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Research Article

In Hospital Outcome of Acute Anterior Myocardial Infarction in Diabetic and Non-Diabetic Patients

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Abstract

Background: Patients with acute anterior myocardial infarction and diabetes have a poor prognosis.

Objectives: To see the in-hospital outcome of acute anterior myocardial infarction in diabetic and non-diabetic patients.

Methodology: This cross-sectional observational study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet over a period of two years from July 2015 to June 2017. A total of 100 acute anterior MI patients (50 diabetic and 50 non diabetic) were included in this study. Acute anterior MI patients admitted after 6 hours of symptom onset or who did not receive streptokinase were excluded.

Results: Male predominance was obvious in both groups [40 (80%) versus 42 (84%); $p > 0.05$] in diabetic and non-diabetic group respectively. Mean age was 53.34 ± 11.32 and 54.84 ± 14.12 years in diabetic and non-diabetic groups respectively. Dyslipidemia [6 (12%) versus 6 (12%); $p > 0.05$], Smoking [32 (64%) versus 34 (68%); $p > 0.05$] and Family history of cardiovascular disease [6 (12%) versus 4 (8%); $p > 0.05$] were similar among diabetic and non-diabetic respectively. Hypertension was found more among non-diabetic [27 (54%) versus 19 (38%); $p > 0.05$] but difference was not statistically significant. Diabetic group had more Apical Anterior MI [22 (44%) versus 19 (38%); $p < 0.05$] and Extensive Anterior MI [20 (40%) versus 11 (22%); $p < 0.05$] while non-diabetic group had more Septal MI [10 (20%) versus 3 (6%); $p < 0.05$] and Mid Anterior MI [10 (20%) versus 4 (8%); $p < 0.05$]. LV ejection fraction was found significantly low in diabetic patients [43.96 ± 5.95 versus 53.68 ± 6.36; $p < 0.01$]. Killip Class III was more in diabetic [24 (48%) versus 9 (18%); $p < 0.01$] and Killip Class I was more in non-diabetic group [18 (36%) versus 3 (6%); $p < 0.01$] according to Killip classification of HF which was statistically significant between the two groups. Atrial Fibrillation was more in diabetics [6 (12%) versus 1 (2%); $p < 0.05$] while sinus tachycardia was more among non-diabetics [20 (40%) versus 5 (10%); $p < 0.05$] which are statistically significant. Diabetic group had more acute MR [2 (4%) versus 0 (0%); $p > 0.05$] but was not significant. Death was more in diabetic group than that of non-diabetic group [7 (14%) versus 3 (6%); $p > 0.05$] but it was statistically not significant.

Conclusion: It is concluded from the present study that in hospital outcomes of acute anterior myocardial infarction are worse in diabetic patients than in non-diabetic patients.

