Original Article

Effects of Diabetes Mellitus on Outcome of Patients with First Acute Myocardial Infarction

Jahanbakhsh Samadikhah, Seyed Hadi Hakim, Ali Reza Yaghoubi, Rezvanieh Salehi, Azin Alizadeh Asl, Rasoul Azarfarin

From Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.
Correspondence: Dr. J.Samadikhah, Associate professor of cardiology, Madani Heart Hospital, Tabriz , IRAN. E-mail: alizadeasl@yahoo.com

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ABSTRACT

Objectives: To evaluate the effects of diabetes mellitus (DM) on outcome and survival of patients with first acute Myocardial Infarction (AMI).

Methods: In 500 patients (358 men and 142 women), 74 (12.6%) were diabetic, and rest of them were non–diabetic. All diabetic patients were divided in to two groups, Group A included 13 patients with type 1 DM and the group B included 61 patients with type 2 DM.

Results: Age–Adjusted mortality in one year follow-up for women with DM was 22%, and significantly higher than 13% in women without DM, (relative risk (RR) 1.69 and 95% CI 1.21 to 2.06). Mortality rate for men with DM (21%) and without DM (16%) was also significantly different (RR 1.31 and 95% CI 1.05-1.62). Painless AMI occurred in15.4% of patients with type 1 and 14.4% of patients with type 2. One year mortality rate in both type 1 and 2 were 19.6% and 21.3% respectively (p>0.05). According to angiographic data, diabetic patients had more involved arteries than non diabetics (mean 2.62 vs. 2.07 vessels; P<0.05). Left ventricular function study demonstrated 34.03% of diabetic patients had lower (<40%) ejection fraction (EF), while 17.6% of nondiabetic patients had EF<40% (p<0.05).

Conclusion: Our results emphasis the role of DM as a risk factor of severity of coronary artery disease and as a predictor of adverse outcome after first AMI. (Rawal Med J 2007;32:131-134).

Key words: Acute myocardial infarction, diabetes mellitus type 1 and type 2, painless AMI, Mortality rate.

INTRODUCTION

Diabetes mellitus (DM) is one of the major risk factors for atherosclerosis and influences coronary artery disease (CAD) in various ways. On the other hand atherosclerosis and CAD is a major cause of premature death in patients with DM in both type 1 and type 2.[1,2] Both, type 1 and type 2 DM are powerful and independent risk factors for CAD, stroke and peripheral artery disease.[3] The

prevalence of more extensive CAD in DM comes from epidemiological, autopsy and angiographic studies.[4,5] Numerous studies have consistently shown a higher in-hospital mortality in diabetic patients when compared to non-diabetics suffering from AMI.[1,2,6] Diabetic women with CAD have relatively poor prognosis related to increased incidence of congestive heart failure (CHF),[7,8] recurrent ischemia, extension of AMI and recurrent AMI and diastolic dysfunction due to cardiomyopathy.[8,9] Also, global pump dysfunction following AMI, multivessel involvement, the hematological milieu are important contribution to the poorer outcome. The efficacy of fibrinolytic therapy in diabetic AMI seems to be same as non-diabetics, and there is no increase in serious bleeding or stroke in diabetics.[7-10] The aim of this study was to evaluate the effects of DM on outcome and survival of patients with first AMI.

METHODS

In this prospective observational study 500 patients who were admitted consecutively to our institute's intensive care unit with diagnosis of first AMI were enrolled into the study. Acute inferior myocardial infarction was defined as the presence of typical chest pain lasting for more than 30 minutes; ST-segment elevation of more than 0.1 mV in two or more of adjacent leads; and a serum creatine kinase concentration that was more than twice the upper limit of the normal range. Standard 12-lead and right precordial electrocardiograms were obtained immediately after admission. Out of 500 patients 74 (12.6%) had diabetic mellitus. Diabetic patients were divided into two groups, Group A included 13 patients with type 1 DM and group B included 61 patients with type 2 DM. All patients underwent electrocardiography and echocardiography. Coronary angiography was performed in 211 patients (diabetics: 33 and non-diabetics: 178). The criteria for angiographic diagnosis were according to American Heart Association (AHA) classification, in which significant coronary stenosis was defined as >75% narrowing of the artery. Patients were classified as having 1, 2 or 3 vessel disease.

Data was analyzed by SPSS v. 14.0 (SPSS Inc, Chicago, IL) statistical package. Continuous variables between the two groups were assessed by student's t-test. Categorical variables analyzed by Chi-Square or Fisher's exact test as appropriate. The estimate of effect of DM on outcomes was calculated and expressed as relative risk (RR) with 95% confidence intervals. Differences were considered statistically significant when $P \leq 0.05$.

