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Original Research Article

THE SIGNIFICANCE OF LIPID PROFILE AND POSITIVE TROPONIN-I IN PREDICTING CARDIAC EVENT

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ABSTRACT

Background: Cardiac troponins (cTn) are specific biomarkers of myocardial injury and have a well-established role in guiding the management of chest pain.5,6 An elevated troponin-I (cTnI) has also been associated with a poor prognosis in critical illness, pulmonary embolism, cardiac and non-cardiac surgery, stroke, and end-stage renal disease.

Materials and Methods: This study was conducted in Department of Medicine in RBM Hospital & Shree Jagannath Pahadia Medical College, Bharatpur, Rajsthan. This cases control study was included 100 control and 250 cases. The duration of study was over a period of one year.

Results: Among the 250 cases examined, 96 tested positive for Troponin-I, while the remaining cases tested negative. Among the Troponin-I positive cases, 64 were male and 32 were female, indicating a higher predominance of Troponin-I positivity among males. Significant differences ($p < 0.01$) were observed in these variables between the cases & control groups.

Conclusion: The present study shows in the patients who developed chest pain due to cardiac event as confirmed by positive troponin-I test were having lipid parameters in the risk level as suggested by ATP III.

Keywords: Troponin-I (cTnI), Myocardial injury, Biomarkers.

INTRODUCTION

Diagnosing patients with acute chest pain that may be due to a cardiac cause (MI) is complex, and confirming a positive diagnosis carries psychological, social, and legal implications.[1] According to the World Health Organization's definition, the presence of two out of three specific features is necessary: symptoms indicating myocardial ischemia, elevated levels of cardiac markers (proteins or enzymes) in the bloodstream, and a distinct electrocardiographic pattern that includes the emergence of Q waves or persistent T wave alterations.[2] Additionally, the American Heart Association (AHA) defines a case of acute myocardial infarction (AMI) as requiring an "adequate set" of biomarkers, with two measurements of the same marker taken at least 6 hours apart.

Traditional methods for detecting myocardial infarction (MI) have relied on assessing cardiac enzymes such as Lactate dehydrogenase (LDH), aspartate transaminase (Serum Glutamate Oxaloacetate Transaminase, SGOT), and CK-MB, which is specific to heart tissue. However, using the gold-standard CK-MB levels alone has limited predictive ability.[1] Consequently, many patients unnecessarily occupy Coronary Care Unit (CCU) beds, while others are discharged only to return with recurring coronary events.[1] To address this, newer assessments have been developed that focus on proteins with smaller molecular masses like Myoglobin and Heart fatty acid binding protein, which are more cardio-specific and appear more rapidly in the blood after necrosis onset, aiding in early MI detection. However, these proteins are not considered standard cardiac markers in clinical practice.[2] Advancements in specific and highly sensitive immunoassays for myocardial proteins such as cardiac Troponins T and I, which are components of the thin filaments of the sarcomere, have allowed

for the identification of subjects with small areas of myocardial necrosis.[2] Studies consistently show that the magnitude of Troponin elevations correlates with the risk of death and the combined risk of death or nonfatal MI, regardless of ST elevation or non-ST elevation acute coronary syndromes.[2] Troponin I testing has demonstrated superior sensitivity, specificity, and prognostic value compared to Troponin T testing, with a positive Troponin I result strongly predicting cardiac events (death from cardiac causes or MI) within 30 days. A negative Troponin I result also carries a high predictive value, with a low 30-day event rate regardless of the admission ECG.[1] Minor elevations in Troponin concentrations indicate myocyte necrosis rather than protein leakage through the myocyte cell membrane. Current immunoassays for Troponins T and I reliably detect cardiac (distinct from skeletal muscle) forms of these proteins.[2] Troponins offer greater sensitivity and specificity in diagnosing MI during acute myocardial ischemia. However, it's worth noting that some patients diagnosed with MI do not exhibit elevated Troponins or CK values.[2] Additionally, some patients may have died before cardiac markers reach detectable levels.[2] Troponin concentrations can also rise due to conditions such as tachycardia, percutaneous coronary intervention, pulmonary emboli with right ventricular infarction, cardiac surgery, myocarditis, and renal failure, where the cause of myocyte necrosis is not well understood.[2]

In this study, we aimed to assess the correlation between lipid profile levels in individuals experiencing chest pain and whether they had a positive or negative Troponin test result.

MATERIAL AND METHODS

Study Area: This study was conducted in Department of Medicine in RBM Hospital & Shree Jagannath Pahadia Medical College, Bharatpur, Rajsthan.

Study Population: This cases control study were included 100 control and 250 cases.

Study Duration: The duration of study was over a period of one year.

Data Collection: This study analyzed the medical records of 250 individuals admitted to the hospital's intensive care unit due to severe chest pain. Troponin-I and lipid profiles were measured for these patients. Additionally, lipid profile data from 100 healthy individuals were collected as a control group for comparison.

Data Analysis: Data were analysed by using Microsoft Excel.

RESULTS

Among the 250 cases examined, 96 tested positive for Troponin-I, while the remaining cases tested negative. Among the Troponin-I positive cases, 64 were male and 32 were female, indicating a higher predominance of Troponin-I positivity among males. Additionally, the two groups were compared based on various parameters including age, Total cholesterol, Triglycerides, LDL, HDL, and VLDL. Significant differences ($p < 0.01$) were observed in these variables between the cases & control groups, as shown in Table 4. This study encompassed a total of 350 cases, including 250 cases and 100 controls.

