

CLINICAL ASSOCIATION AMONG GRACE SCORE AND SYNTAX SCORE IN NON ST ELEVATION MYOCARDIAL INFARCTION PATIENTS

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ABSTRACT:

INTRODUCTION:

American College of Cardiology, American Heart Association, and the European Society of Cardiology advocate utilization of variety of risk assessment tools for assessment of ischemia.

AIMS & OBJECTIVE:

To find association among GRACE and SYNTAX scores in acute coronary syndrome individuals excluding STEMI.

MATERIAL & METHODS:

This research was carried out in Cardiology Department of Central Park Teaching Hospital, Lahore over a period of 6 months. Total 273 patients satisfying the inclusion criteria were included in this research project. All patients underwent an examination for the calculation of GRACE risk score. After cardiac catheterization, SYNTAX score was calculated. The researcher personally calculated both scores. The parameters were recorded on a pre- designed proforma.

RESULTS:

The mean age of patients was 54.81 ± 13.14 years, spanning a range from 30 to 80 years. A higher male-to-female ratio was observed with 164(60.07%) cases being male and 109(39.93%) cases being female. The mean duration of diagnosis was 14.35 ± 5.23 hours with minimum and maximum duration as 6 and 23 hours. The mean Grace risk score was 137.40 ± 13.52 and the syntax score was 28.68 ± 3 . There was correlation of 0.775 among Grace risk score and Syntax score, with significant p-value i.e. < 0.001 .

CONCLUSION:

A robust positive association exists among GRACE and SYNTAX scores in non-STEMI acute coronary syndrome patients. Hence, grace and syntax score may be applied in our clinical setting for identification of high risk patients (with higher GRACE score). As we can avoid unnecessary intervention of low risk individual and referral of high risk patients with further workup and management.

KEY WORDS:

Cardiovascular disease, GRACE score, Syntax scoring.

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INTRODUCTION

The guidelines provided by the American Heart Association/American College of Cardiology and the European Society of Cardiology recommend employing different methods of risk assessment.^{1,2} In the case of patients experiencing acute coronary syndrome, one crucial tool for risk evaluation is the GRACE score. Additionally, the SYNTAX score is an angiography based scoring method while deciding among percutaneous coronary intervention and coronary artery bypass grafting surgery as methods of revascularization.

A research study showed that the association among GRACE score and SYNTAX score.³ While another study reported weak positive relationship among grace and syntax scores in ACS individuals.⁴

The current study is designed to investigate relationship among grace and syntax scores in individuals with ACS excluding STEMI in local population. Although the data is available on such correlation but there the correlation is available with wide range 0.23 - 0.85.⁵ If high correlation is also found in current study then in future the use of GRACE score for predicting outcomes can be done with confidence.. Identification of patients at high risk (higher GRACE score) with acute coronary syndrome in developing country like Pakistan having lower health resources is of much importance to avoid unnecessary work up in low risk patients (low GRACE score) and accurate referral of high risk patients for further workup and management.

METHODOLOGY

This research with cross-sectional design took place in Cardiology unit of Central Park Teaching Hospital, Lahore over a period of 6 months.

Sample size and technique: A total of 273, using 5% margin of error and 95% confidence level and using relationship among grace and syntax scores in individuals with ACS was 0.23.⁹ The

research utilized sequential non-probability sampling method.

Inclusion criteria

Individual ranging from 30-81 years, comprising of both male and female gender with Non STEMI ACS and diagnosed in last 1 day and patients undergoing coronary angiogram were enrolled in this research project.

Exclusion criteria

Criteria for eliminating from the study included those with STEMI, individuals having thoracic discomfort attributed to non-ischemic causes like myocarditis or takotsubo syndrome, those displaying recent onset LBBB on electrocardiogram, and patients having creatinine greater than 1.50 mg/dl or receiving hemodialysis & liver diseases (SGOT greater than 60 IU/L, SGPT greater than 60 IU/L).

DATA COLLECTION PROCEDURE:

After meeting inclusion criteria patients were enrolled from cardiology department. After taking informed consent their basic demographical history (name, age, gender) and contact details were taken. All individuals were scrutinized to calculate the GRACE risk score. Following cardiac catheterization, SYNTAX score was calculated. Both scores were measured by researcher himself. The data acquired in this manner was documented on a pre-designed form. Data collection tool was a Proforma which is annexed.

