

INFLUENCE OF TYPE 2 DIABETES MELLITUS ON THE KILLIP CLASS IN ACUTE MYOCARDIAL INFARCTION PATIENTS VISITING HAYATABAD MEDICAL COMPLEX, PESHAWAR, KHYBER PAKHTUNKHWA

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ABSTRACT

Introduction: Diabetes mellitus (DM) is well known risk factor for myocardial infarction. Some studies report that DM also affects the Killip class of heart failure in post-Acute Myocardial Infarction (AMI) patients. This study was carried out to evaluate the influence of concomitant DM and AMI on Killip class of heart failure.

Materials & Methods: This was a case-control study in which data were collected from 196 patients, who presented with AMI to Department of Cardiology in Hayatabad Medical Complex (HMC) between September and December, 2015. Cases were those who had type 2 Diabetes Mellitus (T2DM) along with AMI, while controls were those AMI patients who were not having T2DM. Within each group, subgroups were made on the basis of Killip Classification. Assessment was done by expert cardiologists. Non-probability convenience sampling technique was used. Data were collected on Performa comprising of demographic data, clinical assessment and Killip scale assessment. Data were analyzed by SPSS version 16.

Results: A total of 196 subjects from both sexes who presented with first AMI were included in the study. Mean age was 59 ± 7.58 years. Out of 196 subjects who had AMI, 17.86% were type 2 diabetics and 82.14% were non-diabetics ($p < 0.001$). There was no significant difference in terms of gender ($p = 0.79$), age ($p = 0.72$), weight ($p = 0.53$), height ($p = 1.00$), body mass index ($p = 0.33$), heart rate ($p = 0.85$), systolic blood pressure ($p = 0.80$) and diastolic blood pressure ($p = 0.83$) between diabetics and non-diabetics. In AMI patients without diabetes mellitus (control group), 57.1% patients did not develop heart failure, 13.7% patients were in Killip Class II, 19.9% were in Killip Class III, and 9.3% were in Killip class IV. In contrast, 57.1 % AMI patients with diabetes mellitus didn't develop heart failure (OR = 1.00, 95% CI: 0.48 to 2.09, $p = 1.00$), 22.9% patients were in Killip Class II (OR=1.67, 95% CI: 0.65 to 4.29, $p = 0.28$), 11.4% were in Killip Class III (OR=0.57, 95% CI: 0.18 to 1.81, $p = 0.34$), and 8.5% were in Killip Class IV (OR=0.92, 95% CI: 0.24 to 3.48, $p = 0.92$). There was insignificant difference between two groups ($p > 0.05$).

Conclusion: Though Type 2 Diabetes Mellitus is one of the major risk factor for Acute Myocardial Infarction, however, concomitant Diabetes Mellitus and Acute Myocardial Infarction do not influence the Killip class outcome (heart failure).

Keywords: Myocardial Infarction; Diabetes Mellitus, Type 2; Heart Failure; Case-Control Study.

INTRODUCTION

Cardiovascular diseases (CVD) are one of the major concerns for health care providers and are number one cause of death worldwide. According to WHO, 17.3 million people died from CVD around the world in 2008 and it is estimated that mortality due to CVD may reach to 23.3 million by 2030 if sufficient preventive steps are not taken to control the disease.¹ In the United States, 60%

of population above the age of 65 years suffers from CVD and one in every four deaths is caused by heart disease.² In the United Kingdom, 74,000 people die from CVD each year. In Pakistan, approximately 200,000 deaths occur every year due to CVD and numbers are increasing at a very fast rate.³ Cardiovascular diseases are a group of diseases which include Myocardial Infarction (MI),

Cerebrovascular disease, Peripheral arterial disease, Rheumatic heart disease, Congenital-heart disease, Deep-venous thrombosis and Pulmonary-embolism. Among these, MI is the prevalent life threatening emergency and is responsible for 7.3 million deaths/year globally (42% of all cardiovascular death).^{1,4} There are more than 300 factors for myocardial infarction i.e. increase in age, male gender, poor diet, genetic factors, ethnical factors, racial factors, psycho-social factors, physical inactivity, hereditary factors, smoking, abdominal obesity, hypertension, diabetes mellitus, dyslipidemia, stress, excessive alcohol consumption, renal diseases, etc. identified by Framingham study, WHO MONICA project and the INTERHEART study^{1,2,4-6}. Diabetes mellitus is well known independent risk factor for myocardial infarction.^{6,7} Risk stratification in the outcome of acute MI patients is done on the basis of Killip Classification (Class I, II, III and IV) which involves the physical assessment of post-acute MI patients. Killip scale is also a useful tool for stratifying the severity of LV dysfunction. Mortality rate is highest in those AMI patients in first thirty days who fall in Killip Class IV and lowest in Killip Class I.⁷ Some clinical studies have proved that diabetes mellitus does not affect the Killip class. Rather, it results in tachycardia and increases cardiac output.⁸ On the other hand, cardiac remodeling studies have shown that concomitant hyperglycemia and acute MI results in severely impaired left ventricle functions⁽⁹⁾ and higher Killip class. This study was carried out to evaluate the impact of DM on Killip class in post AMI patients.

