



**ORIGINAL RESEARCH PAPER**

**Cardiology**

**CORELLATION OF TIMI RISK SCORE AND GRACE RISK SCORE WITH ANGIOGRAPHIC SEVERITY IN PATIENTS WITH NON-ST ELEVATION ACUTE CORONARY SYNDROME**

**KEY WORDS:** TIMI, GRACE, Angiography, Acute coronary syndrome.

<b>Nambirajan Jayabalan</b>	senior assistant professor, Institute of Cardiology, Madras Medical College, Chennai
<b>Elamaran Chidambaram</b>	senior assistant professor, Institute of Cardiology, Madras Medical College, Chennai
<b>Swaminathan nagarajan</b>	Director and HOD , Institute of Cardiology ,Madras Medical College, Chennai
<b>Nisamudeen Kajamohideen</b>	post graduate ,Institute of Cardiology, Madras Medical College, Chennai

<b>ABSTRACT</b>	<b>AIM OF THE STUDY :</b> To evaluate the application of TIMI risk score and Grace risk scores, in Non-ST elevation Acute coronary syndrome patients and its correlation with angiographic coronary anatomy.
	<b>MATERIALS AND METHODS :</b> This study that included patients with NSTEMI hospitalised in the Institute of Cardiology ,Madras Medical College & Hospital, Chennai Tamilnadu from august 2016 to march 2017 who underwent invasive coronary angiography. On admission, TIMI risk score and Grace risk scores were calculated using a standard form of the hospital medical record.
	<b>RESULTS:</b> Both risk scores showed good predictive value in identifying the extent and severity of the disease. A Thrombolysis In Myocardial Infarction score >4 and Global Registry of Acute Coronary Events score > 133 was significantly associated with three vessel disease and left main disease, while the GRACE score is significantly superior than TIMI score.
	<b>CONCLUSION:</b> Risk scores are simple methods of determining prognosis and categorize patients into high risk or low risk for future ischemic events and death. Their use help us to decide upon various therapies in patients with NSTEMI ACS. Our study demonstrates that among patients presenting with NSTEMI ACS who underwent coronary angiography, clinical risk stratification according to the GRACE risk score correlates better with the angiographic extent of CAD.

**INTRODUCTION**

Coronary artery disease is the leading cause of mortality and morbidity throughout the world. While the death rates are declining for the past three decades in the developed nation, these rates are raising in India. CAD tends to occur at a younger age group in Indians with more extensive coronary involvement, mainly contributed by genetic, metabolic, conventional and non-conventional risk factors. Patients presenting with non-ST elevation acute coronary syndromes or unstable angina are at risk for adverse events such as death or recurrent infarction. Patients admitted with non-ST elevation acute coronary syndromes have a wide variation in the disease severity, which ranges according to clinical and laboratory variables, with varying risk of morbidity and mortality, so in this subset of population risk stratification is essential to make appropriate decisions in planning treatment strategies<sup>1</sup>. The use of multivariate models in the form of scoring system has proven to represent the most accurate way to predict risk and was found superior to subjective clinical impressions<sup>2</sup>. For this purpose the The Global Registry Of Acute Coronary Events (GRACE)<sup>3</sup> and Thrombolysis In Myocardial infarction (TIMI) are the two commonly used risk scores to stratify the NSTEMI patients at presentation to the health care facility, these scores bears the proven validity in predicting death and ischemic events in patients with non-ST Elevation MI. Patients designated as high risk category according to TIMI and GRACE risk scores will have the greatest benefit from more aggressive treatment like early coronary interventional procedures and cardiac medications. Several studies have compared TIMI and GRACE scores and concluded that apart from the prognostic significance they also predict the anatomical severity of coronary artery disease which is most useful for clinical decisions such as deciding on early revascularizations. Studies which compare the scores with the corresponding magnitude of the coronary artery lesion are lacking in the south Indian scenario, Objective of this study was therefore to validate the usefulness of TIMI and GRACE scores in predicting the angiographic severity and the extent of coronary involvement in south Indian population getting admitted in a tertiary care hospital.

