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Original Article

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Comparative Study of Clinical Profile, Investigations and Outcome in St Elevation Myocardial Infarction among Diabetic and Non Diabetic Patients

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ABSTRACT

Background: Acute myocardial infarction (AMI) is one of the most common diagnoses in hospitalized patients. Diabetes is an independent risk factor for the development of coronary artery disease.
Hence knowledge of prior diagnosis of diabetes as well as knowing the blood glucose levels at the time admission in patients with myocardial infarction has important implications for proper patient's management, as early aggressive treatment of hyperglycaemia may beneficially influence both the short and long term outcomes in these patients.
Aims and objectives: To study the influence of diabetes on age of occurrence, Gender distribution, incidence of painless STEMI and Complications.
Materials and methods: 36 Patients fulfilling the inclusion and exclusion criteria were involved in the study after obtaining a written informed consent. A pre-tested semi structured questionnaire was used to collect data from study participants. The data were entered in MS excel and was analysed using SPSS. Descriptive analysis, chi-square and odd's ratio were performed. The results were presented in the form of frequency and percentages. $p<0.05$ was considered as significant.
Results: In our study, majority of the patients were within the age group of 51-60 and were male patients. Most of them had sedentary lifestyle. Anterior wall MI was most common. Diabetics showed higher Killip class. Cardiac failure, ventricular arrhythmias, heart block and mortality were more common among diabetics than that of non-diabetics.
Conclusion: Diabetic patients have a blunted appreciation for ischemic pain. As a result of this reduced sensation, myocardial ischemia or infarction may be associated with only mild symptoms and go unrecognized or may be entirely asymptomatic and thus truly silent. Prompt and timely recognition, early treatment, treatment adherence plays a vital role in preventing and treating myocardial infarction among diabetic patients.

Key Words: *Stemi; Chest Pain; Diabetes Mellitus; Ventricular Tachycardia; Heart Failure ; Complete Heart Block*

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INTRODUCTION

Coronary heart diseases (CHD) is the leading cause of morbidity and mortality throughout the world. The most common form of CHD is the myocardial infarction. The risk factors such as dyslipidaemia, smoking, psychosocial stressors, diabetes mellitus, hypertension, obesity, alcohol consumption, physical inactivity, and a diet low in fruits and vegetables were strongly associated with acute MI [1]. In the 21stcentury, CHD is acknowledged as an important threat to the sustainable development in the 21st century [2].

Acute myocardial infarction (AMI) is one of the most common diagnoses made in hospitalized patients. The in-hospital mortality rate after admission for AMI has declined from 10% to about 6% over the past decade. The1 year mortality rate after AMI is about 15%. Mortality is approximately fourfold higher in elderly patients (over age 75) as compared with younger patients. The mortality and morbidity caused by acute myocardial infarction are major public health concerns and is also slowly becoming a leading cause of mortality in developing countries [3].

The Global Burden of Diseases Study reported that the disability adjusted life years lost by CHD in India during 1990 was 5.6 million in men and 4.5 million in women; the projected figures for 2020 were 14.4 million and 7.7 million in men and women respectively [4].

The incidence of diabetes mellitus (DM) is increasing substantially worldwide. Over the past three decades, the global burden of DM has increased from 30 million in 1985 to 382 million in 2014, with current trends indicating that these rates will only continue to rise. The latest estimates by the international diabetes federation project that 592 million (1 in 10 persons) worldwide will have DM by 2035 [5, 6].

Type 2 diabetes mellitus (T2DM) and its complications are seriously affecting the public health worldwide. Myocardial infarction (MI) is the primary cause of death in patients with T2DM. T2DM patients without a history of coronary artery disease (CAD) have the same risk of major coronary events as those with CAD; T2DM patients with a history of MI have >40% risk of recurrence of MI.

In a scientific statement published in Circulation on April 13, 20207, the American Heart Association (AHA) noted that compared with CAD in patients without T2DM, CAD in patients with T2DM needs to be treated more aggressively to reduce the risk of MI.

A close link exists between DM and cardiovascular disease (CVD). CVD is the most prevalent cause of mortality and morbidity in diabetic populations. This increased risk of CVD mortality in diabetic patients is found in both men and women. The relative risk for CVD morbidity and mortality in adults with diabetes ranges from 1 to 3 in men and from 2 to 5 in women compared to those without DM [8, 9].

Proper control and treatment of DM is critical as both the prevalence and economic burden of the disease continues to mount.

