IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 1 Ser.5 (January. 2020), PP 08-11
www.iosrjournals.org

Study of Serum Enzymes and Isoenzymes in Acute Myocardial Infarction

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Abstract: *Serum enzymes and isoenzymes are estimated in 35 patients of acute myocardial infarction and 35 normal healthy controls. The serum enzymes like Aspartate transaminase (AST) or serum glutamate transaminase (SGOT) shows highly significant increase in the activity. Also significant rise in the activity of the serum lactate dehydrogenase (LDH) in case of acute myocardial infarction patients. The activity of creatine kinase isoenzymes MB (CK-MB) in acute myocardial infarction patients are highly significant ($p< 0.001$) as compared to the controls.*

Key Words: *Creatine kinase, Lactate Dehydrogenase, Aspartate transaminase, Acute Myocardial Infarction.*

Date of Submission: 26-12-2019 Date of Acceptance: 10-01-2020

I. Introduction

Myocardial infarction is the serious complication of atherosclerotic coronary heart disease. [Shown In Figure 1] Acute myocardial infarction is the one of the most common diagnosis in hospitalized patients in industrialized countries. Acute myocardial infarction is classically associated with substernal chest pain, frequently described by the patient tightness, squeezing or pressure. This chest pain is radiates to the left arm, shoulder and neck in 80% of cases.[1]

In India incidence of MI is increasing and it is said to be 45% of the total population. MI has high mortality rate. [2] In most patients (80-95%) it results from thrombotic occlusion of the infracted vessel. MI is the gross necrosis of the myocardium as a result of interruption of blood supply to that area. AMI results when obstruction occurs during circulation to heart. [2] The diagnosis of MI is based on clinical symptoms, electrocardiographic (ECG) changes and characteristic pattern of changes in some serum enzymes such as creatine kinase(CK), creatine kinase isoenzymes MB(CK-MB) ,Lactate dehydrogenase isoenzyme 1 (LDH-1).[3,4]

Recently, early and late diagnosis of AMI has been increasingly based on elevated serum levels of cardiac troponin. This elevation begins around four hour after the onset of infarction and lasts longer than LDH, this test has sensitivity similar to CPK-MB fraction and better than LDH.[5] A new type of test evaluated for the diagnosis of AMI is CPK-MB isoform assay which has a 96% sensitivity 93% specificity for the infarction within 6 hours of onset of chest pain.[6] The combination of CPK-MB and troponin testing can have even higher sensitivity and is increasingly employed for the purpose of ruling out MI.[7]

II. Materials And Methods

The present study was carried out in department of biochemistry Government Medical College and hospital Miraj. In this study total 70 subjects were included, out of which 35 were patients of acute myocardial

infarction and 35 were normal healthy control. The patients were selected from intensive care unit (ICU) P.V.P. General Hospital Sangli.

The patients were admitted in ICU of the hospital and under direct supervision of clinical staff. All the patients were generally examined followed by the physician to detect AMI and chest pain. The sample was collected within 12 hours after the infarction. Blood sample were collected in the plane bulb for further processing. Following estimations was carried out on the serum sample CK-MB, LDH, AST by using enzymatic kit methods. Ethical committee had permitted for the research work.

Study Location: The present study was carried out in Department of Biochemistry Government Medical College and Hospital Miraj. The patients were selected from intensive care unit (ICU) P.V.P. General Hospital Sangli.

Sample size: Total 70 subjects were included, out of which 35 were patients of acute myocardial infarction and 35 were normal healthy control.

STATISTICAL ANALYSIS-

Statistical analysis of results was done by normal "z- test". Numerical variable were reported in terms of mean ± SD.

III. Result

According to Indian consensus statement the prevalence of CAD appears to be about 90 out of 1000 in the urban adult population between 25^{th} to 64^{th} years of age. [8] Detection of elevated concentration in plasma macromolecules released from irreversibly injured myocardium has become definitive diagnostic criterion of infarction. Elevated concentration of plasma enzymes including CK-MB, LDH, AST constitute the sensitive diagnostic findings.

Assay of MB isoenzyme of CK (CB-MB) activity in plasma is cornerstone of diagnosis because of marked abundance of this isoenzyme in myocardium and virtual absence of most other tissue and its constituent sensitivity.

The present study indicates that the highly significant rise in the activity of CK-MB isoenzyme in AMI patients as compared to control. The results shown in the Table 1 indicated a highly significant difference in the activity if CK-MB isoenzyme between study group and control group.

Table no.1 Activity of CK-MB isoenzyme in AMI patients and control group.

Sr.No.	Study groups	n	CK-MB (mean ± SD)	Z value	Level of significance
1	Controls	35	21.57 ± 5.63		
2	Patients	35	58.88 ± 35.68	6.11*	P<0.001

The activity of LDH were found to very high in the study group (patients) as compared to control group which are highly significant as shown in Table 2.

n= number of cases studied values are expressed as mean ± SD.

