PRECISELY ACCURATE OR ACCURATELY PRECISE: DIAGNOSTIC ACCURACY OF GRACE AND TIMI SCORING SYSTEM FOR PREDICTION OF TRIPLE VESSEL CORONARY ARTERY DISEASE IN PATIENTS PRESENTING WITH NON-ST ELEVATION MYOCARDIAL INFARCTION TAKING ANGIOGRAPHY AS GOLD STANDARD

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ABSTRACT:

BACKGROUND:	*Patients with acute coronary syndrome can present with ST-segment elevation myocardial infarction (STEMI), non–STEMI (NSTEMI) or unstable angina. Varying degree of reduction in coronary blood flow is observed on coronary angiography in patients with non–STEMI (NSTEMI). In patients with acute coronary syndrome reported frequency of NSEMI is 61.5%. It is essential to stratify risk for adequate clinical decision making and to individualize patients who can benefit from invasive treatment strategy.*
AIMS & OBJECTIVE:	*To determine the diagnostic accuracy of GRACE and TIMI scoring system for prediction of triple vessel coronary artery disease in patients presenting with non-ST elevation myocardial infarction (STEMI) taking angiography as gold standard.*
MATERIAL & METHODS:	*A single centered, prospective, analytical cross sectional trial conducted from March 2018, to Feb 2019. 290 patients were included in the study after fulfilling inclusion criteria. Patients were assessed for TIMI and GRACE risk scores and were labeled as positive and negative for both methods. Coronary angiography was carried out for detection of triple vessel coronary artery disease. All the information was observed and recorded.*
RESULTS:	*A total number of 290 patients with NSTEMI were studied. Frequency of triple vessel coronary artery disease was 25.17%. The diagnostic accuracy of GRACE scoring system was 76.71%, 60.37%, 39.43%, 88.51%, 64.48% for sensitivity, specificity followed by positive and negative predictive values, and diagnostic accuracy of TIMI scoring system was 58.90%, 86.64%, 59.72%, 86.24%, 79.65% while angiography considered as gold standard.*
CONCLUSION:	*The diagnostic accuracy of GRACE is significantly better than TIMI scoring system for prediction of triple vessel disease in patients presenting with NSTEMI.*
KEY WORDS:	*Triple vessel coronary artery disease, non-ST elevation myocardial infarction, GRACE and TIMI scoring system, diagnostic accuracy.*

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Author's Contribution: MFM: Wrote the article, collected the data, performed statistical analysis. BUHMS: Data collection, data interpretation. MKI: Helped in statistical analysis, writing manuscript and proof reading. ZG: Data collection, proof reading. UMB: Data interpretation. SUR: Data analysis & interpretation.

BACKGROUND:

Patients with acute coronary syndrome can present with ST-segment elevation myocardial infarction (STEMI), non–STEMI (NSTEMI) or unstable angina. Varying degree of reduction in coronary blood flow is observed on coronary angiography in patients with non–STEMI (NSTEMI). In patients with acute coronary syndrome reported frequency of NSEMI is 61.5%. It is essential to stratify risk for adequate clinical decision making and to individualize patients who can benefit from invasive treatment strategy. Current guidelines recommend the use of validated risk scores to decide on pharmacological versus invasive strategy.[1-4]

In patients with NSTEMI there is greater likelihood of triple vessel coronary artery disease.[5] Predictive value for existence of triple vessel coronary artery disease among all available risk scoring systemsTIMIand GRACE scoring systems have more value.[6] This study is an effort to find diagnostic accuracy of GRACE and TIMI risk by comparing these scores for prediction of triple vessel coronary artery disease in our population. These two scoring systems are most commonly used, the research is conducted to find better scoring system in our population and by finding and applying that scoring system high risk patients may be identified and get benefit early.

MATERIALS AND METHODS:

A single centered, prospective, analytical cross sectional trial conducted from March 2018 to Feb 2019. Total 290 patients after fulfilling inclusion criteria from department of cardiology of Punjab Institute of Cardiology were enrolled in the study. Patients with NSTEMI were included in the study. Patients with STEMI, CABG, Prior PCI, chronic kidney disease were excluded.

Patients were accessed for TIMI and GRACE risk scores and were labeled as positive and negative for both methods.There are seven dichotomous variables in TIMI risk Score and each variable counts for one point to the total score ranging between zero to seven. These variables are related to the clinical presentation of acute coronary syndrome (ST-segment depression, elevation of myocardial necrosis marker,> 1 episode of angina in 24 hours) or to previous patient characteristics (age

> 65 years, use of aspirin, obstruction coronary > 50%, > 3 risk factors for atherosclerotic disease). There are eight variables in GRACE score: out of them five are computed in a semi-quantitative way, that is, different weight for each age group, Killip class, heart rate, systolic blood pressure and plasma creatinine; three of them computed in a dichotomous manner (ST segment depression, cardiac arrest at admission, elevation of myocardial necrosis marker). Depending upon variables present, score may range from 0 to 372. Coronary angiography was performed for presence of triple vessel coronary artery disease and obstructive CAD was defined as ≥70% stenosis in all three vessels[3,11]. All the information was observed and recorded in a pre-designed performa.