Keywords: Outcome; Acute Anterior Myocardial Infarction; Diabetic

Introduction

Myocardial infarction (MI) is one of the most common life threatening diagnoses in emergency hospital admissions. Most of the complications occur during the first few hours of hospitalization. It is a major cause of death and disability worldwide. MI may be the first manifestation of coronary artery disease (CAD) or it may occur, repeatedly, in patients with established disease. MI is defined in pathology as myocardial cell death due to prolonged myocardial ischemia. STEMI is a clinical syndrome defined by characteristic symptoms of myocardial ischemia in association with persistent ST elevation in ECG and subsequent release of biomarkers of myocardial necrosis [1]. In almost 80% of cases, MI occurs due to abrupt decrease in coronary blood flow following thrombotic occlusion of a coronary artery previously narrowed by atherosclerosis. The remaining 20% cases, MI results from non-atherosclerotic causes [2]. This injury is produced or facilitated by factors such as cigarette smoking, hypertension, lipid accumulation and DM. In most cases infarction occurs when an atherosclerotic plaque fissures, ruptures or ulcerates so that mural thrombus forms at the site of rupture and leads to coronary artery occlusion [3]. The mortality rate after admission for MI has declined by about 30% over the last two decades but it still remains high. Survival is markedly reduced in elderly patients (over age 70) whose in-hospital mortality rate is 21% as compared to 2.8% among patients 60 years old or younger [3]. Diabetes is a universal problem and is becoming a major concern especially in obese people and in people with sedentary life style [4]. From a survey of the International Diabetes Federation, there are 382 million people living with diabetes around the world in 2013, and the total number is expected to rise to 592 million by 2035 and described the condition as an emerging global epidemic. Global prevalence rate of diabetes mellitus in adult population is 8.3% in 2013 and is predicted to rise to 10% in 2030. In Bangladesh, the prevalence rate of diabetes mellitus is 10% in adult population and the prevalence will be 13% by 2030 [5]. DM is considered as a coronary artery equivalent disease and a major cardiovascular risk factor [6], that is associated with a high rate of cardiovascular events [7]. DM plays an important role in the pathogenesis of coronary artery disease (CAD) by promoting the process of atherosclerosis. Patients with DM are comparatively at a higher risk of cardiovascular events such as myocardial infarction as compared to non-diabetics. Therefore, the rates of morbidity and mortality are increased among the diabetics [8]. Following AMI, short- and long-term mortality rates are twice as high for patients with DM as those without DM [6]. Several studies have shown that elevated in-hospital glucose levels predict higher mortality in both diabetic and non-diabetic patients with acute MI [9,10]. Some studies also showed that diabetic patients with ACS had similar in-hospital mortality but higher 1-year mortality in comparison with non-diabetic patients [11]. However, little is known about the role of DM in the in-hospital outcome in patients with acute anterior MI in our population. So, this study has been designed to evaluate the in-hospital outcome of acute anterior MI in diabetic and non-diabetic patients.

Methodology

This cross-sectional observational study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet over a period of two years from July 2015 to June 2017. A total of 100 acute anterior MI patients (50 diabetic and 50 non diabetic) were included in this study. Acute anterior MI patients admitted after 6 hours of symptom onset or who did not receive streptokinase were excluded.

Inclusion criteria

- All patients with acute anterior myocardial infarction, admitted within 6 hours of symptom onset who received streptokinase.
- Both diabetic and non-diabetic patients.
- Age: 18 years and above.
- Both sexes.

Exclusion criteria

- Patients with Non-STE myocardial infarction.
- Acute anterior MI patients admitted after 6 hours of symptom onset or who did not receive streptokinase.
- Other STEMI.
- Patients with renal impairment.
- Age below 18 years.
- Prior myocardial infarction.
- Cardiomyopathy.
- Valvular heart disease.
- Previous MI with revascularization.
- Those who did not want to enroll in this study.

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.

Procedure of data collection

Informed written consent was taken from the patients after detail explanation of the purpose of study.

Assessment of the patients

After admission of a patient with acute myocardial infarction a detail history, general and physical examination were performed. Clinical examination was done with special attention to Kllip class of cardiac failure. Presence of any arrhythmia was 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 [12].

All those who had documented history of diabetes in past (treated with either insulin, oral hypoglycaemic agents or not treated) or those who had random blood glucose level ≥11.1 mmol/liter (200 mg/dl) or fasting blood glucose level ≥7 mmol/liter (≥126 mg/dl) and $HbA_1C \geq 6.5\%$, were documented as diabetics. Those who had no history of diabetes mellitus in past or random blood glucose level < 11.1 mmol/liter or fasting blood glucose level < 7 mmol/liter and HbA1c < 6.5% were documented as non-diabetics [13]. 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 acute ST elevation MI patients with diabetes mellitus and 50 acute ST elevation MI patients without diabetes mellitus 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.

Grouping of the sample

50 acute ST elevation MI patients with diabetes mellitus fulfilling the inclusion and exclusion criteria were enrolled in group-A and 50 acute ST elevation MI patients without diabetes mellitus fulfilling the inclusion and exclusion criteria were enrolled in group-B.

