



ORIGINAL ARTICLE

Assessment of plasma MPO and cTnI levels in patients with cardiac chest pain of 4-6 hours duration.

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ABSTRACT... Objective: To assess the plasma MPO and cTnI levels in patients with cardiac chest pain of 4-6 hours duration. As cardiac troponins rise late almost 6-8 hours after the onset of myocardial infarction, another marker is needed to make earlier diagnosis and in those where ECG findings are nonspecific. **Study Design:** Cross Sectional study. **Setting:** Emergency Department and Central Laboratory of Punjab Institute of Cardiology (PIC) Lahore. Pathology Department and Central Laboratory of Postgraduate Medical Institute (PGMI)/ Lahore General Hospital (LGH)/ Ameer ud Din Medical College (AMC) Lahore. **Period:** January 2018 to December 2018. **Material & Methods:** Eighty subjects were selected who presented with typical chest pain. Two samples from each subject were taken, first sample for MPO within two hours and the second sample for cTnI four to six hours after the start of chest pain. MPO samples were taken in ethylenediaminetetraacetic acid (EDTA) and cTnI samples in heparin tubes. **Results:** Out of 80 patients, the mean age was 56.40 + 11.39 years. Only one (1.2%) patient was found positive (MPO > 5 u/ml) and the mean MPO was 2.10 + 1.35 u/ml. Among these patients, 25.0% had 0.04-0.3 ng/ml (suspected ischemia) while majority 65.0% patients had cTnI >0.3 ng/ml (positive) and mean cTnI was 5.42 + 1.16 ng/ml. **Conclusion:** MPO samples taken within two hours of chest pain, 1.2% patients were positive. Tests carried out for cTnI taken four to six hours after chest pain, 65.0% patients were positive.

Key words: Cardiac Troponin-I, Chest Pain, Duration, Myeloperoxidase, Plasma.

INTRODUCTION

Cardiovascular disease is a common cause of morbidity and mortality worldwide with 30% death rate. In developed nations this rate is 40% and 28% in the developing countries.¹ Cardiac troponins are important markers in diagnosing AMI but their release is very slow. Patients presenting within 4 hours of chest pain onset, the sensitivity of CTnI is much less and is increased if patients present at or after 12 hours.² The troponins are used to rule out cardiac damage in patients presenting with chest pain.³ For better risk prediction, a score of 7 biomarkers i.e., MPO, B-type natriuretic peptide (BNP), soluble FMS- like tyrosine kinase receptor-1, troponin I, C-reactive protein, soluble toll- like receptor-2 and creatinine) can be used than individual markers in diagnosing cardiac diseases.⁴

Atypical presentations for ACS are common.⁵ Atherosclerosis may lead to fatal results in the form of ACS.^{6,7} MPO is a heme protein released after inflammation and plays a role in atherosclerosis. Some studies show correlation between MPO levels and cardiac diseases.⁸ This has been confirmed that the raised plasma concentrations of MPO have been found within 2 hours of onset of symptoms in patients with AMI or ACS presenting 3-12 hours after the last episode of chest pain.⁹

MATERIAL & METHODS

This cross sectional study was conducted at Emergency Department and Central Laboratory of Punjab Institute of Cardiology, Lahore. Ethical Committee of department of Research, Training and Postgraduate Medical Education of PIC issued letter on 06/01/2018 for the approval of the study and was conducted from January 2018 to

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Total 80 subjects were selected presented with typical chest pain in Emergency Department of Punjab Institute of Cardiology Lahore. Non-probability, purposive sampling technique was used to collect samples. Two samples from each subject were taken, first sample for MPO within two hours and the second sample for cTnl, four to six hours after the start of chest pain.

MPO samples were taken in ethylenediaminetetraacetic acid (EDTA) and cTnl samples in heparin tubes. Samples were centrifuged and then stored at temperature of 2 to 8 degree centigrade and then tests were performed within time to determine their concentrations in plasma. The results were obtained according to age, electrocardiogram (ECG), time of taking first and second samples. The data obtained was entered and analyzed by using SPSS (Statistical Package for Social Sciences) version 20.0. Mean \pm SD was given for normally distributed quantitative measurements. Percentages were given for categorical variables.

RESULTS

Table-I exhibits that among 80 patients, 6 (7.5%) were up to 40 years old, 20 (25.0%) patients were 41-50 years old, 34 (42.5%) were 51-60 years old and 20 (25.0%) patients were above 60 years old. The mean age of the patients was 56.40 ± 11.39 years.

Table-II indicates that among 80 patients, 2 (2.5%) had ischemia according to ECG, 5(6.2%) had ST depression, majority 24 (30.0%) had ST elevation, 9 (11.2%) patients had stress pattern, only 1 (1.2%) patient had T wave depression, 7 (8.8%) patients had T wave flattening and 11 (13.8%) had T wave inversion while 21 (26.3%) patients were found normal according to ECG.

Table-III demonstrates that among 80 patients, time of start of chest pain was 9:00pm-11:00pm for 5 (6.2%) patients, 10:00am-12:00am for 20 (25.0%) patients, and 12:00pm-2:00pm for 49 (61.3%) patients while time of start of chest pain was 6:00pm-8:00pm for 6 (7.5%) patients.