Table 1: Distribution of population

Population	Number	Percentage
Cases	250	71.4%
Control	100	28.6%
Total	350	100%

Table 2: Troponin-I positive & negative cases among the subjects with chest pain

Subject with chest pain	Number	Percentage
Troponin-I positive	96	38.4%
Troponin-I negative	154	61.6%
Total	250	100%

Table 3: Distribution of positive Troponin-I cases according to gender

Gender	Number	Percentage
Male	64	66.7%
Female	32	33.4%
Total	96	100%

Table 4: Biochemical markers in cases and control

Parameters	Cases (96) Mean±SD	Control (100) Mean±SD	P value
Age (years)	59.34±12.73	48.76±7.2	<0.01
Total cholesterol (mg/dl)	210.89±18.11	149.6±14.6	<0.01
Triglycerides (mg/dl)	174.62±17.53	89.4±12.5	<0.01
LDL (mg/dl)	138.7±19.46	87.6±17.8	<0.01
HDL (mg/dl)	37.10±3.34	45.4±3.96	<0.01
VLDL (mg/dl)	35.09±3.48	18.27±4.68	<0.01

DISCUSSION

Cardiac troponins (cTn) are highly specific biomarkers of myocardial injury and play a crucial role in guiding the management of chest pain.[5,6] Elevated troponin-I (cTnI) levels have also been linked to poor prognoses in various conditions including critical illness, pulmonary embolism, cardiac and non-cardiac surgery, stroke, and end-stage renal disease.[3-10]

In a prior study involving subjects with chest pain, it was noted that troponin tested positive in 160 individuals (31.9%) and negative in 323 individuals (64.3%).[11] The prevalence of dyslipidemia and obesity has become a significant public health concern due to lifestyle changes favoring processed foods over traditional ones. In the current study focusing on subjects with chest pain, troponin-I tested positive in 96 subjects and negative in 154 subjects. The study also highlighted a higher occurrence of acute myocardial infarction, acute heart failure, and cardiac-related deaths among subjects with chest pain and positive troponin I levels. These findings confirm the effectiveness of troponin I as a robust, independent, and valuable tool for risk assessment in patients experiencing acute chest pain.[12]

The current study highlights that among the subjects experiencing chest pain (totaling 250), only 96 tested positive for troponin I, while a larger proportion (154) tested negative. Despite this, all 250 subjects with chest pain are considered at high risk of developing a cardiac event, even though the actual occurrence of cardiac events was noted in only the troponin I-positive group (96 individuals). It is widely acknowledged that elevated levels of low-density lipoproteins (LDL), triglycerides (TG), and total cholesterol (TC), along with decreased levels of high-density lipoproteins (HDL), are associated with an increased incidence of cardiac events and are recognized risk factors.[12] Therefore, in this retrospective study, the association between lipid profile parameters and troponin-I test results in predicting cardiac events is investigated.

The data from the present study revealed that the mean total cholesterol (TC) level among subjects with positive troponin-I (96) was notably elevated at 210.89±18.11 mg/dl, exceeding the recommended desirable level (<200 mg/dl). This suggests that these subjects are more susceptible to developing a cardiac event.[12] Similarly, in previous studies, subjects with positive troponin showed elevated mean TC levels (221±35.8 mg/dl), also surpassing the desirable level, further emphasizing the risk of developing a cardiac event.[12] In contrast, the TC levels of subjects with negative troponin tests but experiencing chest pain (221) were significantly lower (176±46.17 mg/dl) than those with positive troponin-I, highlighting the importance of maintaining TC levels within the recommended range.[12]

Additionally, the mean triglyceride (TG) level among subjects with positive troponin-I (96) was substantially higher at 174.62±17.53 mg/dl, exceeding the recommended desirable level (<150 mg/dl). Previous studies also reported elevated TG levels among subjects with positive troponin, reinforcing the association between elevated TG levels and cardiac risk.[12] The TG levels of subjects with negative troponin tests but experiencing chest pain were slightly lower (148.20±54.79 mg/dl), yet still above the recommended safe level, indicating a potential risk factor.[12]

Elevated levels of low-density lipoproteins (LDL) are highly atherogenic and pose a risk for cardiac events. The mean LDL level among subjects with positive troponin-I (96) was elevated at 138.7±19.46 mg/dl, exceeding the recommended desirable level (<130 mg/dl), consistent with findings from previous studies.[12] Conversely, subjects with negative troponin tests but experiencing chest pain had lower LDL levels (102.49±44.29 mg/dl), emphasizing the importance of maintaining lower LDL levels to prevent future cardiac events.[12]

Furthermore, lower levels of high-density lipoproteins (HDL) are also considered a cardiac risk factor. The mean HDL level among subjects with positive troponin-I (96) was lower than the recommended safe level at 37.1±3.34 mg/dl, as seen in previous studies.[12] This indicates that reduced levels of HDL are associated with the development of cardiac events, highlighting the significance of maintaining adequate HDL levels.

These data indicated that the chest pain due to cardiac event as determined by positive troponin-I test is closely associated with elevated levels of TC, LDL, and TG and also with significantly reduced HDL. However the comparison of lipid parameters of males and females in the sub group of positive troponin-I tests revealed that there is highly significant difference in parameters due to difference in sex.

CONCLUSION

The present study reveals that patients who experienced chest pain due to a cardiac event, as confirmed by a positive troponin-I test, had lipid parameters indicating a risk level according to ATP III guidelines. Subjects with lipid profiles within this risk level were at a higher risk of developing chest pain due to a cardiac event. Therefore, it is crucial to screen and identify individuals with lipid profile parameters at risk levels and advise them to take measures to control their lipid profiles and maintain them within normal levels as recommended by the ATP III guidelines. This proactive approach can help mitigate the risk of cardiovascular events in these individuals.

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