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Association of SYNTAX II Score with Immediate Outcomes in Acute ST-Segment Elevation Myocardial Infarction Patients Undergoing Primary PCI

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ABSTRACT

Acute ST-segment elevation myocardial infarction (STEMI) is a significant health problem, which needs to be directly addressed in the attempt to regain the proper myocardial perfusion and prevent complications. Primary PCI is the preferred reperfusion therapy for STEMI, nevertheless, its outcomes are dependent on several factors such as clinical and angiographic. The most established risk scores, including TIMI and GRACE scores, barely address lesion complexity as a factor influencing procedural and post procedural consequences. The SYNTAX II score or the updated SYNTAX score is a greater blend; it going beyond clinical assessment by incentivizing specific angiographic characteristics related to STEMI patients undergoing primary PCI. Therefore, the purpose of this study was to assess the correlation of immediate post-PCI SYNTAX II scores with mortality and MACE in 124 STEMI patients burdened by multivessel CAD. There was shown statistically significant positive linear dependence between (SYS scores and mortality rate ($r = 0.389$, $p < 0.001$), and MACE ($r = 0.421$, $p < 0.001$). Subgroup analysis of the correlation between different characteristics and clinical efficacy also showed statistical significance: Elderly patients (≥60 years) and overweight patients had a stronger Correlation relationship. The results highlight the SYNTAX II score to be helpful in deciding the immediate clinical treatment strategies for the high-risk STEMI patient population. This study highlights the SYNTAX II score's strong prognostic value in acute STEMI patients undergoing primary PCI, predicting post-interventional mortality and MACE rates. Higher scores correlate with poorer outcomes, emphasizing its role in risk assessment. Future research should explore its long-term prognostic accuracy and external validation in broader populations.

INTRODUCTION

Acute ST-segment elevation myocardial infarction (STEMI) is one of the most severe presentations of acute myocardial infarction worldwide [1]. Moreover, the appropriate steps need to be taken to ensure timely and optimal repermeation of the ischemic myocardium to attenuate unfavourable consequences. Primary PCI has emerged as the reference treatment for patients with STEMI, which expectedly has enhanced the prognosis of the disease [2, 3]. However, the outcome of primary PCI depends on many clinical and angiographic characteristics, so reliable risk assessment tools are needed to determine therapeutic strategies and prognosis [4-6].

As for other popular scores, also called simple, the Thrombolysis in Myocardial Infarction (TIMI) and Global Registry of Acute Coronary Events (GRACE) scores were developed from the clinical data [7-9]. Although these scores have been applied, they do not take into consideration the severity of the coronary lesions, which may affect procedural and discharge outcomes. To overcome this limitation, a new risk score was designed called the SYNTAX (Synergy between Percutaneous Coronary Intervention with TAXUS and Cardiac Surgery) score [10, 11]. Originally intended to quantify lesion complexity in patients undergoing coronary angiography, the SYNTAX score has been shown to predict adverse outcomes and to be useful in selecting revascularization strategy, especially in patients with multivessel coronary artery disease [12].

Although the original SYNTAX score is useful in stable CAD, there were limitations when attempting to apply it in STEMI settings which are more acute [13]. The prognostic use of SYNTAX score was later confirmed in the STEMI patients undergoing primary PCI, demonstrating its utility in risk stratification with regard to anatomical lesion complexity [14, 15]. Based on this a further development of the SYNTAX score was introduced as SYNTAX II score which provides both clinical risk factors such as the age, diabetes, renal

failure, left ventricular ejection fraction and presence of comorbidities along with the anatomical characteristics [16]. Thus, the prognostication of such a set of procedural risks and further results is less accurate when using a comprehensive approach.

Meta-analyses published in the last few years comment SYNTAX II score effectiveness in terms both by adverse long-term and adverse short-term result in STEMI patients [17]. For instance, Harbalioğlu et al. (2021) compared high-level SYNTAX II scores with adverse ST outcomes, mortality and no-reflow phenomenon, in acute anterior STEMI cases [18]. Also found similar prognostic value of the score in predicting mortality and MACE in the follow up period of 4 years [19]. However, this role of the SYNTAX II score concerning the immediate outcomes after primary PCI, including in-hospital mortality, ARC and cerebrovascular complications, has not been investigated to full extent.

