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In-Hospital Outcome Of Acute Coronary Syndrome In Patients With Diabetes Mellitus

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Abstract

Diabetes mellitus adversely influences the outcome of acute coronary syndrome. This study evaluated the in-hospital outcome of acute coronary syndrome in patients with diabetes mellitus. In this prospective observation study 130 patients with acute coronary syndrome were enrolled. They were divided into diabetic and nondiabetic group. Diabetic patients were taken as case and nondiabetic patients as control. Outcome parameter studied were in-hospital mortality, cardiogenic shock, congestive heart failure, different arrhythmias and recurrent angina. In this study, one third (32%) of the patients were diabetic with mean age 58±10.0 years vs. 53.0±13.6 years in diabetic and nondiabetic group, respectively. Majority of the patients in both groups were male. Congestive heart failure and arrhythmias were more common in case group compared to those in control group (19% vs. 13.6% p=0.424; 23.8% vs. 13.6%, p= 0.148, respectively). Cardiogenic shock developed in 7.1% of diabetic patients and 8% of nondiabetic patients. In hospital mortality was 7.1% and 5.7% in diabetic and nondiabetic group, respectively. Recurrent angina developed only in diabetic patients. Therefore, diabetic patients with acute coronary syndrome encountered more in- hospital adverse outcome.

Introduction

It is well known that coronary artery disease (CAD) is strongly associated with diabetes mellitus (DM). It increases the risk of coronary artery disease (CAD) by twofold to sixfold, which account for 80% of deaths among patients with DM.[1] Furthermore, when CAD develops in diabetic patients, the incidence of acute coronary syndrome (ACS) becomes double[1]. Since diabetic patients have an increased propensity for blood clotting, impaired fibrinolysis and increased platelet reactivity, it is more likely that atherosclerotic plaque rupture or erosion results in thrombotic occlusion of the artery.[2] Overall 20-35% of all ACS patients are diabetic.[3] In addition to being a risk factor, diabetes mellitus is also associated with worse outcome after an acute coronary event.[4,5,6] They are more prone to develop cardiogenic shock, congestive heart failure (CHF), arrhythmias and recurrent ischaemic events after ACS[4,5,6]. The Global Registry of Acute Coronary Events (GRACE) also revealed in- hospital case fatality rate was twice in diabetic ACS patients in comparison to nondiabetic patients.[4]

There are only few studies so far available comparing the various outcomes of ACS in patients with and without DM. We know that the burden of ACS and DM in our population is high. Therefore, this study was designed to find out various in-hospital outcomes of ACS in diabetic and non diabetic patients in our perspective.

Methods

Patient selection

This prospective observational study was conducted on 130 patients presenting with ACS in the Department of Cardiology, BSMMU during the period of January 2007 to December 2007. The patients presenting with symptoms consistent with acute cardiac ischaemia within 24 hours of hospital presentation plus ischaemic ECG changes and/or known CAD and/or elevated serum cardiac biomarkers were included in the study. The patients were grouped into ACS with diabetes mellitus and ACS without diabetes mellitus. Diabetic patients were taken as case and nondiabetic patients as control. The patients were considered diabetic if he/she had documented history of diabetes mellitus treated with diet or oral hypoglycemic agents or insulin or fasting plasma glucose level ≥7mmol/L. Demographic and other baseline clinical characteristics of the patients were recorded. Blood sample for troponin I and CK-MB were collected. All information was recorded in the data collection sheet. Outcome parameters observed during the hospital stay were in-hospital mortality, cardiogenic shock, congestive (CHF), different arrhythmias and recurrent angina.

