ORIGINAL ARTICLE

Correlation of TIMI Risk Score and GRACE Risk Score with Lesion of Coronary Artery Disease in Patients with Non-ST Segment Elevation Acute Coronary Syndrome

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ABSTRACT

Objective: To compare the correlation of "thrombolysis in myocardial infarction (TIMI)" and "Global Registry of Acute Coronary Events (GRACE)" risk score with lesion of coronary artery disease in patients with non-ST segment elevation acute coronary syndrome.
Study Design: Cross-sectional study.
Place and Duration: The Department of adult cardiology, "National Institute of Cardiovascular Diseases (NICVD)", Karachi, Pakistan, from January 2021 to July 2021.
Methodology: Demographics, weight, height, risk factors along with the required information needed for TIMI and GRACE score were obtained at the time of presentation in emergency department as per the scoring criteria. SYNTAX score was calculated after performing conventional angiography of the patients, using SYNTAX.com calculator.
Results: In a total of 104 patients, the mean age was 57.21±12.22 years while 56 (53.8%) patients were male. Hypercholesterolemia was found in 33 (31.7%) patients. Mean score of TIMI was calculated as 4.680±2.064 while SYNTAX score was calculated as 26.45±12.94 and the correlation between TIMI risk score and SYNTAX score was noted as (r=0.109) and P value was found to be non-significant i.e. (P=0.270). Mean score of GRACE was noted as 135.38±90.88 while SYNTAX score was noted as 26.45±12.94 and the correlation between GRACE risk score and SYNTAX score was documented as (r=0.179) and P value was found to be non-significant i.e. (P=0.068).
Practical Implications: Both TIMI and GRACE risk scoring systems showed weak correlations with SYNTAX scores.
Conclusion: There is a weak correlation between TIMI risk score and SYNTAX score as well as GRACE risk score and SYNTAX score.
Keywords: Acute coronary syndrome, coronary artery disease, GRACE score, myocardial infarction, thrombolysis.

INTRODUCTION

A comprehensive examination of clinical characteristics, including electrocardiogram (ECG) results and biochemical indicators of myocardial necrosis, is the foundation for the diagnosis and categorization of acute coronary syndrome (ACS).[1] It is a sign of non-ST elevated (NSTE) ACS that there is no persistent ST-elevation. Cardiac necrosis indicators can be used to further divide NSTE-ACS.[1] The patient is classified as having "non-ST elevated myocardial infarction NSTEMI" if their cardiac biomarkers are increased and their clinical situation is suitable; otherwise, they are classified as having unstable angina.[2,3]

For the treatment of NSTEMI, experts endorse a risk-based treatment approach.[4] "Thrombolysis in Myocardial Infarction (TIMI)" and "Global Registry of Acute Coronary Events (GRACE)" risk scores are some of the most popularly applied approaches and prognostic values of these have been exhibited.[5,6] Researchers have shown that GRACE risk scoring is relatively more accurate when compared to TIMI risk scoring.[7,8] However, limited data is available internationally and locally which have compared both these score with extent and severity of coronary angiographic findings; this helps to identity risk scores which can better correlate with severe coronary artery disease (CAD). A significantly positive correlation was calculated among risk scores and coronary lesions ≥ 50% (TIMI r=0.363, p<0.0001 and GRACE r=0.255, p<0.0001).[9]

As association between TIMI risk score and GRACE score with Syntax score is still debatable due to variability of the findings.[10] Therefore, it is important to generate local data so that both these risk stratification scales can be used extensively to risk stratify patients as soon as they are admitted so that their management can be tailored accordingly. As "National Institute of Cardiovascular Disease (NICVD)" is the major cardiac center of the country and the patient flow is from different socioeconomic status from all over Pakistan and there is marked cultural diversity as well, hence the findings of our study were thought to be more representative of the target population in order to generalize our conclusions. The objective of this study was to compare the correlation of TIMI and GRACE risk score with lesion of CAD in patients with NSTE-ACS.

