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In-Hospital Outcome of Acute Myocardial Infarction among Male and Female Patients

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Abstract

Introduction: Cardiovascular disease involves men more frequently than women. However, women with acute myocardial infarction (AMI) are more likely to die of the disease than men. The reasons for this mortality difference are not completely understood and the method to predict excess mortality in women is still lacking.

Objectives: To compare the in-hospital outcome between male and female patients with acute myocardial infarction.

Methodology: This cross-sectional observational study was conducted in the Department of Cardiology Sylhet MAG Osmani Medical College Hospital, Sylhet during the period from July 2014 to June 2016. Fifty female (group-A) and 50 male (group-B) patients with definite diagnosis of acute myocardial infarction admitted within 24 hours of symptom onset, received Streptokinase (in cases of ST elevation myocardial infarction), aged above 18 years and both sex were included. Prior myocardial infarction, cardiomyopathy, valvular heart disease, Previous MI with revascularization and those who were not willing to enroll in this study were excluded.

Results: Females were older [60.28 (SD 9.50) versus 50.26 (SD 8.88) years; $p<0.001$], more frequently had diabetes mellitus (50.0% versus 30.0%; $p<0.05$), dyslipidaemia (58.0% versus 38.0%; $p<0.05$), Killip class (III and IV) (32.0% versus 14.0%; $p<0.05$, greater pre-hospital delay of more than 12 hours (46.0% versus 18.0%; $p<0.01$), higher in-hospital mortality (24.0% versus 6.0%; $p<0.05$), acute left ventricular failure [16 (32.0%) versus 7 (14.0%); $p<0.05$] and cardiogenic shock [6 (12.0%) versus 1 (2.0%); $p<0.05$] were significantly more in female than that of male. On the other hand female were less frequent smoker (6.0% versus 68.0%; $p<0.001$). Whereas hypertension (56.0% versus 42.0%; $p>0.05$), ST elevation MI (86.0% and 84.0%; $p>0.05$), anterior acute myocardial infarction (52.2% and 52.4%; $p>0.05$), use of streptokinase (70.0% versus 74.0%; $p> 0.05$), ventricular tachycardia [2 (4.0%) versus 0 (0.0%); $p>0.05$]; ventricular fibrillation [1 (2.0%) versus 0 (0.0%); $p>0.05$]; atrioventricular block [6 (12.0%) versus 5 (10.0%); $p>0.05$], post mi angina [3 (6.0%) versus 2 (4.0%); $p>0.05$] and re-infarction [3 (6.0%) versus 1 (2.0%); $p>0.05$] did not differ significantly between female and male. Female sex [OR=4.95; (95% CI=1.30-18.81; $p<0.05$), diabetes mellitus [OR=5.05; (95% CI=1.16-22.00; $p<0.05$) and Killip class III and IV [OR=6.38; (95% CI=1.69-24.10; $p<0.01$) were independent predictors of mortality.

Conclusion: It may be concluded from the present study that hospital outcomes are worse in female than that of male in acute myocardial infarction.

Keywords: In-Hospital Outcome, Acute Myocardial Infarction, Mortality

Introduction

Cardiovascular disease (CVD) is a global health problem reaching epidemic proportions in both developed and developing countries and it is the leading cause of mortality and morbidity worldwide [1, 2]. The South Asian countries have among the highest incidences of CVD globally [3]. Estimates from the global burden of disease study suggest that by the year 2020 this part of the world will have more individuals with atherosclerotic CVD than any other region [4]. Globally CVD deaths represent about 30% of all deaths. However, the death rates and patterns vary between developed or high-income countries and the low and middle income countries. High-income countries have CVD deaths rates of approximately 38%. Cardiovascular disease (CVD) remains the leading cause of death in men and women despite

