ASSOCIATION OF THROMBOLYSIS IN MYOCARDIAL INFARCTION (TIMI) RISK SCORE WITH EXTENT OF CORONARY ARTERY DISEASE IN PATIENTS WITH UNSTABLE ANGINA AND NSTEMI

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ABSTRACT

Objective: To evaluate the correlation between thrombolytic in Myocardial Infarction risk score with the severity of coronary lesions found by coronary angiography during hospitalization in patients with non-ST elevation Acute coronary syndrome.

Study Design: Cross sectional study.

Place and Duration of Study: Adult Cardiology department, Armed Forces Institute of Cardiology & National Institute of Heart Diseases, Rawalpindi from Jul to Dec 2018.

Methodology: Patients who had chest pain suggestive of angina or anginal equivalent symptoms and diagnosis of Acute Coronary Syndrome (ACS) were included in the study. Patients with Acute Coronary Syndrome were risk stratified with Thrombolysis In Myocardial Infarction risk scores and were further evaluated with coronary angiograms to assess the extent of coronary artery disease.

Results: Total 115 patients were recruited in the study with mean age 57.08 ± 10.2 years. There were 87 (75.7%) male patients while 28 (24.3%) female patients. The most common co-morbidity was hypertension 66 (57.4%) followed by diabetes mellitus 39 (33.9%) and smoking 25 (21.7%). 71 (61.7%) patients had one angina episode in the last 2 hours while 34 patients had two angina episodes in the last 2 hours. Cardiac biomarkers were raised in 36 (31.3%) patients. 60 (52.2%) used aspirin in the last 7 days. Chi-square test was applied between Thrombolysis In Myocardial Infarction Score and Coronaries lesions, which showed statistically significant results (p<0.001).

Conclusion: Our study demonstrates that among patients presenting with Non-STE Acute coronary syndrome i.e. unstable angina /NSTEMI who are referred for coronary angiography, clinical risk stratification according to the Thrombolysis in Myocardial Infarction risk score correlates with the angiographic extent of Coronary Artery Disease. Patients with high thrombolysis in Myocardial Infarction risk scores were more likely to have severe multi vessel Coronary Artery Disease compared with those who have low scores. A routine invasive strategy in high Thrombolysis in Myocardial Infarction risk score patients should be considered as the preferred strategy.

Keywords: Coronary artery disease, NSTEMI, Thrombolysis in myocardial infarction, Unstable angina.

INTRODUCTION

Coronary Artery Disease (CAD), also known as Ischemic Heart Disease (IHD)[1], refers to a group of diseases which includes stable angina, unstable angina, non-ST elevation myocardial infarction, ST elevation myocardial infarction and sudden cardiac death[2]. Ischemic heart disease have emerged as a major health issue world over because of increased morbidity and mortality associated with it. Patients presenting with acute coronary syndrome which includes STEMI, NSTEMI and unstable angina are at increased risk of ischemic events. Therefore timely diagnosing such patients with non-invasive and invasive techniques like ECG, ETT, 2D-ECHO and coronary angiography can help initiate appropriate treatment including antithrombotic therapy and percutaneous transluminal coronary angioplasty and prevent from any adverse ischemic event. One easy tool to risk stratify patients presenting with non-STE Acute coronary syndrome (ACS) is Thrombolysis in Myocardial Infarction (TIMI) risk score which helps determine the

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likelihood of underlying coronary artery disease and provides a basis for therapeutic decision making. It helps predict the development of adverse clinical outcome in these patients[3].

The TIMI[4] risk score has proven its validity in predicting death and ischemic events in patients with non-ST elevation ACS. Despite good performance in discriminating which patients are most likely to experience an adverse event, the literature lacks studies that demonstrate the correlation between the scores and the magnitude of coronary lesions found by coronary angiography. We have conducted this study to look for the association of TIMI score in patients with NSTEMI and unstable angina with actual extent of CAD determined by percutaneous transluminal angiography.

The scheme of risk stratification in TIMI risk score is based on seven independent clinical indicators that are evaluated on patient's presentation[3]. It has the advantage of being easy to calculate and has broad applicability in the early assessment of patients.

Coronary Artery Disease: (CAD), also known as ischemic heart disease (IHD), 1 refers to a group of diseases which includes stable angina, unstable angina, myocardial infarction, and sudden cardiac death. 2 Unstable Angina is considered to be an ACS in which there is myocardial ischemia without detectable myocardial necrosis (i.ecardiac biomarkers of myocardial necrosis such as creatine kinase MB isozyme, troponin, myoglobin are not released into the circulation). It causes unexpected chest pain, and usually occurs while resting. Non-ST-elevation myocardial infarctionis defined as a presence of typical chest pain along with ST segment changes in atleast two contiguous electro cardiographic leads associated with elevation of cardiac biomarkers > 99 percentile of normal.

