

# A comparative study of Creatine Kinase-MB and Troponin levels among diabetic and non diabetic patients with Acute MI

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## ABSTRACT

In diabetic patients myocardial infarction (MI) is a major cause of death. Weak metabolic control is very common in diabetic patients with MI and if blood glucose levels are not controlled with different treatments may produce medical complications. Hyperglycemia, CK-MB and troponin levels are very important biomarkers for the assessment of MI. The blood glucose ( $325.56 \pm 23.6$ ), CK-MB ( $350.6 \pm 95.23$ ) and Troponin ( $6.16 \pm 2.23$ ) levels in diabetics individuals showed  $P < 0.001$  significant results.

**Key words:** Myocardial infarction (MI), Creatine kinase (CK), Troponin.

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## INTRODUCTION

Commonly myocardial infarction (MI) or acute myocardial infarction (AMI) is called heart attack and it occurs by the blockages of blood supply to a part of the heart (Agarwall, 2009). When supply of blood stops to the heart it causes damaging of the heart muscle. There are many symptom of MI but the most common is chest pain or which may travel into the shoulder, arm, back, neck, or jaw (Aghaeishahsavari, 2006). This type of pain always starts from the center or left side of the chest and remains for few minutes. The onset of symptoms in myocardial infarction (MI) is usually gradual, over several minutes and rarely instantaneous. In the case of angina, chest pain is also possible (Alsaraj F 2009).

Diabetes mellitus (DM) is a metabolic disease in which the glucose levels increase in the blood (Buehler *et al.*, 2013). Diabetes mellitus is a abnormality in the biological system in which pancreas not producing required amount of insulin to the body or the cells of the body not responding properly to the insulin produced (Chou, 2008). The most common symptoms of high blood glucose levels in the body are frequent urination, increased thirst, and hunger (Dandona *et al.*, 2007). Diabetes may cause many medical complications like diabetic ketoacidosis and nonketotic hyperosmolar coma etc. Other serious long-term complications of DM are cardiovascular disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes. There are three main types of diabetes mellitus (Gufstasson *et al.*, 2007). Type 1 DM results from the pancreas's failure to produce enough insulin. Type 2 DM starts when the insulin resistance occurs and the third type

produced in pregnant ladies without any diabetic history due to the stress (Kosaka *et al.*, 2005).

Creatine kinase (CK) is an intracellular enzyme found its high quantity in skeletal muscles, myocardium, and brain; smaller amounts also occur in other visceral tissues. A CK-MB test is used as biological parameter in MI (Zeller *et al.*, 2005). In the case of MI its concentration in the blood increases than the normal levels. Different researchers found that creatine kinase levels increases due to heart damage or skeletal muscle damage (Lakschevit *et al.*, 2011). CKMB levels increase with myocardial damage.

Troponin is a complicated of three regulatory proteins i.e., troponin C, troponin I, and troponin T that is integral to muscle contraction in skeletal muscle and cardiac muscle, but not smooth muscle (Mazzone 2007). Troponin tests are applied commonly to diagnose heart attack and rule out other conditions with similar signs and symptoms (Roper *et al.*, 2001). Either a troponin I or troponin T test can be performed; usually a laboratory will offer one test or the other. The concentrations are different, but they basically provide the same information (Rosenbloom *et al.*, 1999).

## MATERIAL AND METHODS

Total 55 Individuals were selected in the current study, 5 individuals out of them were control while the remaining all were with myocardial infarction. 25 individuals were diabetic where as 25 individuals were non diabetic and they were divided into A, B and C groups. In Group A all individuals were diabetic with MI and in Group B all individuals were non diabetic with MI. Experimental procedures were conducted with Enzymatic kits for the estimation of Cardiac Enzymes i.e., CK-MB and Troponin-T from the blood samples. All collected information was entered in SPSS. These values being quantitative, t-

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test was applied for estimating significance. A p-value of 0.05 or less was considered significant.

## RESULTS

Diabetic and non diabetic myocardial pts were taken in this study. 50(100%) of patients, had discordant cardiac marker results. Diabetes mellitus had significant effect on patients. Higher enzyme levels of both CK-MB (350.6±95.23) and Tropanin (6.16±2.23) in diabetic pts (325.56±23.6) were concluded as compared with (105.8±35.13) and (4.26±1.53) in non diabetic pts (148.25±33.4) respectively. Both diabetic and non diabetic patients with MI had high troponin and CK-MB levels and shown significant ( $p < 0.001$ ) changes as compared control.