research-based advances in its management and treatment. Mortality from CVD has been steadily decreasing for men, but the same is not true for women [5]. Among the coronary heart disease acute myocardial infarction (MI) is the leading cause of morbidity and mortality among both women and men in substantial areas of the world, but there are several clinically important differences between how MI impacts the two sexes. Although the incidence of acute MI increases with age, women are less prone to developing acute MI than men at any given age, with a lag of approximately 10 years between the sexes [6]. Compared with men, women with acute MI have higher incidences of associated diabetes, hypertension, hypertriglyceridemia, and metabolic syndrome, and a higher mortality rate after acute MI [7, 8, 9]. Some studies have suggested a link to less aggressive hospital care of female patients of acute MI, female patients receive less thrombolytic or reperfusion therapy than male patients, as an explanation for their increased mortality [10, 11, 12, 13]. Females were older, less revascularised, had later presentation for care after symptoms began, had higher prevalence of hypertension and diabetes mellitus and higher incidence of complications like acute pulmonary oedema and cardiogenic shock. Taking these into account, whether these could influence in-hospital and short term mortality, their role as factors has been evaluated. Method to find out their association with in-hospital mortality was tried. In Bangladesh, in a 3 month follow up study after AMI, mortality was 36.3% in women compared to 19.4% in men [14]. In another study Majumder [15] found a higher in-hospital mortality females in univariate analysis (21% vs. 10%, p=0.032), multivariate logistic regression analysis showed that older age, delayed admission after symptom onset, diabetes mellitus, higher Killip class of cardiac failure, underuse of reperfusion therapy with streptokinase and beta-blocker were the independent predictors of excess mortality in females. But factors influencing increased in-hospital outcome in females have not been studied in Bangladesh. Increased in-hospital poor outcome in females deserves special study in our country to find out the influencing factors of these outcomes for the development of appropriate measures to improve their clinical course and outcome.

Methodology

Type of study: This is a cross-sectional observational study.

Place of Study: This study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh.

Study period: This study was conducted during the period from 1st July 2014 to 30th June 2016.

Target Population

All patients both male and female with a definite diagnosis of acute myocardial infarction (AMI) in the Sylhet region were the target population.

Study Population: All patients both male and female with a definite diagnosis of acute myocardial infarction (AMI) admitted in the Department of Cardiology Sylhet MAG Osmani Medical College Hospital, Sylhet fulfilling the inclusion and exclusion criteria were enrolled as the study population.

Inclusion criteria

1. Patients admitted with a definite diagnosis of acute myocardial infarction (AMI) admitted within 24 hours of symptom onset and received Streptokinase (in cases of ST elevation myocardial infarction).
2. **Age:** 18 years and above.
3. Both sex.

Exclusion Criteria

1. AMI patients admitted after 24 hours of symptom onset.
2. Patient who did not receive Streptokinase (in cases of ST elevation myocardial infarction).
3. Prior myocardial infarction.
4. Cardiomyopathy.
5. Valvular heart disease.
6. Previous MI with revascularization.
7. Those who were not willing to enroll in this study.

Sample Size: Sample was calculated by using Guilford and Frucher's formula, considering 5% level of significance, 5% precision level (Marginal error) and the prevalence rate of coronary artery disease in Bangladesh of 3.4% [16].

The formula is: $n = \frac{Z^2 pq}{d^2}$

Calculated sample size was 50 in each group.

Sampling Technique: Non-probability convenient sampling method was applies as sampling method.

Method of Data Collection: Both quantitative and qualitative data were collected by using pre designed questionnaire designed for the study (Annex-I). The questionnaire was prepared reviewing literature and by consulting with experts.

Assessment of the patients: After admission of a patient with acute myocardial infarction a detailed history, general and physical examination was performed. Clinical examination was done with special attention to Kllip class of cardiac failure. Any arrhythmias were also noted.

