



## STUDY OF MORTALITY PATTERNS IN YOUNG PATIENTS: UNCOVERING THE ORIGINS OF TROPONIN ELEVATION

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### Abstract

**Purpose:** Myocardial infarction is one clinical condition in which serum levels of troponin may increase. In older populations, these sources of troponin rise have been extensively investigated, whereas in younger populations, fewer studies have been conducted.

**Methodology:** From June 2021 to June 2023, a retrospective analysis was conducted on individuals younger than 65 years old who presented with elevated blood troponin levels at two large tertiary care facilities. Those with coronary artery disease were excluded from the study. Using electronic medical records, the rise in troponin's cause was determined. The Social Security Administration recorded all-cause mortality in its death master file.

**Results:** There were 693 (64.1%) myocardial infarctions among the 1081 individuals who satisfied the inclusion criteria, whereas 388 (35.9%) had increased troponin levels due to other medical problems. After 2.5 years, patients whose troponin levels increased for reasons other than myocardial infarction had a greater risk of all-cause death. Central nervous system diseases, non-ischemic cardiomyopathies, and end-stage renal illness all increased mortality. Acute myocardial infarction was related with a higher death rate than myocarditis.

**Conclusion:** Numerous demographic factors contribute to the rise in troponin levels among younger individuals. Acute myocardial infarction has a lower mortality rate than other conditions that increase troponin levels.

**Keywords:** troponin, young adults, Pakistan. End stage renal disease.

## **INTRODUCTION**

Throughout the previous few decades, the incidence of myocardial infarction in younger individuals has been anywhere from 2% to 10%. Myocardial infarction remains a major public health problem, but there are several additional conditions that may possibly increase troponin levels in young individuals, and these illnesses appear to be increasingly common (1). Because of their lower vulnerability to atherosclerotic disease, young people have a harder time being diagnosed with increased troponin levels (2).

Myocarditis and drug-induced vasospasm have been identified as the two most prevalent causes of increased troponin in individuals under the age of 20 who arrive with chest pain. A previous study of this type looked at the variables that lead to the rise of troponin levels in older persons, namely those aged 60 to 70 (3). Troponin levels in the elderly can rise due to a range of illnesses (4), including sepsis, tachycardia, heart failure (5), pulmonary embolism, stroke, brain hemorrhage (6), and respiratory failure. There is also no link in many cases between them and acute coronary syndrome.

The rise in troponin levels in Pakistan can be attributed to a variety of factors, the majority of which are global in scope (7). Myocardial infarction is one of the most prevalent causes, particularly among the elderly. Several conditions are associated with an increased risk of mortality (8). The actual statistics, however, may vary depending on a variety of factors, including the patient's age, the level of treatment received, and the presence of other concurrent diseases (9).

However, little research has been done on the processes that result in high troponin levels in younger people, especially those under the age of 65. Understanding the many variables that may cause an increased troponin level in this group has substantial diagnostic, prognostic, and therapeutic repercussions. With a focus on identifying potential differences based on demographic factors and evaluating how well they correlate with overall mortality, the goal of this study is to investigate the myriad of factors that may result in an elevated level of troponin in a large population of patients younger than 45 years old.

## **Methodology**

All patients younger than 45 years old who presented with elevated cardiac troponins (I or T) or who were classified with ICD-9 or ICD-10 for acute myocardial infarction at one of the four most important tertiary hospitals between June 2021 and June 2023 were included in this analysis. The investigation took place between June 2021 and June 2023. People who had a history of having a myocardial infarction, coronary artery bypass graft surgery, or percutaneous coronary intervention were not allowed to participate in the trial. They were also not allowed to participate if the medical data kept on file for them were incomplete or if they had recently (within the preceding 30 days) undergone heart surgery. The Partners HealthCare Institutional Evaluation Board gave its approval for a retrospective analysis of electronic medical records. The data came from a variety of healthcare facilities, including Services Hospital Lahore, Combined Military Hospital (CMH) Lahore, Nishtar Hospital Multan, and Mayo Hospital Lahore, among others. This data compilation offers essential demographic information, clinical diagnoses with associated notes, past health records, test findings, previously prescribed drugs, procedure reports, and imaging tests.