Coronary Angiography is an invasive strategy used to visualize the coronary circulation and blood filled chambers of the heart using a catheter. It is performed for both diagnostic and interventional (treatment) purposes. It is a visually interpreted test performed to recognize occlusion, stenosis, restenosis, thrombosis or aneurismal enlargement of the coronary artery lumens and heart chambers.

TIMI Score: It is a simple score that aids in risk stratifying patients with unstable angina/ NSTEMI and aids in decision making. TIMI Score Calculation (1 point for each of the following): I) Age ≥65. II) Aspirin use in the last 7 days. At least 2 angina episodes within the last 24hrs. IV) ST changes of at least 0.5mm in contiguous leads. V) Elevated serum cardiac biomarkers. VI) Known Coronary Artery Disease (CAD) (coronary stenosis ≥ 50%). VII) At least 3 risk factors for CAD, such as: i) Hypertension ≥140/90 or on anti-hypertensives. ii) Current cigarette smoker. iii) Low HDL cholesterol (<40 mg/dL). iv) Diabetes mellitus. v) Family history of premature CAD. a) Male first-degree relative or father younger than 55. b) Female first-degree relative or mother younger than 65.

The objective of this research is to evaluate the association between TIMI risk score with the severity of coronary lesions found by coronary angiography during hospitalization in patients with NSTEMI and unstable angina. The TIMI risk score has proven its validity in predicting death and ischemic events in patients with non-ST elevation ACS. The risk scores were created and are recommended by national[8] and international[9] guidelines to identify patients with a higher probability for the presence of underlying ischemic heart disease with a recommendation for more intensive treatment.

METHODOLOGY

A Cross sectional analytical study was carried out on 115 consecutive patients who presented to the emergency department and OPD of AFIC/NIHD, Rawalpindi from July to December 2018. Written informed consent was obtained in all cases for recruitment in the study and the procedures involved. The study protocol was approved by the institutional review board. Patients who had chest pain suggestive of angina or anginal equivalent symptoms and diagnosis of

non-STE ACS were included in the study. Inclusion criteria was patients with symptoms of angina, systolic blood pressure >90mmhg and age more than 20 years while exclusion criteria was patients of cardiogenic shock, STEMI, new onset LBBB, previous PCI or CABG and patients presenting with signs and symptoms suggesting non-cardiac origin of pain. Patients with ACS were risk stratified with TIMI risk scores. Patients with ACS were further evaluated with coronary angiograms to assess the extent of CAD. The angiography was performed by the primary physician who had experience of performing coronary angiography. The extent of CAD evaluated on angiography was classified as follows: significant CAD was defined as >70% stenosis in the major coronary arteries and >50% stenosis in left main stem. Angiograms revealing coronary artery stenosis <70% in major coronary arteries was termed non-obstructive CAD. Extent of CAD was defined as significant single, two or three vessel CAD. A proforma was designed inquiring about age, gender, presence of major cardiac risk factors (diabetes, hypertension, family history of premature CAD, dyslipidaemia and cigarette smoking), chest pain episode during last 24 hours, use of aspirin during last 7 days and prior known CAD. All data was collected prospectively through consecutive sampling. Data collection tool was developed regarding patient demographics, co-morbids, previous medical history and laboratory findings. All the data was analyzed using SPSS-23.

RESULTS

Total 115 patients were recruited the study with mean age 57.08 ± 10.2 years. There were 87 (75.7%) male patients while 28 (24.3%) female patients. The most common co-morbidity was hypertension 66 (57.4%) followed by diabetes mellitus 39 (33.9%) and smoking 25 (21.7%). Seventy one (61.7%) patients had one angina episode in the last 2 hours while 34 patients had two angina episodes in the last 2 hours. Cardiac biomarkers were raised in 36 (31.3%) patients. Sixty (52.2%) used aspirin in the last 7 days (table-I). The TIMI score and angiographic findings were described in table-II.

Table-I: Descriptive summary table.

