



Compare the Level of GPBB in Acute Myocardial Infarction with and Without Diabetes Mellitus Patients

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Abstract

Diabetes mellitus is associated with high risk factor in patients with acute myocardial infarction. In the myocardial infarction patients Glycogenphophorylase BB is a sensitive and specific marker. The present study was conducted with this objective to find out the status of GPBB in acute myocardial infarction with and without patients. For this study we included 64 AMI (33 with diabetes mellitus and 31 without diabetes mellitus) and 64 healthy subjects. AMI diagnosed according to the ACC guideline i.e. clinical symptom chest pain, electrocardiograph monitoring and elevated cardiac biomarker. Cardiac marker GPBB was elevated in all the patients within 1 hour after onset of chest pain but it was more elevated in AMI with diabetic patients as compare to the without diabetic patients and there is no statistically significant difference of GPBB between AMI with diabetic and without diabetic patients. We found the highest mean level of GPBB within 3 hour after onset of chest pain.

Keywords: Diabetes mellitus; Acute myocardial infarction; Glycogen phosphorylase BB.

Introduction

Diabetes Mellitus is a major cardiovascular risk factor⁽¹⁾. The global prevalence of diabetes mellitus is around 300 million and its increasing rate is very high approximately 120% from the year 1995- 2025⁽²⁾. Myocardial infarction (MI) is the salient cause of death among patients with Diabetes Mellitus⁽³⁾. Almost 1/3rd of the patients who suffered with MI are diabetic patients⁽⁴⁻⁵⁾. Myocardial Infarction is myocardial necrosis occurring of critical imbalance between coronary blood supply and myocardial demand. It is the

loss of heart function due to insufficient blood flow in the heart. Heart cannot continue function without adequate blood flow, and if it is severely compromised, death is inevitable⁽⁶⁾. Myocardial Infarction is classified into two types on the basis of ECG changes ST-segment elevation myocardial infarction (STEMI) and Non-ST segment elevation myocardial infarction (Non-STEMI). High blood sugar (hyperglycemia) is encountered in up to 50% of all STEMI patients, whereas previously diagnosed diabetes mellitus present in only 20% to 25% of STEMI patients⁽⁷⁾. Apart

from this factor another risk factors are male sex, age, smoking, hyperlipidemia, hypertension etc. As we know the mortality rate is very high so early diagnosis and treatment of MI can reduce the mortality and morbidity. Majority of deaths due to MI occur during the first hour after the onset of symptoms⁽⁸⁾. CKMB is marker but it starts to rise within 3–5 hour after onset of AMI and lack sensitivity⁽⁹⁻¹⁰⁾. Myoglobin is an early and sensitive marker it starts to rise 2 hour after onset of AMI but lacks specificity^(9,11). Cardiac troponins are also sensitive and specific cardiac markers but in the blood increase relatively late after myocardial damage or 3-6 hour after chest-pain⁽¹²⁾. Before some years a marker Glycogen phosphorylase BB (GPBB) is analyzed for the diagnosis of myocardial ischemia within the first 1–3 hour after chest-pain. It is a glycogen bound enzyme found in the sarcoplasmic reticulum and catalyzes the first step of glycogenolysis after activation, which involves the separation of glucose-1-phosphate from glycogen⁽¹³⁾. It is three major isoenzymes: GPBB (brain), GPMM (muscle), and GPLL (liver). GPBB is also found in heart muscle, including human myocardium. During severe chest pain or myocardial ischemia, activation of GPBB is activated and results in an increase in glycogen degradation⁽¹⁴⁻¹⁷⁾. Many of studies over the last few years had indicated the specificity and sensitivity of GPBB but few studies had indicated elevation of the GPBB in MI and there is no study of comparison the level of GPBB in myocardial infarction patients with and without diabetes mellitus. Hence the aim of the present has to compare the level of GPBB in myocardial infarction patients with and without diabetes mellitus.

Materials and Methods

Our study was based on case control study in which 82 patients admitted in coronary care unit (age group ranging from 31 to 72 years) with severe chest pain within 3 hours and 64 were diagnosed of MI. Here, 33 were previous diabetic subjects (group I) and 31 were non-diabetic

subjects (group II). 64 normal healthy (group III) age and sex matched controls were selected. The study was conducted in cardiology and biochemistry department J. A. Hospital and G. R. Medical College, Gwalior, India.

The main inclusion criterion for the study was patients with admitted within 1 hour onset of severe chest pain and ECG changes. The main exclusion criterion for the study was patients presenting 3 hours after the onset severe chest pain. This study has been approved by the Institutional Ethical Clearance Committee. The written consent was obtained from all the patients and the following variables were filled up for each patient in the detailed proforma– sex, age, body mass index (BMI), family history of CAD, smoking habit, drinking habit, hypertension, diabetes mellitus etc. Preliminary investigation ECG monitoring, blood pressure measurement and blood glucose reading were done after than laboratory investigations such as, routine blood investigations and special cardiac marker were done. Routine blood investigation were analyzed by autoanalyser BS-400 using ERBA kits and GPBB was measured by enzyme-linked immunosorbent assay using QAYEE-BIO for life sciences kit Data are presented as mean \pm standard deviation values. The statistical differences between cases and controls were determined by student independent sample *t*-test.