As CVD is the most prevalent cause of mortality and morbidity in patients with DM, a primary goal of diabetes treatment should be initiated to reduce the cardiovascular (CV) risk of diabetic patients. However, one challenge associated with treating DM and reducing CV events is the complex and multifaceted nature of the relationship linking DM to CVD.

CV risk factors including obesity, hypertension and dyslipidaemia are common in patients with DM, particularly those with T2DM Due to the complexity and numerous mechanisms linking DM to CVD, it is crucial to focus on the treatment for which it will have the greatest clinical impact on improving CV outcomes. This paper emphasises on the mechanisms linking DM to CVD as well as current treatment recommendations and future research in diabetes management [10].

Hence knowledge of prior diagnosis of diabetes as well as knowing at the blood glucose levels in patients with myocardial infarction at the time of admission has important implications for proper patient's management, as early aggressive treatment of hyperglycaemia may beneficially influence both the short and long term outcomes in these patients. This study is an effort to compare clinical profile in acute myocardial infarction with respect to diabetic and nondiabetic patients.

METHODOLOGY

The present cross-sectional study was conducted on the patients attending the inpatient and outpatient department of VIMS, and also patients referred from other department of VIMS combined group of hospitals of MCH, Ballari. After attaining clearance from the Institutional Review Board, this hospital based Observational study was conducted in the patients admitted in the ward under the Department Of General Medicine and in patients who are having STEMI. A total of 36 subjects were selected after explaining the purpose of the study and procedure of the study.

Patients fulfilling both the inclusion and exclusion criteria were enrolled in the study. After explaining the patient about the purpose of the study, a written informed consent was obtained from each patient in their own vernacular language.

A pre-tested, semi-structured questionnaire was used for data collection. Information regarding socio-demographic factors, history (Main presenting complaint at the time of admission, Previous history of diabetes including the duration and regularity of treatment), and physical examination, were collected. Random blood sugar and ECG was taken at the time of admission.

The region of myocardial damage was identified with the help of ECG. Patient was then treated for the acute coronary event (viz. thrombolysed or anticoagulated). Fasting blood sugars were sent the following morning. All complications including mortality following the myocardial infarction during the stay in ICCU will be noted. Echocardiography was performed during the period of hospitalization and the ejection fraction was calculated.

Statistical analysis and methods

Data was collected by using a structure proforma. Data was entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA.

Qualitative data is expressed in terms of proportions And Quantitative data is expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact test Comparison of the mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not.

Descriptive statistics of each variable was presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value<0.001 was considered as highly significant.

RESULTS

In the current investigation, the age range of the majority of participants was 51-60 years, with 8 diabetic and 7 non-diabetic individuals. The mean age for diabetic patients was 52.50±10.45 years, while for non-diabetic individuals, it was 57.38±13.39 years.

The study population predominantly consisted of males, with 13 diabetics and 15 non-diabetics, while the female representation was relatively smaller, with 5 diabetic and 3 non-diabetic individuals. As for lifestyle, among 18 diabetic patients, 8 were manual laborers, and 10 led a sedentary lifestyle. Among 18 non-diabetic individuals, 5 were manual laborers, and 13 lived a sedentary lifestyle.

In terms of clinical presentation, 66.67% of diabetic patients reported chest pain. This finding echoes a study by Narayanan B L et al., where patients presented with equal proportions of typical and atypical chest pain. In that study, typical chest pain was more common among diabetics, but a higher proportion of atypical chest pain was observed among diabetics compared to non-diabetics.

The duration of diabetes was less than five years among 11 patients, between 5-10 years among 6 patients, and more than 10 years in one patient. Of the 18 diabetic patients, 8 were regular with their treatment regimen, whereas 10 were not consistent.

Killip classification in this study was as follows:

Grade 1: Diabetic: 7, Non-diabetic: 14
Grade 2: Diabetic: 6, Non-diabetic: 2
Grade 3: Diabetic: 4, Non-diabetic: 1
Grade 4: Diabetic: 1, Non-diabetic: 1

The incidence of anterior wall myocardial infarction (MI) was higher among diabetics (88.89%) compared to non-diabetics (55.56%), a difference that was statistically significant. Heart failure was more prevalent in diabetics (10 patients) compared to non-diabetics (4 patients), a statistically significant difference. Similarly, ventricular arrhythmias were more common in diabetics (6 patients) than in non-diabetics (1 patient), a difference which was also statistically significant.