## **Acute Myocardial Infarction adjudication**

The doctors who took part in the study looked into the patients' medical histories. Each patient was given a classification based on the third global definition of myocardial infarction that was developed by the World Heart Federation (10). In the event that at least one aberrant cardiac biomarker result was obtained that was higher than the test's upper reference limit, a diagnosis of

acute myocardial infarction might be made. At least one of the following conditions needs to be met: Ischemia can be diagnosed when there is a fresh loss of viable myocardium, anomalies in regional wall motion on imaging, or the finding of an intracoronary thrombus during imaging or postmortem. Additional instances include new ST-segment T-wave changes and left bundle branch block. Following the investigation of patients whose diagnoses of myocardial infarction were ambiguous, the committee in charge of strict adjudication came to a conclusion.

### Identification of Non-Myocardial Infarction Factors that Cause an Increase in Troponin

Variables that enhance troponin levels but are not connected to myocardial infarction were found by using certain criteria to make the determination. Cardiomyopathy, including infiltrative cardiomyopathies such as amyloidosis or sarcoidosis, a pre-admission ejection fraction of 30% or less, or a history of cardiac transplantation were some of the symptoms; acute pulmonary embolism; myocarditis, diagnosed by discharge diagnosis or symptoms on imaging or pathology; end-stage renal disease (11), indicated by stage 5 chronic kidney disease, continuous dialysis, or renal transplantation.

### Results of the Study

**Table 01 Standard Features of the Study Participants (N= 1081)**

Characteristics	F(%)	MI (n=693)	Non-MI (n=388)	Sig (p)	M(SD)
<b>Male</b>	704(65.1)	345 (49.00)	359 (47.03)	< 0.01	
<b>Female</b>	377(34.9)	182 (24.2)	195 (32.5)	< 0.023	
<b>Age Mean</b>				< 0.001	37(5.6)
<b>Income level</b>					
<b>Less than 35k</b>	405 (45.02)	199 (39.3)	201 (32.4)	< 0.001	
<b>35k to 50k</b>	398 (37.1)	294 (41.9)	78 (14.7)	< 0.05	
<b>More than 50k</b>	278 (17.9)	121 (21.9)	97 (9.4)	< 0.001	
<b>Comorbidity</b>					
<b>Diabetes</b>	501 (78.1)	302 (44.32)	199 (24.3)	< 0.022	
<b>Hypertension</b>	431 (53.9)	231 (55.34)	200 (45.8)	< 0.001	
<b>Troponin Level</b>					
<b>1-3</b>	528 (17.3)	256 (15.8)	137 (8.4)	< 0.001	
<b>3.1-5</b>	221 (12.6)	108 (12.1)	58 (3.7)	< 0.01	
<b>5.1-7</b>	103 (14.7)	27 (2.4)	45 (4.6)	< 0.01	
<b>7-10</b>	87 (6.54)	14 (3.30)	48 (13.9)	< 0.01	

**Note:** MI= myocardial infarction, nonMI= nonmyocardial infarction

In this study table 01, there were 1081 people who chose to take part. Out of these, 65.1% were boys or men, and 34.9% were girls or women. Among everyone in the study, 693 people were diagnosed with a heart problem called myocardial infarction. Most of these people were boys or men. The average age of the people in the study was 37 years old. Many of the people in the study came from families with not much money, earning less than 35,000 each month. The patients had other health issues like diabetes and high blood pressure. Their Troponin level, which is a measure of heart damage, was between 3.1 and 5. Furthermore, troponin level shows how can signify potential heart damage, have been connected to causes other than myocardial infarction. The patients were classified based on their ages. People between the ages of 25 and 65 were more likely than younger individuals to have the heart illness cardiomyopathy (with a statistical significance of  $P = .001$ ). However, abnormalities such as myocarditis, chest wall injury, or muscular issues (rhabdomyolysis/myositis) were more prevalent among people under the age of 37 than in older people (with statistical significance indicated by  $P.001$  for all illnesses described).

