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TIMI SCORE IN ACUTE ST ELEVATION MYOCARDIAL INFARCTION AND ITS CORRELATION WITH SINGLE QUANTITATIVE TROPONIN I

Cardiology

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ABSTRACT

Background- Acute chest pain remains one of most common reasons for seeking care in emergency department. Considerable variability in mortality exists among patients with ST-Elevation Myocardial Infarction(STEMI). Sophisticated multivariable models developed for prediction of mortality risk. Tools that enhance clinician's ability to rapidly and accurately assess risk are thus of substantial interest. Compared to other risk scoring systems Thrombolysis In Myocardial Infarction(TIMI) Risk Score for STEMI gives a Convenient, Bedside, Clinical Score for Risk Assessment at Presentation. But cardiac biomarker Troponin-I is not a part of TIMI Score, which is an important predictor of mortality in STEMI patients. In this study we want to evaluate is there any quantitative relationship between them. **Method-** The present study is hospital based cross sectional study done over period of 18 months.Total of 102 patients were evaluated,data of each patient collected in specific proforma (TIMI Score).Quantitative troponin I , 12 hour post admission done.All relevant data and values are entered In master chart & Statistical Analysis done. **Results-** 73(71.5%) were males and 29(28.5%)were females. 52(50.9%) patients belong to age group of 45-60 years.Out of 102 patients only 19 patients were devoid of comorbities like diabetes and hypertension. Correlation of thrombolysis in myocardial infarction score (TIMI score) at the time of hospital admission & single quantitaive troponin I at 12 hours done with spearman's rho correlation coefficient. This correlation was found to be strongly and positively correlated which was statistically significant with p value of 0.005. **Conclusion-** It can be concluded from our study that there is a strong association between TIMI score at admission and Single Quantitative Troponin I at 12 hours. Thereby showing adding Troponin I to TIMI Score has a additive prognostic value.

KEYWORDS

Timi Score, Stemi, Troponin I, Myocardial Infarction, Cardiac Biomarkers

INTRODUCTION-

Globally, CVD-related deaths increased by 49% between 1990 and 2017. CHD was the leading cause of death in 2017, accounting for 16% of all deaths worldwide(1). Though Atherosclerosis is considered as modern disease, it is not new to the mankind. HORUS STUDY revealed the presence of atheromatas in 4000 years old mummies (2)

Acute chest pain remains one of the most common reasons for seeking care in the emergency department (ED), accounting for almost 10%.(3) Acute coronary syndrome is the most sinister manifestation of atherosclerotic CAD. Atherosclerosis is a chronic immunoinflammatory, fibroproliferative disease of large and medium-sized arteries fueled by lipid accumulation(4,5) . Based on acute chest pain And electrocardiogram (ECG), two groups of patients are Differentiated(6), STEMI & NSTEMI.

STEMI - Patients with acute chest pain and persistent (>20 min) ST-segment elevation. This condition is termed ST-segment elevation ACS and generally reflects an acute total or subtotal coronary occlusion. Most patients will ultimately develop ST-segment elevation myocardial infarction (STE -ACS / STEMI).Mechanisms of acute coronary syndromes (ACS) at the clinical, pathological, cellular, and molecular levels(7).

The cellular effects of ischemia commence within seconds of the onset of hypoxia with the loss of adenosine triphosphate (ATP) production and accumulation of toxic metabolites (e.g. - lactic acid). Irreversible cell death usually occurs in the ischemic region in 6 hours in the absence of reperfusion or sufficient collateral circulation(8).

The prognosis of myocardial infarction is related to the extent of myocardium at risk and, related to this, to the site of coronary occlusion. Considerable variability in short-term mortality risk exists among patients with ST-elevation myocardial infarction (STEMI) who receive fibrinolytic therapy(9,10). Sophisticated multivariable models developed for the prediction of mortality among patients with STEMI identify independent clinical predictors and quantify their relative contribution to mortality risk(11).Effective risk stratification is integral to the management of patients with acute coronary syndromes (12).In addition, increasing economic pressures have intensified the need for appropriate triage and clinical resource utilization, including decisions regarding transfer to tertiary centers(13).

Tools that enhance the clinician's ability to rapidly and accurately assess risk are thus of substantial interest. There are many models for ex- Killip classification, Forrester and Diamond classification, Multivariate model of 30-day mortality according to GUSTO I trial, GRACE Scoring system etc; most of them are cumbersome to perform at bedside and can not be readily applied in routine clinical practice.

TIMI Risk Score (Thrombolysis In Myocardial Infarction) for ST-Elevation Myocardial Infarction: -

David A. Morrow & Elliott M. Antman et al.. developed and evaluated a convenient bedside clinical risk score for predicting 30-day mortality at presentation of fibrinolytic-eligible patients with STEMI(14). Compared to other risk scoring systems TIMI Risk Score for ST-Elevation Myocardial Infarction gives a Convenient, Bedside, Clinical Score for Risk Assessment at Presentation.

