



Research Article

Diagnostic accuracy of TIMI versus GRACE score for prediction of death in patients presenting with Acute Non-ST Elevation Myocardial Infarction (NSTEMI)

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Keywords: TIMI; GRACE; Cardiac; Infarction; Acute; Risk; Elevation



Abstract

Background: Acute Coronary Syndrome describes a spectrum of disease ranging from unstable angina through non-ST-Elevation Myocardial Infarction (NSTEMI) to ST-Elevation Myocardial Infarction (STEMI). Early death in NSTEMI is usually due to an arrhythmia. Patients should be admitted immediately to hospital, preferably to a cardiac care unit because there is a significant risk of death.

Objective: To compare the diagnostic accuracy of TIMI versus GRACE for prediction of death in patients presenting with Acute Non-ST elevation Myocardial Infarction

Material & Methods: This present cross sectional study was conducted at Department of Cardiology, CPEIC, Multan. All patients assessed according to given scores in the two scoring system i.e. TIMI risk score and GRACE score. Then patients were labeled as high or low risk for death. Data was collected by using pre-designed proforma. 2x2 tables were generated to measure the sensitivity, specificity, positive predictive value, negative Predictive value and diagnostic accuracy of TMI Risk score and GRACE Score for prediction of death in NSTEMI patients.

Results: In our study the mean age of the patients was 55.73±9.78 years. The male to female ratio of the patients was 1.6:1. The diabetes as risk factor was found in 145(39%) patients, smoking as risk factor was found in 53(14.2%) patients and hypertension as risk factor was found in 174(46.8%) patients. the sensitivity of TIMI risk was 97.7% with specificity of 92.93% and the diagnostic accuracy was 95.16%, similarly the sensitivity of GRACE risk was 100% with specificity of 95.96% and the diagnostic accuracy was 97.85%.

Conclusion: Our study results concluded that both the TIMI risk and GRACE risk are good predictor of death in patients presenting with Acute Non-ST elevation Myocardial Infarction with higher sensitivity and diagnostic accuracy. However the GRACE risk showed more accurate results as compared to TIMI risk.

Introduction

Acute Coronary Syndrome describes a spectrum of disease ranging from unstable angina through non-ST-Elevation Myocardial Infarction (NSTEMI) to ST-Elevation Myocardial Infarction (STEMI). The 6months mortality rates in global registry of Acute Coronary Events (GRACE) were 13% for patients with NSTEMI and 8% for those with unstable angina and 30 day mortality was 9.1% despite the best conventional therapy [1,2].

All patients with Unstable Angina and NSTEMI should undergo risk stratification soon after presentation. The Thrombolysis in Myocardial Infarction (TIMI) risk score,

Global Registry of Acute Coronary Events (GRACE) risk index and Platelet glycoprotein IIb/IIIa in Unstable angina [3]. TIMI and GRACE are the risk scores that up until now have been most extensively investigated, with GRACE performing better. There are other potentially useful ACS risk scores available however these have not undergone rigorous validation. This study suggests that these other scores may be potentially useful and should be further researched [4].

Literature is evident that GRACE Score can predict better for high risk of mortality among NSTEMI cases. But still TIMI risk assessment is more in practice. So we aimed to conduct this study to implement the use of more appropriate and accurate method in future to be used as first line diagnostic tool in emergency cases to predict the outcome of NSTEMI cases. This will also help us to get local magnitudes as well as will help us to improve our clinical practice and knowledge.

Objective

The objective of this study is to compare the diagnostic accuracy of TIMI versus GRACE for prediction of death in patients presenting with Acute Non-ST elevation Myocardial Infarction.

Materials and Methods

This Case control study was conducted at Department of Cardiology, CPEIC, Multan for 6 months. Sample size of 372 patients is calculated with 95% confidence interval, 9% margin of error and taking expected percentage of NSTEMI i.e. 64.5% and sensitivity and specificity of TIMI i.e. 75% and 86% respectively, for prediction of death in patients presenting with NSTEMI. Non-probability consecutive sampling was used to include the patients. Patients of age 40-80 years of either gender presenting with Acute NSTEMI. Acute NSTEMI was infarction without ST-segment elevation precordial discomfort in the last 48 hours, associated with at least one of the following characteristics: 1) positive myocardial necrosis marker, defined as Troponin T ≥ 0.01 ug/l, which corresponds to values > 99 th percentile of the normal reference population; 2) ischemic electrocardiographic alterations, consisting of T-wave inversion (≥ 0.1 mV) or transient ST-segment depression (≥ 0.05 mV); 3) previously documented coronary artery disease, defined by a history of myocardial infarction or previous angiography demonstrating coronary obstruction $\geq 50\%$. Risk of Death on TIMI: If TIMI Risk score was >5 , then cases were labeled as high risk for death. Risk of Death on GRACE: If GRACE score was >172 , then cases were labeled as high risk for death. Patients with medical record of intervention for previous MI i.e. PCI or CABG, valvular heart diseases. All patients assessed according to given scores in the two scoring system i.e. TIMI risk score and GRACE score. Then patients were labeled as high or low risk for death. Patients followed up during hospital stay for 7 days. During hospital stay, if patient would die, death was labeled. Data was collected by using pre-designed proforma. Data was entered and analyzed by SPSS version 20. All quantitative variables like age were described by using mean and SD. All qualitative variables gender and death was described by using frequency and percentage. 2x2 tables were generated to measure the sensitivity, specificity, PPV, NPV and diagnostic accuracy of TMI Risk score and GRACE Score for prediction of death in NSTEMI patients.

