

ORIGINAL ARTICLE

To Determine the Frequency of Extent of Coronary Artery Disease (CAD) with Troponin-I level >10 folds ULN in NSTEMI Patients at Tertiary Care Hospital

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ABSTRACT

Introduction: Higher levels of troponins >10 folds of upper normal limits (UNL) are considered as high-risk patients on coronary angiography sufferers having high levels of troponin-I (>10 folds upper limit normal level) had extra three-vessel coronary artery disease involvement.

Objectives: To determine the frequency of degree of cardiovascular disease with Troponin-I level >10 folds ULN in NSTEMI patients at tertiary care hospital.

Methodology: It is a cross-sectional study comprising of a total 800 patients recruited from the Department of Cardiology, National Institute of Coronary Disease, Karachi Pakistan based on Exclusion/Inclusion criteria.

Results: There are 678 male as well as 122 female patients. The mean troponin-I level was 15.00±6.82 ng/ml. Single vessel disease found in 25.25% cases, two vessel diseases were observed in 37.75% cases, and three vessel diseases were observed in 20% cases. 83% were found with extent of CAD findings on angiography. There have been 678 male and also 122 female patients. The mean troponin-I level was 15.00±6.82 ng/ml. Single vessel disease found in 25.25% cases, two vessel diseases were observed in 37.75% cases, and three vessel diseases were observed in 20% cases. 83% were found with extent of CAD findings on angiography.

Conclusion: The higher troponin level found significantly associated with extent of CAD and three vessel disease. To understand the cardiovascular troponin condition of the sufferer as soon as feasible is crucial.

Keywords: Extent of Coronary Artery Disease, NSTEMI, Troponin-I Level >10 Folds ULN

INTRODUCTION

The major reason behind death in the USA among women and men is cardiovascular disease. In the speedily growing older population, the main reason behind physical problems is cardiovascular disease. Low and middle income nations around the world which include India and Pakistan make contributions significantly towards the worldwide burden of coronary heart diseases responsible for seventy-five percent of all fatalities. (1)

Dysfunction of blood circulation to cardiovascular muscle because of blockage by plaque develops as a result of cardio-arterial obstruction. (2) The signs and symptoms of acute myocardial ischemia have been in accordant together with the signs of the myocardial infarction. The signs and symptoms of the myocardial infarction are STEMI, non-ST-elevated myocardial infarction (NSTEMI), and uncontrollable angina. Severe Cardio-arterial thinning, transient occlusion or micro embolization of thrombus and athermanous material often results in non-ST-elevated myocardial infarction (NSTEMI). (3)

Improvement within the occurrence of multi-vessel Coronary artery disease (CAD) in the setting of NSTEMI, there concurrently the total number of hospital admissions with myocardial infarction is rising. American College of Cardiology National Cardiovascular Data base Registry lately described that forty-two percent of non-ST-elevated

myocardial infarction sufferers had multi-vessel cardiovascular disease. (4)

The College of Cardiology/Heart Association of America recommendations considers the diagnostic tests for coronary heart troponins within the medical setting of myocardial infarction a category I symptom for earlier threat stratification because it enhances medical consequences within these sufferers. For the treatments of sufferers with non-ST-elevated myocardial infarction, Guideline up-dates from the American College of Cardiology/Heart Association and European Society of Cardiology set up that the level of troponin elevation is the identifying element in the prognosis. Sufferers having markedly raised troponin ranges (ten times less than the upper normal limit) needs to be regarded as high risk people. (4)

Necessary protein complexes for example Troponins regulate the relaxation and shrinkage of skeletal muscles. (5) Cardiovascular troponin is made up of a few sub-units I, T, and C which are the products of various genetics. In comparison to the protein-mass of some other muscle fibril proteins such as act in and myosin, the whole mass of the Troponin complex is small. The diagnosis of myocardial destruction is indicated as cardio specific is forms as well as both troponin I and T are ultimately intended for their diagnosis. There's unique release kinetics right after MI show an initial peak as a result of the freely bound troponin pool as well as a 2nd extended elevation as a result of the destruction of the contractile apparatus. (6)

American heart association (AHA) American college of cardiology recommendations considers testing cardiovascular troponins in sufferers having myocardial infarction as a class I indication. The prognosis of sufferers with non ST elevated myocardial infarction (NSTEMI) depends upon the level of troponin I levels. (9, 7, 8) The sufferers having much higher levels of troponins >10 folds of higher normal limits are regarded as higher risk sufferers. (4)