Definitions of terms

Congestive heart failure was defined by the criteria same as Killip class II : Bibasilar rales in 50% or less of the lung fields, or an S3 gallop .Cardiogenic shock was diagnosed by the criteria same as Killip class IV: hypotension characterized by systolic BP < 90mm Hg and evidence of poor peripheral perfusion such cool periphery, sweating, oliguria (urine output < 0.5 ml /kg/hr). Arrhythmias consisted of ventricular premature beats, ventricular tachycardia, ventricular fibrillation, ventricular asystole, atrial fibrillation, atrial flutter, supraventricular tachycardia, or different grades of heart block. Recurrent angina was defined as angina at rest lasting at least five minutes that was associated with a new ST-segment shift (elevation or depression) of more than 0.1 mV, or with T-wave inversions, in two contiguous electrocardiographic leads or angina without electrocardiographic changes that prompted a decision to perform a revascularization procedure.

Lab analysis

Serum troponin I was detected by ACON one step myoglobin /CK-MB /troponin I combo test device (ACON laboratories, USA), serum CK-MB was detected by immunoinhibition method (HUMAN Gesellschaft fur Biochemica and Diagnostics mbH, Germany) and serum glucose was measured by Glucose Oxidase (GOD-PAP) method (Randox Laboratories Ltd., UK).

Table- I: Demographic and Baseline clinical characteristics

	Diabetic ACS (n= 42)	Non diabetic ACS (n= 88)	p value
Demographic			
Age, yrs*	58.7±10.0	53.0±13.6	0.009[†]
Sex (%)			
Male	80.9	84.1	
Female	19.1	15.9	
Clinical Presentations (n, %)			
Chest Pain	42 (100.0)	87 (98.9)	0.677[#]
Breathlessness	11 (26.2)	14 (15.9)	0.164[#]
Cardiac arrest	1 (2.4)	1 (1.1)	0.543[#]
Clinical examination			
Heart rate, beat/min*	84.0±13.9	84.7±16.3	0.828[†]
Systolic blood pressure, mmHg*	134.6+27.2	123.1+28.5	0.030[†]
Killip class (n, %)	31 (73.8)	72 (81.8)	
Class- I	10 (23.8)	12 (13.6)	
Class- II	1 (2.4)	3 (3.4)	0.467[#]
Class- III	00	1 (1.1)	
Class- IV			
Risk factors (n, %)			
Smoking	12 (28.6)	60 (68.2)	0.001[#]
Dyslipidemia	40 (95.2)	69 (78.4)	0.015[#]
Family history of IHD	4 (9.5)	10 (11.4)	0.749[#]
Hypertension	28 (66.7)	43 (48.9)	0.049[#]
Investigations			
ST deviation (n, %)	39 (92.9)	73 (83.0)	0.126[#]
LVEF (%)*	53.7±7.9	54.7±9.7	0.322[†]
Serum creatinine (mg/dl)*	1.3±0.3	1.1±0.3	0.003[†]
Troponin-I (raised) (n, %)	28 (66.7)	58 (65.9)	0.932[#]
CK-MB (raised) (n, %)	27 (64.3)	48 (54.5)	0.293[#]

Figures in the parentheses indicate corresponding percentage, * values indicate mean±SD,26Students t-test was used to derive *p* value, [#] χ^2 test was used to derive *p* value

Statistical analysis

Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for Windows version 12 (SPSS Inc., Chicago, Illinois, USA). All the data were expressed as mean ± SD (standard deviation) and percentage (%), as appropriate. The statistical significance of differences between the values was assessed by t test, Chi square test and Fisher's exact formula (as appropriate). A *p* value of < 0.05 was considered statistically significant.

Results

A total of 130 patients of Acute Coronary Syndrome (ACS) were enrolled in the study. Of them 42 (32%) were ACS with diabetes mellitus (cases) and 88 (68%) ACS without diabetes mellitus (controls). Table1 shows the demographic and baseline clinical characteristics of the patients.

Diagnosis

Diagnosis of the diseases shows that about 31% of cases had unstable angina (UA), 28.6% Non-ST segment elevated myocardial infarction (NSTEMI) and 40.5% ST-segment elevated myocardial infarction (STEMI). The controls also had similar distribution by diagnosis with 34.1% unstable angina (UA), 30.7% NSTEMI and 35.2% STEMI (Fig 1).

