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## Research Article

### CLINICAL PROFILE OF MYOCARDIAL INFARCTION IN DIABETES AND NON DIABETES: A HOSPITAL BASED STUDY

Vimal Bharti<sup>1</sup>., Simorjot Kaur<sup>2</sup>., Surender Thakur<sup>3</sup>., Rajeev Bhardwaj<sup>4</sup>  
and Amit Sachdeva<sup>5\*</sup>

<sup>1,3</sup>Department of Medicine, Indira Gandhi Medical College, Shimla

<sup>2</sup>Department of Pathology, Indira Gandhi Medical College, Shimla

<sup>4</sup>Department of Cardiology, Indira Gandhi Medical College, Shimla

<sup>5</sup>Department of Community Medicine, Indira Gandhi Medical College, Shimla

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#### ABSTRACT

**Background:** Diabetes is one of the six primary risk factors identified for myocardial infarction, others being dyslipidaemia, smoking, male gender, hypertension and family history of atherosclerotic arterial disease. Diabetes mellitus patients experience a more complicated post myocardial infarction course including a greater incidence of post infarction, angina, infarct extension and heart failure.

**Material and methods:** The study was conducted in the Department of Medicine at Indira Gandhi Medical College, Shimla with Objectives to study the clinical profile & risk factors of acute myocardial infarction in diabetic and non diabetic hospitalized patients.

**Results:** The mean age of patients in the diabetic group and non diabetic group was 64.4±8.6 years and 58.1 ±10.9 years respectively. Risk factors were analyzed during the study and known hypertensive patients, basal metabolic index, obesity, age, family history of diabetes, random blood sugar, was found to be of statistically significance. Among Clinical features in diabetics and non diabetics, 35 and 48 respectively had chest pain. 36% and 30% respectively had dyspnea, 24 and 29 patients respectively had diaphoresis, 15 and 13 patients respectively had presyncope and syncope. Among diabetics 4 patients had heart failure as compared to 3 patients among non diabetic group. For atrioventricular conduction defects and rhythm disturbances in diabetic patients, 1 patient had PSVT, 2 had atrial fibrillation, 5 patients had ventricular tachycardia and 5 patients had complete heart block. The in hospital mortality rate was 22% in diabetic group and 14% in non-diabetic group.

**Conclusions:** Diabetics with myocardial infarction encounter more adverse clinical complications as well as outcome as predicted.

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#### INTRODUCTION

Cardiovascular disease is the most common cause of death worldwide. Before 1990 infectious disease and malnutrition were the most common cause of death throughout the world and cardiovascular death was responsible for less than 10 % of all deaths. Today cardiovascular diseases accounts for approximately 30% deaths worldwide, including nearly 40% in high income countries and about 28% in low and middle income countries.

As per the Who report, in the year 2020 at least 177 million people would have diabetes mellitus worldwide, greatest

increase will be in India from 19.4 million to 57.2 million, while china from 16 million to 37.6 million and united states of America from 13.9 million to 21.9 million during the same period<sup>1</sup>.

Diabetes is one of the six primary risk factors identified for myocardial infarction, others being dyslipidaemia, smoking, male gender, hypertension and family history of atherosclerotic arterial disease<sup>2</sup>. Diabetes mellitus is a metabolic disorder which increases the rate of atherosclerosis progression of vascular occlusion<sup>3</sup>. The vascular occlusion leads to cardiovascular diseases and many more complications.

\*Corresponding author: Amit Sachdeva

Department of Community Medicine, Indira Gandhi Medical College, Shimla

The population of diabetic with myocardial infarction differs from non diabetic MI in respect of age, sex, lesser percentage of smokers, clinical presentation (less chest pain), higher sugar levels at admission and more hospital mortality<sup>4</sup>.

Sudden death is found to be common among diabetic patients with autonomic neuropathy<sup>5</sup>. Silent progression of coronary disease producing fatal arrhythmias or myocardial infarction, without the classical manifestation of chest pain, is postulated in these patients<sup>6</sup>. On the other hand abnormal autonomic reflexes itself, were thought to account for the increased incidence of sudden deaths in these patients<sup>7</sup>.

Diabetes mellitus patients experience a more complicated post myocardial infarction course including a greater incidence of post infarction, angina, infarct extension and heart failure.

