

ORIGINAL ARTICLE

The severity of coronary artery disease in NSTEMI patients, as evaluated by the Syntax score, is investigated in relation to the TIMI risk score

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Abstract

Background: Non-ST elevation myocardial infarction (NSTEMI) carries significant risks. The TIMI Risk Score for NSTEMI and Syntax score are used to assess coronary artery disease severity, respectively. This study investigates the relationship between these two scores in NSTEMI patients to potentially refine treatment strategies and risk stratification.

Methodology: The Department of Cardiology carried out this descriptive cross-sectional research investigation in PIMS, Islamabad, Pakistan, included 297 NSTEMI patients who underwent coronary angiography between August 27, 2022, and February 26, 2023. The TIMI Risk Score (based on clinical variables) and Syntax Score (calculated using syntax.com) were determined for each patient. Data analysis, performed using SPSS Version 21, included descriptive statistics, Pearson correlation to assess the relationship between the scores, and stratified analysis to control for potential effect modifiers (age, gender, diabetes mellitus, hypertension, smoking status, BMI, and extent of coronary artery disease).

Results: The age range of the 297 NSTEMI patients (median 59) was 18 to 75 years old. There were 136 (45.8%) females and 161 (54.2%) males in the group. The TIMI Risk Score and the Syntax Score showed a weak positive correlation ($r = 0.117$, $p = 0.0001$), indicating a restricted relationship.

Conclusion: This study found a weak correlation among Syntax Score and the TIMI Risk Score in patients with NSTEMI. Further research is needed to confirm these findings and explore the implications for clinical practice.

Keywords

TIMI Risk Score, SYNTAX Score, NSTEMI, Coronary Artery Disease, Risk Stratification.

Introduction

Non-ST elevation myocardial infarction (NSTEMI) is a common form of acute coronary syndrome that presents with diverse clinical manifestations and carries a significant risk of adverse cardiovascular events. Risk stratification tools are crucial for appropriate management and decision-making in NSTEMI patients. Among these tools, the Thrombolysis in Myocardial Infarction (TIMI) risk score is widely utilized to estimate the risk of adverse cardiovascular outcomes based on clinical variables. On the other hand, the Syntax score, determined by coronary angiography, provides an objective assessment of the severity and complexity of coronary artery disease (CAD). The TIMI risk score has been validated in multiple studies and is recommended by clinical guidelines as a reliable tool for risk assessment in NSTEMI patients. This scoring system incorporates clinical variables such as age, heart rate, blood pressure, and biomarker levels to predict short-term and long-term adverse cardiovascular events¹.

In parallel, the Syntax score has gained recognition as a valuable tool for assessing the severity and complexity of CAD. By considering angiographic variables including the extent, location, and severity of coronary artery lesions, the Syntax score enables a comprehensive evaluation of the coronary tree. It has proven useful in risk stratification and guiding revascularization strategies in patients with complex CAD. However, there is limited research investigating the relationship between the TIMI risk score and the Syntax score in NSTEMI patients. A few studies have explored the association between these scores in a general population of acute coronary syndrome patients, including both ST-segment elevation myocardial infarction (STEMI) and NSTEMI cases². A study compared the HEART, TIMI and GRACE scores for the prediction of 30-day major adverse cardiac events in patients with high acuity chest pain in the emergency department and found that the HEART score to be superior to the TIMI and GRACE scores in predicting 30-day MACE. In addition, another study demonstrated that the

GRACE and TIMI scores correlated moderately with the extent of coronary disease assessed by the SYNTAX score, and they could predict obstructive CAD but not severe disease³. A study conducted by Hammami R, et al in 2018 reported a positive correlation between TIMI and SYNTAX scores ($r=0.2$)³⁻⁶. The study of Imran Ali, et al found positive weak correlation as ($r=0.162$) (4). American heart association (AHA) guidelines recommend use of the Thrombolysis in Myocardial Infarction (TIMI) risk score as a prognostic tool for in-hospital and long-term mortality.

However, the specific relationship between these scores in the context of NSTEMI patients remains unclear. Therefore, this study aims to bridge this knowledge gap by analyzing the correlation between the TIMI risk score and the severity of CAD, as assessed by the Syntax score, specifically in NSTEMI patients. This investigation may provide valuable insights into the utility of the TIMI risk score as a surrogate marker for assessing the severity of CAD in this specific patient population.