Results

The mean age of patients was 56.6 ± 9 . The youngest patient was 31 years of age and oldest was 72 years. Out of the 64 patients, 42 (66%) were males and 22 (34%) were females. Almost one-third (70%) consumed mixed diet and remaining (30%) were vegetarians. Smoking habit was recorded in 62% and some were chain smoker, whereas drinking habit was 37%. Previous history of hypertension was in 36% patients. All the patients had suffered from severe chest pain, another symptoms vomiting, giddiness, breathlessness were seen in most of the patients. Mean SBP and DBP at admission time 141 ± 12

and 95±11 mmHg respectively. Table no. 2 showed the mean levels of blood sugar, HbA1c, triglyceride, total cholesterol, VLDL-C, HDL-C, LDL-C, and GPBB within 1hour, 2 hour and 3 hour after acute chest pain AMI with or without diabetic patients. Here, the mean level of blood sugar, HbA1c, triglyceride, total cholesterol,

VLDL-C, LDL-C were higher in group I and statistically significant when compare with group II (p<0.001). The mean level of GPBB & HDL-C was higher in group I patients when compared to group II patients but it was not statistically significant at P < 0.001.

Table no. 1: Baseline characteristics of the study

	Control (64)	AMI Patients (64)	
		With Diabetes Mellitus (33)	Without Diabetes Mellitus(31)
Physical Characteristics			
Age	52.5±7.76	56.7±8.9	56.5±9.1
Male	35 (55%)	23 (70%)	19 (61%)
Female	29(45%)	10(30%)	12(39%)
BMI	22.3±2.3	23.6±4.5	22.6±3.5
SBP	116±12	140±10	142±13
DBP	79±7	97±12	93±11
Smoker	18(28%)	21(64%)	19(61%)
Drinker	19(30%)	11(33%)	13(41%)
Non-Veg.	27(42%)	20(60%)	22(71%)
Hypertension	-	17(50%)	19(61%)

Table no. 2: Mean levels of routine parameters and GPBB in AMI Patients (with and without diabetes mellitus)

	AMI Patients (64)		p value
	With Diabetes Mellitus (33)	Without Diabetes Mellitus(31)	
Blood Sugar	219.4±29.9	130.56±13.36**	<0.001
HbA1c	8.12±0.81	5.42±0.36**	<0.001
Triglyceride	231.53±21.10	204.34±23.63**	<0.001
Total Cholesterol	231.14±19.89	209.40±22.23**	<0.001
VLDL-C	46.08±4.39	40.86±4.72**	<0.001
HDL-C	34.78±4.49	35.59±4.62	>0.001
LDL-C	148.28±21.09	128.93±20.43**	<0.001
GPBB within 1 hour	49.28±16.32	42.01±17.82	>0.001
GPBB within 2 hour	60.21±22.04	53.93±22.68	>0.001
GPBB within 3 hour	89.21±22.64	77.76±19.37	>0.001

**statistically significant (<0.001)

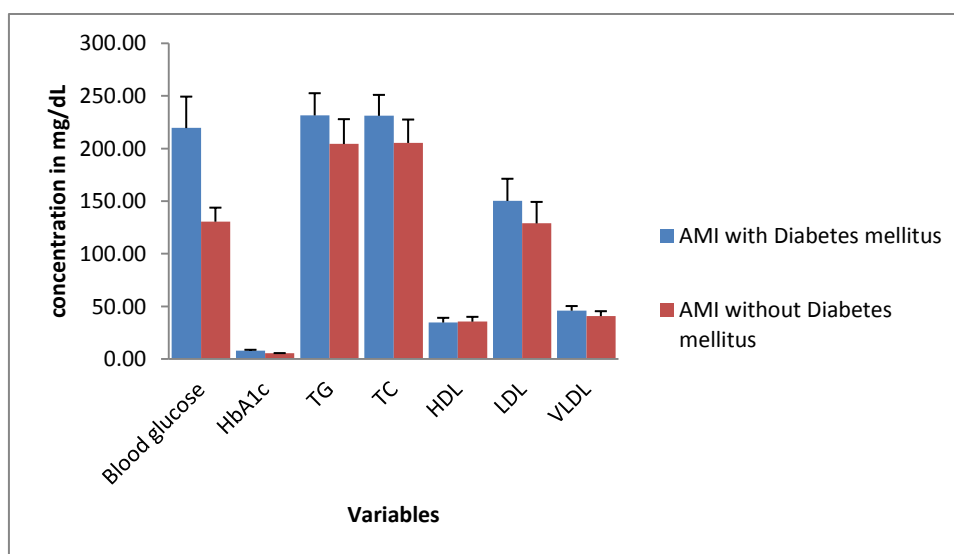


Figure no. 1 shows the mean levels of routine biochemical parameters in AMI with and without diabetic patients.