METHODOLOGY

This cross-sectional study was done at the department of adult cardiology, NICVD, Karachi, Pakistan, from January 2021 to July 2021. Sample size was calculated through online sample size calculator on the basis of parameter of coefficient of correlation between GRACE and coronary lesion as 0.255,[9] level of significance as 5%, power of test 80% then the estimated sample size came out to be 104.

Patients of both genders aged between 18 to 75 years presenting with NSTEMI whose angiography was performed within one week of admission were analyzed. Patients refused to give consent, with history of prior cardiac related surgery or intervention, having new left bundle brunch block, prior history of PCI or CABG were excluded. The NSTEMI was labeled as typical chest pain >20 minutes, ECG showing ST depression, transient ST elevation, and/or prominent T-wave inversion, and a typical rise of cardiac troponin one value above the upper limit of normal range. CAD was labeled as coronary lesion with a diameter stenosis ≥ 50% narrowing of the diameter of the lumen of the left anterior descending coronary artery, left circumflex artery or right coronary artery.

Approval from "Institutional Ethical Committee" was taken. Consents were acquired from all patients. Demographics characteristics were documented. Angiography procedures were performed in all patients. The syntax score was calculated by using web syntax score calculator "(www.syntaxscore.com)". TIMI and GRACE scorings were calculated using online risk calculator "(http:// www.outcomes-umassmed.org/Grace/acs_risk.cfm)".

Hypercholesterolemia was defined as serum cholesterol >200mg/dl and/or serum triglyceride level >150mg/dl.

Data was analyzed using "Statistical Package for Social Sciences (SPSS)", version-26. Mean and standard deviation were calculated for quantitative data. Frequency and percentage were calculated for qualitative variables. Coefficient of correlation was calculated by using Pearson correlation test in order to assess the correlations. Post stratification, Pearson correlation was also applied considered P ≤ 0.05 as level of significance.

RESULTS

In a total of 104 patients, 56 (53.8%) were male. The mean age (years) and BMI (kg/²) were 57.21±12.22 and 26.59±3.72 respectively. The mean TIMI, GRACE and SYNTAX scores were 4.60±2.04, 135.38±90.88 and 26.45±12.94 respectively. Table-1 showing details about the characteristics of patients.

The mean score of TIMI was calculated as 4.680±2.064 while SYNTAX score was calculated as 26.45±12.94 and the correlation between TIMI risk score and SYNTAX score was noted (r=0.109) with p-value 0.270 (table-2). The mean score of GRACE was noted as 135.38±90.88 while SYNTAX score was noted as 26.45±12.94 and the correlation between GRACE risk score and SYNTAX score was documented (rr=0.179) with p-value as 0.068 (tab;e-2).

Table-1: Baseline characteristics (n=104)

Characteristics		Number (%)
Gender	Male	56 (53.8%)
	Female	48 (46.2%)
Diabetes mellitus		40 (38.5%)
Hypertension		49 (47.1%)
Hypercholesterolemia		33 (31.7%)
Family history of CAD		19 (18.3%)
History of smoking		43 (41.3%)
Extent of CAD	1 vessel disease	29 (27.9%)
	2 vessel disease	43 (41.3%)
	3 vessel disease	32 (30.8%)
TIMI Score		4.60±2.04
GRACE Score		135.38±90.88
SYNTAX Score		26.45±12.94

Table-2: Correlation between TIMI and GRACE Risk Scores with SYNTAX Scores (n=104)

Scoring	Mean±SD	Coefficient Correlation (r)	P-value
TIMI Risk Score	4.68±2.06	0.109	0.270
SYNTAX Score	26.45±12.94		
GRACE Risk Score	135.38±90.88	0.179	0.068
SYNTAX Score	26.46±12.94		

Table-3: Stratification of Study Variables with respect to Correlation between TIMI Risk Score and Lesion of CAD (n=104)