A large proportion of evidence demonstrates that for sufferers with troponin positive non-ST-segment elevation myocardial infarction/NSTEMI, the rates of major adverse cardiovascular events (MACE) are connected with earlier re-vascularization. (10, 11)

The real reason for the majority of sufferers having troponin positive pain in the chest go through cardiac catheterisation having an access to revascularization around the index admission is as a result of the recommend earlier Current European and American guidelines. (10)

Patients with NSTEMI went through coronary angiography had been studied by Fernandez as well as his co-workers, who categorized their research population into a couple of groups depending on the cardiovascular troponin-I levels. They discovered sufferers with much higher troponin-I levels (less than 10 folds upper limit normal) experienced much more 3-vessel coronary artery disease involvement (thirty nine percent), on coronary angiography in comparison with sufferers with troponin I levels <10 folds ULN. (4, 12) Raised cTn levels show cardiovascular injury, but don't determine the reason for the damage. (13)

Coronary angiography, as well as treatment, is normally necessary for the treatments for coronary artery disease or CAD. It's very uncommon to have normal coronary angiography in sufferers of the acute coronary syndrome. (14)

In research, as many as 119 NSTEMI sufferers with Troponin-I levels >10 folds ULN, the rates of the extent and significant single, 2, and 3 vessels coronary artery disease had been 25.25%, 37.75%, and (82%). (4)

The rise in troponin levels within the setting of NSTEMI equals the higher percentage of this kind of sufferers discovered to have the extent of CAD. Myocardial infarction or type-1 myocardial infarction [3]. A myocardial infarction may be the procession of myocardial ischemia which ranges from MI having huge areas of myocardial cell death to unsound angina without any irreparable cardiac injury. The reason behind acute coronary syndrome is an unsound plaque in the coronary arterial blood vessels. Split of coronary plaque leads to their thrombogenic contents for being confronted with the circulation of blood. (15)

As earlier identification of intensive CAD as well as subsequent recommendation to earlier coronary revascularization would lead to medical advantage, this finding had essential prognostic and restorative implications. This might also assist reduce the potential risk of major unfavorable cardiovascular events within the high-risk waiting duration of preliminary health care alone. The logic of this research would be to figure out the degree of CAD with troponin-I level >10 folds ULN in non-ST-elevated myocardial infarction patients.

MATERIALS AND METHODS

This cross-sectional study was done at Nationwide Institute of Coronary Disease, Karachi Pakistan for six months (3rd January 2017 to 2nd July 2017). By taking prevalence of single vessel CAD P=19.3%, (4) Margin of error d=5-%, the computed sample size is 800 sufferers by making use of WHO software program for sample size computation using ninety five percent level of confidence. Patients with ages between 40 to 70 years of either gender presented with NSTEMI by electrocardiographic (ECG) changes (NSTEMI/T-wave inversion>1mm) with elevated troponin I levels with chest pain of >20 minutes duration were enrolled in this study. Detailed demographics including age, sex, BMI, and comorbidities were recorded after taking informed written consent. Patients having severe ST-elevation myocardial infarction based on medical history, completely new or even assumed left bundle branch block according to clinical examination, previous record of cardiovascular disease on the basis of clinical history, prior coronary intervention for revascularization either CABG or Angioplasty according to the medical history, renal inadequacy based on serum creatinine>1.4mg/dl ULN level, and patients with severe inter-current illness such as malignancy, CLD on the basis of clinical examination were excluded.

All patients received standard medical therapy for NSTEMI. Blood samples for cardiac troponin I were immediately drawn in lithium heparin bottles upon presentation to the emergency room and a second sample was drawn 8 hours later after admission. Cardiac troponin I was determined using AxSYM Troponin-I ADV (Abbott Laboratories, Abbott Park, Illinois) which is a three-step assay, based on the micro-particle enzyme immunoassay (MEIA) technology with an analytical sensitivity of 0.02 ng/ml and a diagnostic cutoff for myocardial infarction of 0.40 ng/ml. The 99th percentile was 0.04 ng/ml as described by the manufacturer. The assay was designed to have a precision < 10% total coefficient of variation with 95% confidence for concentration from 0.27 ng/ml upto 4.00 ng/ml. All assays were done by technologists unaware of the clinical and angiographic data.