Follow up

All patients were followed up hourly in CCU and 3 times in 24 hours (8.00am, 2.00pm and 8:00pm) in post-CCU up to discharge of the patients. During follow up a 12 lead ECG were recorded daily till discharge. Development of chest pain (post MI angina), any arrhythmias, cardiogenic shock, and 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 22.0. 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

Age (years)	Group		p value
	Group A Anterior MI in diabetic (n = 50)	Group B Anterior MI in non-diabetic (n = 50)	
<40	6 (12.0)	10 (20.0)	0.142^{ns}
41 - 50	17 (34.0)	11 (22.0)	
51 - 60	16 (32.0)	15 (30.0)	
61 - 70	9 (18.0)	7 (14.0)	
>70	2 (4.0)	7 (14.0)	
Mean ± SD	53.34 ± 11.32	54.84 ± 14.12	0.559^{ns}
Range	(28 – 80)	(25 – 85)	
Gender			
Male	40 (80.0)	42 (84.0)	0.202ns
Female	10 (20.0)	8 (16.0)	
Total	50 (100.0)	50 (100.0)	

Table 1: Distribution of patients according to age in both groups (n = 100).

Unpaired t test was done to measure the level of significance

A total of 100 acute anterior MI patients (50 diabetic and 50 non diabetic) were included in this study. Table I shows distribution of patients according to age in diabetic and non-diabetic groups. Mean age was 53.34 ± 11.32 and 54.84 ± 14.12 years in diabetic and non-diabetic groups respectively. No significant difference was seen between two groups ($p > 0.05$). Distribution of patients according to gender in diabetic and non-diabetic groups. Males were predominant in both groups. In group A, males were 40 (80.0%) and females were 10 (20.0%). Similarly in group B, males were 42 (84.0%) and females were 8 (16.0%). No significant difference was seen between two groups ($p > 0.05$).

Risk factors	Group		p value
	Group A Anterior MI in diabetic (n = 50)	Group B Anterior MI in non-diabetic (n = 50)	
Known Diabetes	32 (64.0)	0 (0.0)	0.001
Newly detected DM	18 (36.0)	0 (0.0)	
Hypertension	19 (38.0)	27 (54.0)	0.070
Dyslipidemia	6 (12.0)	6 (12.0)	1.000
Smoking	32 (64.0)	34 (68.0)	0.405
Family history of cardiovascular disease	6 (12.0)	4 (8.0)	0.505

Table 2: Comparison of risk factors between group A and group B (n = 100).

Chi square test was done to measure the level of significance.

Table 2 shows comparison of risk factors between diabetic and non-diabetic patients. Dyslipidemia was similar in both groups i.e., 6 (12%) in each group. Smokers were 32 (64%) in group A and 34 (68%) in group B. Family history of cardiovascular disease was almost same in both groups i.e., 6 (12%) in group A and 4 (8%) in group B. Among Diabetic patients, 32 (64%) were known diabetics and 18 (36%) were newly detected after admission. Hypertension was found more in non-diabetic 27 (54%) than that in diabetic 19 (38%) patients. All the above risk factors were statistically insignificant ($p > 0.05$).

Figure 1 shows comparison of sub classification of MI between diabetic and non-diabetic patients. Apical anterior and extensive anterior MI were found more in diabetic group and septal & mid anterior MI was found more in non-diabetic group. All these observations were statistically significant ($p < 0.05$).

Table 3 shows comparison of laboratory examination findings between diabetic and non-diabetic patients. Troponin-I was elevated in all patients in both groups. Plasma glucose was elevated among all cases in diabetic patients. HbA1C and serum creatinine were found significantly high in diabetic group. LV ejection was found low in diabetic patients 43.96 ± 5.95% as compared to non-diabetics 53.68 ± 6.36% and it was statistically highly significant ($p < 0.001$). There was no significant difference in lipid profiles between the two groups.

