



**STUDY ON IMPACT OF HIGH SENSITIVITY TROPONIN IN THE DIAGNOSIS OF
ACUTE CORONARY SYNDROME IN MALE PATIENTS**

Mohammed A. Dakhil¹, Assisstant Prof. Dr. Shatha M.J. Al-Khateeb² and Assisstant Prof. Dr. Arshad F. Ridha³

¹The Main Laboratory of Baghdad Teaching Hospital/Medical City Baghdad/Ministry of Health.

²Co-Author: College of Medicine/Al Mustansiriya University/ Department of Chemistry and Biochemistry.

³Co-Author: College of Medicine/Al Mustansiriya University/ Department of Internal Medicine.

***Corresponding Author: Mohammed A. Dakhil**

The Main Laboratory of Baghdad Teaching Hospital/Medical City Baghdad/Ministry of Health.

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ABSTRACT

Background: Timely diagnosis of acute coronary syndrome in the emergency department remains challenging. Biomarkers that are not dependent on myocardial necrosis, such as high sensitivity troponin can provide more information on whether there is myocardial ischemia, plaque rupture to help an early diagnosis. **Objective:** This study carried out to evaluate serum high sensitivity troponin in patients with acute coronary syndrome and its correlation with other biomarkers and risk factors. **Patients & Methods:** A total of (58) male patients with diagnosis of acute coronary syndrome were included in this study with age range (23-75year) and divided into: ST-segment elevation myocardial infarction group, non ST-segment elevation myocardial infarction group and unstable angina group as well as (30) apparently healthy persons with age range (27-70year). **Results:** Serum high sensitivity troponin was significantly increased in acute coronary syndromes in comparison with control group, the levels of cholesterol, triglycerides and LDL cholesterol in patients increased statistically significantly compared to the healthy, significant negative correlation was found between Ejection Fraction and serum high sensitivity troponin in acute coronary syndrome patients. Positively significant correlation was found between high sensitivity troponin and other traditional biomarkers. **Conclusion:** This study revealed that serum high sensitivity troponin could be used as an indicator to assess the severity of myocardial injury.

KEYWORDS: Acute coronary syndrome, male patients, lipid profile, cardiac troponin, high sensitivity troponin.

INTRODUCTION

The concept of acute coronary syndrome (ACS) encompasses different clinical presentations resulting from myocardial ischemia and includes unstable angina (UA), non-ST segment elevation myocardial infarction (NSTEMI) and ST-elevation myocardial infarction (STEMI).^[1,2] these types are named according to the appearance of the electrocardiogram (ECG) and troponin levels.^[3] Differentiation is primarily based on whether the ischemia is severe enough to cause myocardial damage and release markers of myocardial injury (troponins), however, the introduction of high-sensitivity troponins considerably reduced the prevalence of UA and considerably increased that of NSTEMI. Timely diagnosis of acute coronary syndrome(ACS) in the emergency department remains challenging. High sensitivity cardiac troponin (hs-cTn) assays are currently available for routine clinical use, their use increases the proportion of non-ST myocardial infarctions (NSTEMI) that will have increased troponins at presentation,^[4,5] and allows for novel ways of ruling out myocardial infarction (AMI).^[6,7] Increased sensitivity implies that hs-cTnT

detects concentrations of troponin 10 times lower than previous assays, enabling detection of circulating normal troponin concentration in healthy individuals, believed to be the results of natural turnover of cardio myocytes, therefore the troponin concentration should be quantitatively interpreted and has been observed to correlate well with disease severity and the histopathological extent of cardiac injury.^[8]

OBJECTIVE

The aim of the study to evaluate the impact of high sensitivity troponin in the diagnosis of ACS and study the correlation of serum, high sensitivity troponin levels as indicators for patients with risk factors.