Table 1: control Individuals (n=5)

Group A (Variables)	Mean+SD	Sig.
Blood glucose levels mg/dL (Random)	120.30±43.6	P<0.001
CK-MB levels ng/ml	5.50±10.83	P<0.001
Tropanin levels ng/ml	0.012±0.63	P<0.001

Table 2: Diabetic individuals with MI. (n=25)

Group B (Variables)	Mean + SD	Sig.
Blood glucose levels mg/dL (Random)	325.56±23.6	P<0.001
CK-MB levels ng/ml	350.6±95.23	P<0.001
Tropanin levels ng/ml	6.16±2.23	P<0.001

Table 3: Non diabetic individuals with MI (n=25)

Group C (Variables)	Mean + SD	Sig.
Blood glucose levels mg/dL (Random)	148.25±33.4	P<0.001
CK-MB level ng/ml	105.8±35.13	P<0.001
Tropanin levels ng/ml	4.26±1.53	P<0.001

## DISCUSSION

It had seen in number of studies, the diabetic individuals have more risk factor of MI than non diabetic individuals. Different studies stated that during acute MI the levels of cardiac enzymes i.e. CK-MB and tropanin increase in the blood (Schwarz, 2011). The prognosis of such patients with discordance varies based on the individual study and timing of follow-up (Weckbach, 2009). In another study evaluating the frequency and outcomes of discordant cardiac marker results showed that CK-MB and tropanin levels increased in patients with MI. In another study which was conducted on 300 patients shown significant changes in CK-MB and tropanin levels respectively (Wong 2006).

The motility rate increased in diabetic patients with MI and has very high troponin and CK-MB levels than normal values. In the current study a strong association of cardiac enzymes i.e. CK-MB and troponin had seen in diabetic and non diabetic

patients with MI. The patients of Group B have 325.56±23.6 blood glucose, 350.6±95.23 CK-MB and 6.16±2.23 tropanin levels respectively. While patients of Group C have 148.25±33.4 blood glucose, 105.8±35.13CK-MB and 4.26±1.53tropanin levels. All the results are significant  $P < 0.001$ .

## REFERENCES

1. Agarwall AK (2009). Prevalence of coronary risk factors in type 2 diabetes without manifestation of overt coronary heart disease. *Journal of the Association of Physicians of India*, 57:135–142
2. Aghaeishahsavari M (2006). Cardiovascular disease risk factors in 17. Patients with confirmed cardiovascular disease. *Saudi Medical Journal*, 27:1358–1361.
3. Alsaraj F (2009). Prevalence of the metabolic syndrome in patients with diabetes mellitus. *Irish Journal of Medical Science*, 178(3):309–313.
4. Buehler AM, AB Cavalcanti, O Berwanger et al (2013). "Effect of tight blood glucose control versus conventional control in patients with type 2 diabetes mellitus: a systematic review with meta-analysis of randomized controlled trials.". *Cardiovascular therapeutics* 31 (3): 147–60.
5. Chou CK (2008). Analysis of traditional and nontraditional risk factors for peripheral arterial disease in elderly type 2 diabetic patients in Taiwan. *Diabetes Research and Clinical Practice*, 81:331–337.
6. Dandona P, AChaudhuri, H Ghanim and P Mohanty(2007). Effect of hyperglycemia and insulin in acute coronary syndromes. *Am J Cardiol*. Jun 4:99(11A):12H-18H.
7. Gufstasson I, CN Kistorp and NK James(2007) . Unrecognized glycometabolic disturbance as measured by hemoglobin A1c is associated with a poor outcome after acute myocardial infarction. *Am Heart J*; 154(3): 470-6
8. Kosaka K, M Noda and T Kuzuya (2005). Prevention of type 2 diabetes by lifestyle intervention: a Japanese trial in IGT males. *Diabetes Res Clin Prac* ; 67: 152-62
9. Kyrou I and S Kumar (2010). Weight management in overweight and obese patients with type 2 diabetes mellitus. *Br J Diabetes Vasc Dis*; 10: 274-83.
10. Lakschevitz F, G Aboodi, H Tenenbaum and M Glogauer (2011). "Diabetes and periodontal diseases: interplay and links." *Current diabetes reviews* 7 (6): 433–9.
11. Mazzone T (2007). Prevention of macrovascular disease in patients with diabetes mellitus: opportunities for intervention. *American Journal of Medicine*, 120(Suppl. 2):S26–S32.
12. Roper NA, RW Bilous, WF Kelly, NC Unwin and VM Connolly (2001). Excess mortality in a population with diabetes and the impact of material deprivation: longitudinal, population based study. *BMJ*;332: 1389–1393.
13. Rosenbloom AL, JR Joe, RS Young, WE Winter (1999). Emerging epidemic of type 2 diabetes in youth. *Diabetes Care* 1999;22(2):345-354.
14. Schwarz EH(2011). Preventing type 2 diabetes – how to proceed? *Br J Diabetes Vasc Dis.*; 11: 158-60
15. Weckbach S (2009). Systemic cardiovascular complications in 20. patients with long-standing diabetes mellitus: comprehensive assessment with whole-body magnetic resonance imaging/magnetic resonance angiography. *Investigative Radiology*, 44:242–250.
16. Wong J (2006). The metabolic syndrome in type 2 diabetes: when does it matter? *Diabetes, Obesity & Metabolism*, 8:690–697.
17. Zeller M, P Steg, J Ravisy, Y Laurent, ML Janin, L I Huillier, J et al. (2005). Prevalence and impact of metabolic syndrome on hospital outcomes in acute myocardial infarction. *Arch Intern Med*;165:1192–1198.