Results

The mean age of the patients was 55.73 ± 9.78 years. In our study 61.83% patients were males and 38.17% patients were females. The male to female ratio of the patients was 1.6:1. Diabetes was found in 145(39%) patients, smoking in 53(14.2%) patients and hypertension in 174(46.8%) patients (Table 1). The mean TIMI score of the patients was 4.19 ± 1.86 . The mean GRACE score of the patients was 132.77 ± 52.73 . The study results showed that the death occurred in 46.77% patients and recovered patients were 53.23% patients (Table 2).



The sensitivity of TIMI risk was 97.7% with specificity of 92.93%. The PPV value of TIMI risk score was 92.39% and NPV value was 97.87%. The diagnostic accuracy of TIMI risk was 95.16% (Table 3). The sensitivity of GRACE risk was 100% with specificity of 95.96%. The PPV value of GRACE risk score was 95.6% and NPV value was 100%. The diagnostic accuracy of GRACE risk was 97.85% (Table 4).

Discussion

Global Registry of Acute Coronary Events (GRACE) and Thrombolysis in Myocardial Infarction (TIMI) risk scores have been widely used for prognosis predicting in patients with ACS [4-6]. In our study the death occurred in 46.77% patients. In this study the sensitivity of TIMI risk was 97.7% with specificity of 92.93% and the diagnostic accuracy was 95.16%, similarly the sensitivity of GRACE risk was 100% with specificity of 95.96% and the diagnostic accuracy was 97.85%. Some of the studies are discussed below showing the results on favor of our study as, the Portuguese study by Goncalves et al. [14], demonstrated the superiority of the GRACE score when compared to the TIMI score with a difference of 0.12 in C-statistics for the combination of death and in-hospital infarction [7]. There are other potentially useful ACS risk scores available however these have not undergone rigorous validation. This study suggests that these other scores may be potentially useful and should be further researched [4]. A study by Kozieradzka et al. [8], compared these scores in ST-segment elevation myocardial infarction and observed similar discriminatory ability. However, these authors did not analyze score calibration. In addition, that study analyzed long-term outcomes (five-year evolution).

The results of Erik P Hess et al. [9], meta-regression analysis indicated a strong linear relation between TIMI risk score and the short-term incidence of cardiac events. The incidence of cardiac events in the lowest risk stratum (TIMI score of zero) was 1.8%; the sensitivity was 97.2% and specificity was 25.0% at this decision threshold. One more study by Hang Zhu et al. [10], presented that both GRACE and TIMI were adoptable in clinical risk stratification and prognosis of female patients with NSTEMI-ACS

Table 1: Baseline characteristics of patients.

Age	55.73±9.78
Gender (m/f)	38.2% / 61.8%
Diabetes	145 (39%)
Smoking	53(14.2%)
Hypertension	174(46.8%)

Table 2: Descriptive statistics of TIMI score.

TIMI score	4.19±1.86
GRACE score	132.77±52.73
Death occurred	46.77%

Table 3: Comparison of TIMI risk with death of the patients.

		Death		Total
		Yes	No	
TIMI risk	High risk	170	14	184
	Low risk	4	184	188
Total		174	198	372

Sensitivity: 97.7%, **Specificity:** 92.93%, **PPV:** 92.39%, **NPV:** 97.87% and **Diagnostic Accuracy:** 95.16%

Table 4: Comparison of GRACE risk with death of the patients.

		Death		Total
		Yes	No	
GRACE risk	High risk	174	8	182
	Low risk	0	190	190
Total		174	198	372

Sensitivity: 100%, **Specificity:** 95.96%, **PPV:** 95.6%, **NPV:** 100% and **Diagnostic Accuracy:** 97.85%.



at different age groups. a study conducted in Brazil, has found that GRACE score has 50% sensitivity and 98% specificity for prediction of high risk for death in NSTEMI patients as compared to TIMI Risk score(sensitivity=75%, specificity=86%). The authors concluded that although the scores show similar discriminatory capacity for hospital death, the GRACE score had better calibration than TIMI. These findings need to be validated populations of different risk profiles [11].

One more study by Ender Öner et al. [12], resulted that GRACE score showed good discriminatory capacity between the patients with and without a high-risk (>33) SYNTAX score, with an area under the ROC curve of 0.804 (CI 0.660-0.948, p=0.002); however, the TIMI score showed no predictive capacity and had an area under the ROC curve of 0.532 (CI 0.358-0.749, p=0.749). A study by G. Ramsay et al. [13], described that the Both GRACE (p<0.001) and TIMI scores (p<0.001) predicted death/MI/revascularization (and the composite including re-admission), but the GRACE score was superior to the TIMI score for predicting major cardiac events (z = 2.05), and both scores were superior to clinical evaluation (ROC areas 0.82, 0.74 and 0.55 respectively).

Emad Abu-Ass et al. [14], revealed in their study that the GRACE risk score for predicting death within 6 months of hospital discharge was validated and can be used in patients with ACS. It would be wise to include the GRACE risk score in the medical records of these patients. Two more studies presented that The GRACE score has shown a greater prognostic value as compared with that of the TIMI score [15,16].

Conclusion

Our study results concluded that both the TIMI risk and GRACE risk are good predictor of death in patients presenting with Acute Non-ST elevation Myocardial Infarction with higher sensitivity and diagnostic accuracy. However the GRACE risk showed more accurate results as compared to TIMI risk.

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