

Research Article

## The evaluation of cardiac markers in diabetic and non diabetic patients with myocardial infarction

Payal M. Patel<sup>\*1</sup>, Trushna Shah<sup>2</sup> and Kishore Krish<sup>3</sup>

<sup>1</sup>Department of Biochemistry, Baroda Medical College and S.S.G Hospital, Vadodara, Gujarat, India.

<sup>2</sup>Department of Biochemistry, SBKS MI & RC, Sumandeep Vidyapeeth, Piparia, Vadodara, Gujarat, India.

<sup>3</sup>Department of Biochemistry, College of Dental Science, Ahmedabad, Gujarat, India.

**\* Correspondence Info:**

Dr. Payal M. Patel

Department of Biochemistry,

Baroda Medical College and S.S.G Hospital, Vadodara, Gujarat, India.

E-mail: [payal510pal@gmail.com](mailto:payal510pal@gmail.com)

### Abstract

**Introduction:** This study was aimed to assess Cardiac marker like C-RP, lipid profile, CK-MB, AND SGOT in diabetic and non diabetic patients with myocardial infarction.

**Methods:** This study was conducted in Department of Biochemistry during period of 2006-2007 in SSG hospital, Vadodara, Gujarat. Biochemical investigation including Fasting blood sugar (FBS), Post prandial blood sugar (PP2BS), CK-MB, SGOT, LDH, Total cholesterol, Triglyceride, HDL-C, LDL-C were determined using semi auto analyzer and fully auto analyzer (Erba cam50 & Mura logo tech respectively) with ready to used kits.

**Results:** In this study, levels of CK-MB ( $p<0.001$ ) and SGOT ( $p=0.0057$ ), C-RP ( $p=0.01$ ), Triglyceride ( $p=0.005$ ) are significantly increased in patients of myocardial with diabetes mellitus, while HDL level decreased in patients of myocardial infarction with diabetes mellitus compared to non diabetic MI patients.

**Statistical Analysis:** Data was compiled in excel sheet, analyzed for percentage and proportion. Statistical analyses were carried out by using one way ANOVA, value of  $p<0.1$  has been considered statistically significant.

**Conclusion:** Study suggest that cardiac markers like C-RP, lipid profile, CK-MB, AND SGOT levels were significantly increased in patients suffering from myocardial infarction with diabetes mellitus compared to patients of myocardial infarction without diabetes mellitus.

**Keywords:** Myocardial Infarction, Cardiac marker, Diabetes

### 1. Introduction

Diabetes mellitus is a metabolic disease associated with hyperglycemia whose incidence and prevalence has significantly increased recent decade. The cardiovascular complication of diabetes could be classified into three categories including cardiomyopathy, macro vascular and micro vascular complication<sup>1</sup>. Diabetes mellitus is responsible for micro vascular complications like neuropathy, nephropathy, cardiomyopathy due to the enhanced vascular oxidative stress, generation of reactive oxygen species (ROS) and advanced Glycation end products (AGEs). In type-2 diabetes mellitus hyperglycemia is often associated with insulin resistance which is strong independent predictor of cardiovascular disease<sup>2</sup>. Insulin resistance leads to hyper insulinemia, which is responsible for dyslipidemia, increased LDL susceptibility to oxidation<sup>3</sup>, and impaired glucose tolerance. Diabetes mellitus is responsible for diabetes dyslipidemia, the key features are increased plasma triglyceride concentration, decreased HDL cholesterol, increased LDL cholesterol and it's conversion to small dense LDL<sup>4,5</sup>. The prevalence of hypertension is 2 fold higher in the type-2 diabetes mellitus patients compared to type-1<sup>6</sup> and those without diabetes<sup>7,8</sup>. Diabetes mellitus also responsible to cause of endothelial dysfunction and hyper coagulation state<sup>9</sup> which are also responsible for cardiovascular disease. There could be several explanations for the different pattern of symptoms in patients with diabetes mellitus, including different thresholds of pain sensitivity, psychological denial, or the presence of autonomic neuropathy leading to sensory denervation. The latter seems to be more likely in diabetic patients, because autonomic neuropathy is a common feature of diabetes, and abnormalities of the autonomic nerve fibers were demonstrated histological in diabetic patients who died after painless myocardial infarction.