Table 1: TIMI Risk Score

SL NO	RISK FACTOR	POINTS AWARDED
1	AGE 65-74 YEARS	2
2	AGE - MORE THAN 74 YEARS	3
3	DIABETES MELLITUS/ HYPERTENSION/ANGINA (ANY ONE)	1
4	SYSTOLIC BLOOD PRESSURE – LESS THAN 100 mm of Hg	3
5	HEART RATE – MORE THAN 100	2
6	KILLIP CLASS – II to IV	2
7	WEIGHT – LESS THAN 67 KG	1
8	ANTERIOR ST ELEVATION / LEFT BUNDLE BRANCH BLOCK	1
9	TIME TO TREAT – MORE THAN 4 HOURS	1
	TOTAL SCORE	14

One of the limitation of TIMI risk score is , it does not take into consideration of cardiac biomarker Troponin-I, which is a major predictor of mortality.

Proteins released into the blood from damaged myocardial cells can indicate myocardial injury. In both skeletal and cardiac muscle tissue, the troponin complex, which is made up of three different structural proteins (troponins T, C, and I), is situated on the thin filament of the contractile apparatus. cardiac troponin assays are more specific for myocardial injury, making cardiac troponin the preferred diagnostic biomarker. elevated troponin I levels predict a higher likelihood of future AMI or cardiac related death; and troponin I may be used as a risk stratifier to choose high-risk patients who are in need of more aggressive therapy, such as angioplasty or bypass grafting (15). The cardiac specific isoform of troponin I (TNNI3) spans eight exons on chromosome 19 and these genes encodes a 210-amino-acid (27–31kDa) protein (16).

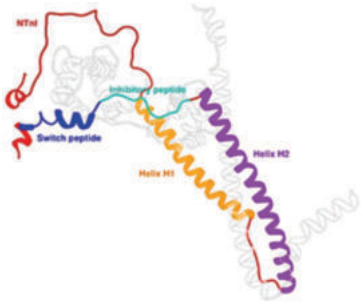

Figure 1- The cTnI Molecule With Its Relevant Structural Regions Highlighted(17)

Due to its release from a cytosolic pool, the first increase in troponins in peripheral blood can be seen in myocardial infarction patients as early as 3–4 hours after the event. This is followed by a prolonged appearance that can last till 2 weeks due to the ongoing proteolysis of the contractile apparatus in the necrotic myocardium.Adding biomarkers to traditional risk prediction models presents a potentially effective approach for future risk prediction algorithms for cardiovascular diseases and heart failure.

AIMS AND OBJECTIVES-

To evaluate & correlate Thrombolysis In Myocardial Infarction (TIMI) score for acute ST Elevation Myocardial Infarction (STEMI) and Single Quantitative Troponin I at 12 hours post admission.

MATERIALS AND METHODS-

It's a Cross Sectional Study done over a period of 18 months. New patients admitted in AL-AMEEN MEDICAL COLLEGE AND HOSPITAL VIJAYAPUR (a tertiary care centre) and diagnosed as Acute ST Elevation Myocardial Infarction were taken for the study considering the inclusion and exclusion criteria. The study was approved by Institutional Ethics Committee.

Inclusion Criteria-

Acute ST Elevation Myocardial Infarction (STEMI) in any new patient older than 18 years, admitted in ICCU.

Exclusion Criteria-

Patients with Prior NSTEMI/UA , History of PCI/CABG, Evolved MI, heart failure, CKD, Severe burns,sepsis, severe infections, myocarditis, pericarditis were excluded.

METHODOLOGY-

After counselling, Informed consent taken. A detailed history taken and physical examination was performed on all patients. The data of each patient collected in a specific proforma (TIMI Score). The standard 12 lead ECG taken & Blood sample collected for basic investigations & Troponin I. Again after 12 hour post admission blood sample collected for Troponin I Quantitative value. All the relevant data and values are entered In a master chart & Statistical Analysis done.

RESULTS-

Total 102 patients enrolled & evaluated in this study. 73 (71.5%) were males and 29 (28.5%)were females. The frequency of the various variables are depicted in tables and graphs below.

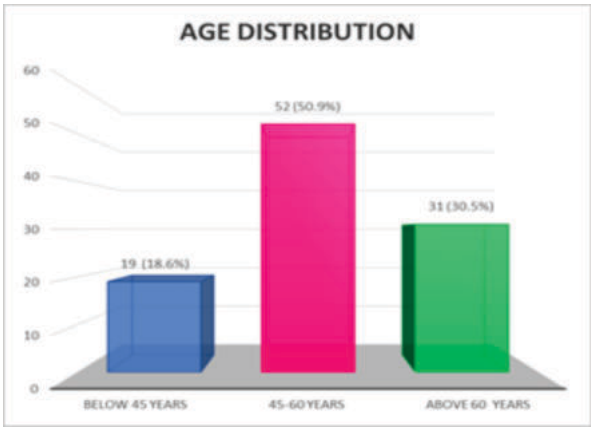

Figure 2- Distribution of subjects according the age in years

Table 2 - Distribution of the study subjects with co-morbid conditions of diabetes, hypertension and angina (in combination or single condition)-