DATA ANALYSIS:

The collected information was analyzed through SPSS version 24. Mean \pm SD was calculated for age, weight, height, BMI, duration of diagnosis, GRACE and SYNTAX score. Frequency and percentages were measured for Qualitative variables like gender. Pearson correlation was applied between GRACE and SYNTAX. P-value less than or equal to 0.05 was regarded as statistically important. Data was categorized into age, gender, BMI (≤ 30 , > 30) to check various factors influencing the outcome. Post stratified Pearson correlation was computed and

p-value less than or equal to 0.05 was acknowledged as important.

RESULTS:

The patient's mean age was 54.81 ± 13.14 years ranging from minimum age of 30 to maximum age of 80 years. 108 cases (39.56%) were in the 30-50 age range, while 165 cases (60.44%) fell within the

60-80 age bracket (Table-1 Fig-1) A total of 164(60.07%) cases were male and 109(39.93%) cases were female, indicating higher male- to- female ratio. Fig-2

The mean values for weight, height & BMI was 81.05 ± 14.53 kg, $1.70 \text{ m} \pm 0.12$ and 28.20 ± 5.61 respectively. There were

Table-1- Patient's age in years	
<i>Mean</i>	54.81
<i>S.D</i>	13.14
<i>Range</i>	50
<i>Minimum</i>	30
<i>Maximum</i>	80

Table 2 Weights (kilogram), heights (meter) and BMI of patients			
	Weight (kg)	Height (m)	BMI
<i>Mean</i>	81.05	1.70	28.20
<i>S.D</i>	14.53	0.12	5.61
<i>Range</i>	55.00	.44	25.98
<i>Minimum</i>	60.00	1.44	17.53
<i>Maximum</i>	115.00	1.88	43.51

Table-3: Descriptive statistics of duration of diagnosis (hours)	
Duration of diagnosis (hours)	
<i>Mean</i>	14.35
<i>S.D</i>	5.23
<i>Range</i>	17
<i>Minimum</i>	6
<i>Maximum</i>	23

Table-4: Grace risk score and syntax score		
	Grace- risk score	Syntax score
<i>Mean</i>	137.40	28.68
<i>S.D</i>	13.52	3.00
<i>Minimum</i>	113.00	23.00
<i>Maximum</i>	170.00	33.00

Table-5: Association between Grace Risk score and Syntax score	
Correlation between Grace risk score and Syntax score	
Pearson Correlation	0.775**
p-value	<0.001**
No. of cases	273
**High positive correlation	

Table-6: Association among Grace Risk score and Syntax score with age groups (years)		
Age groups (years)	Grace risk score and syntax score	
30-50	Pearson Correlation	0.794**
	p-value	<0.001**
60-80	Pearson Correlation	0.762**
	p-value	<0.001**
**High positive association		

Table-7: Association among Grace Risk score and Syntax score with gender		
Gender	Grace risk score and syntax score	
Male	Pearson Correlation	0.715**
	p-value	<0.001**
Female	Pearson Correlation	0.892**
	p-value	<0.001**
**High positive correlation		

Table-8: Association among Grace Risk score and Syntax score with BMI		
BMI	Grace risk score and syntax score	
Obese	Pearson Correlation	0.761**
	p-value	<0.001**
Non-obese	Pearson Correlation	0.781**
	p-value	<0.001**
**High positive correlation		

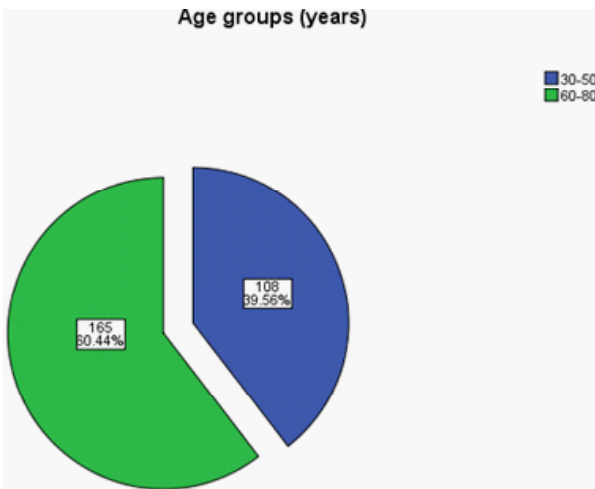


Fig 1.

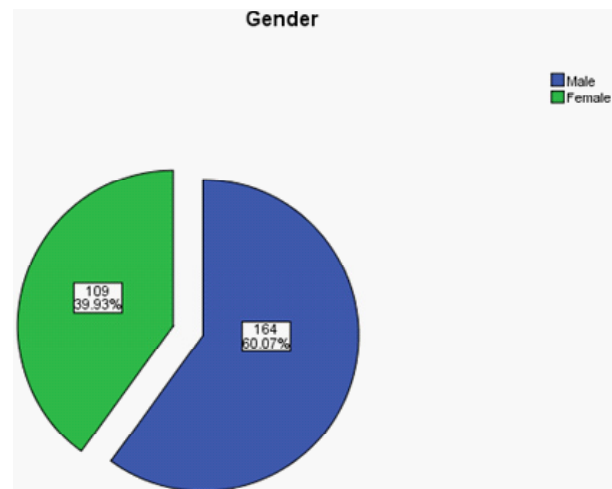


Fig 2.