A 12 lead ECG was taken on admission by placing the leads in proper position. Acute myocardial infarction was confirmed by detection of rise and /or fall of cardiac biomarker value (Cardiac Troponin) with at least one value above the 99th percentile of the upper reference limit (URL) and with at least one of the following: 1) Symptoms of ischemia, 2) New or presumed new significant ST-segment-T wave (ST-T) changes or new left bundle branch block (LBBB), 3) Development of pathological Q wave in the ECG, 4) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality [17]. Those who met the inclusion criteria from history clinical examination and necessary investigations were taken as sample and those met the exclusion criteria were excluded. In this way 50 male and 50 female patients with acute MI were selected. Patients were asked about the major modifiable risk factor profile of coronary artery disease such as hypertension, diabetes mellitus, hyperlipidaemia, smoking status. Previous medical records were also checked for these risk factors. Patients were treated according to 2013 ACCF/AHA Guideline for the Management of acute myocardial infarction (AMI) [18]. In-hospital treatment with special attention to use of Streptokinase (in cases of ST elevation MI) was recorded.

Grouping of the sample: Fifty male and 50 female patients with acute MI were fulfilling the inclusion and exclusion criteria were enrolled in this study. Female patients were enrolled in group-A and male patients were enrolled in group each consisting 50 patients.

Laboratory investigations

1. A 12 lead ECG.
2. Troponin-I.
3. Blood sugar.
4. Fasting lipid profile.

Fasting glucose and lipid profile were measured within 24 h after onset of symptoms. After all participants had fasted for 12-14 hours overnight, blood samples were drawn between 7:00 to 9:00 and centrifuged within 30-45 min of collection. A Sellectra 2 auto-analyzer (Vital Scientific, Spankeren, Netherlands) was used in the laboratory. Fasting plasma glucose (FPG) was measured by enzymatic colorimetric method with glucose oxidase technique. For the determination of 4 parameters of the lipid profile *viz* total cholesterol (T Chol), high density lipoprotein cholesterol (HDL-C), and triglyceride (TG). Total cholesterol assay was done using a modified method of Liebermann-Burchard, HDL-cholesterol by precipitation method and TG was estimated using a kit employing enzymatic hydrolysis of TG with lipases. LDL-C was calculated using the Friedwald's formula LDL = (T Chol - HDL-C) - TG/5 when the values of TG was less than 400 mg% [19].

Follow up: All patients were followed up 3 times in 24 hours (8.00 am, 2.00 pm and 8:00 pm) up to discharge of the patients. During follow up development of chest pain (Post MI angina), any arrhythmias, cardiogenic shock, heart block were observed and recoded. In-hospital mortality was also observed. All patients were observed meticulously during their hospital stay to follow up the course and end result.

Data Analysis and Interpretation: Data were processed and analyzed manually and using SPSS (Statistical Package for Social Sciences) Version 21.0. Quantitative data were expressed as mean and standard deviation; and comparison was done by "Z" test. Qualitative data were expressed as frequency and percentage and comparison was carried by Chi-square (χ^2) Test. Multivariate regression analysis was done to find predictor of in-hospital mortality. A probability (p) value of <0.05 was considered as significant, $p<0.01$ is considered as highly significant but $p>0.05$ is considered as insignificant.

Results

Table 1: Demographic characteristics of the Patients.

Age	Sex		P, Z-value
	Female (n=50)	Male (n=50)	
>55 years	31	10	$p<0.001$, 5.449
≤55 years	19	40	
Mean	60.28 (SD 9.50)	50.26 (SD 8.88)	
Diabetes mellitus			
Present	25	15	$p<0.05$, 4.167
Absent	25	35	
Total	50	50	
Smoking status			
Smoker	3	34	$p<0.001$, 41.227
Non-smoker	47	16	
Total	50	50	
Blood pressure			
Hypertensive	28	21	$p>0.05$, 1.951
Normotensive	22	29	
Total	50	50	
Dyslipidaemia			
Present	29	19	$p<0.05$, 4.006
Absent	21	31	
Total	50	50	