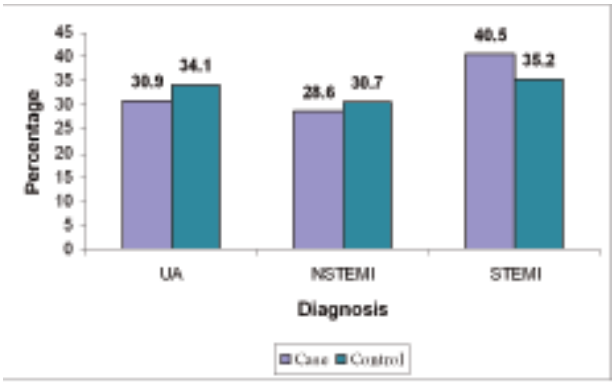

Fig. 1: Distribution by patients by diagnosis (n = 130)

Hospital stay

Table II shows the comparison of hospital stay between groups. The mean duration of hospital stay was found significantly higher in cases than that in controls (8.1 ± 2.2 vs. 7.1 ± 2.2; p = 0.014).

Table II: Comparison of hospital stay between groups (n = 130)

Group	Hospital stay (days) (mean ± SD)	p-value*
Case (n = 42)	8.1 ± 2.2	0.014
Control (n = 88)	7.1 ± 2.2	

***Student t-Test** was done to analyze the data.

Outcomes

Table III shows the complications encountered by the patients. The patients of both groups developed cardiogenic shock in almost equal proportions (7.1% in case group and 8% in control group). The heart failure and arrhythmias were higher in case group compared to those in control group (19% vs. 13.6% p = 0.424; 23.8% vs. 13.6%, p = 0.148, respectively). However, 3(7.1%) patients of the case group experienced recurrent angina as opposed none of the control group (p = 0.032). Death during hospital stay was higher in the case group (7.1%) than that in the control group (5.7%), though the difference between the groups was not significant (p = 0.761).

Table III. Distribution of patients by outcomes (n = 130)

Outcomes	Group		p-value
	Case (n = 42)	Control (n = 88)	
Cardiogenic shock#	3(7.1)	7(8.0)	0.870
Heart failure#	8(19.0)	12(13.6)	0.424
Arrhythmias#	10(23.8)	12(13.6)	0.148
Recurrent angina*	3(7.1)	00	0.032
Death#	3(7.1)	5(5.7)	0.761

Figures in the parentheses indicate corresponding **%;**

Data were analysed using χ^2 Test; *Fisher's Exact Test was done to analyse the data.

Discussion

DM is a strong risk factor for developing ACS. Diabetic patients are also at risk of developing more in-hospital complications. This study was conducted to find out various in-hospital outcomes of ACS in patients with and without DM.

In this study 32% of all patients were diabetic. One previous study[7] also found similar finding. On the contrary another study[5] found 18% of ACS patients were diabetic. But we know that the prevalence of DM is escalating and it will be double by 2025.[8] So the finding of the current study may be more appropriate.

In this study, most of the in hospital adverse outcomes were encountered by diabetic patients except cardiogenic shock. Although in this study cardiogenic shock occurred more commonly in nondiabetic group, this was not statistically significant and this may be due to small sample size of this study. We found congestive heart failure and arrhythmias occurred more in diabetic group. More than one previous studies also demonstrated that ACS patients with DM encountered more CHF and arrhythmias.[4,5,9] This can be partly explained by 'diabetic cardiomyopathy' and autonomic neuropathy. 'Diabetic cardiomyopathy' is a specific entity which influences the systolic and diastolic function, and may predispose these patients to develop heart failure more.[10] Likewise autonomic neuropathy which causes disturbances of myocardial blood flow, myocardial function and reduced heart rate variability, might be a cause of arrhythmias and CHF.[10] Other unknown reasons might also be responsible for these complications.

