

Serum enzymes markers in myocardial infarction: A study of rural area



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ABSTRACT

Background: Acute Myocardial Infarction is the reduction of coronary flow to such an extent that supply of oxygen to the myocardium do not need the oxygen demand of myocardial tissues. The diagnosis of AMI cannot be fulfilled unless the elevated levels of serum cardiac enzymes particularly CK-MB iso-enzyme activity. The rate of release of cardiac enzymes is highly diagnostic. **Aims and Objectives:** Therefore, the present thesis aim is-in evaluating, whether the elevated levels of cardiac marker enzymes can be compared to the extent of the Myocardial infarction. **Material and Methods:** Therefore the present study was undertaken on 50 patients of MI and 50 patients of control. They were group according to the age and sex. The activity of different cardiac enzymes were studied. **Result:** The AMI patients had significantly elevated levels of 90% patients of high LDH values and 86% patients have elevated levels of AST. The significant elevation of serum enzymes as compared to the control. **Conclusion:** The magnitude of the elevated levels of enzymes can be compared to the extent of the myocardial infarction. Serum GGT can also be useful marker of oxidative stress in myocardial infarction.

Key words: Myocardial infarction, CK-MB, LDH, GGT, SGOT

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INTRODUCTION

Myocardial Infarction is one of the most common manifestation of cardiovascular disease. The morbidity and mortality of Myocardial Infarction is now a days reaching epidemic proportion throughout the world. Acute myocardial infarction (AMI) is the leading cause of death in developed countries.¹ However, mortality from this cause has been declining over the last three decades because of early diagnosis and proper treatment.²

The diagnosis of AMI was based on the criteria set by the World Health Organization (WHO) and had to include two of the following: 1) typical history of prolonged ischaemic chest pain; 2) presence of typical acute ischaemic changes in the electrocardiograms (ECG); 3) typical rise and fall of cardiac enzymes in blood like CK-MB, LDH, AST.³

The sensitivity and specificity of these markers have been enhanced by development of the iso-enzyme analysis. The CK-MB iso-enzyme activity appears to be the most sensitive and single specific serum enzyme level which can be helped to detect myocardial injury.⁴ The second enzyme GGT (Gamma Glutamyl Transferase) activity normally found in the serum as well as in the plasma membrane, virtually in all cell catalyzes the first step in degradation of extra cellular Glutathione and allowing for precursor amino acid to be assimilated and reutilized for intra GSH synthesis.⁵ More recently elevated serum GGT has also been found to correlate with cardiovascular diseases and is under active investigation as a cardiovascular risk marker. GGT in fact accumulates in atherosclerotic plaques, suggesting a potential role in pathogenesis of cardiovascular diseases.^{6,7}

Therefore this enzyme study was undertaken to evaluate the role of various enzymes in patients with myocardial infarction and the ischemic heart disease.

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MATERIALS AND METHODS

The present study was conducted in the Department of Biochemistry, Government Medical College & Hospital, Nagpur, during July 2009 to August 2010 with proper ethical approval and patient consent. The present study was performed on 50 patients of myocardial infarction from nearer areas of college and 50 age/sex matched controls. They were grouped according to the age i.e., ≥ 50 and ≤ 50 . After the detail history and clinical examination of all individual who had diagnosed as myocardial infarction patients were taken for biochemical analysis.

For the control study healthy 50 volunteers were selected and match with the age and sex with the study group, there were 32 males and 18 females in the controlled group and 35 males and 15 females in myocardial infarction patients (different numbers in groups depends on availability). The average age of the control was 53.72 ± 9.8 years and for myocardial infarction 59.20 ± 2.57 years. (Table 1)

Samples were collected with 20 to 40 hours after the onset of chest pain. All the enzyme assay were carried out in serum sample for the study group and normal group within 24 hours.

Analytical methods

AST, LDH and CK-MB activity were determined by enzymatic method and GGT by colorimetric end point method.⁷⁻¹⁰

RESULTS

In present study all the levels of serum enzymes observed significant elevation. All the enzymes particularly CK-MB was significantly increased four folds than its normal. In the study, out of 50 patients with AMI 48 (96%) shows elevated levels of CK-MB and 2 patients had CK-MB value within normal range. AST value had elevated in 43 patients (86%) while 7 (14%) patients had AST value within normal. 45 patients (90%) had highly elevated LDH activity and 5 (10%) patients shows normal LDH activity. These observations of our study are comparable to the study reported by the others.