The age of the female patients ranged from 40 to 85 years with the mean age of 60.28 (SD 9.50) years; whereas the age of the male patients ranged from 28 to 70 years with the mean age of 50.26 (SD 8.88) years. The mean age of the female patients was significantly higher than male patients ($p<0.001$). Age distribution of the patients was shown in table-1. Among the female, 31 (62.0%) patients were aged above 55 years and 19 (38.0%) patients were up to 55 years; while among male, 10 (20.0%) patients were aged above 55 years and 40 (80.0%) patients were up to 55 years. There were 25 (50.0%) female diabetic patients and 15 (30.0%) male diabetic patients. Female was more frequently diabetic than that of male ($p<0.05$). The table revealed that 3 (6.0%) female patients were smoker and 34 (68.0%) male patients were smoker. Female was less frequently smoker than that of male ($p<0.001$). Table 4. The table revealed that 28 (56.0%) female patients were hypertensive and 21 (42.0%) male patients were hypertensive. Status of blood pressure did not differ significantly between female and male ($p>0.05$). The table revealed that 29 (58.0%) female patients had dyslipidaemia and 19 (38.0%) male patients had dyslipidaemia. Female patients were more frequent dyslipidaemic than that of male patients ($p<0.05$).

Table 2: Distribution of Patients by Killip Class (III and IV) of Cardiac Failure.

Killip class	Sex		p-value
	Female (n=50)	Male (n=50)	
Killip class (III and IV)	16	7	$p<0.05$ $\chi2=4.574$
No heart failure	34	43	
Total	50	50	

Table 2 showed that Killip functional class III and IV (Combined) was observed in 16 (32.0%) female and 7 (14.0%) male patients. Killip functional class III and IV (combined) was significantly higher in the female group than that in the male group ($p<0.05$).

Table 3: Distribution of Patients by Types of Myocardial Infarction.

Types of myocardial infarction	Sex		p-value
	Female (n=50)	Male (n=50)	
ST elevation MI	42	43	$p>0.05$
Non-ST elevation MI	8	7	
Total	50	50	$\chi2=0.078$

Table 3 demonstrated the distribution of male and female groups by types of MI. Majority of the male and female groups had ST elevation acute myocardial infarction (MI) (84.0% and 86.0% respectively). The difference was not statistically significant ($p>0.05$).

Table 4: Distribution of Patients by Pre-Hospital Delay.

Pre-hospital delay	Sex		p-value
	Female (n=50)	Male (n=50)	
>12 hours	23	9	$p<0.01$, $\chi2=9.007$
≤12 hours	27	41	
Total	50	50	

Table 4 demonstrated the distribution of male and female groups by pre-hospital delay. Time elapsed between onset of chest pain and arrival at the hospital (pre-hospital delay) was above 12 hours in 23 (46.0%) female patients and 9 (18.0%) male patients. Pre-hospital delay above 12 hours was significantly more in female than that of male ($p<0.01$).

Table 5: Distribution of Patients by the Use of Streptokinase.

Use of Streptokinase	Sex		p-value
	Female (n=50)	Male (n=50)	
Used	35	37	$p>0.05$, $\chi2=0.198$
Not used	15	13	
Total	50	50	

Table-6 demonstrated that 35 (70.0%) females received streptokinase compared to 37 (74.0%) males received streptokinase. The use of streptokinase did not differ significantly between females and males ($p> 0.05$).

Table 6: Distribution of Patients by in Hospital Mortality.

In hospital mortality	Sex		p-value
	Female (n=50)	Male (n=50)	
Death	12	3	$p<0.05$, $\chi2=6.353$
Survive	38	47	
Total	50	50	

Table 6 demonstrated that in-hospital mortality was 12 (24.0%) female patients and 3 (6.0%) male patients. In-hospital mortality was significantly higher in female patients than that of male patients ($p<0.05$).

Table 7: Profile of Death Patients.