**METHODS AND MATERIALS**

This was a cross sectional study that included 100 consecutive patients with NSTEMI hospitalised in the Institute of Cardiology , Madras Medical College, Chennai, Tamil nadu from august 2016 to march 2017 who underwent invasive coronary angiography during hospitalisation. On admission GRACE and TIMI risk scores were calculated using a standard form of the hospital medical record.

**Inclusion criteria:** The inclusion criteria patients admitted with history of new onset chest pain occurring at rest or with minimal exertion or with symptoms suggestive of anginal equivalent, with the recent episode occurring within 24 hours of admission. Any ST segment deviation on electrocardiogram (ECG) suggestive of myocardial ischemia (MI) or elevated levels of cardiac biomarkers were also recorded.

**Exclusion criteria:** Patients with ST segment elevation on ECG, new onset of left bundle branch block or previous history of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) were excluded from the study. Patients with absent cardiac biomarkers, or who had angiogram done late were excluded from the study

**Ethical issues:** As this study involves the taking of blood for laboratory investigations, and an invasive diagnostic procedure such as cardiac conventional coronary angiogram, all patients and their relatives were explained of the study design at the time of enrollment. Informed consent was obtained from all patients after clear explanation of the study at the time of admission. The following demographic and clinical variables data were obtained as soon as the patient was admitted. Institutional Ethical Committee approval was obtained.

**Assessment of coronary artery disease extension by Coronary Angiography**

To analyse the correlation between risk scores and coronary anatomy, lesions were considered significant if  $\geq 50\%$  in the left

main coronary artery,  $\geq 70\%$  in left anterior descending coronary artery (or its diagonal branches), circumflex artery (or in its marginal branches) and right coronary artery. The severity of CAD was evaluated by Gensini score. Patients with Gensini scores of 20 or more were defined as having severe CAD, which was approximately equal to one stenosed lesion of 70% or more in the proximal left anterior descending artery

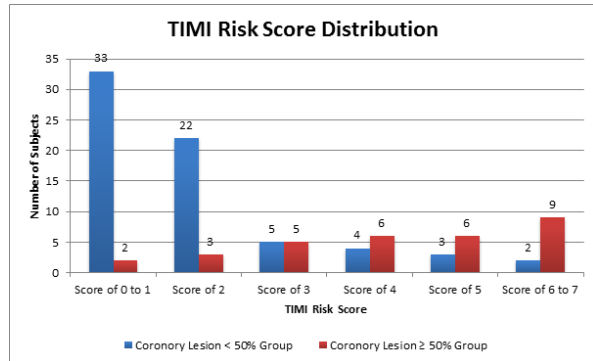
**Statistical analysis:** Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the Unpaired t test. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as  $P < 0.05$ .

**RESULT**

In our study population containing 100 patients with ACS, the mean age was 47.96. On analyzing those with significant stenosis ( $>50\%$ ), the mean age was found to be 46.8. This study included totally 61 male patients of which 18 had  $>50\%$  coronary artery stenosis, 39 were females in whom 13 patients had  $>50\%$  stenosis. This predicts higher prevalence of CAD in males. The prevalence of Diabetes mellitus among NSTEMACS was found to be 60%. Systemic Hypertension prevalence was 51%, Dyslipidemia is prevalent in 40% of patients.

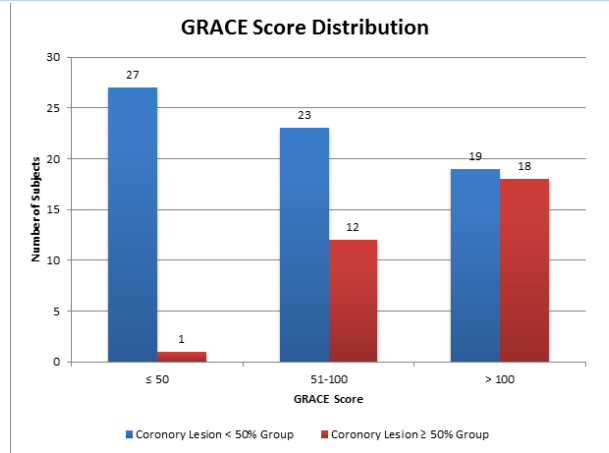
In TIMI score  $>4$ , Single vessel disease CAD occurred in 23 (23.4%) patients, while double vessel, three vessel and Left main involvement occurred in 14 (13.9%), 53 (52.9%) and 10 (9.8%) patients respectively. In patients with TIMI score 4 was significantly associated with three vessel and Left main CAD, and three vessel disease was three times more likely to be observed in patients with TIMI score  $>4$  than in patients with TIMI score  $<4$  than in TIMI score in patients with TIMI  $>4$  than in patients with TIMI score 0 to 4.