Table 2 shows that all four serum enzymes AST, LDH, CK-MB and GGT were significantly ($P < 0.001$) elevated in AMI subjects than in control group.

Table 3 shows a significant increased value of AST, LDH, CKMB & GGT in ≤ 50 years of group of AMI patients when compared with control of same age.

Table 4 shows that there was statistically significant increased values of AST, LDH, CKMB and GGT ≥ 50 age of AMI patients when compared with healthy control of same age group.

The AMI patients had significantly 96% elevated levels of CK-MB, 90% patients of high LDH values and 86% patients have elevated level of AST, the significant elevation of serum enzymes as compared with controlled group as shown in Table 5. The magnitude of the elevated levels of serum enzymes can be compared to the extent of

Table 1: Distribution of the normal and studied subjects

	Control	AMI
Total no. of cases	50	50
Male	32 (64%)	35 (70%)
Female	18 (36%)	15 (30%)
Age (yrs)	53.72 ± 9.38	59.20 ± 12.57

Age: Mean \pm S.D. is given

Table 2: Serum enzymes levels in AMI & control

Subjects	AST	LDH	CKMB	GGT
Control (n=50)	23.94 ± 5.90	409 ± 112.22	13.66 ± 4.12	20 ± 7.93
AMI (n=50)	55.12 ± 16.54	925 ± 164.75	80.3 ± 44.26	55.32 ± 11.26

Mean \pm S.D. is given, $P < 0.001$ when compared with control group, Values expressed in IU/L

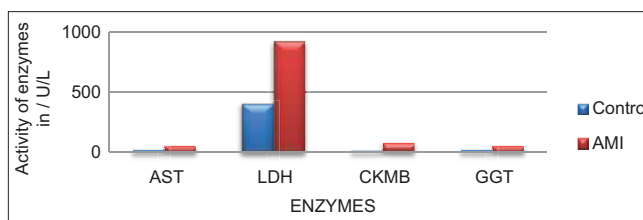


Table 3: Change in serum enzyme levels in AMI & control ≤ 50 yrs age group

Subject	AST	LDH	CKMB	GGT
Control (n=12)	24.39 ± 5.68	413 ± 111.87	14.02 ± 3.82	21.23 ± 8.88
AMI (n=09)	51.33 ± 17.19	863 ± 108.21	62.48 ± 27.26	46.66 ± 7.51

Mean \pm S.D. is given, $P < 0.001$ when compared with control group, Expressed in IU/L

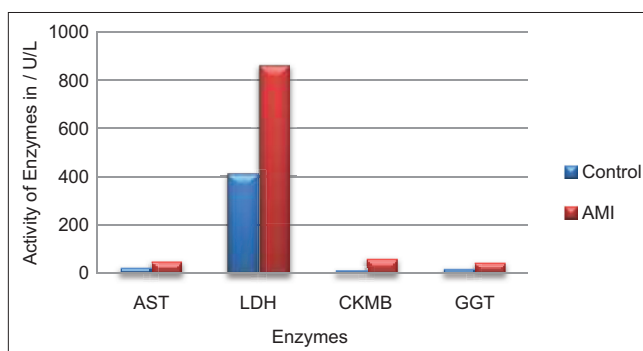


Table 4: Changes in serum enzymes levels in AMI and Control ≥ 50 years age group

Subject	AST	LDH	CKMB	GGT
Control (n=12)	22.5±6.59	396.66±117.39	12.5.02±4.95	16.04±4.39
AMI (n=09)	55.95±16.49	938.43±178.47	84.31±46.50	54.39±2.36

Mean±S.D. is given, P<0.001 when compared with control group, Expressed in IU/L

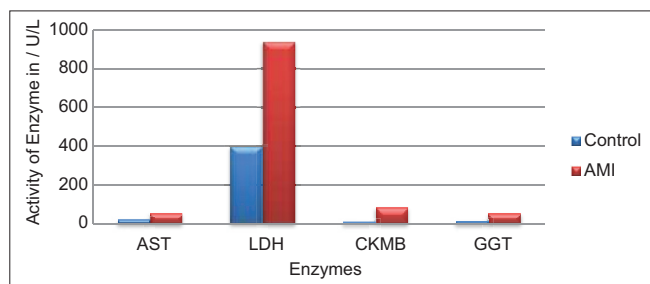


Table 5: Numbers of patients of AMI with elevated serum enzyme level

	AST	LDH	CKMB	GGT
Normal range	42-28.91 IU/L	200-650 IU/L	0-25 IU/L	0-45 IU/L
No. of patients	43	45	48	36
Percentage	86%	90%	96%	72%

