



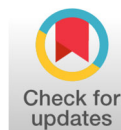
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Research Article

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## Diagnostic Evaluation of Myocardial Injury Using Cardiac Biomarkers: A Comparative Analysis Between Myocardial Infarction Patients and Healthy Controls

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**Abstract** | Previous studies indicate that cardiac troponin I and cardiac troponin T exhibit diagnostic performance comparable to and potentially superior to, Creatine Kinase-MB (CK-MB) in identifying Acute Myocardial Infarction (AMI). These biomarkers may therefore serve as reliable alternatives to CK-MB in clinical detection. The accuracy of assay results can be ensured through the use of appropriate positive and negative controls included in diagnostic kits. The present study aims to assess myocardial cell and tissue injury by quantifying variations in cardiac enzyme levels and to examine the association between enzyme elevation and the extent of tissue damage across different age groups and between genders. Blood samples were obtained from 30 individuals at a Community Health Centre in Acharapakkam, comprising patients aged 30–50 years and 50–70 years. Each group included 15 participants, divided equally into experimental (myocardial infarction) and control (healthy) cohorts. Findings from this comparative analysis demonstrate a significant elevation in all measured cardiac enzymes among myocardial infarction patients, reflecting substantial myocardial cell damage. Enzyme levels were markedly higher in male patients compared to females. Additionally, individuals in the 50–70-year age group exhibited a greater degree of myocardial injury compared to the younger cohort.

**Key Words** Cardiac Biomarkers, Troponin I, Troponin T, Creatine Kinase-MB, Acute Myocardial Infarction, Biomarker Analysis, Myocardial Injury Assessment, Age-Related Variation

### INTRODUCTION

Millions of chest pain patients are admitted each year for ruling out myocardial infarction. More number of patients are admitted to the Cardiac Care Unit (CCU) for suspected Acute Myocardial Infarction (AMI), leading to heavy expenses that could be saved caring for these patients in a less intensive setting. The final WHO criterion involves monitoring the temporal change in biochemical markers of myocardial necrosis [1]. In the past, enzyme activity was used as a marker; However, in the future, measurement of proteins, some of which are enzymes, will become the standard. Cardiac Troponin-I the ultimate breakthrough in biochemical markers. Cardiac Troponin I. Cardiac troponin I is also an important prognostic variable in patients with unstable angina. Elevation of

cardiac troponin I predict adverse short- and long-term prognosis. The rapid test for the estimation of cardiac troponin I in human serum. The test is rapid, immuno chromatography based test used for detection of elevated levels of cardiac troponin I. The total testing time is just 15 minutes [2,3].

### MATERIALS AND METHODS

In order to find out the myocardial damage with cardiac enzymes on myocardial infarction patients and normal subjects experimental design was used and 30 sample were selected for this study. The samples were collected in Community Health Centre at Acharapakkam with sample size of 30 patients, age between 30-50years and 50-70 yrs. In each experimental and control group 15 patients were selected.

Table 1: The Level of Creatine Kinase MB, Serum Glutamate Oxaloacetate Transaminase, Lactate Dehydrogenase and Troponin I in Normal and Acute Myocardial Infarction Patients of Male Age Between 30-50 years and 50-70 years. Among these two Age Groups, in 50-70 Years' Group the Extent of Myocardial Damage is Highly Significant

S.No	Parameters	30-50yrs Male (Mean±SD)	50-70 yrs Male (Mean±SD)
1	Creatine Kinase MB	86.6±19.42	92.4±39.29
2	Serum glutamate oxaloacetate transaminase	156.1±48.99	202±50.87
3	Lactate Dehydrogenase	614.2±65.35	643.2±96.35
4	Troponin I	Positive	Positive

Table 2: The level of Creatine Kinase MB, Serum Glutamate Oxaloacetate Transaminase, Lactate Dehydrogenase and Troponin I in Normal and Acute Myocardial Infarction Patients of Male and Female. Compared to Male and Female Patients of Myocardial Infarction the Cardiac Enzymes Are Very Significantly Higher in Male Patients with Myocardial Infarction

S.No	Parameters	Female patient (Mean±SD)	Male patient (Mean±SD)
1	Creatine Kinase MB	68.26±14.05	92.4±39.29
2	Serum glutamate oxaloacetate transaminase	87.12±16.03	202±50.87
3	Lactate Dehydrogenase	516.6±37.85	643.2±96.35
4	Troponin I	Positive	Positive

The blood samples obtained by various arm puncture are collected in a heparinized tube [4,5]. Then the blood was subjected to centrifugation at 3000 RPM for 10 minutes to separate the serum. Plasma was stored in sample vial and used for analysis. Parameters used for Myocardial damage are Troponin I, Creatine kinase MB, Glutamate oxaloacetate transaminase and Lactate dehydrogenase.