Parameters	Death (n=15)	Survive (n=85)	p-value
Age			
> 55 years	10 (66.7)	31 (36.5)	$p<0.05$
≤ 55 years	5 (33.3)	53 (63.5)	
Sex			
Female	12 (80.0%)	38 (44.7)	$p<0.05$
Male	3 (20.0)	47 (55.3)	
Smoking status			
Smoker	4 (26.7%)	33 (38.8)	$p>0.05$
Non-Smoker	11 (73.3)	52 (61.2)	
Diabetes mellitus			
Present	11 (73.3)	29 (34.1)	$p<0.01$
Absent	4 (26.7%)	56 (65.9)	
Hypertension			
Present	9 (60.0%)	40 (47.1)	$p>0.05$
Absent	6 (40.0%)	45 (52.9)	
Dyslipidaemia			
Present	8 (53.3%)	40 (47.1)	$p>0.05$
Absent	7 (46.7%)	45 (52.9)	
Kllip Class			
III and IV	9 (60.0%)	14 (16.5)	$p<0.01$
No heart failure	6 (40.0%)	71 (83.5)	
Type of MI			
ST elevation MI	13 (86.7%)	72 (84.7)	$p>0.05$
Non-ST elevation MI	2 (13.3%)	13 (15.3)	
Pre-hospital delay			
>12 hours	6 (40.0%)	26 (30.6)	$p>0.05$
≤12 hours	9 (60.0%)	59 (69.4)	

Table 7 showed that age above 55 years ($\chi^2=4.806$; $p<0.05$); female sex was associated with death ($\chi^2=6.353$; $p<0.05$); diabetes mellitus ($\chi^2=8.170$; $p<0.01$) and Kllip Class III and IV ($\chi^2=13.641$; $p<0.01$). Other parameters such as smoking status ($\chi^2=0.808$; $p>0.05$), Hypertension ($\chi^2=0.854$; $p>0.05$), dyslipidaemia ($\chi^2=0.201$; $p>0.05$), Type of MI ($\chi^2=0.038$; $p>0.05$) and Pre-hospital delay ($\chi^2=0.519$; $p>0.05$) did not differ significantly between death and sivivours.

Table 8: Distribution of Patients by in Hospital Complications.

In hospital complications	Sex		p-value
	Female (n=50)	Male (n=50)	
Acute left ventricular failure	16	7	$p<0.05$
Post MI angina	3	2	$p>0.05$
Re-infarction	3	1	$p>0.05$
Atrial fibrillation	0	0	
Supraventricular Tachycardia	0	0	
Ventricular Tachycardia	2	0	$p>0.05$
Ventricular fibrillation	1	0	$p>0.05$
AV block	6	5	$p>0.05$
2nd degree	1	2	$p>0.05$
3rd degree	5	3	$p>0.05$
Cardiogenic shock	6	1	$p<0.05$

Table 8 showed that acute left ventricular failure [16 (32.0%) versus 7 (14.0%); $\chi^2=4.574$; $p<0.05$] and Cardiogenic shock [6 (12.0%) versus 1 (2.0%); $\chi^2=3.840$; $p<0.05$] were significantly more in female than that of male. But Ventricular tachycardia [2 (4.0%) versus 0 (0.0%); $\chi^2=2.041$; $p>0.05$]; Ventricular fibrillation [1 (2.0%) versus 0 (0.0%); $\chi^2=1.010$; $p>0.05$]; atrioventricular block [6 (12.0%) versus 5 (10.0%); $\chi^2=0.102$; $p>0.05$], post MI angina [3 (6.0%) versus 2 (4.0%); $\chi^2=0.211$; $p>0.05$] and re-infarction [3 (6.0%) versus 1 (2.0%); $\chi^2=0.1.042$; $p>0.05$] did not differ significantly between female and male. None of the patients of both group developed Supraventricular tachycardia and atrial fibrillation.

Table 9: Influencing Factors of Mortality in Patients of AMI.

