p>0.05)

Table-XVI

Comparison of the study patients according to hospital stay(N=90)

Hospital stay (days)	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
≥3 days	28	62.2	25	55.6	53	58.9	
<3 days	17	37.8	20	44.4	37	41.1	
Mean±SD	4.4±1.2		2.6±0.4		3.5±0.8		0.03[s]

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from unpaired t test
s = Significant (p<0.05)

Table-XVII

Multivariate binary logistic regression analysis for determinants of adverse in-hospital outcome after primary percutaneous coronary intervention(N=90)

Variables of interest	Regression coefficient (β)	P value	OR	95% CI of OR
Agee"60 years	0.462	0.04[s]	1.59	1.015 – 4.562
Increased BMI	0.267	0.14[ns]	0.87	0.112 – 10.217
Diabetes mellitus	0.754	0.01[s]	2.75	1.011 – 7.833
Hypertension	0.131	0.11[s]	1.02	0.177 – 3.327
Pain to door time	0.003	0.21[ns]	1.00	0.089 – 7.812
Door to balloon time	0.027	0.15[ns]	0.94	0.041 – 6.241
Pain to balloon time	0.141	0.10[ns]	1.11	0.104 – 8.201
Stent diameter	0.017	0.19[ns]	0.89	0.201 – 4.363
Stent length	0.012	0.24[ns]	0.84	0.051 – 3.120
Troponin I	0.242	0.09 [ns]	1.20	0.247 – 9.201
Female sex	0.631	0.04[s]	1.94	1.008 – 18.201

Dependent variable: presence of adverse in-hospital outcome;
Independent variables: ageee60 years, increased BMI, diabetes mellitus, hypertension, pain to door time, door to balloon time, pain to balloon time, stent diameter, stent length, troponin I and female gender
S = Significant, NS = Not significant

Discussion:

This prospective observational study was conducted in the Department of Cardiology, NICVD, Dhaka. The aim of the study was to evaluate the gender influence on in-hospital outcomes of ST-segment elevation myocardial infarction (STEMI) patients who underwent primary percutaneous coronary intervention (pPCI). A total of 90 patients were included in the study. The patients were divided into two groups on the basis of sex; patients with female sex were categorized as group- I and those with male sex were categorized as group- II.

The mean age of females was significantly higher than males (61.8±10.9 versus 56.5±10.7years, p=0.02) that was slightly lower than the patients population of Italian study by Luca et al. [18](72±13 versus 63±12 years, p<0.0001) and German study by Heer et al [19] (72 vs. 67 years, p<0.001) which was possibly due to the fact that Bangladeshis are unduly prone to develop coronary artery disease (CAD) which is often premature in onset and follows a rapidly progressive course and results in angiographically more severe coronary artery diseased[2].

Smoking was significantly higher in group II patients which was also observed exclusively in Indian populations among males (68.9%) observed by Patted SV[20]and was also supported by some Western studies (Vaccarino et al.[21]). Females (group II patients) had significantly worse baseline risk factors than men, particularly hypertension, diabetes and BMI. Several other studies have made similar observation (Fu et al.[22] ; Luca et al.[18]; Srinivas et al.[23]). According to the clinical parameters, the two group of study populations showed no significant differences that indicates two group of study subjects were nearly homogenous.

The mean plasma glucose level and mean serum creatinine level were observed insignificant difference

between two groups (group I vs group II; 10.4±3.1 vs. 8.2±2.8 mmol/L, p=0.34 and group I vs group II; 1.09±0.34 vs 1.13±0.32 mg/dl, p=0.65 ; respectively). On admission troponin I level was also found higher in group I patients compared to group II patients (14.89±20.48 vs. 8.25±7.92) with significant difference (p=0.04). You et al.[24]also found statistically significant difference (p<0.01) in troponin I on admission. Troponin I correlate with severity of myocardial infarction and it is a traditional predictor of poor prognoses in patients with AMI (Antman et al.[25]).

Heart failure in terms of Killip-Kimball classification at admission was studied; class-'! 80%(75.6% vs. 84.4 %respectively in female and male), class-a! 11.1%(15.6% vs. 6.7% respectively in female and male) class-b! 4.4% (4.4% vs. 4.4%respectively in female and male) and class-c! 4.4% (4.4% vs. 4.4%respectively in female and male) with statistically insignificant difference between the groups (p>0.05) that was supported in studies done by Fu et al.[22]; You et al.[24]; and Barbosa et al.[16]

The mean duration of chest pain to door time was observed significantly higher in females than in males (Female vs Male ; 281.90±88.70 vs. 240.33±80.81 min, p=0.04 ; respectively) and the mean duration of chest pain to balloon time was also observed significantly higher in females than in males (359.77±80.83 vs.312.00±76.02 min respectively in female and male, p=0.02). Fu et al.[22] found pain to door time higher among females than in males (7.00 vs. 4.5 hours) and Barbosa et al.[16] also showed higher pain to door time (181±154 vs. 125±103 min) and pain to balloon time(550±498 vs. 438±340 min) among females than in males.

Distribution of SVD (20% vs. 33.3% respectively in female and male), DVD (40% vs. 31.1%respectively in female and male) and TVD (40% vs. 35.6% respectively in female and male) had statistically insignificant difference (p>0.05) between two groups, though multivessel disease was more common among the female sex. Fu et al.[22]found statistically significant difference (p<0.001) of SVD (19.82% vs. 32.07%), DVD (34.80% vs. 34.67%) and TVD (45.37% vs. 33.25%) distribution between two groups. Lee et al.[26]also found statistically significant difference (p<0.001) of SVD (39.5% vs. 48.1%), DVD (33% vs. 29.3%) and TVD (24.8% vs. 20.3) distribution. In our country, according to Islam and Majumder[2]; the coronary artery disease follows a rapidly progressive course of atherosclerosis and rapidly developing more severe coronary artery diseases. Therefore, our study did not reveal significant difference in terms of involved vessels.