Objective of this study was to find out the influence of Diabetes Mellitus (if any) on Killip class of heart failure in acute MI patients.

MATERIALS & METHODS

This was a case control study in which data was collected from 196 patients who present with first AMI to Department of Cardiology in Hayatabad

Medical Complex (HMC) between September and December, 2015 after the permission from in charge of the department. Control was taken as those MI patients who were not having T2DM and cases were those who had T2DM. Within each group, subgroups were made on the basis of Killip Classification. In this study, DM was defined according to American Diabetes Association (ADA) 2015 guidelines (the use of anti-diabetic medication or the patients having documented proof (e.g., HbA1c test result) or documents related to history of diabetes mellitus) (10). Those patients having first AMI and were 21 - 75 year's age were included in this study. Patients of first AMI not giving informed consent; patients of first AMI presenting after 12 hours of onset of chest pain; patients having previous history of MI or coronary artery bypass surgery, valvular or myopathic heart disease were excluded from this study. Data was collected on Performa. The Performa comprised of patient's personal information (age, gender), clinical examination (anthropometric measurements, heart rate, systolic and diastolic blood pressure) and Killip Scale assessment which was done by expert cardiologists. Data collected from the patients were entered into the computer on regular basis and processed by using SPSS version 16. Mean and Standard Deviation (SD) was used for expressing continuous data and for categorical data, frequency and percentage was calculated. For comparison between frequencies, chi-square test was applied and for comparison between Means of two groups, Student t-test was used.

RESULTS

A total of 196 subjects from both sexes who presented with first acute MI were included in the study. Mean age was 59 ± 7.58 years (CV=0.13); mean BMI was 27 ± 4.35 (CV=0.16); mean heart rate was 92 ± 11.19 (CV=0.12); mean systolic blood pressure was 155 ± 34.75 (CV=0.22) and mean diastolic blood pressure was 85 ± 22.90 (CV=0.27) as shown in Table 1.

Table 1: Demographics and Vital Signs on Admission (n = 196)

Variables	Mean \pm SD	Coefficient of Variation (CV)
Age (years)	59.49 \pm 7.58	0.13
BMI (kg/m ²)	27.21 \pm 4.35	0.16
Heart rate (beats/minute)	92.67 \pm 11.19	0.12
Systolic Blood Pressure (mmHg)	155.15 \pm 34.7	0.22
Diastolic Blood Pressure (mmHg)	85.31 \pm 22.90	0.27

Out of 196 patients, 57.1% had no sign of heart failure post-MI; whereas 15.31% subjects were in Killip class II, 18.37% subjects were in Killip class III and 9.18% subjects were in Killip class IV (Table 2).

Table 2: Baseline Killip Scale Grading (n = 196)

Killip Class	n (%)
I	112 (57.14)
II	30 (15.31)
III	36 (18.37)
IV	18 (9.18)

Out of 196 subjects who had AMI, 17.86% were type 2 diabetics and 82.14% were non-diabetics ($p < 0.001$). There was no significant difference in terms of gender ($p = 0.79$), age ($p = 0.72$), weight ($p = 0.53$), height ($p = 1.00$), body mass index ($p = 0.33$), heart rate ($p = 0.85$), systolic blood pressure ($p = 0.80$) and diastolic blood pressure ($p = 0.83$) between those who were diabetics and those who were non-diabetics, as shown in Table 3.

Table 3: Demographics and Vital Signs of Cases and Controls.

Variables	Cases (AMI+ DM)	Controls (AMI only)	p value
Number of cases (Percentage)			
Subjects (n=196)	35(17.86)	161 (82.1)	<0.001
Males (n=116)	20(57.14)	96(59.6)	0.79
Females (n=80)	15(42.86)	65(40.3)	
Mean ± SD			
Age (years)	59.9 ± 5.58	59.4 ± 7.95	0.72
Weight (kg)	77.7 ± 11.31	78.9 ± 9.96	0.53
Height (m)	1.7 ± 0.07	1.7 ± 0.09	1.00
BMI (kg/m²)	26.5 ± 3.91	27.3 ± 4.4	0.33
Heart rate (beats / minute)	91.7 ± 10.00	92.8 ± 11.4	0.85
Systolic Blood Pressure (mmHg)	156.5 ± 39.10	154.8 ± 33.8	0.80
Diastolic Blood Pressure (mmHg)	86.0 ± 24.39	85.1 ± 22.6	0.83

In patients with concomitant DM and AMI, 34.3% patients had normal BMI, 45.7% patients were overweight and 20% were obese. In control group (DM = -ve), 30.4% patients had normal

BMI, 49.7% patients were overweight and 19.9% were obese. There was no difference between two groups ($p > 0.05$) as shown in table 4.

