

Association of GRACE Risk Score with Angiographic Severity of Coronary Artery Disease in Patients with Non ST-elevation Acute Coronary Syndrome

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Abstract:

Background: Due to the wide spectrum of risk for death and recurrent events among patients with NSTEMI-ACS, management guidelines emphasise the importance of early risk stratification. In addition to prognostic assessment, predicting the anatomical extension of coronary artery disease is potentially useful for clinical decision. The aim of the study is to determine whether the GRACE risk score correlates with the angiographic extent and severity of coronary artery disease in patients with non ST-elevation ACS

Methods: A total of 50 patients with non-ST-elevation acute coronary syndrome were enrolled to the study. Based on the GRACE risk score classification system, the patients were divided into low (<108), intermediate (109-140), and high (>140) risk groups. All patients underwent coronary angiography within five days after admission. The severity of the coronary artery disease was assessed by Gensini score. Relation between Grace score and Gensini score was evaluated.

Results: Mean Gensini score were 12.20 ± 13.60 , 34.52 ± 13.50 and 48.41 ± 14.56 in low group, intermediate group and high GRACE risk group respectively and the difference of mean Gensini score was statistically significant ($p < 0.001$). A GRACE score of 135 was identified as the optimal cut-off to predict severe CAD (sensitivity = 82.4% and specificity = 75.8%). In our study correlation coefficient between GRACE risk score and Gensini score was $r = 0.66$ ($p < 0.001$).

Conclusion: The study demonstrates that the GRACE risk score has significant positive correlation with coronary artery stenosis in patients with non-ST-elevation acute coronary syndrome.

Key words: % GRACE Risk Score % Gensini Score % Coronary Artery Disease % Non-ST-Elevation acute coronary syndrome.

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Introduction:

Cardiovascular disease (CVD) is the number one cause of death worldwide, accounting for 17.9 million deaths per year. It contributes 30% of all deaths. Among them 80% occur in low and middle-income countries.¹ The exact prevalence of coronary artery disease (CAD) in Bangladesh is not known. More recent data indicates that CAD prevalence is 1.85% to 3.4% in rural population and 19.6% in an urban population.²

Patients presenting with non-ST elevation ACS are at risk for adverse events such as death or recurrent infarction. The risk scores were created and are recommended by national and international guidelines to identify patients with a higher probability for the occurrence of adverse event.³

The GRACE (Global Registry of Acute Coronary Events) risk score, which was derived from a large international registry, aim to provide a simple and applicable risk score. However, it is not intended to identify the severity of coronary artery disease (CAD). Estimating the possible severity of CAD before performing coronary angiography may change the therapeutic decision and the timing of interventions.

The aim of the present study was to evaluate the relationship between GRACE score and severity of coronary artery disease (CAD) angiographically evaluated by Gensini score in patients with NSTEMI-ACS.

Methods:

This cross sectional, observational study was done in the Department of Cardiology, University Cardiac Center,

BSMMU, Dhaka, Bangladesh from August, 2017 to July, 2018. Patients who were admitted with NSTEMI-ACS fulfilled the inclusion criteria were included in the study. Among them 50 patients were selected by purposive sampling. Patients with previous coronary artery bypass graft (CABG), percutaneous coronary intervention (PCI), myocardial infarction (MI), and who did not accept coronary angiography were excluded from the study.

For each patient, GRACE score was calculated by using specific variables collected at admission. Patients were classified into 3 categories low (1–108), intermediate (109–140), and high (>140), according to the GRACE score. All patients underwent emergency, early or elective coronary angiography within 5 days of admission (mean 3 days). Gensini scoring system was used to evaluate the severity and extent of coronary stenotic lesions.

Coronary angiography and Gensini score:

Coronary angiography was performed in all patients. Left and right coronary angiographies were performed at various projections. Interpretation of coronary stenosis was done by 2 experienced cardiologists and Gensini score was calculated for each patient according to coronary angiography results.