96% patients of AMI had high value of CKMB, 90% patients had elevated value of LDH, 86% patients had elevated value of AST than normal range, 72% patients had higher value of GGT than normal range

the myocardial infarction. GGT can also be useful marker of oxidative stress in myocardial infarction.

All four serum enzymes AST, LDH, CK-MB and GGT were significantly (P< 0.001) elevated in AMI subjects than in control group.

There was a significant increased value of AST, LDH, CKMB & GGT in ≤ 50 years of group of AMI patients when compared with control of same age.

Table 4 shows that there was statistically significant increased values of AST, LDH, CKMB and GGT ≥ 50 age of AMI patients when compared with healthy control of same age group.

DISCUSSION

The diagnosis of AMI based upon the clinical symptoms, ECG changes and characteristics changes in enzyme. Since the clinical symptoms are not very reliable. ECG is most widely used method for the diagnosis of AMI, but many times ECG shows inclusive pattern. In such situation the importance of serum biochemical markers

of myocardial injury arises to confirm the diagnosis.¹¹ The need for enzymes assay in the diagnosis of cardiac diseases, stress from the relative inaccuracy of current diagnostic method. Twenty-thirty percent of AMI are not diagnosed clinically. However the physician trust upon most often in the diagnosis of myocardial infarction on ECG. Though it may reveal the diagnosis to the number of situation.

The reliability of the panel of the cardiac enzymes is now considered good enough so that CHD and AMI may be excluded as a diagnostic consideration. If all the three enzymes levels particularly AST, LDH and CK-MB are consistently normal. Elevation of cardiac enzymes are rarely if ever seen. It is believed that myocardial necrosis has indeed occurred. Increased serum enzyme activity associated with the AMI generally results from release of enzyme from myocardial itself. Several factors may influence the rate of depletion of enzymes from myocardium and appears in serum including the balance between myocardial oxygen supply and demand.¹²

The rate of appearance of enzyme in serum is not influenced by the myocardial enzymes depletion with release from the heart but also the contribution of enzymes release from non myocardial sources.¹³ CK is released in skeleton muscles, hence the quantitative relation between serum CK depletion attack, which are responsible for many of the false positive enzymes elevation reported particularly in early studies, when iso-enzymes study were not available.¹⁴⁻¹⁶

Several studies have shown the elevated relation between peak serum enzyme activities after myocardial infarction.¹⁷⁻¹⁹

Lindsay et al.²⁰ are argued that the metabolic effect that leads to increase in flux may fully and partially reversible, therefore the elevation of CK-MB could signify the adverse effect on the myocardial cell resulting from something other than necrosis or ischemia.

Thaygeshen et al. reported that the sensitivity of elevated serum LDH activity as a diagnostic criteria of AMI is some what less than that of the AST and CK-MB. Our study also showed that elevation of serum LDH was less as compared to high value observed in all patients.²¹

Lee D.H. et al. reported in their epidemiological studies that serum GGT within its normal range be an early and sensitive enzyme related to oxidative stress. An increase of GGT might be interpreted as defense mechanism reflecting induction of cellular GGT under oxidative stress.¹⁸

The present findings suggest that serum GGT may be increase due to increase oxidative stress in AMI. Thus

serum GGT may be useful marker of oxidative stress in AMI and IHD.

CONCLUSION

Significant elevation of CK-MB activity as compared to AST and LDH proves as a single enzyme criteria for the early markers of AMI.

Serum GGT might be useful marker of oxidative stress in AMI.

The extent of myocardial infarction can be made by the magnitude of elevated serum enzyme levels.

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Authors Contribution:

MP - Concept and design of the study, collected data, literature search, statistically analyzed and interpreted, prepared first draft of manuscript; **MGM** - Review of study, review of literature, critical revision of the manuscript.

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