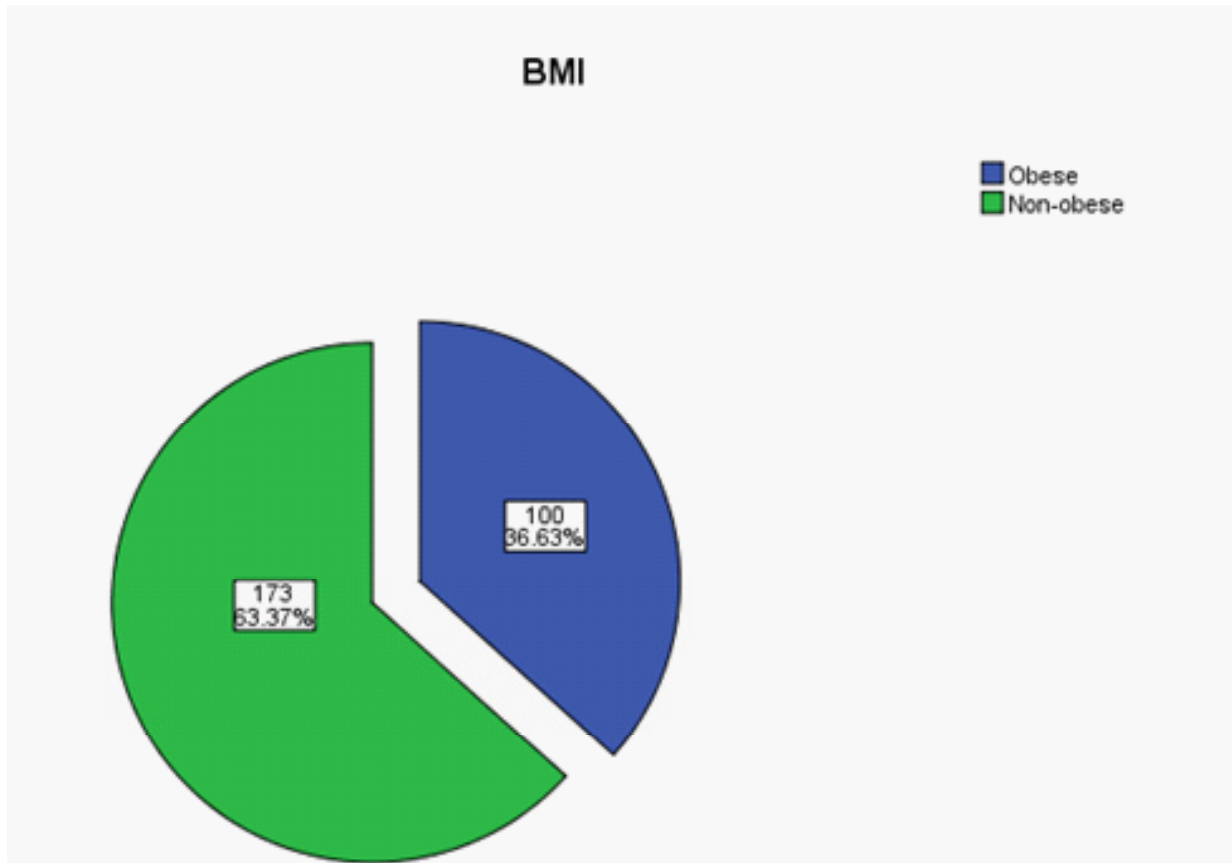


Fig 3.

100(36.63%) obese and 173(63.37%) were no obese cases. Table-2, Fig-3

The mean duration of diagnosis was 14.35 ± 5.23 hours with minimum and maximum duration as 6 and 23 hours. Table-3

The mean Grace risk score was 137.40 ± 13.52 and the mean value of Syntax score was 28.68 ± 3 . Table-4

The association between Grace risk score & Syntax score was 0.775, with significant p-value i.e. < 0.001 . Table-5

STRATIFICATION:

Among 30-50 years old cases, there was strong positive association among Grace score and Syntax score i.e. Correlation Coefficient (r) of 0.794 and p-value < 0.001 . Among 60-80 years old cases, there was also strong association among Grace Risk score and Syntax score i.e. Correlation Coefficient (r) of 0.672 (p-value < 0.001). Table-6

Among male and female cases there was strong positive association among Grace Risk score and Syntax score i.e.