PATIENTS AND METHODS

This study was conducted at AL-Yarmouk Teaching Hospital and Ibn AL-Bitar Cardiac Center in cooperation with Department of Clinical Biochemistry/College of Medicine/Al Mustansiriya University during the period from February 2018 until July2018. A total (58) referred

male patients with ACS were included in this study with age range (23-75year). The diagnosis of ACS in every patient was done by a cardiologist based on clinical presentation and history of ischemic heart disease, which was confirmed by ECG, cardiac enzymes and quantitative cardiac Troponin. The study included also (30) healthy persons served as control with age range (27-70year). Data were collected by direct interviews with the patients by the researcher after obtaining their verbal consent to participate in the study. Clinical examination of patients and control with (BMI and BP) were done by physician in CCU of AL-Yarmouk Teaching Hospital and Ibn AL-Bitar Cardiac Center, Lipid profile: total cholesterol(TC),^[9] triglyceride (TG),^[10] High density lipoprotein cholesterol (HDL),^[11] and low-density lipoprotein cholesterol (LDL),^[12] and Very Low Density Lipoprotein(VLDL) were measured in ACS and control, Cardiac troponin I(cTn I),^[13] Creatine Kinase-MB (CK-MB),^[14] and high sensitivity troponin,^[15] were measured for ACS patients and control.

Statistical Analysis

Data collected were coded and entered in the computer then analyzed by using Excel 2016. Data were presented as mean, standard deviation (SD). To compare the significance of the difference in the mean values between patients and control; Student t-test and/or ANOVA were

applied. Receiver Operating Characteristic (ROC) analysis was performed; by using NCSS version 12.0.9.0. P-value of <0.05 was considered as statistically significant.

RESULTS

This study was done on 88 subjects (58 acute coronary syndrome patients and 30 healthy control), all study subjects were males, the mean ± SD of their age was 56.259±12.181, 51.8±12.516 respectively, Table (1) summarizes the Baseline characteristics of study groups. In evaluation lipid profile levels regarding the TC, TG, LDL, LDL/HDL and VLDL were significantly increased in ACS patient when compared to control while the levels of HDL were significantly decreased in ACS patients in comparison with control group. The table also showed highly significant increase in concentrations of Creatine Kinase-MB (CK-MB), troponin and high sensitivity troponin values in ACS patients in comparison with control. There were highly statistically significant increase in concentrations of serum high sensitivity troponin (hs-cTn) level in ACS patients in comparison with control group, the lower level in control mean ± SD was (3.62±1.421 and increased in ACS patients to (10.005±8.917)P-value < 0.0001.

Table 1: Baseline characteristics of the study groups (Mean ±SD).

| Parameter | Study Group | | P-value |
|----------------------------------|--------------------|-------------------|----------|
| | Patients (Mean±SD) | Control (Mean±SD) | |
| Age(year) | 56.259±12.181 | 51.8±12.516 | 0.115 |
| BMI(kg/m2) | 27.772±4.989 | 25.48±3.427 | 0.013 |
| SBP(mmHg) | 139.84±25.096 | 124.33±5.647 | <0.05 |
| DBP(mmHg) | 85.88± 14.91 | 75.97±6.473 | <0.05 |
| TC (mg/dl) | 205.655 ±32.876 | 182.4±10.881 | <0.05 |
| TG (mg/dl) | 160.155± 50.579 | 131.113±27.263 | 0.0007 |
| LDL(mg/dl) | 133.852±28.656 | 109.777±10.352 | <0.05 |
| HDL(mg/dl) | 40.362± 7.661 | 46.967±7.421 | <0.05 |
| VLDL(mg/dl) | 31.603±9.005 | 26.223±5.453 | 0.0008 |
| CK-MB(ng/ml) | 16.036±24.339 | 5.101±1.525 | 0.001 |
| Troponin (ng/ml) | 4.822±5.583 | 0.24±0.155 | < 0.0001 |
| High sensitivity troponin(ng/ml) | 10.005±8.917 | 3.62±1.421 | < 0.0001 |

Table2: shows a significant positive correlation is noted between high sensitivity troponin and most parameters in patients with acute coronary syndrome (ACS), among them a significant very strong positive correlation noted between high sensitivity troponin and TC, TG, LDL, VLD, CK-MB, troponin, but significant negative correlation was found between Ejection Fraction and serum high sensitivity troponin in ACS patients.

