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Outcome Differences in Diabetic and Non-Diabetic Following Primary PCI In Stemi Patients

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ABSTRACT

The purpose of this study is to determine the outcome and associated Major Adverse Cardiac Events (successful or failed primary percutaneous coronary intervention (PCI), complicated primary PCI, heart failure, cardiac arrest, ventricular tachycardia (VT), ventricular fibrillation (VF), renal failure, shock) within six months in diabetic and non- diabetic patients presenting with ST- segment elevation myocardial infarction and treated by primary percutaneous coronary interventions. This prospective study was conducted to include one hundred and nine patients with ST-segment elevation myocardial infarction (STEMI) admitted to the emergency department (ED) of Alexandria Main University Hospital (AMUH) and International Cardiac Centre (ICC) that are going to do primary PCI divided into two groups; diabetic group fifty nine patients and non-diabetic group fifty patients. History taking, clinical examination, laboratory investigations and radiological investigations including Echo cardiography done for those patients. The frequency of MACE among the diabetic group was 69.8% and among the non-diabetic group was 30.2%, so there was statistically significant difference between diabetic and non-diabetic groups ($p<0.001$). In this study, it was noted that despite of reperfusion therapy, STEMI patients with diabetes have an increased the risk of MACE and adverse prognosis. Mortality remain substantially higher in patients with diabetes following primary PCI for STEMI in comparison with those without diabetes and presence of diabetes which highlights the importance of aggressive strategies to manage the high risk population with acute MI.

Keywords: Diabetes mellitus, ST-segment elevation myocardial infarction, Primary percutaneous coronary intervention, Major advanced cardiac events.

INTRODUCTION

Every year, over millions of people attend an emergency department because of chest pain. The epidemiological relevance of cardiovascular disease (CVD), among patients with chest pain particularly coronary artery disease (CAD) , is widely recognized. CAD is one of the main causes of death in our country, particularly in patients with acute coronary syndrome (ACS) (Grech ED et al 2003).

Acute myocardial infarction is currently classified as either ST-segment elevation myocardial infarction (STEMI) or non ST-segment elevation myocardial infarction (Armstrong PW et al 1998).

Acute STEMI typically arises from sudden thrombotic occlusion of a coronary artery. STEMI is the most lethal form of ACS. In addition to high mortality rates, STEMI is also associated with high rates of serious complications that can be avoided with early treatment (Jollis JG et al 2012).

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Management of patients with acute coronary syndromes aims at early and sustained restoration of antegrade flow in the infarct related artery (Park YH et al 2012).

Primary percutaneous coronary intervention (PCI) is the main treatment for STEMI patients, PCI is a non-surgical procedure used to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease. These stenotic segments are due to the buildup of the cholesterol-laden plaques that form due to atherosclerosis (Palmerini T et al 2012).

Diabetes mellitus (DM) is a metabolic condition characterized by dysfunction in insulin secretion and insulin action resulting in chronic hyperglycaemia and deeply affecting the cardiovascular system. However, DM itself is the main cause of accelerated atherogenesis and atherothrombosis observed in this patient population (Creager MA et al 2003).

In patients with STEMI, primary PCI is wellestablished treatment. However, the long term prognosis remains unsatisfactory in patients with DM. Meta-analyses, randomized trials, and cohort studies have shown that, in patients with STEMI undergoing primary PCI, DM is associated with impaired perfusion, distal embolization, and higher mortality *(*De Luca G *et al 2009).*

PATIENTS AND METHODS

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Patients:

One hundred and nine diabetic and non-diabetic patients presenting with ST-segment elevation myocardial infarction (STEMI) to the emergency department (ED) of Alexandria Main University Hospital (AMUH) and International Cardiac Centre (ICC) that are going to do primary PCI.

Inclusions criteria:

1. Age over 18 years.
2. Recent STEMI.

Exclusions criteria:

1. Previous coronary artery bypass graft (CABG).
2. Previous PCI.
3. Cardiogenic shock.
4. Renal failure.
5. Heart failure.