This study is sought to fill this gap by assessing the relationship between the SYNTAX II score and early post-PCI outcomes assessment in STEMI patients with a focus on two weeks. As the present study aims to clarify the value of the score in acute settings for early risk allocation and the identification of optimal management approaches in STEMI patients, the findings should thus hold positive implications for patient outcomes.

METHODOLOGY

The objective of this current descriptive cross-sectional study was to assess the relationship between SYNTAX II score as ranked in STEMI patients with outcomes at their time of initial PCI. The study was completed at the Department of Cardiology, Lady Reading Hospital, Peshawar after six months of the approval of the study synopsis from 28th June 2023 till 28th December 2023. The participants were recruited from a rural health facility hence non-probability consecutive sampling was used; a total of 124 participants were recruited as per the sample size calculated by the WHO formula. The assumed values were the correlation coefficient rho (rho = 0.249), the power of 80% and the level of significance 5%.

Inclusion criteria comprised patients 40-70 years of age, males and females of any ethnicity, residents of the region served by the study centers who were meeting the operational definition of STEMI and receiving primary PCI. Exclusion criteria included patients receiving CABG, previous PCI, or emergent CABG indication. Each participant provided a written informed consent for his/her participation in the study, and all data collected were anonymized to eliminate identification of the participants, it was also pointed out that there were no other risks associated with participating in the study.

Baseline demographic and clinical data, including age, gender, BMI, and pain duration, were recorded on a predesigned proforma. SYNTAX II scores were calculated using baseline angiograms and an online SYNTAX score calculator. All coronary lesions with ≥50% diameter stenosis in vessels >1.5 mm was scored, including occluded infarct-related arteries as occlusions of <3 months. Scores were categorized as low (≤22), intermediate (23–32), or high (≥33). Two independent investigators blinded to clinical data performed the scoring to reduce bias.

Primary PCI was conducted by consultant cardiologists with at least five years of post-fellowship experience, adhering to standard procedural protocols. Patients were monitored during hospitalization and for 14 days post-procedure. Immediate outcomes included mortality (death within 14 days post-PCI) and major adverse cardiac and cerebrovascular events (MACE), such as repeat revascularization, acute coronary syndrome, or stroke.

Data analysis was performed using IBM SPSS version 25. Descriptive statistics summarized quantitative variables as means and standard deviations and qualitative variables as frequencies and percentages. Spearman's correlation coefficient assessed the association between SYNTAX II scores and outcomes, with stratified analyses for age, gender, BMI, and pain duration. A p-value ≤ 0.05 was considered statistically significant. This methodological framework facilitated a comprehensive evaluation of the predictive value of SYNTAX II scores in immediate post-PCI outcomes for STEMI patients.

RESULTS

Baseline Characteristics

A total of 124 patients with acute STEMI undergoing primary PCI were included in the study. The mean age of the participants was 56.8 ± 8.2 years, with 76% being male and 24% female. The mean BMI was 26.3 ± 4.1 kg/m². The mean duration of pain prior to presentation was 4.2 ± 1.1 hours.

Table 1

Summarizes the Baseline Characteristics of the Study Population.

Variable	Mean ± SD	Frequency (%)
Age (years)	56.8 ± 8.2	-
Male	-	94 (76%)
Female	-	30 (24%)
BMI (kg/m²)	26.3 ± 4.1	-
Pain duration (hours)	4.2 ± 1.1	-

SYNTAX II Score Distribution

The mean SYNTAX II score for the study population was 26.4 ± 7.3. When categorized based on scoring ranges, 52 patients (41.9%) were classified as having low SYNTAX II scores (≤22), 45 patients (36.3%) fell into the intermediate range (23–32), and 27 patients

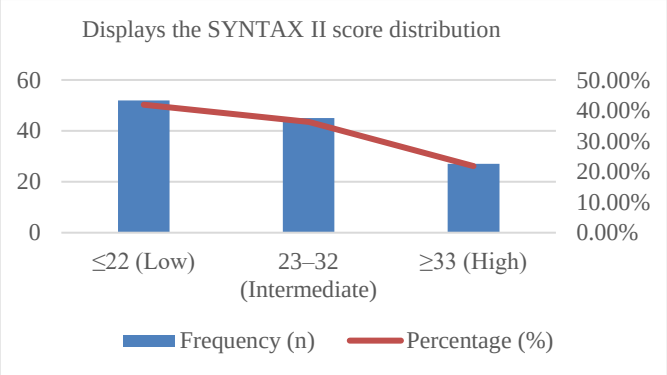
(21.8%) were identified as having high scores (≥33).