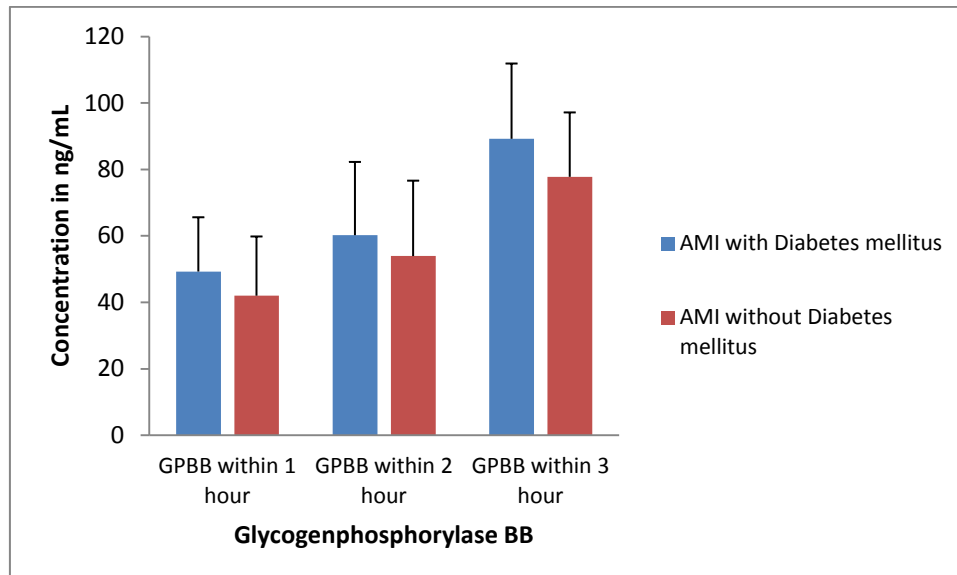


Figure no. 2 shows the mean levels of cardiac marker GPBB in AMI with and without diabetic patients

Discussion

Myocardial infarction is also called sudden heart attack. Myocardial ischemia results from the reduction of coronary blood flow supply of oxygen to the myocytes and does not meet the oxygen demand of myocardial tissue. When this condition is prolonged and irreversible, then myocardial cell death and necrosis occur which is defined as myocardial infarction. This study is showing the comparison between AMI with and without diabetic patients (group I & II). The results of the study showed that group I patients had significantly more serious complications due to diabetes, hypertension and myocardial infarction. R. Rajkakati et al reported in their study that the linear relation between age and MI in the non-diabetic patients as compared to diabetic patients⁽¹⁸⁾. Males are more prone to the AMI and in our study we found 66% males. The body sugar level had very high in group I as compared to the group II patients. It may be due to genetically or lack of physical activity and modern life style. In both groups (I and II) lipid metabolism is irregular. Serum lipids had incriminated in the pathogenesis of atherosclerosis, and the atherosclerosis is the main factor for diabetes and acute myocardial infarction. Some studies concerning the possible inter-relationship between abnormal levels of serum lipids and development of vascular

complications. Vinita Elizabeth Mani et al found in their study the mean level of HbA1c in diabetic group 8.4 ± 1.9 , while Tahir Soomro et al found mean level of HbA1c 7.52 ± 3.89 in diabetic group⁽¹⁹⁻²⁰⁾. The results of our study mean level of HbA1c in diabetic group 8.12 ± 0.81 and in non-diabetic group 5.42 ± 0.36 .

Glycogen phosphorylase BB has been analyzed for the early diagnosis of myocardial ischemia and myocardial infarction. Singh et al, reported in their study the mean levels of cardiac marker GPBB, was higher in AMI within the first 4 h after the onset of chest pain cases when compared to that of healthy controls and was statistically significant. They also found that GPBB was the most sensitive and specific biomarker to detect myocardial infarction⁽²¹⁾. Before this study many studies Rabitzsch et al⁽¹⁵⁾, Peetz et al⁽²²⁾, Stejskal et al⁽¹⁷⁾, McCann et al, Bozkurt et al⁽²³⁾, Cubranic et al⁽²⁴⁾ showed the sensitivity and specificity of the GPBB within 3 hour or within 4 hour or within 6 hour after chest pain. Peetz et al reported the sensitivity and specificity of GPBB at different time interval in AMI patients. In this study we found the level of GPBB in within 1 hour after the onset of chest pain patients and they were further classified diabetic and non-diabetic patients. We found higher mean levels of GPBB in diabetic subjects as compare with non-diabetic subjects but

statistically there is no significance at <0.001 . We also found that the highest mean level of GPBB within 3 hour after chest pain in AMI with diabetic and without diabetic patients.

Conclusion

GPBB starts to release in blood circulation within 1 hour of AMI due to hypoxia and it is used as an early biomarker for the diagnosis of AMI. But there is no statistically significant difference of GPBB in AMI with Diabetic and non-diabetic patients.

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