# Role of Serum Cardiac Markers in Myocardial Infarction

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**Abstract**

**Background:** Acute Myocardial Infarction (AMI) has become one of the major causes of mortality in the world at present, and it is for this reason various researches are being done for its diagnosis and prognostic assessment. Serum enzyme estimation is an important tool for it. **Aim:** To study changes in serum cardiac markers, after acute attack of MI Before & 2 hours after reperfusion and to establish usefulness of enzymes in early diagnosis of AMI. **Methodology:** A study of changes in serum cardiac markers CK-MB, LDH and AST, after acute attack of MI-before and 2 hours after reperfusion was conducted at govt. hospital. Total 100 patients were studied. All the patients were confirmed cases of AMI, admitted in the intensive care unit of hospital. Blood samples were collected in plain bulb, at the time of admission and at 90 minutes (i.e. after reperfusion) and enzyme estimation was done for all 3 enzymes. **Result:** It was found that the serum CK-MB is the first and earliest enzyme released in compare to AST and LDH, and after reperfusion it increases 6-7 folds. The mean levels of all enzymes were higher after reperfusion, suggestive of good prognosis in case of early reperfusion after an attack of AMI.

**Key Words :** Acute myocardial infarction, cardiac markers, reperfusion

## Introduction :

Acute myocardial infarction (AMI) is one of the most common diagnoses in hospitalized patients in industrialized countries. The early (30 days) mortality rate from AMI is approximately 30%, with more than half of these deaths occurring before the individual reaches the hospital. [1] So it has become one of the major causes of mortality in the world at present, and it is for this reason various researches are being done for its diagnosis and prognostic assessment. Serum enzyme estimation is an important tool for it. [2, 3]

In recent years, the incidence of myocardial infarction (MI) has increased in the population because of change in life style, urbanization, and increase in mental stress, inadequate physical exercises and diet rich in lipids. It has also been observed that there is sudden increase in AMI in young subjects mostly in second & third decades of life, who show increased morbidity & mortality. Hence, this will become a dreadful condition for the coming years. [2, 4] It becomes very much necessary for us to diagnose AMI as quickly as possible. In past years, there was a little interest in the early diagnosis of MI because it was thought that duration of symptoms had negligible impact on the hospital management strategy. However, the attitude changed in last few decades, after the publication of major mortality studies of thrombolytic therapy which showed that not only the treatment improves the prognosis but also that if it was given earlier after the onset of symptoms then much better benefit was obtained.

Accuracy of ECG diagnosis of AMI is not more than 80% and it is often found that in cases of early AMI the ECG could be normal. So the enzyme estimation has become of immense utility in early diagnosis. For specific diagnosis, combination of several enzymes is used. Aspartate amino transferase was discovered in 1937 by Braunstern, who named it amino transferase and a practical method for its determination was made in 1951. Diagnostic value of AST for AMI was introduced into clinical practice by La Due et al (1952). [5, 6, 7] Because of greater specificity for heart, measurement of lactate dehydrogenase and lactate dehydrogenase isoenzymes replaced AST estimation. [7, 8] However, the rapid appearance of creatinine kinase (CK) in the serum after AMI and improved specificity for myocardial injury provided by measurement of the MB isoenzyme quickly established CK-MB as the marker of choice. [9] The current WHO criteria for the diagnosis of AMI include the presence of two of the following criteria .

1. Clinical symptoms compatible with acute ischemia.
2. ECG abnormalities.
3. A pattern of enzyme release typically of myocardial injury.[10]

## Objectives

1. To study changes in serum cardiac markers after acute attack of MI Before & 2 hours after reperfusion.
2. To determine the earliest release of each enzyme after an attack of AMI.
3. To establish usefulness of enzymes in early diagnosis of AMI.
4. To evaluate the role of reperfusion on enzyme release after an attack of AMI.

## Methodology

A study of changes in serum cardiac markers CK-MB, LDH and AST, after acute attack of MI-before and 2 hours after reperfusion was conducted at pathology department of govt. medical college and hospital of Gujarat. Total 100 patients were studied. All the patients were confirmed cases of AMI, admitted in the intensive care unit of G.G. Hospital, Jamnagar. Detailed history, clinical findings, ECG findings,

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whether or not thrombolytic therapy received, and enzyme studies of all patients were collected.

The diagnosis was based upon the ECG findings, complains and other relevant clinical findings. Serum estimation of creatine-kinase MB (CK-MB), aspartate amino transferase (AST) and lactate dehydrogenase (LDH) was done. Blood samples were collected in plain bulb, at the time of admission and at 90 minutes (i.e. after reperfusion).