## RESULTS

The present study assessed the levels of key cardiac biomarkers Creatine Kinase-MB (CK-MB), Serum Glutamate Oxaloacetate Transaminase (SGOT), Lactate Dehydrogenase (LDH) and Troponin I in patients diagnosed with Acute Myocardial Infarction (AMI). Statistical analysis was performed using mean, standard deviation, percentages and inferential statistics.

### Age-Wise Comparison

A comparison between two male age groups (30–50 years and 50-70 years) revealed a noticeable increase in cardiac biomarker levels in the older age group. CK-MB levels were higher in the 50–70-years group (92.4±39.29) compared to the 30–50-years group (86.6±19.42). Similarly, SGOT levels increased from 156.1±48.99 to 202±50.87 and LDH levels rose from 614.2±65.35 to 643.2±96.35. Troponin I was positive in both groups (Table 1).

This elevation suggests that myocardial injury is more extensive in older patients, with statistical analysis indicating a highly significant difference ( $p < 0.05$ ).

### Gender-wise Comparison

When comparing male and female patients, cardiac biomarkers were consistently higher in males. CK-MB levels were 92.4±39.29 in males versus 68.26±14.05 in females. SGOT levels showed a marked increase in males (202±50.87) compared to females (87.12±16.03). Similarly, LDH levels were higher in males (643.2±96.35) than in females (516.6±37.85). Troponin I remained positive in both groups.

These differences were statistically significant ( $p < 0.05$ ), indicating a greater extent of myocardial damage among male patients (Table 2).

The collected data was analyzed using mean, standard deviation, percentage and inferential statistics. Present study emphasis the sensitivity of Creatine Kinase MB, Serum glutamate oxaloacetate transaminase, Lactate Dehydrogenase, Troponin I in identifying the myocardial damage and its extent in myocardial infarction patients compared with normal subjects. Troponin I enzyme show a sharp rise in initial phase of myocardial infarction. Compared to male and female patients of myocardial infarction the cardiac enzymes are very significantly higher in male patients with myocardial infarction. Among the two age groups, in 50-70 years' group the extent of myocardial damage is highly significant.

## DISCUSSION

This study highlights the clinical significance of cardiac biomarkers in diagnosing and assessing the severity of acute myocardial infarction. Elevated levels of CK-MB, SGOT and LDH were observed across all patients, with significantly higher values in older individuals and male patients.

The observed age-related increase in biomarker levels suggests that advancing age is associated with more severe myocardial injury. This may be attributed to cumulative cardiovascular risk factors, reduced myocardial reserve and delayed recovery mechanisms in older individuals. These findings are consistent with existing literature, which reports higher morbidity and severity of AMI in elderly populations [6].

Gender-based analysis revealed significantly higher enzyme levels in males compared to females. This may reflect differences in risk factor profiles, including higher prevalence of smoking, hypertension and lifestyle-related factors among males, as well as possible protective hormonal effects in females [7].

Among all biomarkers, Troponin I emerged as the most sensitive and reliable indicator of myocardial injury. Its early and sustained elevation makes it the gold standard for AMI diagnosis. In contrast, CK-MB, SGOT and LDH provide supportive information regarding the extent and progression of myocardial damage [8].

The combined use of these biomarkers enhances diagnostic accuracy and allows better assessment of infarct severity. This is particularly important in clinical settings where early diagnosis and timely intervention are critical to reducing morbidity and mortality [9].

### Clinical Implications

- Early measurement of cardiac biomarkers, especially Troponin I, is essential for prompt diagnosis of AMI
- Higher biomarker levels in older and male patients suggest the need for more aggressive monitoring and management in these groups
- Combined biomarker analysis improves diagnostic confidence and helps in assessing the severity of myocardial damage

### CONCLUSIONS

The study concludes that cardiac biomarkers particularly Troponin I are highly sensitive indicators for the detection of myocardial infarction. Increased levels of CK-MB, SGOT and LDH correlate with greater myocardial damage, especially in older and male patients. A combined biomarker approach is recommended for accurate diagnosis and assessment of disease severity.

### Limitations

- The study sample size was relatively small, which may limit generalizability
- Lack of longitudinal follow-up prevented assessment of long-term outcomes
- Additional biomarkers and imaging modalities were not included for comparison

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