Table-IV depicts that out of 80 patients, time of taking first sample (collected within two hours of start of CP) was 10:00pm-1:00am for 4 (5.0%) patients, 11:00am-2:00pm for 8 (10.0%) patients, and 1:00pm-4:00pm for 58(72.5%) patients while time of taking first sample was 7:00pm-10:00pm for 10 (12.5%) patients.

Table-V asserts that among 80 patients, time of taking second sample (collected within 4-6 hours of start of CP) was 1:00am-2:00am for 3 (3.7%) patients, 2:00pm-6:00pm for 1 (1.3%) patient and 4:00pm-8:00pm for 39(48.7%) patients while time of taking second sample was 10:00pm-2:00am for 37 (46.3%) patients.

The samples for MPO were collected from the patients within two hours of start of CP. Table-VI elucidates that among 80 patients, only 1 (1.2%) were found positive (MPO > 5 u/ml) while most of the patients 79 (98.8%) were negative (MPO <5 u/ml). The mean MPO among patients was 2.10 ± 1.35 u/ml.

Samples for cTnl were taken within four to six hours after the onset of chest pain. Table-VII exhibits that among 80 patients, 8(10.0%) had Cardiac Tnl <0.04ng/ml (negative) and 20 (25.0%) patients had 0.04-0.3 ng/ml (suspected ischemia) while majority 52 (65.0%) had cTl > 0.3 ng/ml (positive). The mean cTnl among patients was 5.42 ± 1.16 ng/ml.

Age	Frequency (%)
Upto 40 years	6 (7.5%)
41-50 years	20 (25.0%)
51-60 years	34 (42.5%)
Above 60 years	20 (25.0%)
Total	80 (100.0%)
Mean + SD	56.40 ± 11.39

Table-I. Frequency distribution of patients according to age

ECG	Frequency (%)
Ischemia	2 (2.5%)
ST Depression	5 (6.2%)
ST Elevation	24 (30.0%)
Stress pattern	9 (11.2%)
T Wave Depression	1 (1.2%)
T Wave Flattening	7 (8.8%)
T Wave Inversion	11 (13.8%)
Normal	21 (26.3%)
Total	80 (100.0%)

Table-II. Frequency distribution of patients according to ECG

Time of Start of CP	Frequency (%)
9:00pm-11:00pm	5 (6.2%)
10:00am-12:00pm	20 (25.0%)
12:00pm-2:00pm	49 (61.3%)
6:00pm-8:00pm	6 (7.5%)
Total	80 (100.0%)

Table-III. Frequency distribution of patients according to time of start of chest pain

Time of Taking 1 st Sample	Frequency (%)
10:00pm-1:00am	4 (5.0%)
11:00am-2:00pm	8 (10.0%)
1:00pm-4:00pm	58 (72.5%)
7:00pm-10:00pm	10 (12.5%)
Total	80 (100.0%)

Table-IV. Frequency distribution of patients according to time of taking first sample

Time of Taking 2 nd Sample	Frequency (%)
1:00am-2:00am	3 (3.7%)
2:00pm-6:00pm	1 (1.3%)
4:00pm-8:00pm	39 (48.7%)
10:00pm-2:00am	37 (46.3%)
Total	80 (100.0%)

Table-V. Frequency distribution of patients according to time of taking second sample

Cardiac Troponins are important markers of diagnosis of ACS but their concentration start to increase after 6-8 hours of start of chest pain. So a marker is required that raises just after cardiac chest pain. Many studies have revealed MPO rises as the inflammation occurs in the heart cells. In patients with atypical ECG findings and late increase in cardiac troponins, MPO can help

in keeping patients in hospital and to make a diagnosis of ACS to save lives. So samples of MPO taken just after start of chest pain to know the its concentration and cTnI after 4-6 hours to confirm diagnosis. Troponins levels start rising after 4-8 hours of acute onset of chest pain which peaks at 10 – 12 hours and remain higher for 7-10 days. This shows that troponins are the earliest markers of AMI but used for the later presentation of chest pain (Boeddinghaus et al., 2016). MPO is released after inflammation and plays a role in atherosclerosis. Some studies show correlation between MPO levels and cardiac diseases (Teng et al, 2017). This has been confirmed that the raised plasma concentrations of MPO have been found within 2 hours of onset of symptoms in patients with ACS presenting 3-12 hours after the last episode of chest pain (Omran et al, 2018).