Cardiovascular disease has been defined as "Impairment of heart function due to inadequate flow of blood to the heart compared to its need caused by obstructive changes in the coronary circulation to the heart". Nowadays, vascular disease is the leading cause of death and disability in the world. There are several firmly established risk factors for myocardial infarction such as Hypertension, Obesity, smoking, family history. Independently of the presence or absent of other risk factors diabetes mellitus add to the risk for cardiovascular morbidity and mortality<sup>10</sup> because of this diabetes mellitus should be defined as a "state of premature cardiovascular death associated with chronic hyperglycemia".

Cardiac markers are used to evaluate heart function. In the present study we measured the activity of cardiac enzymes such as Creatine kinase-MB (CK-MB), Serum glutamate oxaloacetate transaminase (SGOT), Lactate dehydrogenase (LDH), lipid profile and C-RP in the serum of myocardial infarction patients with diabetes mellitus after 12 hrs of chest pain and compared with patients of myocardial infarction without diabetes mellitus to understand a possible role of the diabetes mellitus in increasing mortality rate of myocardial infarction patients.

### 2. Material and Methods

Descriptive cross sectional study was conducted in department of Biochemistry, S.S.G Hospital & Baroda Medical College. One hundred and twenty Patients were included in this study. Written consent was taken from all Patients. Patients divided into two groups, group-1 consists of 60 patients suffering from myocardial infarction without diabetes mellitus and group-2 consists of 60 patients suffering from

myocardial infarction with diabetes mellitus. The diagnosis of myocardial infarction was based on a history of prolonged chest pain, characteristic ECG changes and elevated CK-MB level within 12 hrs after the onset of chest pain. We excluded patients of liver disease, bone disease, kidney disease and inflammatory disease.

Biochemical investigation including fasting blood sugar (FBS), post prandial blood sugar (PP2BS), CK-MB, SGOT, LDH, Total cholesterol, Triglyceride, HDL-C, LDL-C were determined after 12 hours of chest pain using semi auto analyzer and fully auto analyzer (Erba cam50 & Muira logo tech respectively) with ready to used kits. VLDL-C was calculated according to Friedewald et al. C-RP level measured by rapid latex agglutination slide test by IMMUNOPAK.

### 2.1 Statistical Analysis

Data was compiled in excel sheet, analyzed for percentage and proportion. Statistical analyses were carried out by using one way ANOVA, value of  $p < 0.1$  has been considered statistically significant.

### 3. Results

This study was conducted in department of Biochemistry, S.S.G Hospital & Baroda Medical College, Vadodara, and Gujarat. One hundred and twenty Patients were included in this study. The mean age group is  $52.8 \pm 8.02$  and  $54.8 \pm 6.01$  in group-1 and group-2 respectively.

**Table 1: Demographic characteristics in myocardial patients with and without diabetes**

		Group-1	Group-2
Age (years)		$52.8 \pm 8.02$	$54.13 \pm 6.1$
No. of cases		N=60	N=60
Sex	Male	N=38 (63.3%)	N=48 (80%)
	Female	N=22 (36.6%)	N=12 (20%)
Past history			
Hypertension		N=18(30%)	N=18 (30%)
Smoking		N=18 (30%)	N=10 (16.6%)
Alcohol		N=14 (23.3%)	N=24 (40%)

Values are in mean+ SD, N= no. of samples

The mean age group is  $52.8 \pm 8.02$  and  $54.8 \pm 6.01$  in group one and group two respectively. While In our study, male cases were predominant with an incidence of 63.5% and 80% in group 1 and group 2 respectively. While females were only 36.6% and 20% in group 1 and group 2 respectively. In both groups the hypertension is one of the factors which are 30% in both.

**Table 2: Biochemical and cardiac marker in myocardial patients with and without diabetes**

Parameters	Group-1	Group-2	P' value
CK-MB (IU/L)	$102 \pm 19.69$	$157 \pm 27.6$	$P < 0.001$
SGOT (IU/L)	$90 \pm 8.90$	$108 \pm 27.89$	$P = 0.0057$
LDH (IU/L)	$187 \pm 36.49$	$192 \pm 38.16$	$P = 0.56$
Cholesterol (mg/dl)	$256 \pm 9.01$	$242 \pm 14.23$	$P = 0.19$
Triglyceride (mg/dl)	$208 \pm 14.19$	$252 \pm 26.71$	$P = 0.05$
HDL (mg/dl)	$35 \pm 3.56$	$33 \pm 3.57$	$P = 0.14$
VLDL (mg/dl)	$51 \pm 5.72$	$50 \pm 5.02$	$P = 1.00$
LDL (mg/dl)	$143 \pm 9.03$	$146 \pm 10.03$	$P = 1.02$
C-RP (mg/dl)	$5.2 \pm 2.35$	$7 \pm 3.25$	$P = 0.01$
FBS (mg/dl)	$92 \pm 8.9$	$192 \pm 48.65$	$< 0.001$
PP <sub>2</sub> BS (mg/dl)	$117 \pm 10.38$	$264 \pm 73.86$	$< 0.001$

As shown in table no-2 levels of CK-MB ( $p < 0.001$ ) and SGOT ( $p = 0.0057$ ), C-RP ( $p = 0.01$ ), Triglyceride ( $p = 0.005$ ) are significantly increased in patients of myocardial with diabetes mellitus, while HDL level decreased in patients of myocardial infarction with diabetes mellitus compared to non diabetic MI patients.