Gensini score was computed by assigning a severity score to each coronary stenosis according to the degree of luminal narrowing and its geographic importance. Reductions of 25%, 50%, 75%, 90%, 99%, and complete occlusion, were given Gensini scores of 1, 2, 4, 8, 16, and 32, respectively. Each principal vascular segment was assigned a multiplier in accordance with the functional significance of the myocardial area supplied by that segment: the left main coronary artery $\times 5$; the proximal segment of left anterior descending coronary artery (LAD) $\times 2.5$; the proximal segment of the circumflex artery $\times 2.5$; the mid-segment of the LAD $\times 1.5$; the right coronary artery, the distal segment of the LAD, the posterolateral artery, and the obtuse marginal artery $\times 1$; and others $\times 0.5$.

Significant coronary artery disease was defined as $> 70\%$ stenosis in any of the three major epicardial coronary arteries or a left main coronary artery stenosis $> 50\%$. Extent of CAD was defined as significant single, two or three vessel CAD. Score ranges from 0 to 3, depending on the number of vessel involve.

Statistical analyses:

Statistical analysis was carried out by using the Statistical Package for Social Sciences (SPSS) version 20.0 for

Windows. Mean and standard deviation were computed for quantitative variables and was analyzed by Student's t-test and ANOVA. Frequency and percentage were computed for categorical variables like gender, risk factors. To test association between GRACE risk score and coronary artery disease severity score Pearson's correlation coefficient test was used. P value of less than 0.05 was considered as significant. The receiver operating characteristics (ROC) curve was used to test the strength of the risk score in predicting the angiographic severity of coronary artery disease.

Results:

The mean age of the study population was 54.8 ± 9.2 years ranging from 32 - 75 years and most of the patients (40%) were belonged to 50 - 59 years of age. Among 50 patients 41 (82%) were male and 9 (12%) were female. So male were predominant in this study. Risk factors analysis revealed that highest percentage (56%) of the patients had history of hypertension. Diabetes mellitus and smoking were the second commonest (44%) risk factor after hypertension. The mean GRACE score of the study population was 133.92 ± 27.56 and when divided into low, intermediate and high risk group according to GRACE score, it was found respectively 20.0%, 46.0% and 34.0% patients in each group (Figure 1)

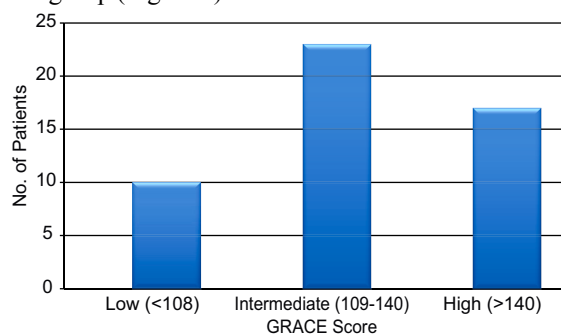


Fig.-1: Distribution of the study population according to GRACE Score

Mean Gensini score were 12.20 ± 13.60 , 34.52 ± 13.50 and 48.41 ± 14.56 in low, intermediate and high GRACE risk group respectively (Table-I) and the difference of mean Gensini score was statistically significant ($p < 0.001$). So higher is the GRACE score also higher the Gensini score.

Table-I

Difference of Gensini score between groups according to GRACE Score

GRACE Score	Gensini score (Mean \pm SD)	P-value
Low (<108) n=10	12.20 ± 13.60	
Intermediate (109-140) n=23	34.52 ± 13.50	$< 0.001^S$
High (>140) n=17	48.41 ± 14.56	

The correlation co-efficient between GRACE risk score and Gensini score was $r = 0.667$ ($p < 0.001$). So the GRACE score was positively and significantly associated with the Gensini score (Fig.-2).