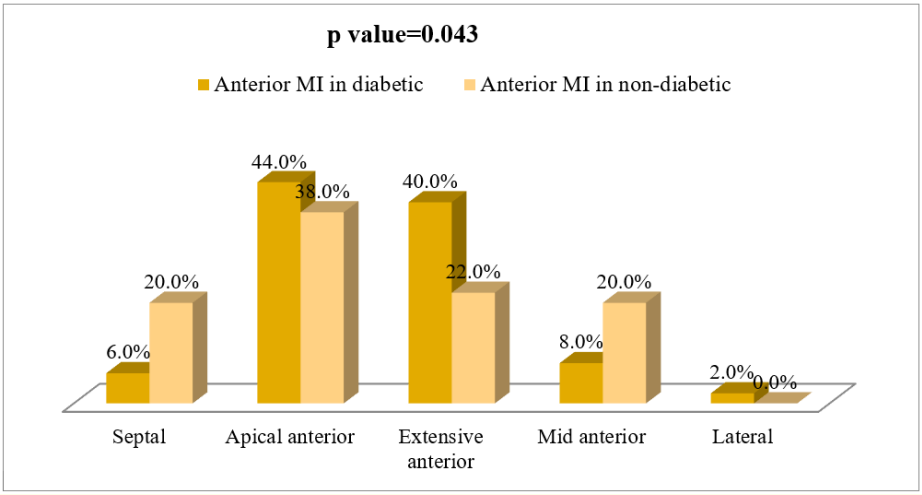

Figure 1: Comparison of sub classification of anterior MI between group A and group.

Laboratory examination findings	Group		p value
	Group A Anterior MI in diabetic (n = 50)	Group B Anterior MI in non-diabetic (n = 50)	
Troponin-I (elevated)	50 (100.0)	50 (100.0)	
Plasma glucose (elevated)	50 (100.0)	0 (0.0)	<0.001
FBG (elevated)	50 (100.0)	0 (0.0)	<0.001
HbA1C (%)	8.45 ± 1.42	5.51 ± 0.60	<0.001
TC (mg/dl)	229.00 ± 28.70	225.80 ± 37.55	0.633
LDL (mg/dl)	142.80 ± 33.16	143.02 ± 31.56	0.973
TG (mg/dl)	237.82 ± 59.79	247.50 ± 65.26	0.441
HDL (mg/dl)	35.72 ± 4.63	35.04 ± 5.19	0.491
Serum creatinine (mg/dl)	0.83 ± 0.23	0.68 ± 0.26	0.003
LV Ejection (%)	43.96 ± 5.95	53.68 ± 6.36	<0.001

Table 3: Comparison of laboratory examination findings between group A and group B (n = 100).

Chi square and unpaired t test was done to measure the level of significance.

Table 4 shows comparison of hospital outcome between diabetic and non-diabetic patients. Killip Class III was more in diabetic [24 (48%) versus 9 (18%)] and Killip Class I [3 (6%) versus 18 (36%)] was more in non-diabetic group according to Killip classification of HF. There was significant difference between two groups ($p < 0.05$). There was also significant difference in post MI arrhythmia between two groups. Mechanical complications were more in diabetic group than in non-diabetic group. Death was also more in diabetic group 7 (14%) than in non-diabetic group 3 (6%).