Affected person's information had been gathered as well as examined by means of stats package for Social Sciences (SPSS) Edition 21. Rate of recurrence as well as proportion were calculated for qualitative factors such as gender selection, potential risks (DM, hypertension, Cigarette smoking, Genealogy of coronary artery disease), extent of coronary artery disease (Yes/No), single-vessel (Yes/No), 2 vessels (Yes/No), 3 vessels (Yes/No). Mean \pm SD had been computed for quantitative variable i.e. age group, troponin-I level. Effect modifiers were handled by means of stratification of age, gender, raised troponin-I level and comorbid to determine the impact of these modifiers on results variable by making use of chi-square test, applied p-value = 0.05 as significant.

RESULT

Out of 800 study subjects, 678 (84.75%) were male and 122 (15.25%) were female. The general mean chronological age of research subjects was 60.23 \pm 7.69 years. The overall mean height and weight of study subjects were 176.37 \pm 7.26 cm and 72.64 \pm 9.00 Kg respectively. The mean BMI was 35.32 \pm 2.99 kg/m². The mean troponin I

level had been 14.00±6.82 nanograms per milliliter. Among 800 study subjects, 30% had diabetes mellitus, 61.25% were hypertensive, 32.5% were smokers and 42.5% had family history of CAD. (Table 1)

Table No 1: Baseline Details of all the patients

Variables	Frequency No.	%age
Mean Age (yrs)	60.23±7.69	-
Mean Height (cm)	176.37±7.26	-
Mean Weight (kg)	72.64±9.00	-
Mean BMI (kg/m)	35.32±2.99	-
Troponin I level	14.00±6.82	-
Gender		
Male	678	84.75
Female	122	15.25
Co-morbidities		
DM	240	30
Hypertension	490	61.25
Smokers	260	32.5
Family History of CAD	340	42.5

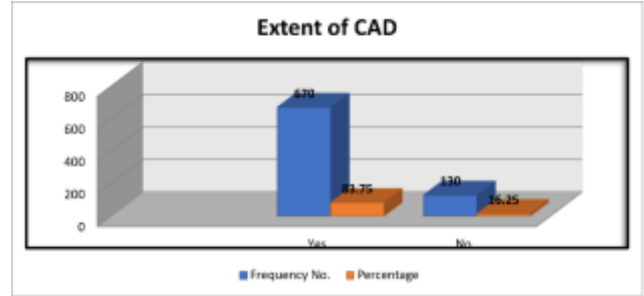
Out of 800 study subjects, single vessel disease found in 74.75% cases, two vessel diseases were observed in 62.25% cases, and three vessel diseases were observed in 75% cases as presented in Table-2.

Table No 2: Frequency distribution of number of coronary vessels involved (n=800)

Variables	YES n (%)	No n (%)
Single Vessel Disease	202(25.25%)	598(74.75%)
Two Vessel Disease	302(37.75%)	498(62.25%)
Three Vessel Disease	200(20%)	600(75%)

In our study, 83.75% study subjects were found with extent of CAD findings on angiography. The detailed frequency distribution of extent of CAD findings on angiography is presented in Figure-1.

Figure No 1: Frequency distribution of extent of cad findings on angiography (n=800)



The results showed that extent of CAD findings on angiography was positively observed in 86.6% male and 80.9% female patients. The main difference has not been statistically significant with p value 0.0461. The extent of CAD findings on angiography was positively observed in 77.3% patients with age =60 years and 97.8% patients with age >60 years. The difference was statistically significant with p-value 0.0614. The extent of CAD findings on angiography was positively observed in 68.5 Percent in non-obese patients and 31.25% in obese patients. The significant difference had been statistically not significant with p value 0.647. The extent of CAD findings on angiography was positively observed in 87.6% patients with Troponin-I =15 ng/ml and 12.3% patients with Troponin-I >15 ng/ml. The difference was statistically significant with p-value 0.061. The extent of CAD findings on angiography was positively observed in 92.6% in diabetes patients and 80.1% in non-diabetes patients. The major difference had been statistically significant with p value 0.007. The extent of CAD findings on angiography was positively observed in 55.75% in hypertensive patients and 41.75% in non-hypertensive people. The main difference had been mathematically significant with p value 0.004. The extent of CAD findings on angiography was positively observed in 23% in smoking patients and 77% in non-smoking patients. The difference was statistically significant with p-value 0.05. The extent of CAD findings on angiography was positively observed in 30.75% among patients with genealogy and family-history of coronary artery disease as well as 69.25% between sufferers without genealogy of coronary artery disease. The main difference had been statistically not-significant with p value 0.073. (Table 3)