Hence knowledge of prior diagnosis of diabetes as well as knowing at the time of admission of blood glucose levels in patients with myocardial infarction has important implications for correct patient's management, as early aggressive treatment of hyperglycemia may beneficially influence both short and long term outcomes in these patients.

The present study is aimed at comparing the clinical profile, risk factors and in hospitalised acute myocardial infarction patients of diabetic and non diabetic population.

## MATERIAL AND METHODS

The study was conducted in the Department of Medicine at Indira Gandhi Medical College, Shimla from June 2007 to May 2008 with an aim to study the clinical profile and risk factors in patients with acute myocardial infarction in diabetic and non diabetic patients. Further the study also noted the short term outcome of acute myocardial infarction in hospital. Hence 50 consecutive patients of acute myocardial infarction without diabetes and 50 cases of acute myocardial infarction having diabetes were selected. Written informed consent was taken from the patients as per Performa.

The detailed history about the presentation and duration of the symptoms, delay between the onset of symptoms and admission to the hospital was recorded. The patients were divided into ST elevated and non ST elevated myocardial infarction depending on the ECG changes. Diabetic status was recorded, detailed clinical examination was done and their Killip class was recorded, detailed clinical examination was done, Troponin T/ I was done after 6 hours, if negative was repeated after 12 hours of onset of chest pain. Echocardiography was done before discharge. Patients were advised to come for review after one month. Patients who did not come for review within one month, they or their relatives were contacted telephonically and the reason of not coming for review was recorded and any symptoms / mortality during this period was noted. Demographic profile of the patients was recorded as per Performa attached and variables( age, sex, marital status, occupation, place of residence, rural / urban, history regarding smoking and alcohol consumption, diabetic or not, hypertensive and non hypertensive status )were recorded.

The inclusion and exclusion criterion was made by including those AMI with diabetes and non diabetics who came to IGMC shimla and exclusion were patients with chronic kidney

disease, patients with history of previous coronary artery bypass with surgery or prior stent insertion, patients with severe anemia and patient with pericardial diseases.

Criterion kept for diagnosis of diabetes was known diabetic patient and also patient with random blood sugar more than 200 mg and Hb A 1 c more than 7 % on admission.

Criterion for diagnosis of myocardial infarction was either two of the following criterion satisfies the diagnosis for an acute, evolving or recent myocardial infarction a) typical rise and gradual fall troponin or more rapid rise and fall or biochemical markers of myocardial necrosis with at least one of following: ischemic symptoms, development of pathologic Q waves on the ECG reading, ECG changes indicative of myocardial infarction, coronary artery intervention.

The ECG criterion for localization of site of infarction was A) anterior wall MI- changes in I, AVL, V1- V6 .B) antero septal MI- changes in lead V1-V4. C) Anterolateral wall MI – changes in leads I, AVL, V4-V6. D) Inferior wall MI- changes in lead II, III, AVF.E) right ventricular MI- changes in lead RV 4- RV6. F) Posterior wall MI- reciprocal changes in lead V1. For criterion for heart failure Killip classification was used which has grading from of scale 1 to 4.

In the hospital outcome in both diabetic and non diabetic for reinfarction, heart failure (Killip class), left ventricular dysfunction, arrhythmias, emergency percutaneous transluminal coronary angioplasty was compared.

Laboratory studies done in patients at the time of admission were complete hemogram, blood urea/ creatinine / electrolyte/ random blood sugar by Konelab 30 fully automatic analyzer, if not previously diagnosed Hb A 1 C was done by using Nyco – card reader, lipid profile within 24 hours of admission by using Konalab 30 fully automatic analyzer, Troponin T/ I was done after 6 hours of chest pain and if negative repeated after 12 hours of chest pain using QDx troponin I card test. ECG was done in all patients at the time of admission and 1 ½ - 2 hours after thrombolytic therapy.

Echocardiography was done before discharge using ATL HCl 3000 echo machine from parasternal and apical windows. Detailed M mode and 2 D and Doppler examination was done. Detailed regional wall motion abnormality, valve regurgitation, Left ventricular clot, mechanical complications, pericardial effusion, and ejection fraction were measured by modified Simpson's methods in 4 C views.