Methodology

This descriptive cross-sectional study was conducted at the Department of Cardiology, PIMS, Islamabad, from August 27, 2022, to February 26, 2023. The sample size was determined using an online calculator, based on the correlation between the TIMI Risk Score and the severity of coronary artery disease ($r = 0.165$), with a significance level (α) of 5% and a power of test ($1-\beta$) of 80%. The calculated sample size was 297. A non-probability consecutive sampling technique was used to recruit participants.

The inclusion criteria comprised patients aged 18 to 75 years, diagnosed with NSTEMI, of either gender, and who had undergone coronary angiography within the last week. Patients were excluded if they had ST-segment elevation myocardial infarction, left bundle branch block on ECG, a history of prior cardiac surgery or intervention, non-ischemic chest pain, or refused to provide consent.

Data collection was started from Subjects who fulfilled the inclusion criteria were included in the study after taken the written informed consent regarding the inclusion of his/ her data in this study after assuring them the secrecy of information, Demographics (such as gender, age (years)), weigh, height, diabetic mellitus, hypertension and smoking status. Well-trained personnel measured subjects' height (in cm) while wearing no shoes using a wall-mounted stadiometer and weight (in kg) while wearing light clothing and no shoes using a scale (SECA 755, Hamburg, Germany). TIMI score of all the included patients obtained at the time of presentation in emergency department as per the scoring criteria provided in annexure "A". SYNTAX score was calculated after performing conventional angiography of the patients using syntax.com calculator.

This study included 297 patients in order to evaluate the relationship between the severity of coronary artery disease (as assessed by the Syntax Score) and the risk score for thrombolysis in myocardial infarction (TIMI) in non-ST elevation myocardial infarction.

clothing and no shoes using a scale (SECA 755, Hamburg, Germany). TIMI score of all the included patients obtained at the time of presentation in emergency department as per the scoring criteria provided in annexure "A". SYNTAX score was calculated after performing conventional angiography of the patients using syntax.com calculator.

Results

The findings were summarized as follows:

As indicated in the tables 1-8, the Shapiro-Wilk test was used to evaluate the distribution of continuous variables for age ($P=0.0001$), weight ($P=0.0001$), height ($P=0.0001$), body mass index ($P=0.0001$), TIMI score ($P=0.0001$), and SYNTAX score ($P=0.0001$).

Table 1: Normality Assessment of Continuous Variables Using the Shapiro-Wilk Test (n=297)

Variable	Mean±Sd	P-Value
Age group	56.99±12.28	0.0001
Weight	74.89±9.62	0.0001
Height	1.68±0.07	0.0001
Body mass index	26.65±3.67	0.0001
TIMI Score	4.67±2.05	0.0001
SYNTAX Score	26.05±12.83	0.0001

Table 2: Correlation Analysis of TIMI Risk Score and Syntax Score in NSTEMI Patients (n=297)

Comparison	Mean	SD	Coefficient Of Correlation (R)	P-Value
TIMI Risk Score	4.6758	2.05	0.117	0.0001
SYNTAX Score	26.05	12.83		

Applied Pearson Correlation test

Table 3: Age-Stratified Correlation Coefficients for TIMI Risk Score and Syntax Score n=297

Age Group [In Years]		Mean	SD	Coefficient Of Correlation (r)	P-Value	
18 – 50	TIMI	4.17	2.00	0.094	0.0001	
	SYNTAX	26.75	13.05			
>50	TIMI	4.82	2.05	0.130		
	SYNTAX	25.84	12.79			
Extent Of CAD						
SVD	TIMI	4.40	2.04	0.080		
	SYNTAX	27.11	13.59			
2VD	TIMI	4.94	2.01	0.213		
	SYNTAX	24.96	12.21			
3VD	TIMI	4.55	2.09	0.065		
	SYNTAX	26.54	12.98			

Table 4: BMI-Stratified Correlation Coefficients for TIMI Risk Score and Syntax Score (n=297)

BMI [In kg/m ²]		Mean	SD	Coefficient Of Correlation (r)	P-Value
19 – 24	TIMI	5.14	1.81	-	0.0001
	SYNTAX	28.61	12.78		
>24	TIMI	4.54	2.10	0.140	
	SYNTAX	25.32	12.78		

Applied Pearson Correlation test

Table 5: Gender Structural Analysis Concerning the Correlation Between TIMI Risk Score and Syntax Score n=297