### 4. Discussion

Our study was aimed to evaluate the cardiac markers like C-RP, lipid profile, CK-MB, and SGOT in diabetic and non diabetic patients with myocardial infarction. Diabetes mellitus is commonly associated with both micro vascular and macro vascular complications. Increasing evidence supports that atherosclerosis is a co-morbid condition in the diabetic patients. Impairment of vascular endothelial function is an initial step in the development of cardiovascular problems. Hypercholesterolemia causes focal activation of endothelium by infiltration and retention of LDL -cholesterol in arteries causing inflammatory response and activation of reactive oxygen species (ROS). Modification of LDL, through oxidation and enzymatic activity causes LDL oxidation. Oxidized LDL when recognized by macrophages is converted into foam cells, which is a key event in atherogenesis. The central role of dyslipidemia in causing progression of atherosclerosis in adults with diabetes has been elucidated. There are a few researchers who have reported higher levels of total cholesterol, LDL-cholesterol and triglyceride with higher HbA1c concentrations in diabetic patients.<sup>11</sup> In the present study, there is a higher incidence of myocardial infarction in male (73%) compare to female and the male to female ratio is 2.5:1. The ratio further decreased with the advancement of age. This ratio probably due to stressful life and high incidence of smoking in male. In women due to estrogen it protects against cardio vascular disease by decreased LDL cholesterol and lipoprotein a, it also prevent oxidation of LDL cholesterol and increased HDL cholesterol<sup>12</sup>.

Recently the important contribution of inflammation and oxidative stress to the pathogenesis of accelerated atherosclerosis in diabetic patients has been emphasized. Diabetic patients presented with higher CRP levels compared with those in non diabetic subjects. Coronary artery disease is a major complication of diabetes mellitus, representing the ultimate cause of death in more than half of all patients with this disease. There could be several explanations for the different patterns of symptoms in patients with diabetes mellitus, including different thresholds of pain sensitivity, psychological denial, or the presence of autonomic neuropathy leading to sensory denervation.<sup>13</sup> Cardiac markers are biomarkers measured to evaluate heart function. They are often discussed in the context of myocardial infarction, but other conditions can

lead to an elevation in cardiac marker level. Evidence accumulated in recent years demonstrated that asymptomatic myocardial infarction or asymptomatic myocardial ischemia occurs more frequently in diabetic patients. The underlying pathophysiology of the atherosclerotic process is not significantly different in diabetic subjects, but the pro thrombotic and pro coagulant state with which diabetes is associated is thought to contribute to the higher incidence of and worse prognosis after myocardial infarction. In our study all the cardiac marker is significantly increases in diabetic patients with myocardial infarction which is true with one study which also shown the same correlation<sup>14</sup>. There are a few researchers who have reported higher C-RP<sup>15</sup> level in myocardial infarction patients with diabetes mellitus compared to patients of myocardial infarction without diabetes mellitus.

## 5. Conclusion

- Study suggest that cardiac markers like C-RP, lipid profile, CK-MB, AND SGOT levels were significantly increased in patients suffering from myocardial infarction with diabetes mellitus compared to patients of myocardial infarction without diabetes mellitus.
- The significant higher value of CK-MB, SGOT in patients of acute myocardial infarction with diabetes mellitus are because of diabetic neuropathy.
- Pattern of Cardiac markers indicate that patients having hyperglycemia during acute myocardial infarction is associated with poor prognosis, higher rate of complication and mortality rate due to delayed treatment and late hospitalization.
- With this we conclude that public awareness has to be created in the patients of diabetes mellitus for regular checkup of these well known risk-factors of CHD such as lipid profile, HbA1C, various stress markers and inflammatory markers such as ultrasensitive CRP etc.
- For prevention of cardiac complication induced by diabetes mellitus, patients can be treated with anti ischemic therapy as well as insulin and oral hypoglycemic drugs.

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