Table 4: Body Mass Index (BMI) Distribution of the Study Groups

BMI	Cases (AMI+ DM) n = 35	Controls (AMI only) n = 161	p value
Normal (18.5-24.9)	12 (34.3)	49 (30.4)	0.59
Overweight (25-29.9)	16 (45.7)	80 (49.7)	0.63
Obese (≥ 30)	7 (20)	32 (19.9)	0.83

In AMI patients without diabetes mellitus (control group), 57.1% patients did not develop heart failure, 13.7% patients were in Killip Class II, 19.9% were in Killip Class III, and 9.3% were in Killip class IV. In contrast, 57.1 % AMI patients with diabetes mellitus didn't develop heart failure (OR=1.00, 95% CI: 0.48 to 2.09, p=1.00), 22.9%

patients were in Killip Class II (OR=1.67, 95% CI: 0.65 to 4.29, p=0.28), 11.4% were in Killip Class III (OR=0.57, 95% CI: 0.18 to 1.81, p=0.34), and 8.5% were in Killip Class IV (OR=0.92, 95% CI: 0.24 to 3.48, p=0.92). There was no significant difference between two groups (p>0.05) as shown in table 5.

Table 5: Killip Scale (KS) Distribution of the Study Groups

Killip Scale	Cases (AMI+ DM) n= 35	Controls (AMI only) n= 161	Odds ratio	95 % CI	p value
I	20(57.1)	92(57.1)	1.00	0.48-2.09	1.00
II	8(22.9)	22(13.7)	1.67	0.65-4.29	0.28
III	4(11.4)	32(19.9)	0.57	0.18-1.81	0.34
IV	3(8.5)	15(9.3)	0.92	0.24-3.48	0.90

DISCUSSION

One hundred and ninety six patients of both sexes who presented with first acute MI were included in this research work. Out of 196 subjects who had first AMI, 17.86% were type 2 diabetics and 82.14% were non-diabetics (p=<0.00). This finding is not in accordance with the results of Kassaian et al., (2012)¹¹ and Mak et al., (1997)¹² in which 24.4% and 14.5% were diabetics. This difference is due to large sample of both these studies; the former study had a sample of 2884 while the latter had 41,021 subjects in their study.

In this study, mean age was 59 \pm 7.58 years (CV= 0.13). The mean age of subjects with T2DM was 59.9 \pm 5.58 years and non-diabetics were 59.4 \pm 7.95 years with insignificant difference between these

groups (Table 3). This observation is similar to that of Khan et al., (2011).¹³ However, Mak et al., (1997)¹² and Corpus et al., (2004)¹⁴ showed mean age around 63-64 years in their results. This difference in age might be due to racial factors. In contrast, a study by Naseem and Moin, (2002)¹⁵ showed mean age of 52.8 years. This difference might be due to small sample size of 100 patients in Naseem and Moin, (2002) research in comparison to 196 patients in this research. There was no significant difference in terms of gender (p=0.79), age (p=0.72), weight (p=0.53), height (p=1.00), body mass index (p=0.33), heart rate (p=0.85), systolic blood pressure (p=0.80) and diastolic blood pressure (p=0.83) between those who were diabetics and those who were non-

diabetics as shown in Table 3. Several authors^{11,12,16,17} have also reported similar observations.

Minicucci et al., (2011)¹⁸ have indicated that approximately 25% of post-AMI patients develop heart failure. Post-MI heart failure was assessed in this research clinically by using Killip Scale criteria. Killip scale was also used to stratify subjects into Killip Class I, II, III and IV according to clinical assessment. When heart failure frequency was determined by Killip Scale grading criteria, present study found out that 57.1% subjects did not develop heart failure whereas 42.9% subjects were in heart failure (Table 2). Similar results were obtained by Khan et al., (2011)¹³ in which 39.5 % diabetic patients developed heart failure after AMI. This might be due to almost similar sample size (182 in Khan et al., 2011 and 196 in this

study). These findings are slightly different from the results of Khan et al., (2012)¹⁹ in which 63% post-AMI patients did not develop heart failure, and 37% develop heart failure.

In AMI patients with diabetes mellitus, 8.5% were in Killip Class IV which has poor prognosis and high mortality rate. In comparison, 9.3% patients without diabetes mellitus were in Killip class IV. There was insignificant difference between two groups ($p>0.05$) as shown in table 5. Mak et al., (1997)¹² showed that only 1-2% subjects were in Killip Class IV.

Conclusion

Though type 2 diabetes mellitus is one of the major risk factor for AMI, however, in the present study, concomitant DM and AMI did not influence the Killip class outcome.

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