Methods:

History taking, clinical examination, laboratory investigations and radiological investigations done including Echo cardiography.

Statistical Analysis:

The results were expressed as means, standard deviation (SD), counts and percentages. Univariate analysis was performed using a $\chi 2$ test for categorical data. Fisher's exact test was used when a data table had at least one cell with an expected frequency of < 5 .Differences were considered to be significant at the ($p \leq 0.05$) probability level. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS 14) for Windows (SPSS, 2005).

RESULTS AND DISCUSSION

Diabetes mellitus (DM) is associated with a 2 to 4-fold increased risk of coronary artery disease, and ischemic coronary artery disease is responsible for three-quarters of diabetes-related deaths (Luscher TF et al 2003).

The adverse macrovascular consequences of DM are well recognized, as is the accompanying accelerated rate of atherosclerosis that predisposes patients to occlusive coronary artery disease, myocardial infarction and death. Patients with DM are prone to a diffuse and rapidly progressive form of atherosclerosis, which increases their likelihood of requiring revascularization, so DM is considered as an independent predictor and a strong risk factor for development of major adverse cardiac events (MACE) following successful ballon angioplasty or coronary stenting in STEMI patients (Berry C et al 2007).

After adjustment for differences in baseline variables, however, diabetes was still associated with an increased long-term mortality. Patients with diabetes had a greater reduction in LVEF after STEMI, which could also have had a major impact on survival. The decreased LVEF observed in diabetes could have been the result of glycometabolic disturbances, including an increased utilisation of free fatty acids, and impaired pre-conditioning causing myocardial cells to be more prone to ischaemic and reperfusion injury (Ishihara M et al 2001).

Table-1. Relation between MACE and DM

	MACE				χ^2	p
	Non MACE (n=46)		MACE (n=63)			
	No.	%	No.	%		
DM						
DM	15	32.6	44	69.8	14.844*	<0.001*
Non DM	31	67.4	19	30.2		

χ^2: Chi square test
**: Statistically significant at $p \leq 0.05$*

Table-2. Relation between MACE and demographic data

	MACE				Test of sig.	p
	Non MACE (n=46)		MACE (n=63)			
	No.	%	No.	%		
Sex						
Male	31	67.4	48	76.2	χ^2=1.032	0.310
Female	15	32.6	15	23.8		
Age (years)						
Min. – Max.	34.0 – 77.0		34.0 – 80.0		t=0.826	0.411
Mean ± SD.	57.41 ± 9.57		59.06 ± 10.81			
Median	59.0		60.0			

χ^2: Chi square test
t: Student t-test

As regard relation between MACE and DM in the present study, there was found a strong statistical correlation between occurence of MACE and diabetes (p<0.001); while the findings were reported by Saeid Sadrnia et al (Saeid Sadrnia et al,2013), who said that there were no statistically significant differences between the two groups (Table 1).

As regard relation between age and MACE in the present study, There was no correlation between age and MACE occurrence in both studied groups; similar findings were reported by Saeid Sadrnia et al (Saeid Sadrnia et al,2013), who said that there were no statistically significant differences between the two groups, with respect to the mean of age (Table-2).

When correlation was done between MACE and all risk factors in both diabetic and non-diabetic groups we found no positive correlation, similar findings were reported by Saeid Sadrnia et al (Saeid Sadrnia et al,2013) who said that there were no positive correlation found between MACE and all risk factors (Table 3).

As regard relation between 30 days mortality and DM in the present study, There was no statistical correlation between occurence of 30 days mortality and diabetes; similar findings were reported by J Sala et al (J Sala et al,2002), who said that there were no statistically significant differences between the two groups (Table 4).

As regard relation between age and 30 days mortality in the present study, There was no correlation between age and 30 days mortality occurrence in both studied groups; similar findings were reported by Bernd Waldecker et al (Bernd Waldecker et al,1999) and J Sala et al (J Sala et al,2002), who said that there were no statistically significant differences between the two groups, with respect to the mean of age (Table 5).