Co Morbid Condition	Frequency	Percentage
Diabetes	24	23.5
Diabetes / Angina	7	6.9
Diabetes / Hypertension	22	21.7
Diabetes / Hypertension/ Angina	4	3.9
Hypertension	20	19.6
Hypertension/ Angina	6	5.8
None	19	18.6
Total	102	100

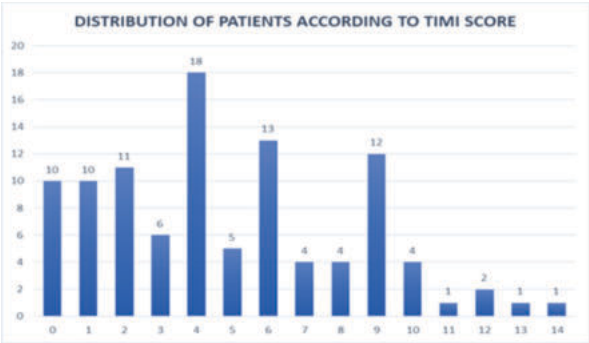

Figure 3 -Distribution of subjects According to Thrombolysis In Myocardial Infarction Score (TIMI Score)

Statistical Analysis-

Correlation of thrombolysis in myocardial infarction score (TIMI SCORE) at the time of hospital admission & single quantitaive troponin I at 12 hours -

Thrombolysis In Myocardial Infarction score for acute STEMI calculated at the time of hospital admission is correlated with Single Quantitative Troponin I performed at 12 hours post admission. This correlation was ascertained using non parametric correlations, using spearman's rho correlation coefficient. The p value of less than 0.05 was considered to be statistically significant. In the present study it was noted that the two variables were positively correlated. With r value of 0.916. This correlation was found to be strongly and positively correlated which was statistically significant with p value of 0.005.

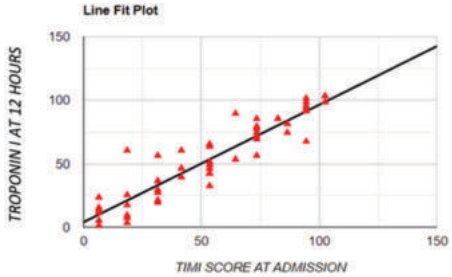

Figure 4- Showing results of the spearman correlation, it indicated

that there is a significant large positive relationship between TIMI SCORE AT ADMISSION and TROPONIN I at 12 hours post admission , (r(102) = .917, p =0.005). rs = 0.9168

DISCUSSION-

Acute Coronary Syndrome is a spectrum of disorders which include ST Elevation Myocardial Infarction (STEMI), Non ST Elevation Myocardial Infarction(NSTEMI) and Unstable Angina (UA). STEMI is usually associated with significant short term as well as long term mortality . STEMI is diagnosed by characteristic ECG changes along with clinical features and elevation of cardiac biomarkers(17).

There are a lot of prognostic markers available for ST Elevstion Myocardial Infarction . But the Thrombolysis In Myocardial Infarction (TIMI) score is a convenient bedside clinical risk score for predicting 30-day predict mortality at presentation of fibrinolytic-eligible patients with STEMI.

The cardiac isoforms of troponin I & troponin T were first used in clinical settings in the early 1990s. However, the cardiac isoforms of each of these troponins are transcribed by a different gene, and they can be identified by monoclonal antibodies that recognise the specific amino acid sequence for the cardiac isoform(18,19,20). Hence, compared to CKMB assays, cardiac troponin assays are more specific for myocardial injury, making cardiac troponin the preferred diagnostic biomarker.

We evaluated association between TIMI Score in STEMI patients with Single Quantitative Troponin I at 12 hours post admission. Total of 102 patients were evaluated in our study over a period of 18 months. In our study 73 (71.5%) were males and 29 (28.5%)were females, this shows STEMI presentation in males is higher. 52 (50.9%)patients belong to the age group of 45-60 years this young onset shows change in trend of disease. Out of 102 patients only 19 patients were devoid of comorbities like diabetes and hypertension. This shows presence of diabetes and hypertension increases the risk of STEMI.

The TIMI score at the time of hospital admission and the Single Quantitative Troponin I at 12 hours were correlated with spearman correlation. This correlation was found to be strongly and positively associated which was statistically significant with p value of 0.005.

In a study done by Louise Cullen, Christian Mueller et al , where they evaluated hs-troponin I for 30-day outcomes in ACS patients. This study assessed two prospective cohorts of ACS patients in an accelerated diagnosis pathway that included hs-troponin I values at 0 and 2 hours, TIMI scores, and ECG. TIMI risk scores of 0 or ≤ 1 were included into strategies to find patients at low risk. The primary endpoint of this study was major adverse cardiac event (MACE) within 30 days. According to this study, an early discharge strategy using a hs-troponin I test and a TIMI score of less than one had similar safety to that previously described, but additionally it also offered the potential to shorten observation times and reduce hospital stays for about 40% of patients with suspected ACS(21).

CONCLUSION-

It can be concluded from our study that there is a strong association between TIMI score at admission and Single Quantitative Troponin I at 12 hours. Thereby showing adding Troponin I to TIMI Score has a additive prognostic value.

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