Variables	Analysis		p-value
	Univariate (p-value)	Multivariate Odds Ratio (95% CI)	
Age (> 55years)	$p<0.001$	1.36 (0.31-5.88)	$p>0.05$
Sex (Female)	$p<0.05$	4.95 (1.30-18.81)	$p<0.05$
Pre-hospital delay (>12 hours)	$p<0.01$	0.58 (0.13-2.53)	$p>0.05$
Killip class (III & IV)	$p<0.05$	6.38 (1.69-24.10)	$p<0.01$
Smoker	$p<0.001$	8.83 (0.69-112.61)	$p>0.05$
Diabetes mellitus	$p<0.05$	5.05 (1.16-22.00)	$p<0.05$
Dyslipidaemia	$p<0.05$	0.79 (0.20-24.10)	$p>0.05$

Table-9 demonstrated the binary logistic regression analysis of Odds Ratios for variables likely to cause death. All the variables significantly associated with mortality in univariate analysis were entered into the model directly. Of the 7 variables female sex [OR=4.95; (95% CI=1.30-18.81; $p<0.05$), presence of diabetes mellitus [OR=5.05; (95% CI=1.16-22.00; $p<0.05$) and higher Killip class of cardiac failure [OR=6.38; (95% CI=1.69-24.10; $p<0.01$) were found independent predictors of mortality.

Discussion

Although cardiovascular disease involves men more frequently than women, women with acute myocardial infarction (AMI) are more likely to have an adverse outcome than men [20]. Recognizing the mortality difference between men and women with AMI is of paramount clinical significance because women with AMI may need more aggressive treatment than men. The reasons for the observed mortality difference are not completely understood [20]. In the present study the age of the female patients ranged from 40 to 85 years with the mean age of 60.28 (SD 9.50) years; whereas the age of the male patients ranged from 28 to 70 years with the mean age of 50.26 (SD 8.88) years. The mean age of the female patients was significantly higher than male patients ($p<0.001$). Yu, Mehran, Grinfeld, Xu, Nikolsky, *et al*., [21] reported a little bit higher mean age of acute myocardial infarction in both male and female. But the mean age of the female patients was significantly higher than male patients ($p<0.0001$). Iyanoye, Moreyra, Swerdel, Gandhi, Cabrera, *et al*. [22] also reported higher mean age of acute myocardial infarction in both male and female. But the mean age of the female patients was significantly higher than male patients ($p<0.0001$). Other studies also reported that women with AMI were older than men [15, 23, 24, 25]. The higher age incidence of ischemic heart diseases in female patients explains the fact that reproductive hormones before menopause offers protection against ischemic heart diseases, which is markedly reduced at menopause due to hormonal imbalance rendering them more vulnerable to ischaemic heart diseases [26]. The present study also revealed that 31 (62.0%) female patients were aged above 55 years and 19 (38.0%) patients were up to 55 years; while 10 (20.0%) male patients were aged above 55 years and 40 (80.0%) patients were up to 55 years. Hong and Kang [27] found that the proportion of female patients was higher than that of males among those 65 years of age or older (female 75.6% vs male 40.5%). This study revealed that there were 50.0% female diabetic patients and 30.0% male diabetic patients. Diabetes mellitus was considerably higher in female patients than that of male patients ($p<0.05$). Diabetes mellitus was considerably higher in female patients (39%) than that in male patients (24%) in the study of Majumder [15] which was consistent with the present study. This finding was also consistent with several studies [7, 20, 21, 23, 24, 25]. But Hong and Kang [27] found that there was no significant difference of Diabetes mellitus between male and female (p=0.845). The differential impact of diabetes on the coronary risk of men and women may have important implications for pathogenesis of atherosclerosis [28]. Diabetes mellitus is a stronger risk factor in women than in men for coronary heart disease incidence and mortality [29]. Premenopausal women with diabetes face a similar risk of developing CAD as nondiabetic men of the same age. Following an MI, diabetic women have double the rate of recurrence and shorter survival than men [30]. Women with diabetes not only have significantly higher levels of blood pressure and lipids than men with diabetes but also that the difference in the levels among people with or without diabetes was significantly greater in women than it was in men. Sex difference in coronary heart disease risk is mediated in large part by difference in the level of cardiovascular risk factors [31]. This study revealed that 3 (6.0%) female patients were smoker and 34 (68.0%) male patients were smoker. Female was less frequently smoker than that of male ($p<0.001$). Similar smoking behaviour was observed in several other studies [7, 20, 21, 23, 25]. The current study revealed that 28 (56.0%) female patients were hypertensive and 21 (42.0%) male patients were hypertensive. Status of blood pressure did not