## OBSERVATIONS AND RESULTS

The mean age of patients in the diabetic group was 64.4+ 8.6 years. The mean age of patients in non diabetic group was 58.1 +- 10.9 years. The age difference between diabetic and non diabetic patients was statistically significant (p =0.002).

Among the diabetic group, 34 were males, 16 females, 27 were from working class, 23 from non working class, 11 patients were illiterate, 39 literate, 22 were from rural area, 28 from urban background. And among non diabetic group 36 were males, 14 female, 30 and 20 were from working and non working class, 18 patients were illiterate, 32 literate, 28 were from rural area and 22 are from urban background. Nine of the diabetics and 13 of the non diabetics were living within a radius of five kilometers from the hospital. (Table 1)

**Table 1** Demographic Profile of Study Population

Characteristics	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		Total (N=100)	P-Value
	No	%	No	%		
Age Groups (Years)	≤ 60	20	40	33	66	0.019
	> 60	30	60	17	34	
Sex	Male	34	68	36	72	0.663
	Female	16	32	14	28	
Occupation	Working	27	54	30	60	0.545
	Non-Working	23	46	20	40	
Residence	Rural	22	44	28	56	0.230
	Urban	28	56	22	44	
Education	Illiterate	11	22	18	36	0.123
	Literate	39	78	32	64	
Distance From Hospital(Km)	≤ 5	9	18	13	26	0.334
	>5	41	82	37	74	

Risk factors were analyzed during the study and known hypertensive, basal metabolic index and obesity, age, family history of diabetes, random blood sugar, was found to be of statistically significance in proving that they were the risk factors. (Table 2A& 2B)

**Table 2A** Risk factors profile of study population

Characteristics	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		Total (N=100)	P-Value
	No	%	No	%		
BMI (Kg/M <sup>2</sup> ) WHO Standards	<25	17	34	31	62	0.009
	25-29.9	33	66	18	36	
	≥ 30	0	0	1	2	
Waist Hip Ratio	Normal	28	56	34	68	0.216
	High	22	44	16	32	
Dislipidemia	Present	44	88	38	76	0.19
	Absent	6	12	12	24	
Smoking	Smoker	27	54	31	62	0.670
	Non Smoker	17	34	15	30	
	Ex-Smoker	6	12	4	8	
Known Hypertensive	Yes	17	34	4	8	0.001
	No	33	66	46	92	
Family Histroy of Hypertension	Present	17	34	4	8	0.001
	Absent	33	66	46	92	
Family Histroy of Diabetes	Present	24	48	2	4	0.001

**Table 2B** Risk factors profile of study population

Characteristics	Diabetics Patients (N=50)	Non-Diabetics Patients(N=50)	Total (N=100)	P-Value	
Age	64.4± 8.6	58.1±10.9	61.3±0.3	0.002	
Bmi (Kg/M <sup>2</sup> )	25.5±2.5	24.5±2.6	25.0±2.6	0.039	
WHR	Males	0.88± 0.09	0.86±0.09	0.87±0.09	0.382
	Females	0.91± 0.11	0.83±0.08	0.87±0.10	0.021
SBP (mm of Hg)	127.4±26.4	118.9±27.9	123.2±27.3	0.134	
DBP (mm of Hg)	79.8±13.2	78.7±15.1	79.3±14.0	0.713	
RBS (mg/dl)	282.5±108.5	135.4±56.4	209.0±113.5	0.001	
Total Cholestrol (mg/dl)	237.6±39.2	232.7±39.3	235.0±39.1	0.558	
Triglycerides (mg/dl)	174.6±49.9	178.6±37.8	176.0±44.0	0.663	
	HDL (mg/dl)	43.9±9.5	49.8±10.4	46.9±10.3	0.021
LDL (mg/dl)	Male	48.0±7.1	48.9±15.6	48.5±12.1	0.624
	Female	133.6±23.5	127.4±27.9	130.4±25.9	0.252

Clinical features were analyzed in both and among diabetics 35 had chest pain and among non diabetics 48 had chest pain making the difference clinically significant. 36% diabetics had dyspnea and 30% patients had dyspnea features among non diabetics. 29 diabetics had history of nausea among diabetics and among non diabetics 30 had nausea. Diaphoresis was in 24 patients who were diabetic and in 29 patients who were non diabetic. Among diabetic patient's presyncope and syncope

was present in 11 and 4 patients and among non diabetics patients 10 and 3 had presyncope and syncope. Mean heart rate amongst diabetes was 84.1 ±25.9 beats /min as compared to 79.2 ± 29.2 in non diabetics. Among diabetics 4 patients had heart failure as compared to 3 patients among non diabetic group. (Table 3)