SPSS version 20 was used to analyze collected data of quantitative variables like age, TIMI and GRACE score were presented as mean and standard deviation. Qualitative variables gender, TVD (on TIMI, GRACE and angiography) were presented as frequency and percentage. Sensitivity, positive predictive value, specificity, negative predictive value and diagnostic accuracy of scoring systems were measured by generating 2x2 tables taking coronary angiography as gold standard. The strength of the risk scores in predicting angiographic severity of coronary artery disease was accessed by using ROC curve. 0.05 p value was considered as significant cut off. The area under the ROC curve of 0.5 and the difference between the areas under the ROC curve of at least 0.05 for superiority was defined as statistical significance.

RESULTS:

Frequency of triple vessel disease in patients (on gold standard) was calculated as 25.17%(n=73) while 74.83%(n=217) had no findings of triple vessel coronary artery disease(Table I). The receiver operation characteristic (ROC) curve showed that area under ROC curve for TIMI is 0.728 and for GRACE score it is 0.685. The area under ROC curve for both scores is statistically significant but the area of TIMI is more than GRACE and the difference was of (0.043).

In our study, out of 290 cases of non-ST elevation myocardial infarction, 38.62%(n=112) were between 45-60 years of age while 61.38%(n=178)

Table I: Frequency of tipple vessel disease (gold standard)			
		Frequency	Percentage
Triple Vessel Coronary Artery Disease	No	217	74.83
	Yes	73	25.17
	Total	290	100

Table II: Diagnostic accuracy of grace scoring system for prediction of triple vessel disease in patients presenting with non-ST elevation myocardial infarction taking angiography as gold standard.			
GRACE scoring system	Angiography		Total
	Triple vessel coronary artery disease Positive	Triple vessel coronary artery disease Negative	
Positive	56 (19.31%)	86 (29.66%)	142 (48.97%)
Negative	7 (5.86%)	131 (45.17%)	148 (51.03%)
Total	73 (25.17%)	217 (74.83%)	290 (100%)

Table III: Diagnostic accuracy of TIMI scoring system for prediction of triple vessel disease in patients presenting with non-ST elevation myocardial infarction taking angiography as gold standard.			
TIMI SCORING SYSTEM	Angiography		Total
	Triple vessel coronary artery disease Positive	Triple vessel coronary artery disease Negative	
Positive	43 (14.83%)	29 (10%)	72 (24.83%)
Negative	30 (10.34%)	188 (64.83%)	218 (75.17%)
Total	73 (25.17%)	217 (74.83%)	290 (100%)

were between 61-80 years of age, mean age was calculated as 63.41+9.29 years, 58.62%(n=170) were male and 41.38%(n=120) were females, frequency of triple vessel disease in patients (on gold standard) was calculated as 25.17%(n=73), the diagnostic accuracy of grace scoring system for prediction of triple vessel disease in patients presenting with NSTEMI taking angiography as gold standard was calculated, it shows 76.71%, 60.37%, 39.43%, 88.51%, 64.48% for sensitivity, specificity followed by positive and negative predictive value and diagnostic accuracy while these findings for TIMI scoring system was recorded as 58.90%, 86.64%, 59.72%, 86.24%, 79.65%.

DISCUSSION:

Ischemic heart disease is a global burden worldwide now, with one cause of mortality is still acute myocardial infarction[7]. Non ST elevation myocardial infarction is more frequent than ST elevation myocardial infarction with almost same mortality percentage at six months and higher with a two-fold difference at four years[8]. Risk of adverse events requiring individualized medical and interventional management decisions are required

in patients with non-ST elevation myocardial infarction[9].

A few risk scores have been proposed to predict the adverse outcomes in patients presenting with NSTEMI. Among all risk scoring systems, GRACE and TIMI scores have more weightage in literature for the presence of tripe vessel coronary artery disease. Though, a lot of work has been done on ST elevation myocardial infarction cases but very little work has been done on non-ST elevation myocardial infarction patients. It has also been shown that GRACE is more reliable that TIMI, but still TIMI is used more frequently than GRACE[3].So this study was planned to find that which method is more reliable for prediction of triple vessel coronary artery disease in NSTEMI patients to prevent unnecessary interventions and can start treatment plan accordingly. In an international study the sensitivity and specificity of TIMI was 53% and 85% and of GRACE score was 80% and 55% while taking angiography as gold standard[5].

In another local study they accessed combined sensitivity and specificity of TIMI and GRACE scores for prediction of left main andtriple vessel

coronary artery disease and found it 68% and 62.7%[9]. These results are quiet similar with above study results.

Nakachi et al found that the diagnostic accuracy ofTIMI score was inferior to GRACEscore and also described that GRACE score provides better diagnostic information in patients presenting with NSTEMI with regards to extent of coronary artery disease, triple vessel disease and multiple rapid progression in non-culprit lesions[10].

The preferred use of TIMI scoring system in emergency is because of its simplicity,whereas the ideal score to stratify risk in patients with NSTEMI is GRACE Scores[11] with heart rate ,age and serum creatinine as continuous variables are more accurate but are relatively complex to use. These factors should not preclude the use of GRACE score which gives better diagnostic insight and guides for early management.

The results of this study are helpful in improving our clinical decision making and patient outcome.

STUDY LIMITATIONS:

Study is conducted on a limited data, future studies on this subject with large number of patients in multi centers may provide a more clear picture.

CONCLUSION:

This study demonstrated that both scores had good predictive value for detection of triple vessel coronary artery disease in patients with NSTEMI but when both scores are compared GRACE is comparatively better than TIMI scoring system for prediction of triple vessel disease in patients presenting with NSTEMI.

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