Gender		Mea n	SD	Coefficient Of Correlation (r)	P- Value
Male	TIMI	4.67	1.99	0.25 1	0.0001
	SYNT	24.4	12.77		
	AX	5			
Female	TIMI	4.67	2.12	- 0.03 1	0.0001
	SYNT	27.9	12.70		
	AX	3			

Applied Pearson Correlation test

Table 6: Analyzation Of Diabetes Mellitus In Respect To The Link Between Syntaxscore And Timi Risk Score n=297

Diabetes Mellitus		Mean	SD	Coefficient Of Correlation (r)	P-Value
Diabetic	TIMI	4.09	2.1 1	0.1 19	0.0001
	SYNT	25.7	12.		
	AX	2	86		
Non-Diabetic	TIMI	5.04	1.9 3	0.1 13	0.0001
	SYNT	26.2	12.		
	AX	5	85		

Applied Pearson Correlation test

Table 7: Hypertension's statistical significance in relation to the correlation between the hybrid score and the TIMI risk score n=297

Hypertension		Mea n	±S D	Coefficient Of Correlation (R)	P-Value
Hypertensive	TIMI	5.00	1.9 2	0.1 87	0.0001
	SYNT	29.2	12.		
	AX	6	93		

Non- Hypertensive	TIMI	4.39	2.1	0.003	0.0001
	<hr/>				
	SYNT	23.2	12.		
	AX	9	13		

Applied Pearson Correlation test

Table 8: Statistics on smoking status in relation to the correlation between the Syntax Score and the TIMI Risk Score n=297

SMOKING STATUS		Mean	SD	Coefficient Of Correlation (R)	P-Value
Smoker	TIMI	4.70	2.1	0.125	0.0001
	<hr/>				
	SYNT	26.3	12.		
	AX	3	70		
Non-Smoker	TIMI	4.65	1.9	0.11	0.0001
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	SYNT	25.8	12.		
	AX	5	97		

Applied Pearson Correlation test

Discussion

Patients presenting with non-ST elevation ACS (acute myocardial infarction non-ST elevation or unstable angina) are at risk for adverse events such as death or recurrent infarction. The risk scores were created and are recommended by national and international^{7,8} guidelines to identify patients with a higher probability for the occurrence of adverse events, with a recommendation for more intensive treatment and early coronary angiography.

The TIMI⁹ risk score has proven its validity in predicting death and ischemic events in patients with non-ST elevation ACS. It is comprised of seven independent variables related to the occurrence of death, (re) infarction or urgent myocardial revascularization (MR) due to recurrent ischemia within 14 days from its calculation, with the advantage of being easily calculable and reproducible in the real world.

Patients with non-ST segment elevation acute coronary syndrome (NSTEMI-ACS) are a heterogeneous population with varying risk of morbidity and mortality^{10,11}. Risk stratification is important to make appropriate decisions about the care and treatment of these patients. Patients at highest risk for adverse outcomes may derive the greatest benefit from rapid and comprehensive use of effective treatments, including coronary interventional procedures and cardiac medications^{9,12}. The Global Registry of Acute Coronary Events (GRACE) and Thrombolysis in Myocardial Infarction (TIMI) risk scores (RS) are the two most commonly used scores to risk-stratify patients with NSTEMI-ACS patients⁷. These scores have been validated in several independent populations to predict prognosis^{10,13,14}. However, no study has been done locally to compare the TIMI or the GRACE risk scores with the extent or comparison of coronary angiographic findings so as to identify

the risk score that better predicts and correlates with severe coronary artery disease (CAD). The TIMI risk score based on the TIMI IIB4 and Efficacy and Safety of Subcutaneous Enoxaparin Non-Q-wave Coronary Events (ESSENCE) trial incorporates seven variables, each having one point¹⁵. In this study, extent of coronary artery disease was as single vessel disease as noted in 82 (27.6%) patients, double vessel disease in 122 (41.1%) while triple vessel disease was found to be in 93 (31.3%) patients. Hammami R, et al found single vessel disease in 24 (28.57%) cases, double vessel 14 (16.67%) and triple vessel 13 (15.48%) patients¹⁶.

Conclusion

In light of our findings, we can conclude that there is a weak correlation between the TIMI risk score and the SYNTAX score. Epidemiological and research data should be expanded by further studies to validate the current findings.

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