differ significantly between female and male (p>0.05). Regarding hypertension, no significant difference was observed between the groups (Female 42%, male 39%, p=0.666) bearing consistency with findings of the study of Majumder [15]. However, the finding was different from those reported by Gottlieb [7] and Jiang, Ji [20] who found a significantly higher prevalence of hypertension in females compared to males. Hong and Kang [27] also found that there was significantly higher rate of hypertension in female than that of male (p<0.001). Several other studies also reported a significantly higher rate of hypertension in female than that of male [21, 22, 23, 24, 25]. Directorate General of Health Services [32] reported that prevalence of hypertension of general population of urban male was 21.1% and urban female was 18.8%; while prevalence of hypertension in rural male was 15.9% and urban female was 15.9%. Treatment of hypertension markedly reduces the risk of ischemic disease. Current recommendations establish that patients with hypertension and coronary heart disease should be treated aggressively to attain blood pressure (BP) targets lower than those in the general population [33]. Aggressive treatment of elevated systolic blood pressure (greater than 160 mm Hg) in older women reduces the risk of cardiovascular events. Stroke, and congestive heart failure and probably decreases the incidence of MI [34]. This study revealed that 29 (58.0%) female patients had dyslipidaemia and 19 (38.0%) male patients had dyslipidaemia. Females had a higher incidence of hyperlipidemia as opposed to males (p<0.05). Females had a higher incidence of hyperlipidemia as opposed to males (45% vs. 32%, p = 0.040) which was consistent with the study of Majumder [15]. Similar results were also reported in several other studies [7, 11, 20, 21]. But no difference of dylipidaemia between female and male observed in other study (p=0.18) [24]. Abnormal levels of lipoproteins are a strong risk factor for CVD for men and women, particularly elevated low-density lipoprotein cholesterol (LDL-C) and combined hyperlipidemia (increased levels of triglycerides, LDL-C and decreased levels of HDL-C. The net result of estrogen on lipoprotein is an increase in triglycerides, a decrease in LDL-C levels, and an increase in HDL-C levels. The female “catching-up” to male heart attack rate occurs late in life and is associated with aging, as in men [35]. The present study showed that Killip functional class III and IV (Combined) was observed in 16 (32.0%) female and 7 (14.0%) male patients. Killip functional class III and IV (Combined) was significantly higher in the female group than that in the male group (p<0.05). This is an important in-hospital complication of AMI and may also be the presenting feature in AMI. We stratified our patients of congestive heart failure complicating AMI by Killip class. Killip classification is a simple and accurate tool for early risk assessment of patients with AMI and has been used as a prognostic indicator of survival after AMI [36]. Killip class of cardiac failure I through IV predicts hospital mortality by 6%, 17%, 38% and 81% respectively [37]. This finding is almost consistent with study of Majumder [15] that 45% and 43% patients of anterior and inferior MI respectively. Mahon, McKen [38] reported that 40% were anterior MI in male and 36% were anterior MI in female male; difference was not statistically significant. This study demonstrated that time elapsed between onset of chest pain and arrival at the hospital (pre-hospital delay) was above 12 hours in 23 (46.0%) female patients and 9 (18.0%) male patients. Pre-hospital delay above 12 hours was significantly more in female than that of male (p<0.01). This delay may be due to presentation of myocardial infarction in female. The female presents more commonly without chest pain [39, 40] which leads to delay in hospital arrival. This study demonstrated that in-hospital mortality was 12 (24.0%) female patients and 3 (6.0%) male patients. In-hospital mortality was significantly higher in female patients than that of male patients (p<0.05). This result was consistent with the study of Mahon, McKenna, *et al* [38] that in hospital death of acute MI was significantly higher in female (23.3%) than that of male (14.1%) (p=0.02). Several other studies conducted