Complete heart block was observed in 4 diabetic patients and none in non-diabetic patients, representing a statistically significant difference. Ejection fraction (EF) of less than 40 was found among 3 diabetic patients and none of the non-diabetic patients. EF of 41-50 was observed in 7 diabetic and 1 non-diabetic patient. Most of the non-diabetic patients (17) had EF greater than or equal to 51, while only 8 diabetic patients had an EF of this magnitude. This difference was found to be statistically significant. Finally, the mortality rate was higher among diabetics (38.89%) compared to non-diabetics (5.56%).

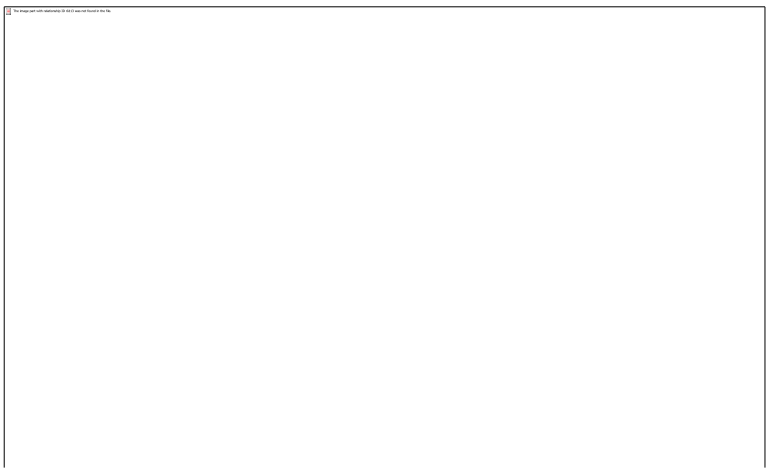

Figure 1: Distribution According To Duration of Diabetics

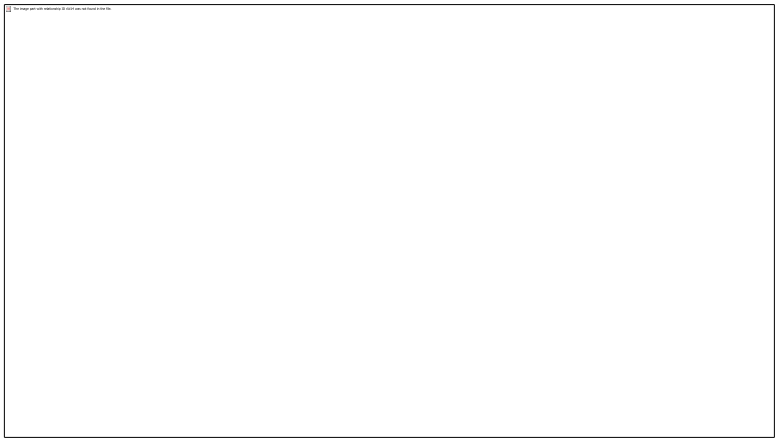

Figure 2: Distribution of Ventricular Arrythmias

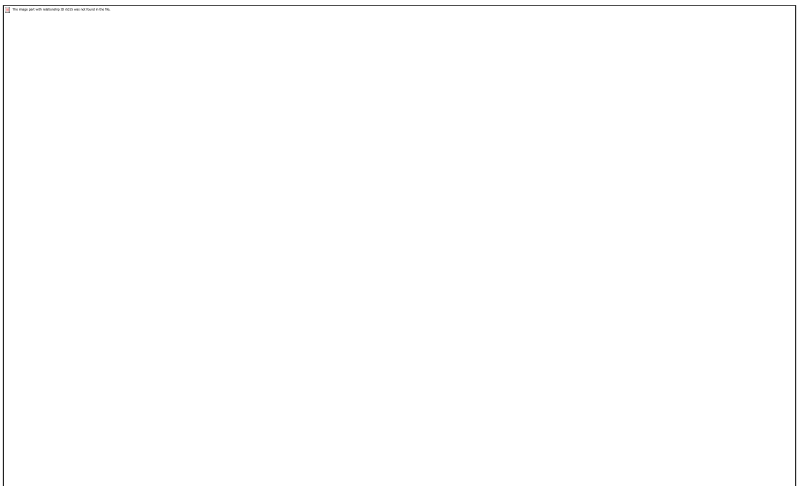

Figure 3: Distribution of Complete Block Heart

Table 1: Distribution According To Gender

Gender	Diabetic		Non Diabetic	
	Frequency	Percentage	Frequency	Percentage
Male	13	72.22	15	83.33
Female	5	27.78	3	16.67
Total	18	100.00	18	100.00