Patients were divided into 3 groups, according to the time of admission for the first sample only.

Group A : Those admitted within 6 hours of onset of chest pain.

Group B: Those admitted between 6-12 hours, after the onset of chest pain.

Group C: Those admitted after 12 hours of chest pain. All patients were thrombolysed in ICCU, mostly with inj. Streptokinase. The serum level of CK-MB was determined by the commercially available kit manufactured by Reckon Diagnostic. The reference range for CK-MB with this kit is 0-25 IU/L. The serum level of AST was determined by the commercially available kit manufactured by Crest Biosystems. The reference range for AST with this kit is 0-37 U/L. The serum level of LDH was determined by the commercially available kit manufactured by Crest Biosystems. The reference range for LDH with this kit is 230-460 U/L.

**Results and Discussion**

**Table 1: Distribution of patients based on duration of chest pain at the time of admission.**

| Time of admission | Male | Female | Total |
|---|---|---|---|
| Group A:<br>0-6 hrs<br>(including 6th hour) | 59 | 14 | 73 |
| Group B:<br>6-12 hrs<br>After 6 hrs | 19 | 5 | 24 |
| Group C:<br>i) At 15 hrs<br>ii) At 18 hrs<br>iii) At 36 hrs | <br>1<br>1<br>1 | <br>0<br>0<br>0 | 3 |
| Total | 81 | 19 | 100 |

It is evident from the above table that majority of patient were admitted within first six hours of onset of chest pain. However three patients had delayed admission beyond 12 hours, even up to 36 hours.

**Table 2: Levels of CK-MB among patients**

| Time of sampling | Sample Size | Mean Value | Mean of Diff Between CK-MB Value at Time of Admission & after reperfusion | SD | T | P |
|---|---|---|---|---|---|---|
| At time of Admission | 100 | 117.21 | 427.08 | 187.5 | 22.77 | <0.001 Highly Significant |
| After 90 min (after reperfusion) | 100 | 522.60 | | | | |

Table 2 shows mean value of CK-MB of 100 patients at the time of admission is 117.219, which is increased after reperfusion significantly to 522.605. The mean value of difference value of CK-MB at time of admission and after reperfusion is 427.086.

**Table 3: Levels of LDH among patients**

| Time of sampling | Sample Size | Mean Value | Mean of Diff Between AST Value at Time of Admission & after reperfusion | SD | T | P |
|---|---|---|---|---|---|---|
| At time of Admission | 100 | 452.02 | 788.34 | 461.82 | 17.07 | <0.001 |
| After 90 min (after reperfusion) | 100 | 1284.04 | | | | |

Table 3 shows that mean value of LDH of 100 patients at the time of admission is 452.02, which is increased after reperfusion significantly to 1284.047. The mean difference value of LDH at time of admission and after reperfusion is 788.342 which was highly significant. (t value 47.0, $p<0.001$)

**Table 4: Levels of AST among patients**

| Time of sampling | Sample Size | Mean Value | Mean of Diff Between AST Value at Time of Admission & after reperfusion | SD | T | P |
|---|---|---|---|---|---|---|
| At time of Admission | 100 | 55.253 | 120.345 | 82.48 | 14.59 | <0.001 |
| After 90 min (after reperfusion) | 100 | 179.38 | | | | |

Table 4 shows that mean value of AST of 100 patients at the time of admission is 55.253, which is increased after reperfusion significantly to 179.386. The mean difference value of AST at time of admission and after reperfusion is 120.345, which was highly significant. (t value14.59 ,p<0.001)

**Table 5: Mean values of all enzymes**

| Enzymes | Mean value | |
|---|---|---|
| | At time of Admission | At 90 min (after Reperfusion) |
| CK-MB | 117.219 | 522.605 |
| AST | 55.253 | 179.386 |
| LDH | 452.02 | 1284.047 |

Table 5 shows that after reperfusion the mean values of all enzymes rises 3 to 5 times, which signifies successful reperfusion.

**Conclusion :**

The CK-MB level increases rapidly after reperfusion, which is 5-6 times more as compared to CK-MB level before reperfusion. The AST and LDH levels increase not so fast as CK-MB level after reperfusion. This is 2-3 times more as compared to AST and LDH levels before reperfusion, but it is also significant statistically. Hence, at the end of study regarding the serum enzymes in AMI, some important conclusions were derived: Serum CK-MB is the first and earliest enzyme released in compare to AST and LDH, and after reperfusion it increases 6-7folds. The mean levels of all enzymes were higher after reperfusion, suggestive of good prognosis in case of early reperfusion after an attack of AMI.

Thus, enzyme evaluation is a convenient and non-invasive method for diagnosis of MI.

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