Table 2: Correlation coefficient value (r) for (hs-cTn) with all parameters in patients with acute coronary syndrome (ACS).

| Parameters | Hs-cTn(ng/ml) | R P-value |
|-------------|---------------|-----------|
| Ages(years) | 0.409 0.001 | |
| BMI(kg/m2) | 0.5 <0.0001 | |
| SBP(mmHg) | 0.548 <0.0001 | |
| DBP(mmHg) | 0.376 0.004 | |
| EF% | -0.730 <0.05 | |
| TC(mg/dl) | 0.495 <0.05 | |
| TG(mg/dl) | 0.491 <0.0001 | |
| LDL(mg/dl) | 0.428 0.0008 | |
| HDL(mg/dl) | 0.958 0.0007 | |

| | |
|-------------------|---------------|
| VLDL(mg/dl) | 0.44 0.0006 |
| Ck-MB(ng/ml) | 0.796 <0.0001 |
| Troponin I(ng/ml) | 0.642 <0.0001 |

From the ROC curve, the optimum cut-off value for high sensitivity troponin levels was found to be 5.36ng/mL Fig. (1), Table (4), the area under the curve (AUC) was found to be 0.9602, 95% CI (0.8654–0.9887) ($P < 0.0001$) with 94.87% sensitivity 91.84% specificity and 93.18% accuracy.

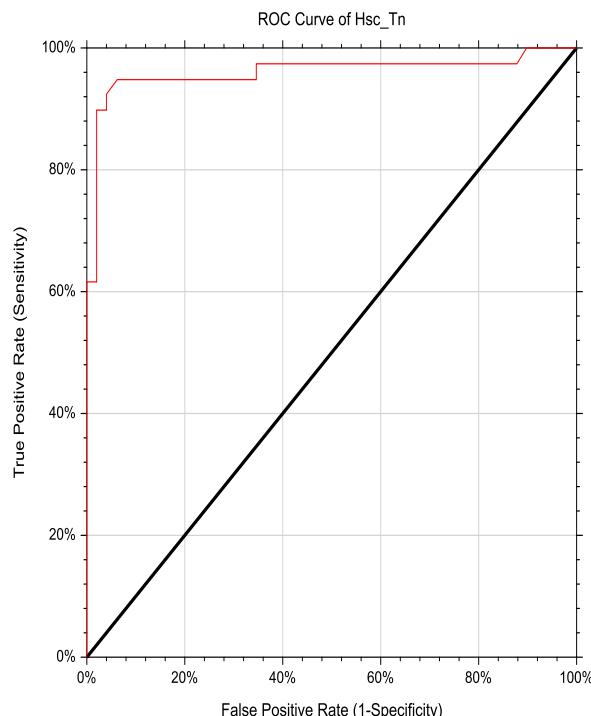


Fig. 1: Receiver operator characteristic (ROC) of Hs-cTn

From the ROC curve, the optimum cut-off value for troponin levels was found to be 0.34ng/ml,

Fig. (2), Table (3) the area under the curve (AUC) was found to be (3)0.8703, 95% CI (0.7505–0.9347) (P -value < 0.0001) with 81.58% sensitivity ,82% specificity and 81.82% accuracy.

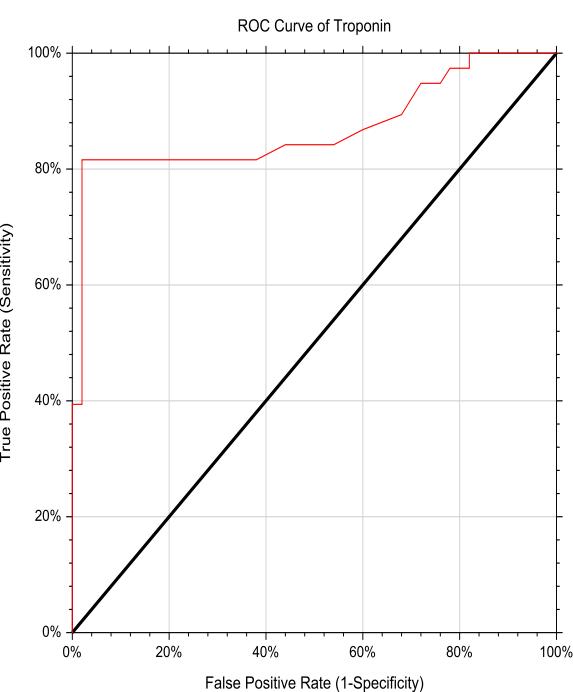


Fig. 2: Receiver operator characteristic (ROC) of Troponin.

From the ROC curve, the optimum cut-off value for CK-MB levels was found to be 7.04ng/ml, Fig. (3), Table (3), the area under the curve (AUC) was found to be 0.8830, 95% CI (0.7728–0.9416) (P -value < 0.0001) with 82.05% sensitivity 87.76% specificity and 85.23% accuracy.