In hospital outcome	Group		p value
	Group A Anterior MI in diabetic (n = 50)	Group B Anterior MI in non-diabetic (n = 50)	
Asymptomatic	3 (6.0)	0 (0.0)	0.242
Reinfarction	2 (4.0)	6 (12.0)	0.268
Post MI Angina	40 (80.0)	32 (64.0)	0.075
Killip classification of HF			
Class I	3 (6.0)	18 (36.0)	<0.001
Class II	16 (32.0)	20 (40.0)	
Class III	24 (48.0)	9 (18.0)	
Class IV	7 (14.0)	3 (6.0)	
Post MI arrhythmia			
Sinus Bradycardia	4 (8.0)	4 (8.0)	0.016
Sinus Tachycardia	5 (10.0)	20 (40.0)	
PVC	3 (6.0)	2 (4.0)	
VT	3 (6.0)	1 (2.0)	
Atrial Fibrillation	6 (12.0)	1 (2.0)	
1 AV block	1 (2.0)	0 (0.0)	
LBBB	2 (4.0)	0 (0.0)	
RBBB	6 (12.0)	2 (4.0)	
Mechanical complications			
MR	2 (4.0)	0 (0.0)	0.360
VSR	1 (2.0)	1 (2.0)	
Outcome			
Discharge	43 (86.0)	47 (94.0)	0.182
Death	7 (14.0)	3 (6.0)	

Table 4: Comparison of in hospital outcome between group A and group B (n = 100).

Chi square test was done to measure the level of significance.

Discussion

Although there have been significant advances in the care of many of the extra pancreatic manifestations of diabetes, acute myocardial infarction continues to be a major cause of morbidity and mortality in diabetic patients. The clinical course of myocardial infarction is frequently complicated and carries a higher mortality rate in the diabetic than in the non-diabetic patient. Pathophysiology of myocardial infarction differs to some degree in diabetic patients from those in patients without diabetes [14]. This study was done to see the in-hospital outcome of anterior myocardial infarction in diabetic and non-diabetic patients. In this study, MI was prone among the younger in diabetic but not in diabetic cases MI was seen among the older age population but the difference was not statistically significant. MI is more among elderly people [15]. MI occurred in early ages in diabetic patients than non-diabetic patients in this study. Mean age was 53.34 ± 11.32 and 54.84 ± 14.12 years in diabetic and non-diabetic groups respectively. Similar findings were also found in the study of Mak., *et al.* [16] where they have shown that MI occurred at early age in diabetic patients