Table 2: Distribution According Killip Classification

KILLIP	I		II		III		IV		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Diabetic	7	38.89	6	33.33	4	22.22	1	5.56	18	100
Non Diabetic	15	83.33	1	5.56	1	5.56	1	5.56	18	100

Table 3: Distribution According To Ejection Fraction

Ejection Fraction	Diabetic		Non Diabetic	
	Frequency	Percentage	Frequency	Percentage
≤40	3	16.67	0	0.00
41-50	7	38.89	1	5.56
≥51	8	44.44	17	94.44
Total	18	100.00	18	100.00

DISCUSSION

Diabetes mellitus (DM) is strongly associated with the adverse cardiovascular (CV) events. DM affects the development of coronary artery disease (CAD) and clinical outcomes following the various manifestations of CAD. DM is a CAD risk- equivalent because the risk of acute myocardial infarction (AMI) in DM patients with no evidence of CAD matches the risk in patients with a previous history of AMI without DM.

DM contributes to poor the clinical outcomes after the event of AMI However; multiple confounding relationships between the clinical factors may influence the early term events simultaneously. Hence, this study was undertaken to compare the clinical profile in acute myocardial infarction with respect to that of diabetic and nondiabetic patients. In the present study a total of 36 patients were included (18 diabetic and 18 non- diabetic).

Demographic profile:

In the present study, Majority of the study participants were in the age group of 51-60years (Diabetic = 8 and non-diabetic= 7). The mean age among diabetic patients was 52.50±10.45, among non-diabetics it was 57.38±13.39.

Most of the study participants were male (diabetic=13 and non-diabetic=15) and females were (diabetic = 5 and non-diabetic = 3).

Among 18 diabetic patients 8 were manual labourers and 10 had a sedentary lifestyle. Among 18 non-diabetic 5 were manual labourers and 13 had a sedentary lifestyle.

Narayanan BL et al [11]. In their study observed that the Mean age was found to be 41.2±4.01 years.35 were male and 8 were female. Muhammad AS et al [12], in their study observed that the mean age was 39.04 ± 4.86.87.7% were male and 12.3% were female. In a study conducted by Iqbal et al. [10], the mean age of group-A (diabetics) was 59.44+9.95 years and group B(non-diabetics) was 54.52+11.95 years Most of the study subjects were male which was 58% and 88% in group-A and group-B respectively and female was 42% and 12% in group-A and group-B respectively. Shah et al. [13] found that 57.19+9.95 years in diabetic and 56.42+10.30 in non- diabetic STEMI patients.

Chest pain:

In the current study the majority of diabetic patients presented with chest pain (66.67%). In a study conducted by Narayanan B L et al. [11], patients presented with typical chest pain and atypical chest pain in equal proportions. Typical chest pain was more common among diabetics but the proportion of atypical pain as a presenting feature was high in diabetics when compared to that of non-diabetic population.

Other studies in the literature showed that the typical chest pain was found to be the most common presenting symptom in both diabetics and non-diabetics which is consistent with this study. Similarly, in the other studies most of the patients had higher incidence of STEMI in young CAD [14-16].

Duration and Regularity of treatment:

Duration of diabetes was less than five years among 11 patients, 5-10 years among 6 patients and in one patient it was more than 10 years. Out of 18 diabetic patients, 8 patients took treatment regularly and 10 were irregular with the treatment.

Killip classification:

The following results were observed in the present study:

Grade 1 = Diabetic : 7 and nondiabetic:14
Grade 2 = Diabetic : 6 and non-diabetic :2
Grade 3 = Diabetic : 4 and non-diabetic:1
Grade 4 = Diabetic : 1 and non-diabetic :1

In a cross-sectional study conducted by Hashmi KA et al., they observed that the frequency (percentage) of patients with STEMI in each Killip class from I to IV was 395 (81.4%), 46(9.5%), 27 (5.6%), and 17 (3.5%), respectively, while the in-hospital mortality in each Killip class came out to be 39 (9.9%), 4 (8.7%), 25 (92.6%) and 17 (100%), respectively. The presence of diabetes, history of smoking, and body mass index (BMI) of more than 30 kg/m2 were significant contributors to mortality, along with higher Killip class and age of presentation [17].