Study Variables		Scoring	Mean±SD	Coefficient of Correlation (r)	P-value
Gender	Male	TIMI	4.70±2.0	0.253	0.060
		SYNTAX	24.80±12.90		
	Female	TIMI	4.66±2.16	-0.042	0.779
		SYNTAX	28.38±12.86		
Age (years)	18-50	TIMI	4.16±2.10	0.069	0.753
		SYNTAX	27.00±13.15		
	>50	TIMI	4.82±2.04	0.126	0.263
		SYNTAX	26.30±12.96		
BMI (kg/m²)	19-24	TIMI	5.01±1.87	-0.031	0.863
		SYNTAX	27.12±12.50		
	>24	TIMI	4.53±2.14	0.158	0.189
		SYNTAX	26.14±13.21		
Diabetes mellitus		TIMI	4.15±2.14	0.130	0.423
		SYNTAX	26.18±12.99		
Hypertension		TIMI	5.01±1.93	0.180	0.217
		SYNTAX	29.61±12.96		
Hypercholesterolemia		TIMI	4.85±2.14	0.137	0.448
		SYNTAX	27.00±13.19		
Family history of CAD		TIMI	4.25±2.16	-0.037	0.0879
		SYNTAX	26.16±13.42		
History of smoking		TIMI	4.69±2.18	0.095	0.547
		SYNTAX	26.47±12.89		
Extent of CAD	Single vessel disease	TIMI	4.43±2.05	0.080	0.679
		SYNTAX	27.28±13.67		
	Double vessel disease	TIMI	4.95±2.05	0.204	0.190
		SYNTAX	25.40±12.37		
	Triple vessel disease	TIMI	4.54±2.12	0.047	0.796
		SYNTAX	27.13±13.34		

Table-4: Stratification of Study Variables with respect to Correlation between GRACE Risk Score and Lesion of CAD (n=104)

Study Variables		Scoring	Mean±SD	Coefficient of Correlation (r)	P-value
Gender	Male	GRACE	133.46±96.48	0.225	0.095
		SYNTAX	24.80±12.90		
	Female	GRACE	137.60±88.67	0.119	0.419
		SYNTAX	28.38±12.86		
Age (years)	18-50	GRACE	131.43±100.34	0.185	0.397
		SYNTAX	27.00±13.15		
	>50	GRACE	136.49±88.65	0.179	0.111
		SYNTAX	26.30±12.96		
BMI (kg/m²)	19-24	GRACE	118.15±78.45	-0.138	0.444
		SYNTAX	27.12±12.50		
	>24	GRACE	143.38±78.45	0.301	0.011
		SYNTAX	26.14±13.21		
Diabetes mellitus		GRACE	121.08±77.89	0.168	0.299
		SYNTAX	26.18±12.99		
Hypertension		GRACE	137.57±96.09	0.063	0.668
		SYNTAX	29.61±12.96		
Hypercholesterolemia		GRACE	142.94±87.68	0.205	0.252
		SYNTAX	27.00±13.19		
Family history of CAD		GRACE	106.21±53.18	-0.042	0.866
		SYNTAX	26.16±13.42		
History of smoking		GRACE	132.72±84.56	0.210	0.177
		SYNTAX	26.47±12.89		
Extent of CAD	Single vessel disease	GRACE	109.07±64.21	0.206	0.284
		SYNTAX	27.28±13.67		
	Double vessel disease	GRACE	149.84±99.51	0.296	0.054
		SYNTAX	25.40±12.37		
	Triple vessel disease	GRACE	139.78±96.66	0.064	0.727
		SYNTAX	27.13±13.34		

The stratification of study variables with respect to SYNTAX scoring and its correlation with TIMI and GRACE risk score are shown in table-3 and 4.