Under killip classification 44 diabetics and 41 non diabetics had ST elevation and myocardial infarction so under diabetics 29 were under class 1, 7 in killip class 2, 5 in killip class 3 and 3 in killip class 4. Of the 41 non diabetics 37 were in killip in class 1 and 2 each in killip class 2 and class 3 and the difference was statistically significant. (Table 4)

The location of infarct was at the inferior wall in 23 patients and anterior wall + other wall among 17 in diabetic patients and at inferior wall in 9 and at inferolateral in 1 patient. Among non diabetics' anterior wall + other wall affected 22 patients and followed by inferior wall among 16, inferior wall with RVMI in 11 patients and 1 at inferolateral area.

For atrioventricular conduction defects and rhythm disturbances, 1 patient had psvt in diabetic group compared to

none in non diabetic group. 2 had atrial fibrillation in diabetic group compared to 2 in non diabetic group. 5 patients versus 3 had ventricular tachycardia in diabetics versus non diabetics. Among diabetic group 5 patients had complete heart block compared to 2 in non diabetics. One had 1<sup>st</sup> degree heart block in diabetic group as well as in non diabetic group, 2 had second degree heart block in diabetic group as compared to 1 in non diabetic group. 1 patient had right bundle branch and 1 had left bundle branch block in diabetic group as compared to no right or left bundle branch block. (Table 5)

During the hospital stay the echocardiographic findings were noted in all patients. No regional wall motion abnormality was found in 32 diabetics and 28 in non diabetic patients.

Right wall motion abnormality with mild left ventricular systolic dysfunction was present in 24 of diabetics and 20 of non diabetic group. Right wall motion abnormality with moderate left ventricular dysfunction was present in 7 of diabetics and 6 of non diabetics. Right wall motion abnormality with severe left ventricular dysfunction was present in 1 and 2 among diabetic and non diabetic group. 2 patients had valve regurgitation among diabetics as compared to none in non diabetic group. (Table 6)

**Table 3** Symptomatic profile of study population

Characteristics symptoms	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		Total (N=100)	P-Value
	No	%	No	%		
Durations Of Symptoms	<6 Hours	12	24	8	16	0.122
	>6 Hours	38	76	42	84	
Chest Pain	Present	35	70	48	96	0.005
Breathlessness	Present	18	36	15	30	0.523
Palpitation	Present	18	36	19	38	0.826
Syncope/Pre-Syncope	Present	15	30	13	26	0.656
Nausea	Present	29	58	30	60	0.830
Vomiting	Present	21	42	24	48	0.547
Diaphoresis	Present	24	48	29	58	0.316
	Non-Recordable	2	4	3	6	
Heart Rate (Beats/Minutes)	<60	5	10	5	10	0.747
	60-100	32	64	35	70	
	>100	11	22	7	14	
SBP(mm of Hg)	Hypertensive	17	34	12	24	0.534
	Non- Hypertensive	30	60	34	68	
	Non-Recordable	3	6	4	8	
	Hypertensive	16	32	11	22	0.321
DBP(mm of Hg)	Non- Hypertensive	30	60	31	62	
	Non-Recordable	4	8	8	16	
JVP	Raised	12	24	7	14	0.202
Murmur	Present	0	0	1	2	1.000
CHF	Present	4	8	3	6	1.000
S3 Gallop	Present	7	14	4	8	0.338
Oedema	Present	3	6	3	6	1.000

**Table 4** Killip Classification (Diabetic Vs Non Diabetic Group)

Killip Class	Diabetics Patients (N=44)	Non-Diabetics Patients(N=41)	p-value
Class-I	29(66.0%)	37(90.2%)	0.047
Class-II	7(15.9%)	2(4.8%)	
Class-III	5(11.3%)	2(4.8%)	
Class-IV	3(6.8%)	0(0.0%)	

For the reperfusion therapy 44 diabetic patients with STEMI, received streptokinase. 2 patients had contraindications to thrombolytic therapy. Of remaining 22 patients 4 died before thrombolytic therapy could be started and 18 were outside the window period. (reported to hospital >12 hours after the onset of symptoms). Among 41 non diabetic patients with STEMI ,19 patients received streptokinase.