MPO	Frequency (%)
>5 u/ml	1 (1.2%)
<5 u/ml	79 (98.8%)
Total	80 (100.0%)
Mean+SD	2.10 + 1.35

Table-VI. Frequency distribution of patients according to myeloperoxidase
Positive: > 5 u/ml, Negative: < 5 u/ml

CtnI	Frequency (%)
<0.04 ng/ml	8 (10.0%)
0.04-0.3 ng/ml	20 (25.0%)
>0.3 ng/ml	52 (65.0%)
Total	80 (100.0%)
Mean+SD	5.42 + 1.16

Table-VII. Frequency distribution of patients according to cardiac troponin-I
Negative: <0.04 ng/ml, Suspected Ischemia: 0.04-0.3 ng/ml, Positive: >0.3 ng/ml

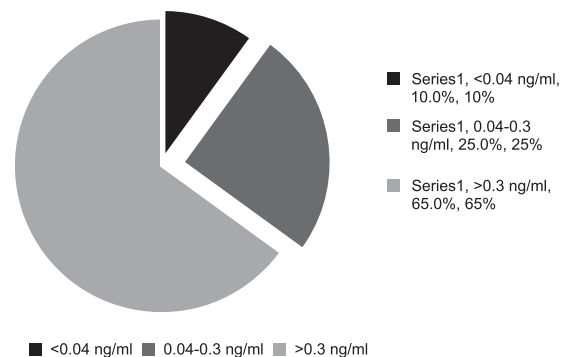


Figure-1. Frequency distribution of patients according to cardiac troponin-I

DISCUSSION

Current study was carried out at Emergency and Pathology Department of PIC Lahore regarding assessment of plasma MPO and CTnI levels in patients with cardiac chest pain of 4-6 hours duration. To acquire appropriate outcomes, a group of 80 patients were advised to be included in the study.

It is believed that cardiovascular diseases are associated with increasing age most of the times and many people experience heart diseases in their later period of life. There is decreased perfusion of heart due to insufficient blood flow caused by atherosclerotic plaque, thrombosis or vasospasm of the coronary arteries leading to the formation of infarct in myocardium.¹⁰ The findings of our study also demonstrated that among patients that were brought to Emergency Department of Punjab Institute of Cardiology, only 7.5% were upto 40 years old while majority (67.5%) was 41-60 years old and 25.0% patients were more than 60 years old. The mean age of the patients was 56.40 + 11.39 years. The results of our study are almost comparable with a study conducted which reported that 26.8% patients were upto 40 years old, most of them (55.0%) were 41-60 years old and 18.2% were more than 60 years old. The mean age of the patients was 48.7+13.5years.¹¹ Another study demonstrated that 9.2% patients were up to 40 years old, 46.7% were 41-60 years old and 44.1% were more than 60 years old which shows that disease was prevalent among mainstream of the patients who were more than 40 years old.¹²

The ECG is one of the medical tests that discover heart problems through measuring electrical activity generated by the heart when it contracts. This test is recommended for patients who could be at the risk of cardiac disease. But many times the changes are nonspecific or there may be no change, in spite of the presence of underlying heart disease. Study highlighted that according to ECG, majority (30.0%) had ST elevation, followed by T wave inversion (13.8%), stress pattern (11.2%), T wave flattening (8.8%), ST depression (6.2%), and Ischemia (2.5%) and T wave depression (1.2%). There were 26.3% patients

found normal according to ECG. The findings of a study indicated that most of the patients (19.4%) had T wave inversion, followed by ST elevation (18.6%) and ST depression (13.0%).¹³

MPO is an enzyme discharged from neutrophils due to severe inflammatory modifications following myocardial injury. For ACS, MPO has been recommended as an investigative marker. Patients with heart attack presenting during two hours of start of CP were reported with considerably increased MPO levels than the healthy controls. Hence, it has been suggested that MPO measurement could be helpful for early diagnosis of AMI.¹⁴ The chance of cardiovascular disease is increased when raised levels of MPO are found in blood.¹⁵ It is possible that patient may become troponin positive later who was classified troponin negative earlier changing the diagnosis.¹⁶ MPO can determine whether to keep patients in hospital or to send home.¹⁷

Our study revealed that according to the results obtained from the samples taken within two hours after the onset of CP for MPO, 1.2% patients were found positive (MPO >5 u/ml) while majority (98.8%) of patients were found negative (MPO <5u/ml). The mean MPO level of the patient was 2.10 + 1.35 u/ml. This may show the difference of reference ranges in a society where the reference ranges were established and where our study is conducted. If the reference ranges are established in our population, the reference ranges may be changed and the results may be different. The results of our study are different from the study which reported that mean MPO level of patients with acute coronary syndrome was 5.30+3.78 u/ml.¹⁸

Study further disclosed that according to the results determined on the samples taken four to six hours after the start of CP for cTnI, majority (65.0%) of patients were positive (CTnI >0.3 ng/ml) and 25.0% were found suspected for ischemia (cTnI 0.04-0.3 ng/ml) while only 10.0% patients were negative (cTnI <0.04 ng/ml). The mean cTnI among patients was 5.42 + 1.16 ng/ml. The findings of a similar study also indicated that the patients were positive as the mean cTnI

among patients was $3.76+5.11$ ng/ml.¹⁹ Another study reported that increased level of marker of myocardial damage, mainly cTnI is a prerequisite of AMI diagnosis.²⁰

CONCLUSION

The tests performed on samples for MPO, concluded that 1.2 % patients were positive. While 65% patients were positive for TnI. 25.0% patients were suspected for Ischemia.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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