Distribution of study patients in respect to the infarct related artery (LAD- 46.7% vs. 48.9%; LCX- 15.6% vs. 17.8%; RCA- 37.8% vs. 33.3%respectively in female and male) had statistically insignificant difference (p>0.05) between female and male patients. Barbosa et al.[16]also found insignificant difference of culprit vessels involvement in between two groups(LAD- 49% vs. 40.8%; LCX- 17.6% vs. 19.7%; RCA- 33.3% vs. 37.6%; LM- 2% vs. 1.3%). Tamis-Holland et al.[27]also found in their study that infarct-related artery did not differ between men and women.

Length of stent in between two groups differed insignificantly (25.24±5.12 vs. 26.61±5.11 mm respectively in group '! and group a!; p>0.05). Stent diameter also showed insignificant difference (2.80±0.19 vs. 2.91±0.22 mm; p>0.05). Both observations were supported by Fu et al.[22]and Barbosa et al.[16].

Before PCI majority of patients had TIMI 0 flow in both groups with insignificant difference (Group-I vs Group-II=53.3% vs.48.9%; p>0.05). After PCI TIMI 3 flow was established in majority of Group I and Group II (82.2% vs.95.6%) which differed significantly(p<0.05) between two groups. Lee et al.[26] also found that final TIMI 3 flow was more common in men than in woman (92.6% vs. 86.8%, p<0.001). HORIZONS-AMI trial shows patients with TIMI 3 flow grade are expected to have higher survival rates and fewer complications following primary PCI (Caixeta et al.[28]).

In this study angiographic and procedural success did not differ significantly between the groups; which was also observed in studies done by Srinivas et al. [23]. Despite this, women had greater incidence of adverse in-hospital outcome variables studied, particularly bleeding (11.1% vs. 2.2%; p=0.03) and vascular access site complications (15.6% vs. 4.4%; p=0.04). Furthermore, as per GUSTO bleeding classification, significantly more young women had severe bleeding in comparison to young men (6.3% vs. 1.1%) (Srinivas et al. [23]).

The higher risk of bleeding among women might be partly related to the lack of weight or body mass dose adjustment of most antithrombotic drugs, and also to a lower use of radial access among women who, compared with men, have smaller radial arteries that may be more prone to spasm, which is a major cause of radial procedure failure (Dehghani et al.[29]). Furthermore, young women had insignificantly smaller coronary arteries as reflected by the smaller diameter stents implanted in them (2.80±0.19mm vs.2.91±0.22mm for females and males respectively). Chandrasekhar, et al.[30]

also reported smaller stent diameters in females (2.94±0.5 vs. 3.1±0.5mm in females and males respectively).

Females had higher incidence of in-hospital MACE in our study (11.1% vs. 6.7% for women and men respectively), though the difference was not statistically significant (p>0.05).You et al.[24] also observed no significant difference in major in-hospital complications constituting MACE (5.13% vs.5% respectively). Alternatively, Heer et al.[19];Luca et al.[18] and Lee et al.[26] reported a statistically significant increase of post-PCI in-hospital mortality following STEMI in females, with female sex found to be an independent predictor of MACE.

Consequent to a significantly greater bleeding risk and insignificant increase in MACE, both groups were evaluated for net adverse clinical events (NACE), a term first defined in the HORIZONS-AMI study, and found that women had significantly higher incidence of short term NACE (20.0% vs.8.8% respectively in female and male; p<0.05), largely owing to their increased rates of major bleeding. Females in developed countries with STEMI undergoing PCI have a significantly increased risk for short-term NACE(Chandrasekhar et al.[30]. Fu et al.[22] also found significantly higher incidence of short-term NACE in females than males (5.28% vs. 2.07%; p=0.02).

Mean hospital stay was significantly higher in group I than in group II patients (4.4±1.2 vs 2.6±0.4; p=0.03). The duration of hospital stay is influenced by in-hospital outcome with poor in-hospital outcome prolonged hospital stay.

In this study female sex was an independent predictor of adverse in-hospital outcomes in STEMI patients on multivariate logistic regression analysis. Both Luca et al.[18] and Heer et al.[19]found female sex being an independent predictor of mortality, vascular complications and MACE. Older age (ed60 years) and diabetes mellitus also emerged as independent predictors of adverse outcome among STEMI patients undergoing primary PCI. The presence of greater co-morbidities among females is a contributing factor to their adverse outcomes, as observed by Barbosa et al.[16] and Luca et al.[18].

Conclusion:

This study demonstrates that female sex is associated with more prevalence of conventional coronary artery disease risk factors except smoking, in comparison to male sex. Ischaemic time in terms of pain to balloon time is longer in females than in males. However angiographic and procedural success does not differ between the sexes. On the other hand, in patients undergoing primary PCI, female sex is associated with more in-hospital adverse outcomes, particularly bleeding and vascular access site complications. Although no statistically significant difference was observed for MACE, female sex had significantly higher rates of NACE i.e, a composite of MACE and major bleeding. Female sex together with ageed60 years and diabetes mellitus were an independent predictor for the development of in-hospital adverse outcomes in STEMI patients undergoing primary PCI.

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