DISCUSSION

In this study, the mean score of TIMI was 4.680±2.064 while SYNTAX score was 26.45±12.94 with the correlation between the TIMI risk score and the SYNTAX score was observed (r=0.109, p=0.270). The mean score of GRACE was 135.38±90.88 while SYNTAX score was 26.45±12.94 and the correlation between GRACE risk score and SYNTAX score was observed (r=0.179, p=0.068). The study of Santos ES, et al reported a positive correlation (r=0.363) with TIMI score 3.47±1.37 and GRACE score 105.68±28.10 and p<0.0001 (highly significant).[9] Another study done by Hammami R, et al noted TIMI score as 3.22±1.37 and GRACE score as 122.48±33.86 with (r=0.23, p<0,001).[11] The two risk ratings that are most frequently used to categorise NSTE-ACS patients at presentation are the TIMI and GRACE scores.[5-8] Since early coronary intervention in high-risk patients has consistently been shown to enhance clinical outcomes, risk stratification is crucial.[10,12]

In our study, the mean age was 57.21±12.22 years. Santos ES, et al reported age as 59.9±10.6 years.[9] Minutello RM, et al revealed the mean age as 62±14 years.[13] Another study done by Jahic E et al reported mean age as 58±8.08 years.[14] Xiu WJ, et al in his study stated age as 58.49±12.81 years.[15] Another study done by Ruiz AC, et al stated mean age as 61.3±13.7 years whereas Kim HK, et al noted 63.9±13.0 years.[16,17] In the present study, 53.8% were male. Santos ES, et al documented to have 319 (54.8%) male subjects.[9] The study of Minutello RM, et al noted 70% male patients.[13] Xiu WJ, et al noted 81.8% males.[15] Ruiz AC, et al noted 81.3% males whereas Kim HK, et al 74.3% male patients.[16,17] treatment of NSTEMI, experts endorse a risk-based treatment approach.[4] "Thrombolysis in Myocardial Infarction (TIMI)" and "Global Registry of Acute Coronary Events (GRACE)" risk scores are some of the most popularly applied approaches and prognostic values of these have been exhibited.[5,6] Researchers have shown that GRACE risk scoring is relatively more accurate when compared to TIMI risk scoring.[7,8] However, limited data is available internationally and locally which have compared both these score with extent and severity of coronary angiographic findings; this helps to identity risk scores which can better correlate with severe coronary artery disease (CAD).

We noted diabetes mellitus to be present in 38.5% patients. JahicC E et al reported the proportion of diabetes mellitus to 31.3% in the similar set of patients.[14] Xiu WJ, et al reported diabetic patients as 24.2% while Kim HK found 24.4% patients to have diabetes mellitus.[15,17] We noted hypertension to be in 47.1% patients. Jahic E et al noted hypertension in 42.6% patients.[14] Xiu WJ, et al noted hypertension in 31% patients and Kim HK, et al noted 46.8% hypertensive patients.[15,17] It was found that extent of CAD was as 1 vessel disease in 27.9% patients, 2 vessel disease in 41.3% while 3 vessel disease in 30.8% patients. Relatively similar proportions were reported by Mahmood M, et al.[18] Medical resources, diagnosis, and treatment must improve in developing countries. There are limited resources: access to medical and health resources; knowledge about disease; awareness, trainings, and awareness about health. Health literacy is mandatory for any disease and facilitates the patient's access to resources, databases, and trainings about the disease. [19-25]

The TIMI score does not include any measurements of heart rate, blood pressure, heart failure, cardiac arrest at presentation, or renal function, despite the fact that some variables, such as risk factor status, prior coronary artery disease, prior aspirin intake, and the experience of angina in the previous 24 hours, are indicative of the extension of coronary artery disease. There is no continuous variable in this score.[26-28] The GRACE score, on the other hand, assesses a number of indicators as a continuous variable, including age, heart rate, systolic blood pressure, and renal failure. Heart failure and cardiac arrest at presentation are also included.[29,30]

There were some limitations of this research. Being a single center study conducted on a relatively small sample size, our findings need further verification. We could not note outcomes in the current set of patients.

CONCLUSION

It is concluded that there is a weak correlation between TIMI risk score and SYNTAX score as well as GRACE risk score and SYNTAX score.

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