Table No 3: Extent of CAD findings on angiography according to age, sex, BMI, Troponin I level and comorbidities

Variables	EXTENT OF CAD FINDINGS ON ANGIOGRAPHY		P-Value
	Yes (n=670)	No (n=130)	
Gender			
Male (n=678)	503(74.2%)	175(25.8%)	0.461
Female (n=122)	90(73.7%)	32(26.2%)	
Age			
≤60 years (n=639)	515(86.8%)	124(59.9%)	0.0614
>60 years (n=161)	78(13.1%)	83(40.1%)	
BMI			
Non Obese (n=548)	450(75.8%)	139(67.1%)	0.647
Obese (n=252)	143(24.1%)	68(32.8%)	
TROPONIN-I LEVEL			
≤25 ng/ml (n=701)	498(83.9%)	115(55.5%)	0.060
>25 ng/ml (n=99)	95(15.8%)	92(44.4%)	
Diabetes Mellitus			
Yes (n=294)	187(31.53%)	67(32.3%)	0.007
No (n=506)	406(68.4%)	140(67.6%)	

Hypertension			
Yes (n=466)	393(66.2%)	101(48.7%)	0.004
No (n=334)	200(33.7%)	106(51.2%)	
Smoking			
Yes (n=184)	279(47.0%)	95(45.8%)	0.05
No (n=616)	314(53%)	112(54.1%)	
Family History of CAD			
Yes (n=246)	143(24.11%)	93(44.9%)	0.065
No (n=554)	450(75.8%)	114(55.07%)	

DISCUSSION

Patients introducing with myocardial infarction, a number of sections with the coronary arterial tree demonstrate plaque interruption is most likely associated with a pan inflammatory procedure, (17) as a result is uncommon to determine nonobstructive cardiovascular disease or even a normal cardiac catheterisation in sufferers going through cardiac angiogram for myocardial infarction. (14) Rise in the occurrence of multivessel CAD within the setting of non-ST elevation myocardial infarction (NSTEMI), there concurrently the total number of clinical admissions with severe coronary syndromes is likewise rising. College of Cardiology Nationwide Cardiovascular Data base Registry in America lately described that forty-two percent of NSTEMI sufferers experienced multi-vessel coronary artery disease. (18)

Several sufferers with acute coronary syndrome have minimal or border-line troponin levels. (19) it happens to be recommended that this group of sufferers have substantial coronary artery disease/CAD and they get prognostic gain from intense medical treatment plus an earlier intrusive technique in comparison to sufferers having unknown troponins. (20)

Within our research, the degree of Coronary Artery Disease results on angiography had been favorably noticed mainly in men instead of women sufferers. The people having age >60 years demonstrated the likelihood of positive results on angiography. There wasn't any such distinction of the extent of CAD findings on angiography among obese and non-obese patients. Most commonly patients having diabetic issues, high blood pressure, cigarette smoking, and genealogy of coronary artery disease will also be found with a positive extent of CAD in angiographic results.

Our results are equivalent to scientific studies. In research, Non ST elevation myocardial infarction people who went through cardiac angiography had been researched by Fernandez as well as his fellow workers, who categorized their research population in a couple of groups in accordance with the cardiovascular troponin I levels. They discovered people with much higher troponin I levels (less than 10 folds upper limit normal level) experienced a lot more three vessel coronary artery disease involvement (thirty nine percent), $p = 0.005$ on cardiac angiogram in comparison to people with troponin I levels greater than 10 folds upper limit normal. (21) In our research, 79.5% of patients with troponin-I = 15 ng/ml and 90.2% patients with troponin-I > 15 ng/ml had been positively seen the extent of CAD on angiography, that is in comparison to some other scientific studies.