comparing to non-diabetic patients. Anterior MI was found higher among male in both diabetic and non-diabetic groups. In group A, males were 40 (80.0%) and females were 10 (20.0%). Similarly in group B, males were 42 (84.0%) and females were 8 (16.0%). No significant difference was seen between two groups. Prevalence of MI in male is higher than in female [15]. Male was 61.2% in diabetic and 79.5% in non-diabetic patients with MI [17]. Male was 75.5% in diabetic and 86.2% in not diabetic patients in the study of Hsu., *et al*. [7]. Chest pain is the most common symptom of MI along with sweating, breathlessness. In this study, chest pain and chest tightness were found in almost all cases in both groups but dyspnoea was observed significantly high in diabetic group than in non-diabetic group. Sricharan., *et al*. [18] found chest pain (90.0%), sweating (50.0%) and breathlessness (20.0) in AMI patients in their study. Sweating and palpitation were found in almost all cases in both groups but vomiting was found more in diabetic group than in non-diabetic group but no statistically significant. Dyslipidemia, smoking and family history of cardiovascular disease were almost same in both groups, hypertension was found more in non-diabetic than in diabetic patients but difference was not statistically significant. Smoker was 68.2% and 81.7% in diabetic and non-diabetic patients with MI; Hypertension was found 65.9% and 50.1% in diabetic and non-diabetic patients with MI [17]. Hypertension was found 76.6% and 62.1% in diabetic and non-diabetic patients with MI; Current smoker was 26.0% and 42.9% in diabetic and non-diabetic patients with MI [7]. Regarding drug history, anti-diabetic (oral) and lipid lowering drug were consumed more in diabetic group than in non-diabetic group and the difference was statistically significant. Anti-hypertensive drug was consumed more in non-diabetic than in diabetic patients but difference was not statistically significant. Blood pressure was significantly low in diabetic group than that in non-diabetic group in this study. Systolic BP was higher in diabetic group but diastolic BP was lower in diabetic group [7]. There was no significant difference in apex beat, heart sound, murmurs and pericardial rub between two groups. Apical anterior and extensive anterior MI were found more in diabetic group and septal & mid anterior MI were found more in non-diabetic group. Troponin-I was elevated in all patients in both groups. Plasma glucose was elevated among all cases in diabetic patients. Admission glucose was also higher in diabetic patients compared to non-diabetic patients (212.38 ± 107.9 mg/dl vs. 128.89 ± 52.76 mg/dl, $p < 0.001$) [7]. HbA1C and serum creatinine were found significantly high in diabetic group. HbA1c and serum creatinine were significantly higher in diabetic group, [7] which was consistent with this study result. Left ventricular (LV) ejection fraction was found significantly low in diabetic patients. LV ejection fraction was lower in diabetic group, [7] which is consistent with this study result. There was no significant difference in lipid profiles between diabetic and non-diabetic groups. TG, TC, HDL and LDL were lower in diabetic group [7]. Killip Class III was more in diabetic and Class I was more in non-diabetic group according to Killip classification of Heart failure. There was significant difference between two groups. Higher incidence of higher Killip classification was seen in diabetic group and higher incidence of lower Killip classification was seen in non-diabetic patients, [7] which are consistent with this study result. There was also significant difference in post MI arrhythmia between two groups. Mechanical complications and death were more in diabetic group than that in non-diabetic group. In this study, reinfarction was seen in 2 (4.0%) in diabetic and 6 (12.0%) in non-diabetic groups. Reinfarction was found 37.7% and 43.2% of cases in diabetic and non-diabetic groups after 3 months of MI [17]. Post MI Angina was 9.57% in non-diabetic and 10.35% in diabetic patients, [19] but in this study post MI angina was found higher in diabetic (80.0%) than non-diabetic (64.0%) patients. Mortality among diabetic patients with MI was reported to be as high as 40% and at least double the mortality rate in patients without diabetes [20]. In this study, death was 7 (14.0%) and 3 (6.0%) cases in diabetic and non-diabetic patients respectively. In hospital mortality in non-diabetic patients was 5.8% (men) & 13.9% (women) and in diabetic patients was 10.1% (men) and 24.0% (women) [19]. Death was found in 7.1% and 1.9% of cases in diabetic and non-diabetic group respectively [17].

Limitations

Data are derived from a single tertiary care hospital in Bangladesh.

The study sample was taken consecutively (non-randomly) which might have affected the outcome of study.

The study did not have the scope to include the information of the patients of acute MI who died on the way to hospital, which might have resulted in an underestimation of the mortality rates in patients with acute MI.

Duration of DM was not taken into consideration which could have made a significant difference in the outcome.

Conclusion

The present study demonstrates that diabetic patients have poor in-hospital outcomes after acute anterior MI. On admission, Killip class was higher in diabetic patients than non-diabetic patients. Post MI angina was higher in diabetic than non-diabetic patients. Mechanical complications were also more in diabetic patients. However rate of reinfarction was higher among non-diabetic than that in diabetic patients. Mortality rate was higher in diabetic than that in non-diabetic patients. So, it may be concluded from the present study that in hospital outcomes of acute anterior myocardial infarction are worse in diabetic patients than in non-diabetic patients.

Recommendation

In the light of the findings of the present study the following recommendations are made: Public awareness should be raised to minimize prehospital delay after symptom onset of acute MI. Diabetic patients must have regular checkup of blood sugar, serum lipids to control the risk of ischemic heart diseases. Streptokinase should be adequately used in acute MI patients with DM unless otherwise contraindicated. Close monitoring and frequent follow-up of acute MI patients with diabetes should be done and complications should be managed promptly. The clinicians must bear in mind that diabetic patients with acute MI die more frequently than non-diabetic and so aggressive treatment should be given. However a multicenter study involving large sample is recommended for further evaluation.

Source of Fund

Nil.

Conflict of Interest

None.

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