According to this study there were no statistically significant differences between the two groups with respect to sex. It should also not be ignored that although the sex is not statistically significant, male patients had increased risk for primary mortality as compared to female patients, similar findings were

Table-3. Relation between MACE and risk factors

Risk factors	MACE				χ^2	p
	Non MACE (n=46)		MACE (n=63)			
	No.	%	No.	%		
HTN	28	60.9	36	57.1	0.152	0.696
Dyslipidemia	13	28.3	17	27.0	0.022	0.883
Smoking						
Non smoker	17	37.0	27	42.9	0.385	0.535
Ex-smoker	6	13.0	10	15.9	0.170	0.680
Current smoker	23	50.0	26	41.3	0.819	0.366
+VE FH for ACS	18	39.1	20	31.7	0.638	0.424
Sedentary life (lack of exercise)	27	58.7	31	49.2	0.962	0.327
High fatty diet	23	50.0	28	44.4	0.330	0.566
Central obesity	24	52.2	25	39.7	1.676	0.195
Alcohol consumption	5	10.9	4	6.3	0.717	^{FE}p=0.489
Psychosocial factors (work stress,personality)	26	56.5	32	50.8	0.350	0.554

χ^2: Chi square test
FE: Fisher Exact for Chi square test

Table 4. Relation between 30 days mortality and DM

	30 days mortality				χ^2	p
	Survived (n=98)		Died (n=11)			
	No.	%	No.	%		
DM						
DM	50	51.0	9	81.8	3.78	0.052
Non DM	48	49.0	2	18.2		

χ^2: Chi square test
**: Statistically significant at $p \leq 0.05$*

reported by Bernd Waldecker et al (Bernd Waldecker et al,1999) and J Sala et al (J Sala et al,2002), who said that there were no statistically significant differences between the two groups, with respect to sex (Table-5).

When correlation was done between 30 days mortality and all risk factors in both diabetic and non-diabetic groups we found no positive correlation, similar findings were reported by Bernd Waldecker et al (Bernd Waldecker et al,1999) and J Sala et al (J Sala et al,2002), who said that there were no positive correlation found between 30 days mortality and all risk factors (Table 6).

As regard relation between 6 months mortality and DM in the present study, There was found a strong statistical correlation between occurence of 6 months mortality and diabetes (p=0.006); while the findings were reported by Sunil Kumar Agarwal et al (Sunil Kumar Agarwal et al,2009), who said that there were no statistically significant differences between the two groups (Table-7).

As regard relation between age and 6 months mortality in the present study, There was no correlation between age and 6 months mortality occurrence in both studied groups; similar findings were reported by Sunil Kumar Agarwal et al (Sunil Kumar Agarwal et al,2009), who said that there were no statistically significant differences between the two groups, with respect to the mean of age (Table - 8).

Table-5. Relation between 30 days mortality and demographic data

	30 days mortality				Test of sig.	p
	Survived (n=98)		Died (n=11)			
	No.	%	No.	%		
Sex						
Male	70	71.4	9	81.8	χ^2=0.535	FEp=0.724
Female	28	28.6	2	18.2		
Age (years)						
Min. – Max.	34.0 – 80.0		34.0 – 77.0		t=0.463	0.652
Mean ± SD.	58.58 ± 9.73		56.45 ± 14.88			
Median	60.0		60.0			