RESULTS

The 12.6% of the AMI patients had diabetes mellitus. The diabetes patients were older than non-diabetics (64±10 vs. 59±12 years old, P<0.05), and AMI occurring more frequently in female than male diabetics (38/3% vs. 23.1%, P<0.05), More than half of DM patients had hypertension (53%

vs. 38% in non-diabetics, P<0.05). Chest pain suggesting AMI was presented only in 11% of diabetic patients with proved AMI, while 85.8% of non-diabetics with AMI experienced typical chest pain (P<0.05). Painless AMI occurred in 15.4% of patients with type 1 DM and in 14.4% of patients with type 2 DM, which the difference was not statistically significant. The streptokinase treatment was done more commonly in AMI in nondiabetics than diabetic patients (39.2% vs. 18.7%, P<0.05). Left ventricular function study demonstrated 34.03% of diabetics had lower ejection fraction (EF<40%) than nondiabetics (17.6%, P<0.05). Diabetic patients had a higher risk of developing cardiogenic shock and conduction disorders than nondiabetic pts (p<0.05). According to angiographic data, diabetic patients had more involved arteries than nondiabetic patients (mean 2.62 vessels vs. 2.07 p<0.05).

Table 1. Baseline clinical variables and angiographic data.

Variable	Diabetics (n=74)	Non-diabetics (n=358)	P value
Mean age (years)	64±10	59±12	<0.05
Patients age > 70 years	31%	24%	0.087
Female sex	38.3%	23.1%	<0.05
Smokers	47%	49%	>0.05
Hypertension	53%	38%	<0.05
Hyper Cholesterolemia	41%	34%	>0.05
Chest pain suggesting AMI	11%	85.8%	<0.05
Streptokinase treatment	18.7%	39.2%	<0.05

Also angiographic variables demonstrated that the diabetic patients had more extensive CAD (55% vs. 41%, P<0.05). In-hospital mortality rate was significantly higher among AMI patients with DM (35.3% vs. 15.5%, P<0.05). The age-adjusted mortality (one year follow- up) for women with DM (22%) was significantly higher than women without DM (13%), [relative risk (RR) 1.69 and 95% CI 1.21 to 2.06). For men with DM one year mortality rate was 21% and in pts without DM was 16% (RR 1.31 and 95% CI 1.05-1.62). Mortality rate (in one year follow-up) in both type 1 and 2 were 19.6% and 21.3% respectively, which was statistically non-significant difference.

DISCUSSION

The higher prevalence of CAD in newly discovered diabetes and individuals with only impaired glucose tolerance without significant hyperglycemia compels one to think that hyperinsulinemia and not hyperglycemia per se is responsible for the development of atherosclerosis.[1,2] The direct atherogenic properties of insulin have been shown in the various experimental and observational studies.[1,4] Severity and duration of hyperglycemia are implicated in the pathogenesis of

microvascular disease and is a good predictor of morbidity and mortality in CAD. DM with a variety of adverse genetic and environmental factors an adverse milieu that results in a process of accelerated obstructive disease in small and large vessels as well as non-ischemic cardiomyopathy. The dysautonomia may contribute to this process and presence of hypertension accelerates the atherosclerotic process. In middle aged women diabetes increases the incidence of CAD by three fold and that AMI by ten fold as compared to men. In later life occurrence of diabetes is less severe in women that in men. The metabolic syndrome X is often observed in women in peri- or post-menopause leading to reduced coronary reserve.[4-6,11]

Table 2. Mortality rates in different subgroups.

	Diabetic pts	Non diabetic pts	Type 1	Type 2	Men with DM	Men without DM	Women with DM	Women without DM	P
In-hospital Mortality	35.3%	15.5%	-	-	-	-	-	-	<0.05
Mortality rate in one year follow-up	-	-	-	-	-	-	22%	13%	<0.05
	-	-	-	-	21%	16%	-	-	<0.05
	-	-	19.6%	21.3%	-	-	-	-	>0.05
	40.3	21.6	-	-	-	-	-	-	<0.05

It is well established that the presence of diabetes increases the mortality rate after AMI. Mortality from AMI before hospital admission is about 20-30% and does not differ between diabetic and nondiabetic patients. Of those diabetics who reach the hospital, 60-80% are still alive one year later, compared to 80-90% on nondiabetic patients.[6,7] Increased Mortality rate in diabetic patients may have several explanations. First, diabetics experience more severe coronary atherosclerosis and more often multivessel disease, which doubles their risk for a subsequent infarction. Also, some but not all studies reported that DM patients have larger and more frequent anterior infarcts. Second, CHF and cardiogenic shock are more common and more severe in DM patients than would be predicted from infarction size.[6] Third, diabetic patients are more likely than non–diabetics to have fatal ventricular arrhythmias after AMI and AV block. Fourth, beta-blocker treatment in CAD is less frequently used in diabetic patients. Fifth, type 2 DM pts are often treated with oral antidiabetic sulphonylurea agents who may increase the risk of dying during critical myocardial ischemia. Sixth, proliferation of smooth muscle cells is involved in the healing of the ulcerated coronary plaque stabilization through synthesis of macromolecules that strengthen the fibrous cap. Endothelial dysfunction and insulin resistance at the cellular smooth muscle level, which is a frequent feature of type 2 DM may impair the coronary healing processes and plaque stabilization.[8,9] Thus, DM with its profound effects on metabolic milieu, vascular tree and nervous system no wonder has influence on

cardiovascular system and its disorders. It is needless to emphasis that cardiac patients with diabetes are a different group and deserve special consideration for assessment and therapeutics. They need a tight glycemic control and aggressive correction of other risk factors.[10-12] In conclusion, our data emphasis the role of DM as a important risk factor of severity of CAD and as a predictor of adverse outcome after   first   AMI.

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