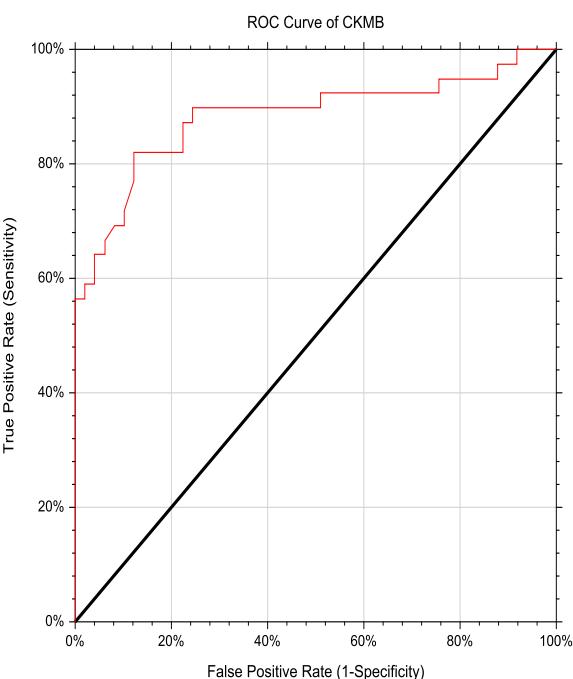


Fig. 3: Receiver operator characteristic (ROC) of CK-MB.

Table 3: Sensitivity%, Specificity%, Accuracy, Area Under the Curve and 95%confidence interval of all studied biomarkers at optimum cut-off value obtained from the receiver operator characteristic curve.

| Biomarker | cut-off | AUC | Sensitivity% | Specificity% | 95% CI | Accuracy |
|-----------------|---------|--------|--------------|--------------|---------------|----------|
| Hs-cTn (ng/ml) | 5.36 | 0.9602 | 94.87 | 91.84 | 0.8654-0.9887 | 0.9318 |
| Troponin(ng/ml) | 0.34 | 0.8703 | 81.58 | 82 | 0.7505-0.9347 | 0.8182 |
| CK-MB(ng/ml) | 7.04 | 0.8830 | 82.05 | 87.76 | 0.7728-0.9416 | 0.8523 |

DISCUSSION

This study reveals highly significant increase in TC, TG, LDL, VLDL and lower HDL in ACS group compared to control group, these results were in line with other researchers.^[16,17,18,19] Lipid profile levels play a serious role in cardiovascular risk assessment, the oxidation of low density lipoprotein cholesterol (LDL-C) is considered as the most important major factor for coronary artery disease which is the underlying cause of coronary artery disease,^[20,21] also troponin and CK-MB are increased in ACS groups, which are consistent with recent study.^[22,23] Prolonged myocardial ischemia leads to an oxygen deficit and irreversible myocardial necrosis. A deficit in the delivery of blood to myocardial tissues, either due to increased demand or the presence of a ruptured coronary artery plaque causes myocardial ischemia which initiates a cascade of molecular and cellular events.^[24] This study shows highly significant increase in hs-cTn in ACS patients and these results were in agreement with other researchers.^[15,18]

There is a misconception that troponin elevation is secondary only to myocyte injury and necrosis. There are six mechanisms that have been proposed to explain the release of troponin into the bloodstream: normal cell turnover, myocyte necrosis, apoptosis or programmed cell death, proteolytic fragmentation, increased cell membrane permeability and membranous blebs.^[25,26,27]

This study investigated the correlation between hs-cTn with risk factors and other biomarkers in ACS and it reveals that there is significant positive correlation between this biomarker and age BMI SBP, DBP in ACS group ,these results were in agreement with other researchers.^[28,29] There is significant positive correlation between hs-cTn and TC, LDL and in ACS, but high-density lipoprotein cholesterol values independently and inversely predict cardiac troponin T and I concentration these results are in agreement with other researchers.^[8,30] This study reveals significant positive correlation between hs-cTn and other cardiac biomarkers namely: troponin I,CK- MB , these results were consistent with other researchers.^[27,29]

CONCLUSION

- High sensitivity troponin levels (Hs-cTn) were significantly increased in ACS patients compared to control and the levels increased as the severity of myocardial injury increased (from UA to NSTEMI and STEMI) respectively.
- Hs-cTn levels can be affected by age and BMI.

- High sensitivity troponin and other traditional cardiac enzymes are positively correlated with each other, while negative correlation were found between Ejection Fraction (EF%) and high sensitivity troponin in ACS patients.

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