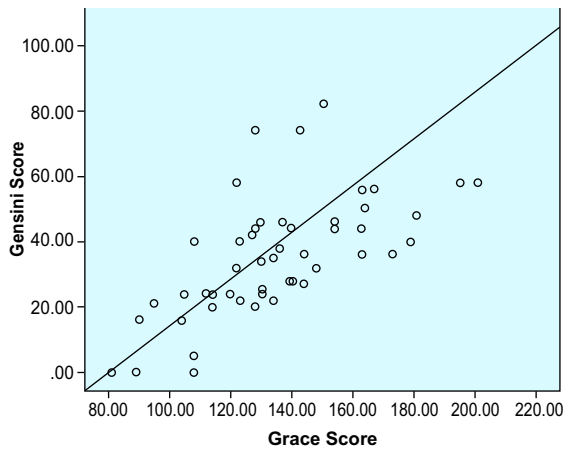


Fig.-2: Scatter diagram showing correlation between GRACE Score and Gensini score

The results of Receiver operating characteristic (ROC) curve for GRACE score is shown in Figure 3. A GRACE score of 135 was identified as the optimal cut-off to predict severe CAD (sensitivity = 82.4% and specificity = 75.8%, AUC = 0.86, 95% CI = 0.76-0.96, $P < 0.001$).

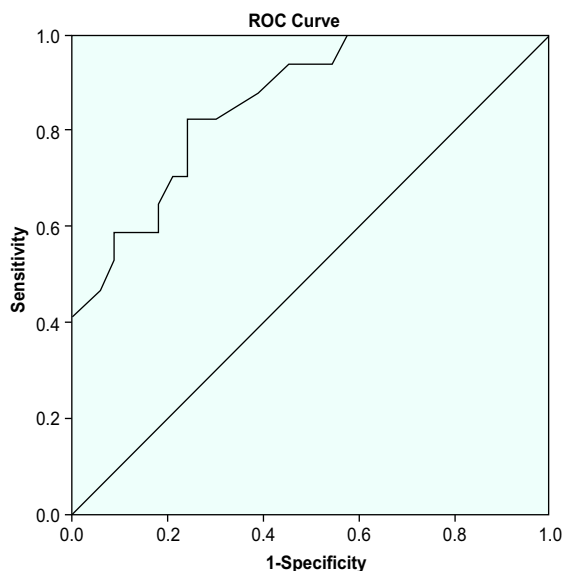


Fig.-3: Receiver operating characteristic (ROC) curve for determination of cut-off value to predict severe coronary artery disease.

Discussion:

Due to the wide spectrum of risk for death and recurrent events among patients with NSTEMI-ACS, management guidelines emphasise the importance of early risk

stratification. The GRACE scoring system is based on the medical history, admission ECG and biochemical evidence of myocyte necrosis. Nevertheless, GRACE score is not identify the extent of CAD. In this study, The GRACE risk score has been evaluated for its ability to detect the extent of CAD among patients with NSTEMI-ACS.

This study revealed that many independent variables have been shown to be associated with severe coronary obstruction in patients presenting with NSTEMI-ACS. Among the clinical variables, elderly patients have more severe lesions compared the younger patients. Diabetic patients exhibit substantially more severe coronary atherosclerosis than non-diabetic patient. Renal function is also an important predictor of the presence and severity of angiographic CAD. Therefore, it is not surprising to find an association of GRACE score with the severity of CAD considering that all of these predictors indicating unfavorable coronary anatomy, except for the presence of diabetes, take part in the GRACE scoring system.

This study showed normal coronary arteries and noncritical CAD were more often found in patients in the low-risk group by GRACE score and TVD were more often found in patients in the high-risk group by GRACE score. Specifically, low-risk patients are more likely to have normal coronary arteries or noncritical CAD, whereas intermediate and high-risk patients are more likely to have significant CAD. So GRACE score is also important for determining the severity of the CAD beside predicting death.

Our study found that Gensini score was positively and significantly correlated with the GRACE score. The significant linear relationship between Gensini score and GRACE score is reported in Fig. 2 ($r = 0.667$, $p < 0.001$). With the increased GRACE score, Gensini score increases demonstrating more severe coronary atherosclerosis.

So, according to the results of this study, patients with high GRACE score have more severe CAD, therefore angiography is important in the first 24 hr for early intervention in these patients.

Limitations of the study:

There are some limitations to this study. Sample size was small in number to generalize the results, sampling method was not random and coronary angiography was assessed by visual observation, intravascular ultrasonography was not used, so there was every chance of interobserver variation.

Conclusion:

This study demonstrates that the GRACE risk score has significant positive correlation with coronary artery stenosis in patients with non-ST-elevation acute coronary syndrome. Nevertheless further large-scale, multicenter study is recommended.

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