around different parts of the world reported higher in-hospital mortality in females than in males [21, 20, 22, 25]. Higher rate of female mortality in the present study may be due to female had higher age, more frequent diabetes mellitus, higher frequency of preshospital delay and cardiogenic shock at presentation in this study. This study showed that acute left ventricular failure [16 (32.0%) versus 7 (14.0%); p<0.05] and Cardiogenic shock [6 (12.0%) versus 1 (2.0%); χ^2=3.840; p<0.05] were significantly more in female than that of male. But Ventricular tachycardia [2 (4.0%) versus 0 (0.0%); p>0.05]; Ventricular fibrillation [1 (2.0%) versus 0 (0.0%); p>0.05]; atrioventricular block [6 (12.0%) versus 5 (10.0%); p>0.05], post MI angina [3 (6.0%) versus 2 (4.0%); p>0.05] and re-infarction [3 (6.0%) versus 1 (2.0%); p>0.05] did not differ significantly between female and male. None of the patients of both group developed Supraventricular tachycardia and atrial fibrillation. Mahon, McKenna, Codd, O'Rorke, McCann, *et al*., [38] observed that ventricular arrhythmia between male and female did not differ significantly (p>0.05). But Kytö, Sipilä and Rautava [41] found that significantly lower rate of ventricular arrhythmia was observed in female compared to male (p<0.0001). This study demonstrated that the Odds Ratios for variables likely to cause death after acute MI. All the variables significantly associated with mortality in univariate analysis were entered into the model directly. Of the 7 variables female sex [OR=4.95; (95% CI=1.30-18.81; p<0.05), presence of diabetes mellitus [OR=5.05; 95% CI=1.16-22.00; p<0.05) and higher Killip class of cardiac failure [OR=6.38; 95% CI=1.69-24.10; p<0.01) were found independent predictors of mortality. Women had higher in-hospital mortality than men after adjustment for co-morbidities [21, 22, 25] reported that the unadjusted all-cause mortality rates between days 1 and 16 were 3.46% in women and 2.53% in men. Women were more likely to die than men (unadjusted HR 1.38, 95% CI 1.13-1.68; P =0.002). Mahon, McKenna, Codd, O'Rorke, McCann, *et al.* [38] also found that in hospital death of acute MI was significantly higher in female with odd ratio of multivariate analysis of association of variable with women after adjusting for age (OR=1.48; 95% CI=1.07-2.04; p=0.02). But Kytö, Sipilä and Rautava [41] reported that women had higher unadjusted mortality rate compared with men (HR 17.5, 95% CI 16.7% to 18.4%, vs 8.0%, 95% CI 7.6% to 8.4%, respectively; HR 1.65, 95% CI 1.54 to 1.76; p<0.0001). However, when adjusted for age and co-morbidities there was no difference in mortality between genders (HR 1.04, 95% CI 0.97 to 1.12; p=0.2303). Furthermore, there was no gender-based difference in mortality at any age after adjustment for co-morbidities. Consistently with previous studies, we found patients with diabetes, to have worse prognosis after STEMI [41, 42].

Limitations of the study were

1. Data are derived from a single tertiary care hospital in Bangladesh.
2. The study sample was taken consecutively (non-randomly) which might have affected the outcome of study.
3. Primary PCI or rescue PCI could not be done due to inadequate facilities.
4. The study did not have the scope to include the information's of the patients of AMI who died on the way to reaching hospital, which might have resulted in an underestimation of the mortality rates in patients with AMI.

Conclusion

It may be concluded from the present study that hospital outcomes are worse in female than that of male in acute myocardial infarction.

Recommendation

In the light of the findings of the present study the following recommendations are made:

1. Public awareness should be raised to minimize prehospital delay after symptom onset of AMI.
2. Older aged females must have regular checkup of blood sugar, serum lipids to control the risk of ischemic heart diseases.
3. Streptokinase and beta-blocker should be adequately used in female unless otherwise contraindicated.
4. The clinicians must bear in mind that female patients with AMI die more frequently than their male counterpart and so aggressive treatment should be given.
5. However, a multicenter study involving large sample is recommended for further evaluation.

Conflict of Interest

Not available.

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