Correlation Coefficient (r) of 0.715 (p-value < 0.001) and $r = 0.892$ (p-value < 0.001) respectively. Table -7

Among obese and non-obese cases there was strong positive association among Grace Risk score and Syntax score i.e. $r = 0.761$ (p-value < 0.001) and $r = 0.781$ (p-value < 0.001) respectively. Table-8

DISCUSSION:

Ischemic heart disease (IHD) stands out as the primary global contributor to mortality. Acute coronary syndrome (ACS) represents crucial aspect of Atherosclerotic cardiac disease. Individuals diagnosed with crescendo angina or non-ST elevation myocardial infarction (UA/NSTEMI) require prompt evaluation for determination of an early catheterization approach.

The Synergy between Percutaneous Coronary Intervention (SYNTAX) score serves as an excellent scoring tool based on angiography.⁶ It aids in making the decision among coronary artery bypass

grafting (CABG) surgery and percutaneous coronary intervention (PCI). Among individuals falling within the lowest (0 - 22) & intermediate (23 - 32) SYNTAX score categories, similar results were observed for both PCI and CABG in final analysis. However, in cases where the score was high (≥ 33), CABG yielded superior outcomes at the 12-month mark. The SYNTAX score serves as a valuable method in predicting intermediate-term results in individuals with triple vessel disease after angioplasty & offers an effective means of selecting the appropriate revascularization strategy for individuals with triple vessel disease.⁷

Contemporary clinical research underscores the importance of utilizing the GRACE scores for risk assessment & prognostic evaluation in individuals with ACS. Few research papers have studied the connection among the extent of coronary artery occlusion & the GRACE score.⁸

In certain investigations, GENSINI score system evaluated the extent of atherosclerotic cardiac disease⁸. In separate research, the effectiveness of the GRACE score to anticipate elevated risk coronary anatomy (HRCA) was evaluated including SYNTAX scores exceeding 32 or the existence of notable left main disease, lesion in proximal LAD, or two to three vessel disease affecting the LAD.⁷

The present clinical guidelines in UK and USA advise the implementation of the GRACE risk score for forecasting critical outcome in such individuals. This risk assessment model relies on diverse clinical, laboratory, and electrocardiographic factors upon admission and is routinely employed in our clinical setting to assess likelihood of mortality or major cardiac event during 6 months period, encompassing events occurring during hospitalization.⁹

Current recommendations for non-ST-elevation patients have highlighted the significance of the GRACE score in identifying elevated risk individuals. The SYNTAX score represents robust assessment method for assessing the extent of atherosclerotic cardiac Disease.¹⁰ This scoring system aids in making decision among patients with PCI and CABG, with its assessment primarily relying on the

findings from coronary angiography to gauge coronary anatomical complexity. Consequently, the GRACE score has capacity to effect prognostic plan, timing, & intensity of intervention.⁷

Until now, a considerable body of research has explored association between risk assessment tools & the extent of CAD. However, only a limited subset of these studies applied the GRACE score to anticipate substantial risk CAD, with the majority concentrating solely on individuals experiencing non-ST-elevation ACS. Moreover it's worth noting that the GRACE score has potential to expedited shifting of STEMI patients from hospitals without PCI capabilities to facilities capable of PCI, immediately following thrombolytic treatment.¹¹

A recent investigation aimed to evaluate these scoring systems and determine the GRACE score's accuracy in forecasting the severity of atherosclerotic cardiac involvement. A cumulative of 539 individuals diagnosed with ACS underwent cardiac angiogram and they were categorized based on their SYNTAX scores, distinguishing between those with SYNTAX scores less than 33 and those equal to or greater than 33. The study employed Spearman's correlation and receiver operator characteristic analysis to assess how well the GRACE score predicts SYNTAX score. The findings indicated a statistically significant positive association among the SYNTAX and the GRACE scores ($r = 0.32$, $p < 0.001$). The GRACE score demonstrated a moderately effective prediction of advanced CAD (SYNTAX ≥ 33) achieving a receiver operating curve of 0.595 (0.522–0.667). An optimal cut-off of 126 for the GRACE score was identified to anticipate SYNTAX score of ≥ 33 , achieving a sensitivity of 53.5% and specificity of 66%. Consequently, this study reveals a notable positive relationship among the GRACE and SYNTAX scores in individuals with ACS diagnosis. A interdisciplinary strategy involving cardiologists can enhance the treatment strategies and overall management for patients with ACS and elevated GRACE scores.¹²