χ^2: Chi square test
t: Student t-test

Table-6. Relation between 30 days mortality and risk factors

Risk factors	30 days mortality				χ^2	p
	Survived (n=98)		Died (n=11)			
	No.	%	No.	%		
HTN	57	58.2	7	63.6	0.122	FEp=1.000
Dyslipidemia	28	28.6	2	18.2	0.535	FEp=0.724
Smoking						
Non smoker	38	38.8	6	54.5	1.022	FEp=0.346
Ex-smoker	15	15.3	1	9.1	0.305	FEp=1.000
Current smoker	45	45.9	4	36.4	0.365	FEp=0.751
+VE FH for ACS	35	35.7	3	27.3	0.310	FEp=0.744
Sedentary life (lack of exercise)	52	53.1	6	54.5	0.009	0.925
High fatty diet	47	48.0	4	36.4	0.534	0.465
Central obesity	46	46.9	3	27.3	1.546	FEp=0.339
Alcohol consumption	7	7.1	2	18.2	1.591	FEp=0.225
Psychosocial factors (work stress,personality)	50	51.0	8	72.7	1.872	0.171

χ^2: Chi square test
FE: Fisher Exact for Chi square test

Table-7. Relation between 6 months mortality and DM

	6 months mortality				χ^2	p
	Survived (n=91)		Died (n=18)			
	No.	%	No.	%		
DM						
DM	44	48.4	15	83.3	7.406*	0.006*
Non DM	47	51.6	3	16.7		

χ^2: Chi square test
**: Statistically significant at $p \leq 0.05$*

Table-8. Relation between 6 months mortality and demographic data

	6 months mortality				Test of sig.	p
	Survived (n=91)		Died (n=18)			
	No.	%	No.	%		
Sex						
Male	65	71.4	14	77.8	χ^2=0.304	^{FE}p=0.775
Female	26	28.6	4	22.2		
Age (years)						
Min. – Max.	34.0 – 80.0		34.0 – 77.0		t=0.066	0.948
Mean ± SD.	58.33 ± 9.54		58.56 ± 13.82			
Median	59.0		61.50			

χ^2: Chi square test
t: Student t-test

Table-9. Relation between 6 months mortality and risk factors

Risk factors	6 months mortality				χ^2	p
	Survived (n=91)		Died (n=18)			
	No.	%	No.	%		
HTN	53	58.2	11	61.1	0.051	0.821
Dyslipidemia	27	29.7	3	16.7	1.274	^{FE}p=0.388
Smoking						
Non smoker	35	38.4	9	50.0	0.831	0.362
Ex-smoker	13	14.3	3	16.7	0.068	^{FE}p=0.726
Current smoker	43	47.3	6	33.3	1.177	0.278
+VE FH for ACS	35	38.5	3	16.7	3.143	0.076
Sedentary life (lack of exercise)	47	51.6	11	61.1	0.540	0.462
High fatty diet	42	46.2	9	50.0	0.089	0.765
Central obesity	41	45.1	8	44.4	0.002	0.962
Alcohol consumption	7	7.7	2	11.1	0.232	0.630
Psychosocial factors (work stress,personality)	46	50.5	12	66.7	1.568	0.211

χ^2: Chi square test
FE: Fisher Exact for Chi square test

According to this study there were no statistically significant differences between the two groups with respect to sex. It should also not be ignored that although the sex is not statistically significant, male patients had increased risk for 6 months mortality as compared to female patients, similar findings were reported by Sunil Kumar Agarwal et al (Sunil Kumar Agarwal et al,2009), who said that there were no statistically significant differences between the two groups, with respect to sex (Table-8).

When correlation was done between 6 months mortality and all risk factors in both diabetic and non-diabetic groups we found no positive correlation, similar findings were reported by Sunil Kumar Agarwal et al (Sunil Kumar Agarwal et al,2009), who said that there were no positive correlation found between 6 months mortality and all risk factors (Table-9).

CONCLUSION

Despite of reperfusion therapy, STEMI patients with diabetes have an increased the risk of MACE and adverse prognosis. Mortality remain substantially higher in patients with diabetes following primary PCI for STEMI in comparison with those without diabetes. Presence of diabetes which highlights the importance of aggressive strategies to manage the high risk population with acute MI.

Conflicts of Interest

Authors declare that there is no conflict of interests regarding the publication of this paper.

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