In GRACE score  $>133$ , SVD occurred in 22 (22%) patients, while 2VD, 3VD and LM CAD occurred in 19(19%), 48 (48%) and 12 (12%) patients respectively.



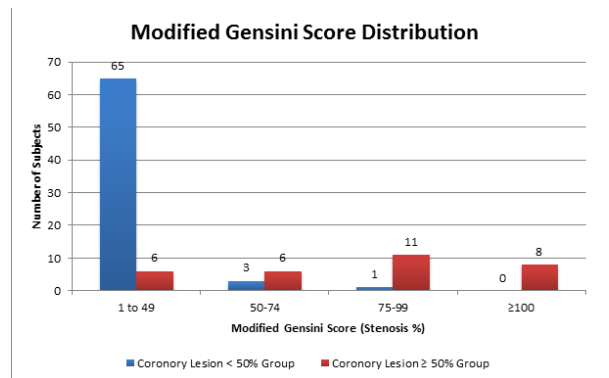
TIMI Risk Score	Coronary Lesion < 50% Group	Percentages	Coronary Lesion $\geq$ 50% Group	Percentages
Score of 0 to 1	33	47.83	2	6.45
Score of 2	22	31.88	3	9.68
Score of 3	5	7.25	5	16.13
Score of 4	4	5.80	6	19.35
Score of 5	3	4.35	6	19.35
Score of 6 to 7	2	2.90	9	29.03
Total	69	100.00	31	100.00
Chi Square Statistic				15.300
Degrees of Freedom				5
P value (Chi Square Test with Yates Correction)				0.009*

By conventional criteria the association between TIMI Risk Score and acute coronary syndrome Severity is considered to be statistically significant since  $p < 0.05$ .



GRACE Score	Coronary Lesion < 50% Group	Percentages	Coronary Lesion $\geq$ 50% Group	Percentages
$\leq 50$	27	39.13	1	3.23
51-100	23	33.33	12	38.71
$> 100$	19	27.54	18	58.06
Total	69	100.00	31	100.00
Chi Square Statistic				7.110
Degrees of Freedom				2
P value (Chi Square Test with Yates Correction)				0.029*

By conventional criteria the association between Grace Score and acute coronary syndrome Severity is considered to be statistically significant since  $p < 0.05$ .



Modified Gensini Score (Stenosis %)	Coronary Lesion < 50% Group	Percentages	Coronary Lesion $\geq$ 50% Group	Percentages
1 to 49	65	94.20	6	19.35
50-74	3	4.35	6	19.35
75-99	1	1.45	11	35.48
$\geq 100$	0	0.00	8	25.81
Total	69	100.00	31	100.00
Chi Square Statistic				47.100
Degrees of Freedom				2
P value (Chi Square Test with Yates Correction)				0.001*

By conventional criteria the association between Gensini Score and acute coronary syndrome Severity is considered to be statistically significant since  $p < 0.05$ .

**Discussion**

In our study NSTEMACS patients undergoing coronary angiography, demonstrated the superiority of the GRACE risk score compared with TIMI risk score in predicting a greater extent of CAD<sup>4, 5</sup>. The risk stratification is important as it has been consistently proved that early coronary intervention in high-risk

patients improves clinical outcomes<sup>6,7</sup>. The TIMI risk score based on the TIMI IIB4 and Efficacy and Safety of Subcutaneous Enoxaparin Non-Q-wave Coronary Events (ESSENCE) trial<sup>12</sup> incorporates seven variables, each having one point, while the GRACE risk score on the other hand is a more extensive scoring system, utilising variables like age, heart rate, systolic blood pressure, creatinine (mg/dl), killip class, cardiac arrest at admission, elevated cardiac markers and ST-segment deviation<sup>8,9</sup>. In addition to predicting the clinical outcome after NSTEMI/ACS, these scores have also been studied with regards to their correlation with the extent and severity of CAD on coronary angiography<sup>10</sup>. These studies showed a strong association of TIMI score >4 with multi vessel CAD and LM disease and the low TIMI score with normal or non-obstructive CAD; these findings correlates well with our study.