One research gives an understanding of the association among the 2 cut off ranges of cardio troponin-I

(greater than the 10 folds upper-limit-normal as well as 1e10 folds ULN) in NSTEMI as well as the number of main Epicardial cardiac vessels which have major luminal thinning (> Seventy Percent stenosis). It indicated that between people with troponin-I levels less than 10 folds upper limit normal, 25.25 % of the sufferers had single vessel, Thirty Six Percent had 2 vessels and Thirty Percent had 3 vessels important for coronary artery disease, whilst between people with troponin-I levels greater than 10 folds-ULN, 19.3-% of the sufferers had a single vessel, thirty-one percent had two vessels and fourthy-six percent had three vessels significant coronary artery disease. We discovered a mathematically important link just among troponin-I level greater than 10 folds upper limit normal level and seriously impacted 3 vessels CAD. (4)

The load of non ST elevated myocardial infarction is rising throughout the world when compared with STEMI. (22) In ACS, it's assumed that the plaque interruption or even frank split happens at several sections of the coronary arteries wrap probably because of a higher thrombotic and inflammatory-state. (23)

In spite of the existence of scientific studies that have examined the connection of troponins to angiographic conclusions of patient sore morphology within the setting of the acute coronary syndrome, research analyzing angiographic connections with regards to the number of considerably narrowed coronary arterial blood vessels as well as the exact occurrence of multi-vessel coronary artery disease having various cardiac troponin levels happen to be very constrained in worldwide literature as well as there isn't any local information for this kind of association. Cardiovascular specific troponins show little levels within the upper limit normal level in small infarctions, e.g. in Non ST elevation myocardial infarction in comparison with large infarctions feature of ST-Elevation myocardial infarction where troponin levels could be a lot more than 20-50 times ULN. (16)

In people going through coronary angiography for severe coronary syndrome, it's difficult to acquire the lack of CAD. (14)) One research demonstrated that 3 (3.7 Percent) patients with troponin-I greater than 10 folds uoer-limit normal as well as only one (1.85%) individual within the trponin-I > 10 folds ULN-group experienced a completely normal cardiac angiography. There had been a lot more amounts of women having cardiac angiography within the reduced troponin-I level group. (16)) The TACTICS-Thrombolysis In Myocardial Infarction 18 sub study including 896 sufferers demonstrated that in people who found with signs of the acute coronary syndrome and also don't have any critical Epicardial cardiovascular disease angiographically, the existence of an increased troponin had been connected with the unfavorable medical diagnosis. (24)

Angiography offers an intrusive approach to the risk class. In people with non-ST-elevated myocardial infarction, angiographic information demonstrates that there are many complicated and acute plaques, a lot more multivessel disease, decreased TIMI flow levels whenever levels of troponin are raised. (25, 26)

Fernandez, et al., (21) researched 220 continual sufferers admitted in the hospital having non-ST-elevated myocardial infarction who went through coronary angiography. Patients had been separated into 2 groups with different cutoff levels of cardiovascular troponin I of 10 folds upper limit of normal level. They examined angiographic and medical factors as well as found sufferers with troponin-I levels (greater than 10 folds upper limit normal), often experienced much high Braunwald Class angina, (27) much higher percentage of three-vessel CAD (39%) higher intensity of the culprit lesion more serious ECG modifications and participation on coronary angiography. (4)

These types of results both are short and long-term. (28) The optimum troponin-thresholds for associated risk class as well as restorative decision-making remain a topic for discussion. Nevertheless, nearly in all series, minimal levels in troponin levels presage long and short term events. (29, 30)

CONCLUSION

Troponin is definitely an elegantly sensitive marker of myocardial infarction (MI). It is crucial with regard to the proper diagnosis of myocardial infarction in the medical setting in line with ischemia. These types of sufferers have acute multi vessel cardiovascular disease as well as require immediate cardiovascular revascularization. Subsequently, by the research results, high troponin is substantially connected with the extent of cardiovascular disease and 3 vessel disease. Understanding the cardiovascular troponin status of an individual as soon as possible is extremely important. It is important to be aware of the cardiac troponin status of the individual immediately. Earlier coronary angiography is recognized as particularly in non ST elevation myocardial infarction sufferers having much higher troponin levels.

In addition, research studies need to assess the connection among various levels of cardiac troponins in NSTEMI as well as the follow up or in hospital coronary heart events.

Ethical Clearance: This research had been performed after authorization of CPSP. The sufferers in Cardiology Dept of National Institute of Coronary heart Diseases Karachi, with non ST elevation myocardial infarction (NSTEMI) as well as getting together with the inclusion criteria had been opted in for the research. After describing the process, a written informed consent had been obtained from the sufferer.

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