Variables	n (%)
Age	57.08 ± 10.2 years (Range 34 - 80 years)
Gender	
Male	78 (75.7)
Female	28 (24.3)
Hypertension	66 (57.4)
Diabetes Mellitus	39 (33.9)
Active Smokers	25 (21.7)
Family History	16 (13.9)
Low LDL	5 (4.3)
Known CAD	6 (5.2)

Table-II: TIMI score and angiographic findings of the patients.

Parameters	n (%)
Thrombolysis in myocardial infarction	
TIMI score <4	96 (85.3)
TIMI SCORE >4	19 (16.5)
Angiographic Findings	
SVCAD	26 (22.6)
DVCAD	27 (23.5)
TVCAD	48 (41.7)
Unconstructive Coronaries	14 (12.2)

Chi-square test was applied between TIMI Score and coronary lesions, which showed sta-

Table-III: Chi-square test between thrombolysis in myocardial infarction and coronaries lesions.

	Coronary Lesions				*p*-value
Thrombolysis in Myocardial Infarction (TIMI Score)	**DVCAD**	**SVCAD**	**TVCAD**	**Unconstructive Coronaries**	
0		1 (0.9%)		2 (1.7%)	<0.001
1	-	9 (7.8%)	-	12 (10.4%)	
2	21 (18.3%)	15 (13.0%)	4 (3.5%)	-	
3	6 (5.2%)	1 (0.9%)	14 (12.2%)	-	
4	-	-	25 (21.7%)	-	
5	-	-	5 (4.3%)	-	

tistically significant results (p<0.001), (table-III).

DISCUSSION

It was concluded in this study that patient with high TIMI score (>4) were associated with a greater extent of significant CAD. Risk stratification in the setting of UA/NSTEMI has been addressed in several large studies for predicting the risk of myocardial infarction and death[3,9]. The severity of CAD has been correlated with different risk stratification schemes like the PURSUIT[1], AHCPR[2] and the GRACE risk scores[3]. The TIMI risk score was developed and adapted for patients presenting with non-STE ACS. It is a simple prognostic tool that helps to determine the probability of death and ischemic events in patients with underlying coronary artery disease. The TIMI risk score is used for objective risk stratification of patients into one of three groups: low score (0 to 2; 5-8% risk); intermediate (3 to 4; 13-20% risk); and high (5 to 7; 26-41% risk). The risk corresponds to future major cardiac events[4]. It also identifies those who are likely to benefit most from an early invasive strategy[3]. This score has been validated by the results of the PRISM-PLUS[5] trial and TACTICS-TIMI[18] trials[6]. The TIMI risk score based on the TIMI IIB[4] and ESSENCE trials[7], incorporates the combination of age, clinical characteristics, ECG changes and cardiac biomarkers for risk stratification. In order to improve the predictive accuracy of TIMI risk score additional biomarkers were also studied. Of note the important biomarkers studied were N terminal pro brain natriuretic peptide (NT-pro BNP), CRP, trop T, and D-dimer in a study conducted by Montoliu *et al*. The coexistence of derangement in two or three of these biomarkers in-conjunction with elevated TIMI risk score portends high probability for development of adverse cardiac events. They also found positive correlations between these biomarkers[8]. In our study we divided our patients into two groups based on the TIMI risk scores of <4 and >4 and looked at the association with the extent of CAD. The results of our study compare well with the findings of Mega *et al*[6], who studied the correlation between the TIMI risk score and high-risk angiographic findings in NSTE-ACS. Patients with risk scores of more than 4 were more likely to have a critical stenosis (81% vs 58%, p<0.001) and multivessel disease (80% vs 43%, p<0.001)[9]. Garcia and coworkers also showed that the extent and severity of CAD increases as the TIMI risk score increases (p<0.001)[7]. Risk scoring systems should ideally be validated, practical and easy to use at the patient bedside in day-to-day clinical practice[2]. There is presently no risk model conforming to all the above. The simplified version of the GRACE risk score, for instance relies on a computed algorithm for calculation. The TIMI risk score, on the otherhand is a validated scoring system and is a useful bedside tool in the evaluation of risk for patients presenting with acute coronary syndromes. Our study represents the experiences of a single institution. The severity and location of the coronary lesions was based on the operator visual estimation without quantitative or physiological evaluation.

CONCLUSION

Our study demonstrates that among patients presenting with non-ST ACS i.e UA/NSTEMI who are referred for coronary angiography, clinical risk stratification according to the TIMI risk score correlates with the angiographic extent of CAD. Patients with high TIMI risk scores were more likely to have severe multivessel CAD compared with those who have low scores. A routine invasive strategy in high TIMI risk score patients should be considered as the preferred strategy.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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