Table no.2 Activity of LDH enzyme in AMI patients and control group.

Sr.No.	Study groups	n	LDH (mean ± SD)	Z value	Level of significance
1	Controls	35	155.31 ± 27.59		
2	Patients	35	278.11 ± 118.08	6.57*	P<0.001

Also in case of activity of AST enzyme it shows highly significant as shown in Table 3.

Table no.3 Activity of AST enzyme in AMI patients and control group.

Sr.No.	Study groups	n	AST (mean ± SD)	Z value	Level of significance
1	Controls	35	17.97 ± 2.7		
2	Patients	35	81.38 ± 40.44	9.31*	P<0.001

IV. Discussion

Michael M. Marin, MD (1992) has determined that range of elevated MB concentration in the infarction group was wide and eventually grow wider, were as it remain low and narrow in non-infarction group .[9] Our result similar to those of Puleo PR, Meyer D, Wathen C. et al. (1994). They stated that CK-MB isoform is sensitive marker for diagnosis of myocardial infarction. [10] Zimmerman J, et al. (1999), also observed that CK-MB isoform were more sensitive than cardiac troponin and CM-MB mass for early detection of myocardial infarction. [11]

Apple FS. (1992) reported that the serum cardiac marker for the AMI and cardiac reperfusion. In this study he detected that the measurement of serial CK-MB in serum remains the "gold standard" clinical laboratory test. This test has advantage in early detection of AMI. [12] Hitesh shah and N.Haridas (2007) determined that the similar findings of CK and CK-MB in patients who underwent successful coronary reperfusion for AMI produced by arterial occlusion of 99 to 100%. [13]

Lott JA, Stang JM (1980) studied that serum enzymes and isoenzymes in the differential diagnosis of myocardial ischemia and necrosis. They diagnosed that the injury to the myocardium is facilitated by information on the activity of LDH isoenzyme in serum three isoenzymes being present in higher activity in the myocardium than in other tissue or in normal serum. The LDH is highly sensitive and specific for acute injury to the heart particularly AMI. [14]

Our study shows similar result to that of Lott JA highly significant increase in the activity of LDH-1 were observed in AMI patients as compared to control seen in table no.2. Miyazawa K (1985) studied the serial determination of serum enzymes following coronary bypass surgery and AMI. The serial determination of serum CK, cardio specific isoenzymes of CK (CK-MB) and glutamic oxaloacetic transaminase (GOT) were made in 29 patients undergoing aorta coronary (AC) bypass grafting and results were compared with those in 31 patients with AMI. The peak activities of SGOT in AC bypass patients were 718 ± 32 which are equivalent to 22% of in AMI. [15] In our study we observed that highly significant increase in the activity of AST in AMI patients as compared to controls seen in table no 3.

Panteghini M. (1989) also showed similar observation, he studied that the therapeutic coronary reperfusion on AST with AMI. The work examined that the activity in serum increased rapidly immediately after recanalization reaching a maximum 12 hours onset of infarction.

V. Conclusion

The conclusion of the study can be enumerated as follows.

In our study highly significant activity of serum creatine kinase isoenzyme MB were observed in patient of AMI as compared to controls. Remarkable increased activity of lactate dehydrogenase was observed in AMI patients as compared to controls. Also we observed highly significant activity of AST in AMI patients as compared to controls.

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Figures:

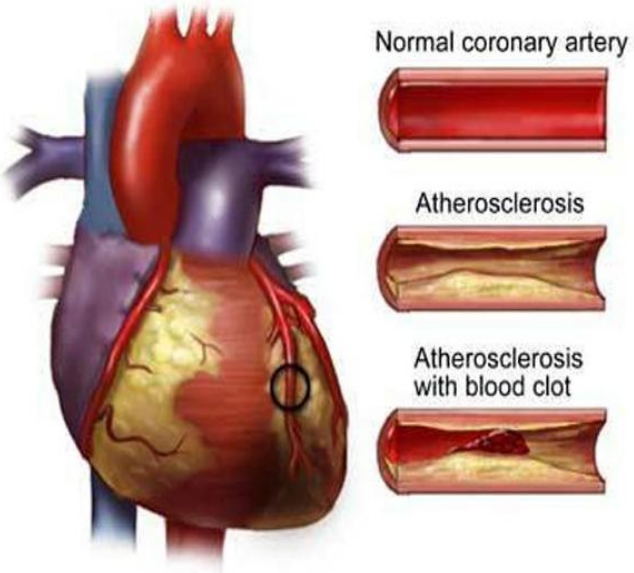

Fig.1. Atherosclerotic coronary heart disease

Sadhana D Gawade.et.al. "Study of Serum Enzymes and Isoenzymes in Acute Myocardial Infarction."*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(1), 2020, pp. 08-11.