This study showed that compared with TIMI score, GRACE score provides greater diagnostic information with regards to the extent of CAD in patients with NSTEMI/ACS. The results of our study suggests the GRACE score should be given preference in risk-stratifying NSTEMI/ACS patients as it is associated both with better assessment of mortality as well as prediction of the severity of CAD

### CONCLUSION

Risk scores are simple methods of determining prognosis and categorize patients in to high risk or low risk for future ischemic events and death. Their use help us to decide upon various therapies in patients with NSTEMI/ACS. Our study demonstrates that among patients presenting with NSTEMI/ACS who underwent coronary angiography, clinical risk stratification according to the TIMI risk score and GRACE score correlates with the angiographic extent of CAD. In our study when both the scores are compared, the GRACE score is found to be superior and correlates better with multi vessel and left main disease.

### REFERENCES

1. Antman EM, Cohen M, Bernink PJ, McCabe CH, Horacek T, Papuchis G, et al. The TIMI risk score for unstable angina/non-ST elevation MI: a method for prognostication and therapeutic decision making. *JAMA* 2000; 284: 835-42
2. Antman EM, McCabe CH, Gurfinkel EP, Turpie AGG, Bernink PJLM, Salein D, et al. Enoxaparin prevents death and cardiac ischemic events in unstable angina/non-Q-wave myocardial infarction: results of the Thrombolysis In Myocardial Infarction (TIMI) IIB Trial. *Circulation* 1999; 100:1593-601.
3. Granger CB, Goldberg RJ, Dabbous OH, Pieper KS, Eagle KA, Cannon CP et al. Predictors of hospital mortality in the global registry of acute coronary events. *Arch Intern Med* 2003; 163:2345-2353
4. de Araújo Gonçalves P, Ferreira J, Aguiar C, Seabra-Gomes R. TIMI, PURSUIT, and GRACE risk scores: sustained prognostic value and interaction with revascularization in NSTEMI/ACS. *Eur Heart J* 2005; 26:865-872.
5. Ramsay G, Podogrodzka M, McClure C, Fox KA. Risk prediction in patients presenting with suspected cardiac pain: the GRACE and TIMI risk scores versus clinical evaluation. *QJM* 2007; 100:11-8.
6. Morrow DA, Antman EM, Snapinn SM, McCabe CH, Theroux P, Braunwald E. An integrated clinical approach to predicting the benefit of tirofiban in non-ST elevation acute coronary syndromes. Application of the TIMI risk score for UA/NSTEMI in PRISM-PLUS. *Eur Heart J* 2002; 23:223-229.
7. Cannon CP, Weintraub WS, Demopoulos LA, Vicari R, Frey MJ, Lakkis N, et al. Comparison of early invasive and conservative strategies in patients with unstable coronary syndromes treated with the glycoprotein IIb/IIIa inhibitor tirofiban. *N Engl J Med* 2001; 344:1879-87.
8. Nakachi T, Kosuge M, Hibi K, Ebina T, Tsukahara K, Okuda J, et al. Comparison of GRACE risk score versus TIMI risk score on angiographic findings in patients with non-ST-segment elevation acute coronary syndrome. *J Am Coll Cardiol* 2010; 55: A115-E1071.
9. Eagle KA, Lim MJ, Dabbous OH, Pieper KS, Goldberg RJ, Van de Werf F, et al. A validated prediction model for all forms of acute coronary syndrome: estimating the risk of 6-month postdischarge death in an international registry. *JAMA* 2004; 291:2727-33.
10. Ben Salem H, Ouali S, Hammas S, Bougizma I, Gribaa R, Ghannem K, et al. Correlation of TIMI risk score with angiographic extent and severity of coronary artery disease in non-ST-elevation acute coronary syndromes. *Ann Cardiol Angeiol* 2011; 60:87-91