### Discussion

This is the most in-depth investigation that has ever been conducted on the relationship between elevated troponin levels and death in young adults. According to the findings of this study, a

significant number of young people who have increased troponin levels do not suffer from myocardial infarctions. Young people who did not have a myocardial infarction had a death rate from all causes that was considerably higher (64.1 percent of the study group) than those who did have a MI. This link was still there after taking into account demographics, cardiovascular risk factors at the beginning of the study, and troponin elevation. Patients who suffered from myocardial infarction tended to be older, have higher troponin levels, and have more risk factors for coronary artery disease than patients who suffered from other causes, who were more likely to be younger. In younger patients who did not have a myocardial infarction, increased troponin levels were seen in cases of myocarditis, chest wall injuries, and rhabdomyolysis/myositis (12).

Patients who do not have a heart attack might have increased troponin levels for a variety of reasons. In patients with heart failure, myocardial strain leads to an increase in troponin, as well as apoptosis, myocyte damage, and cell death (13). The load on the right side of the heart, brought on by factors such as hypertension and pulmonary embolism, can be harmful to the myocardium. It is often more difficult to identify myocardial infarction in patients suffering from kidney illness because elevated troponin levels. It is not understood exactly how a subarachnoid hemorrhage might lead to pulmonary edema and left ventricular systolic failure; both of these conditions, however, can be caused by the condition (13). Other disorders, such as myocarditis and cardiac contusions, which are caused by direct myocyte death, are also capable of elevating troponin levels. Because not all individuals diagnosed with these illnesses have high troponin levels, there are issues with susceptibility, early identification, prevention, diagnosis, and therapy (13).

Patients diagnosed with non-myocardial infarction who have increased troponin levels had worse short-term and long-term outcomes, independent of the underlying etiology of the elevated troponin levels. According to the findings of our study, which are in line with those of other investigations, young people who had increased troponin levels but who had not had an acute myocardial infarction had poorer long-term outcomes than those who had suffered an acute MI (14). This highlights how important it is to develop effective treatment techniques in order to address the underlying causes and modifiable risk factors that contribute to the higher mortality of these individuals (15). If cardiac biomarkers are elevated, this might be an indication of more serious underlying issues, which would make it more difficult to lower the risk. Additional study is necessary in order to discover which therapy approaches are the most effective for younger patients who have increased troponin levels but who have not yet experienced a myocardial infarction (16).

Because an accurate diagnosis is of the utmost importance, medical professionals have an obligation to be knowledgeable about the many circumstances that might lead to increases in cardiac biomarkers. It was difficult to diagnose young people with increased troponin levels since these individuals had low pre-test likelihood of having atherosclerotic disease (17). It is feasible to avoid doing unnecessary cardiac tests if the cardiac etiology can be differentiated from the increase of the biomarker. According to the findings of our research, the demographics of patients might be of assistance in the process of diagnosing and elucidating the causes of increased troponin levels.

The findings from this study shed insight on the rise in troponin levels seen in young persons. In the same way that traditional assays may lead to an increase in mortality, high-sensitivity troponin testing may do the same thing; however, further study is required to fully grasp the diagnostic and prognostic implications of these tests. When using high-sensitivity troponin testing, it is absolutely necessary to make an accurate distinction between acute myocardial infarction and other conditions that might induce a rise in troponin levels.

## **Conclusion**

We found that 64.1% of the young patients in our study cohort had elevated troponin levels for causes other than myocardial infarction. These patients came from two large tertiary medical

institutions, which were both part of our research cohort. When compared to patients who initially came with an acute myocardial infarction, this group had a mortality rate that was noticeably higher across the board throughout the course of the study's duration. These findings point to the existence of a number of demographically dependent factors that, together, are responsible for the elevated levels of troponin seen in this specific group. In order to better understand the diagnostic and prognosis significance of these differences, greater research and thought are required.

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