Wall involved in MI:

In the present study, Majority of the diabetic patients had anterior wall MI (88.89%) and only 55.56% among non-diabetic patients. This difference was found to be statistically significant. In India and elsewhere most common MI was anterior wall MI 74, 75. In a study conducted by Narayanan B L et al. [11], also had higher incidence of anterior wall MI (82%) followed by inferior wall MI and lateral wall MI with 16%and 2%, respectively.

Heart failure and related parameters:

Heart failure was seen in 10 diabetic patients and 4 non-diabetic patients. This difference was found to be statistically significant. Heart failure was more common in diabetics compared to that of nondiabetics. Ventricular arrhythmias were noted among 6 diabetic patients and 1 non-diabetic patient, the difference was statistically significant. Ventricular arrhythmias were more common in diabetics compared to that of nondiabetics.

Complete heart block was seen in 4 diabetic patients and none in non-diabetic patient. This difference was statistically significant. EF (less than 40) was found among 3 diabetic patients and none of the nondiabetic patients had EF less than or equal to 40 EF of 41-50 was found in 7 diabetic and in one non diabetic patient Most of the nondiabetic patients (17) had EF greater than or equal to 51 and only 8 diabetic patients had EF greater than or equal to 51 This difference was found to be statistically significant.

Complete Heart blocks were more common in diabetics when compared with that of nondiabetics in myocardial infarction. Mortality was higher among diabetics (38.89) than non-diabetics (5.56).

Nichols et al. [18] in their retrospective study observed that the incidence of HF in DM subjects was 3 times more than that of non-DM. Stratton et al. 2000 (UKPDS 35) [19] in prospective observational study they observed that In type 2 DM patients the risk of diabetic complications and HF was strongly associated with previous hyperglycaemia.

Matsushita et al. 2010 (ARIC study) [20] in their prospective study mentioned that Elevated HbA1c (≥5.5–6.0 %) was associated with incidence of HF. Boonman-de Winter et al. 2012 in a cross-sectional study observed that HF (28 %) and left ventricular dysfunction (23 %) are highly prevalent in DM patients [21].

The first demonstration of an increased risk of HF in patients with DM was reported by Kannel and McGee based on data obtained from 20 years of follow-up of the Framingham cohort. Compared with non-diabetic males and females, the age- adjusted relative risks of HF for diabetic males and females were 2.20 and 5.37, respectively [22].

Iqbal S et al. [10], in their study observed that among the risk factors for CAD, diabetes is a major contributor, not only to the development of CAD but also to the outcome following various manifestation of disease. 52% of non-diabetic myocardial infarction patient showed complete resolution, 36% had partial resolution and 12% showed failed resolution. But in cases of diabetics STEMI, 28% of patients showed complete resolution, 30% partial resolution and 42% failed resolution. Among the in- hospital complications between two groups, cardiogenic shock was significantly higher in diabetic patients with STEMI than those of non-diabetic patients with STEMI. Left ventricular ejection fraction (LVEF) was significantly lower in diabetic STEMI patients in comparison to that of non-diabetic STEMI patients (46.54 vs. 51.64; p=0.008). Most commonly noted arrhythmia was bradycardia with complete AV block, other noted arrhythmia was 2nd degree Mobitz type II AV block, 1st degree AV block and left and right bundle branch block and few patients develop ventricular tachycardia. Hospital stay was significantly prolonged in diabetic patients with STEMI than non-diabetic patients with STEMI. Hospital stay was considered prolonged if >5 days in case of inferior MI and >7 days in anterior MI.

In a study conducted by Donahoe SM et al., 81 observed that mortality was significantly higher among the patients with diabetes than among patients without diabetes at 30 days following either UA/NSTEMI (2.1% vs 1.1%, P .001) or STEMI (8.5% vs 5.4%, P .001).

CONCLUSION

STEMI in our study is more common among males, and is in the age group of 51-60 years amongst the diabetic and nondiabetic population. STEMI is associated with the people living a sedentary life. Typical chest pain is usually seen in Non diabetics rather than the diabetic population. Anterior wall myocardial infarction is more commonly seen in the diabetic population rather than the nondiabetic patients. Complications such as Heart failure, ventricular arrhythmias and complete heart block are seen more commonly in diabetic patients with STEMI than the Non Diabetic patients with STEMI. Mortality was higher in diabetics rather than the Non diabetics.

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