We found tha recurrent angina occurred only in diabetic patients. McGuire et al. also found recurrent ischaemia occurred more in diabetic patients.[11] Why recurrent angina occurred only in diabetic patients was unknown. But several factors including abnormalities of platelet function and fibrino/proteolytic system, autonomic and endothelial dysfunction, increased fatty acid turnover might have predisposed these patients to recurrent ischaemic events. In-hospital mortality was also more in diabetic patients which was also supported by one previous study.[4]

Granger et al[12] described 8 predictors of hospital mortality. These are age, blood pressure, heart rate, Killip class, resuscitated cardiac arrest, positive finding for cardiac biomarkers, serum creatinine and ST-segment shift. Out of these 8 predictors 6 were present in diabetic patients of this study. These might contribute to more in-hospital mortality in diabetic group. Moreover, Diabetes mellitus is a strong independent predictor of adverse outcomes for patients admitted across the entire spectrum of ACS.[9] Several studies[4,6,13] also demonstrated that ACS patients with DM had poor prognosis both in short and long term.

Study limitation

This study was conducted with small sample size. Only 130 patients were studied. Follow-up period was also very short. Results of this study should be proved in larger trial.

Conclusion

This study showed diabetic patients with acute coronary syndromes encountered in-hospital mortality and other adverse outcomes at a greater extent than those of non diabetic patients. Most of the predictors of adverse outcomes were also more prevalent in diabetic group. So, they should be monitored closely, given more care and treated with all effective evidence based therapy.

References

1. McGuire DK, Newby LK, Biswas MS, Hochman JS. The elderly, women, and patients with diabetes mellitus. In: Theroux P, editor: Acute coronary syndromes. Philadelphia: Saunders; 2003:563-68.
2. Beckman JA, Creager MA, Libby P. 'Diabetes and atherosclerosis: epidemiology, pathophysiology and management', JAMA, 2002; 287:2570-81.
3. Basand JP, Hamm CW, Ardissino, D, Boersma, et al.

Guidelines for the diagnosis and treatment of non-ST segment elevation acute coronary syndromes: The task force for the diagnosis and treatment of non-ST- elevation acute coronary syndromes of the European Society of Cardiology. Eur Heart J 2007; 28: 1598-1660.

4. Franklin K, Goldberg RJ, Spencer F, et al. Implication of diabetes in patients with acute coronary syndromes. Arch Intern Med 2004; 164:1457-63.
5. McGuire DK, Emanuelsson H, Granger CB, et al. 'Influence of diabetes mellitus on clinical outcomes across the spectrum of acute coronary syndromes: findings from the GUSTO-IIb study. Eur Heart J 2000; 21: 1750-58.
6. Malmberg K, Yusuf S, Gerstein HC, et al. Impact of diabetes on long term prognosis in patients with unstable angina and non-Q-wave myocardial infarction: results of the OASIS (Organization to Assess Strategies for Ischemic Syndromes) Registry. Circulation 2000; 102: 1014-19.
7. Esteghamati A, Abbasi M, Nakhjavani M, et al. Prevalence of diabetes and other cardiovascular risk factors in an Iranian population with acute coronary syndromes. Cardiovascular Diabetology 2006; 5: 5-15.
8. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care 1998; 21: 1414-31.
9. Fergus TS, Fazel R, Fang J, et al. Presentation, management and outcomes of diabetic compared to non-diabetic patients admitted for acute coronary syndromes. Heart 2004; 90: 1051-52.
10. Marwick TH. Diabetic heart disease. Postgrad Med J.2008; 84:188-92.
11. McGuire DK, Newby LK, Bhapkar MV et al. Association of diabetes mellitus and glycemic strategies with clinical outcomes after acute coronary syndromes. Am Heart J. 2004; 147:246-52.
12. Granger CB, Goldberg JR, Dabbous O, Piepper KS et al. Predictors of hospital mortality in the Global Registry of Acute Coronary Events. Arch Intern Med 2003; 163:2345-53.
13. Danhoe SM, Stewart GC, McCabe CH, et al. Diabetes and mortality following acute coronary syndromes. JAMA 2007; 298:765-75.