In a similar way, another study involving 330 patients examined the utility of the GRACE score in forecasting the magnitude and range of coronary artery occlusion as indicated by the SYNTAX score.¹³ The GRACE score was assessed for each patient upon admission, and coronary angiogram was conducted in all subjects within two-day window period. SYNTAX scores were computed to gauge the magnitude and range of coronary artery disease. The study employed ROC curve analysis to determine the threshold GRACE score for evaluating a SYNTAX Score of ≥ 23 . The study results revealed that a GRACE score of 107.11 ± 34.3 was associated with a SYNTAX score of < 23 , while a GRACE score of 134.80 ± 48.3 correlated with a SYNTAX score of ≥ 23 (p-value equal to 0.001). Thus, there was noted direct relationship between the GRACE score and the SYNTAX score.¹³

In a similar study, the association among TIMI score, GRACE score system, and the SYNTAX score system is examined.¹⁴ This investigation involved 238 patients experiencing NSTEMI/ACS, and coronary angiograms were conducted while admitted in hospital. Both the GRACE score and TIMI score were computed at the time of admission, while the SYNTAX score was determined after the cardiac angiography. In this research study, SYNTAX score exceeding 32 defined the presence of critical coronary artery disease. Pearson's test was utilized for identifying connections among these scores.

The key discovery of this research demonstrated that patients with elevated GRACE scores and TIMI scores also exhibited high SYNTAX scores ($p=0.001$). Furthermore, a notable direct association was found among GRACE and SYNTAX scores ($r=0.23$, $p<0.001$), and similar association was noted among TIMI Score and SYNTAX score ($r=0.2$, $p=0.002$). GRACE score as well as TIMI score were identified as moderate predictor of obstructive CAD. This was indicated by an area under the curve (AUC) of 0.599 for GRACE score ($p = 0.015$) and an AUC of 0.639 for the TIMI score ($p = 0.001$). It was established that GRACE score of 120 was 57% sensitive and 61.8% specific, while a

TIMI score equal to 2 had a sensitivity of 75.7% and a specificity of 47.9%. Thus, this study concludes that GRACE and TIMI scores can predict existence of obstructive coronary artery disease but not the severity of occlusion in CAD.¹⁴

In developed countries, patients with ACS typically present around 68 years of age, with gender distribution of 3 males to every 2 females¹⁵. However, in our study, patients presented at notably lower age (54.81 ± 13.14 years), ranging from 30 to 80 years. Among the cases, there were 164 (60.07%) males and 109 (39.93%) females, indicating a higher male-to-female ratio. This study's findings confirm the prevalence of males. In contrast, another study reported a higher mean age and a greater male-to-female ratio, with a mean age of 60.34 ± 8.14 years, with males comprising 62% ($n=124$) of the participants⁶.

In one study, GRACE risk score exhibit mean of 138.56 with standard deviation of 7.88 and SYNTAX score showed mean of 28.69 with standard deviation of 4.86.¹⁰ In current study the mean Grace risk score was 137.40 ± 13.52 while SYNTAX score showed mean of 28.68 ± 3 . These findings are almost similar with previous study. In current study the correlation of 0.775 was identified between Grace risk score and Syntax score with significant p-value i.e. < 0.001 . Our findings are almost similar to that study in which they reported correlation of 0.85 between GRACE score and SYNTAX score.¹⁰ The correlation found in current study was better as found in one more study in which they reported weak positive correlation of 0.23 among grace and syntax scores in patients with acute coronary syndrome 0.23.⁷ Both clinical scores provide moderate prediction of presence of obstructive CAD (area under the curve [AUC] for GRACE score was 0.599 with , p-value of 0.015, while for TIMI score it was 0.639 with p-value of 0.001), however they inadequately predict the occurrence of significant disease. Predictive values of 120 for GRACE score and 2 for TIMI score were linked with obstructive CAD. showing a sensitivity of 57.1% and 75.8%, and a specificity of

61.8% and 47.9%, respectively. Therefore, the GRACE and TIMI scores exhibit a moderate correlation with magnitude of atherosclerotic heart disease as evaluated by the SYNTAX score. They are reliable in anticipating coronary artery occlusion but less effective in predicting severe disease⁷.

CONCLUSION:

It is concluded that in individual with

acute coronary syndrome excluding STEMI, robust positive association exists among GRACE and SYNTAX score. Hence, GRACE and SYNTAX score may be applied in our clinical setting for identification of elevated risk individuals (with higher GRACE score) having lower health resources. This is of much importance to avoid unnecessary work up in low-risk patients (low GRACE score) and accurate referral of high-risk patients for further workup and management.

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