**Table 5** ECG Findings of study population

Characteristics	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		Total (N=100)	
	No	%	No	%		
St Elevation	Present	44	88	41	82	85
	Not Present	6	12	9	18	15
Q-Wave	Present	6	12	9	18	15
	Not Present	44	88	41	82	85
Arrhythmia	Psvt	1	2	0	0	1
	Af	2	4	2	4	4
	Ventricular Tachycardia	5	10	3	6	8
Conduction Block	1st Degree Heart Block	1	2	1	2	2
	2nd Degree Heart Block	2	4	1	2	3
	Complete Heart Block	5	10	2	4	7
	RBBB/LBBB	2	4	0	0	2
	Ant Wall Mi	9	18	9	18	18
	Anteroseptal Mi	2	4	1	2	3
Location Of Infarct(Based On Changes In Ecg Changes)	Anterolateral Mi	3	6	3	6	6
	Inferior Wall Mi	23	46	16	32	39
	Anterioinferior Mi	1	2	1	2	2
	Inferolateral Mi	1	2	1	2	2
	Inf Wall+RVMI	9	18	11	22	20
	Extensive Ant Wall Mi	2	4	8	16	10

**Table 6** Echocardiographic findings of study population

Characteristics findings	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		P-Value	
	No	%	No	%		
Regional Wall Motion Abnormality	32	64	28	56	0.54	
LV Systolic Dysfunction (Based On Ejection Fraction)	Mild(40-50%)	24	48	20	40	0.54
	Moderate (30-40%)	7	14	6	12	1.00
	Severe (<30%)	1	2	2	4	0.50
Valve Regurgitation	2	4	0	0	0.495	
LV Clot	0	0	0	0	N.A.	
Mechanical Complications	0	0	0	0	N.A.	

1 died before thrombolytic therapy could be initiated and 21 were outside the window period. The mean door to needle time was 38.2+- 11.1 minutes in diabetic and 40.03 +- 22.1 in non diabetics. Transient hypotension was seen in 2 of the patients receiving streptokinase in diabetics and 1 in non diabetics.

When analysis was done on reasons for hospital delay, we found that among diabetes only 9 patients came within duration of less of 6 hours as compared to 4 patients among non diabetic group. 17 diabetic versus 18 non diabetic patients perceived that pain was not of cardiac origin, 20 diabetic versus 18 non diabetic patients sought medical attention at local hospital, 4 diabetic patients versus 10 non diabetic patients came from far flung places that lack transport facilities. (Table 7)

**Table 7** Reason for seeking delayed medical attention

Characteristics Findings	Diabetics Patients (N=50)		Non-Diabetics Patients(N=50)		P-Value
	No	%	No	%	
Perception That Pain Is Non-Cardiac	17	34	18	36	1.00
Sought Medical Attention At Local/Private Hospital	20	40	18	36	0.83
Lack Of Transport Facilities Reached In Time(<6 Hours)	4	8	10	20	0.14
	9	18	4	8	0.41

The in hospital mortality rate was 11 (22% patients) in diabetic group and seven (14% patients) in non-diabetic group. The difference between two groups was statistically non-significant, (p=0.30). Heart failure or killip class >I was seen in 44% of diabetic vs.10% of non-diabetic, LVdysfunction/RWMA was seen in 32 (64%) of diabetics vs 28(56%) of non-diabetics. Arrhythmias were seen in 8 (16%) of diabetics vs. 5(10%) of non-diabetics in hospital. Among diabetic group, 27(54%) patients stayed less than one week, as compared to 33(66%) patients among non-diabetic group. The difference between two groups was statistically non-significant (p=0.30). Whereas 23 (46%) patients in diabetic group and 17 (34%) patients in non-diabetic group stayed more than one week respectively. The difference between two groups was statistically non-significant (p=0.30). There was no CART/PTCA in either group in our study in-hospital. (Table 8)

**Table 8** in-hospital outcome of study population

Variables	Diabetics Patients (N=50)	Non-Diabetics Patients (N=50)	P-Value
Discharge	39 (78%)	43 (86%)	0.30
PMIA(Re-Infarction)	0 (0%)	0 (0%)	0.30
Heart Failure/Killip Class >1	44%	10%	0.015
LV Dysfuction/RWMA	32 (64%)	28 (56%)	0.54
Arrhythmias	8 (16%)	5 (10%)	0.55
Hospital Stay< 7 Days	27 (54%)	33 (66%)	0.54
Hospital Stay >7 Days	23 (46%)	27 (54%)	
CART +PTCA	0 (0%)	0 (0%)	N.A.
Death	11 (22%)	7 (14%)	0.30

Among diabetic group 27(54%) patients stayed less than one week, as compared to 33 (66%) patients among non diabetic group. The difference between two groups was statistically non-significant (p=0.30). Whereas 23(46%) patients, 17(34%) patients stayed more than one week among diabetic and non-diabetic group respectively. The difference between two groups was statistically non-significant (p=0.30).

One patient each among both groups died within one month after discharge from hospital, one (2.5%) among diabetic

and one (2.2%) among non-diabetic. Five(12.8%) patients among diabetic and two (4.5%) patients among non-diabetic had congestive heart failure (CHF).

## DISCUSSION

In the present study recording and analysis of the difference in demographic profile, risk factor profile, clinical presentation between 50 diabetic and 50 non diabetic patients with myocardial infarction was done.

Mean age of patients in diabetic group was 64.4 +- 8.6 years compared to 58.1+-10.9 years in non diabetic group. This is consistent with study of Gupta N *et al*<sup>8</sup> And Aronson D *et al*<sup>4</sup> having mean age of patients in diabetic group was more than non diabetic group.

There were 54% current smokers in diabetic group and 62 % smokers in non diabetic group whereas in the study Timmer JR *et al*<sup>9</sup>, there was slightly higher prevalence of smoking in those who were non-diabetics.

There were 34 % known hypertensives among diabetic and 8 % known hypertensives in non diabetic group and difference was highly significant. The increased frequency of hypertension in diabetic population in our study is comparable with other studies by Strausmann E *et al*<sup>10</sup>, Aronson D *et al*<sup>4</sup>.

The difference in BMI showed 66% overweight in diabetic group and 36% in non diabetic group. The increase in overweight in diabetic group in our study is consistent with other trials<sup>9,10</sup>.

In our study 88 % of diabetics and 76 % of non diabetics were dyslipidemic comparable with studies by Schnell O *et al*<sup>11</sup> and Aronson D *et al*<sup>4</sup>.

In the diabetic group 70% of the patients presented with chest pain as compared with 96 % in non diabetic group and this difference were significant. The low frequency of chest pain in diabetic population was consistent with the finding of other studies by Soler NG *et al*<sup>12</sup> and Bradley RF *et al*<sup>13</sup>.

The incidence of symptoms in diabetic versus non diabetic include dyspnea, nausea, diaphoresis, presyncope and heart rate which were also comparable with studies by Ganeshan N *et al*<sup>14</sup> and Chowta KN *et al*<sup>15</sup>.

The location of infarct on the basis of ECG findings was comparable in two groups and statistically insignificant consistent with the study by Praveen K *et al*<sup>16</sup>. On echocardiography 64% diabetic and 56% non diabetics had abnormal regional wall motion abnormality and reduced ejection fraction and found comparable with study by Kouvaras G *et al*<sup>17</sup>.

Congestive heart failure was seen in 24 % patients among diabetic group as compared to 14 % patients among non diabetic group and was found comparable with other trials<sup>16,17</sup>. In the study 45.5 % of diabetic STEMI received streptokinase and 41 % were outside window period compared to 36 % who received streptokinase and 36 % who were outside window period in non diabetics and found consistent with study by Pais P *et al*<sup>18</sup>.

In hospital mortality among diabetic and non diabetic patients were 22 % diabetic and 14 % respectively and found consistent with study by Tang EW *et al*<sup>19</sup> and Rao G *et al*<sup>20</sup>.

## CONCLUSION

In conclusion about the profile of the patients presenting with acute myocardial infarction, known hypertensive patients, basal metabolic index and obesity, age, family history of diabetes, random blood sugar, were found to be of statistically significant risk factors. Diabetics with myocardial infarction encounter more adverse clinical complications as well as outcome as predicted.

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