Table 2

Displays the SYNTAX II Score Distribution.

SYNTAX II Score	Frequency (n)	Percentage (%)
≤22 (Low)	52	41.9%
23–32 (Intermediate)	45	36.3%
≥33 (High)	27	21.8%

Figure 1



Immediate Outcomes

Out of 124 patients, 16 (12.9%) experienced mortality within 14 days of PCI, while 31 (25%) developed major adverse cardiac and cerebrovascular events (MACE).

Table 3

Summarizes the Immediate Outcomes of the Study Population.

Outcome	Frequency (n)	Percentage (%)
Mortality	16	12.9%
MACE	31	25.0%

Correlation Between SYNTAX II Score and Outcomes

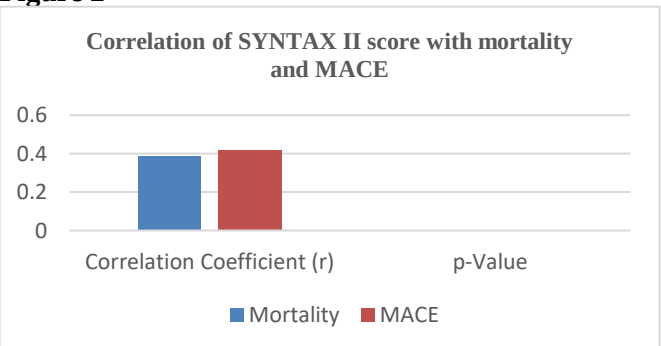
The SYNTAX II score demonstrated a statistically significant positive correlation with both mortality (r=0.389, p<0.001r = 0.389, p < 0.001r=0.389, p<0.001) and MACE (r=0.421, p<0.001r = 0.421, p < 0.001r=0.421, p<0.001).

Table 4

Correlation of SYNTAX II Score with Mortality and MACE.

Outcome	Correlation Coefficient (r)	p-Value
Mortality	0.389	<0.001
MACE	0.421	<0.001

Figure 2



Stratified Analysis

When stratified by age, gender, BMI, and pain duration, the correlation between the SYNTAX II score and mortality was found to be significant among patients aged 60 years or older (r = 0.418, p < 0.001). Male participants demonstrated a stronger correlation (r = 0.401, p < 0.001) compared to female participants (r = 0.311, p = 0.045). Additionally, patients with a higher BMI (>25 kg/m²) exhibited a greater correlation between the SYNTAX II score and major adverse cardiac and cerebrovascular events (MACE) (r = 0.435, p < 0.001).

DISCUSSION

SYNTAX II Score Distribution

This research aimed to assess the feasibility of SYNTAX II score as a prognostic tool for assessing immediate outcomes in patients with acute STEMI who were treated through primary PCI. We found out that an increased SYNTAX II score was a predictor of adverse outcomes such as mortality, MACE, and macroreen. These findings reaffirm the importance of SYNTAX II score as crucial resource in categorization of patients and management of STEMI.

For the purpose of the study, patients were grouped according to the therapeutically relevant SYNTAX II score: high-risk patients with SYNTAX II score of ≥33 were identified in 21.8% of patients and those with intermediate and high scores of 26.4±7.3. Materials and Methods For each patient, SYNTAX II score was calculated, and analyzed for correlation to mortality and MACE; Cut-off points of SYNTAX II = 32 had a moderately strong positive correlation to mortality rate (r = 0.389, p < 0.001) and an almost equal positive relationship to MACE rate (r = 0.421, p < 0.001), while establishing the SYNTAX II score These results are consistent with Farooq et al., (2013), who showed that the SYNTAX II score provides better predictive value than conventional risk models. In addition, the tendencies for the observed relations to be much higher in patients at least 60 years old suggest the need for age-related risk factors' assessment in practice.

The actual combination of anatomical and clinical characteristics presented by the SYNTAX II score allows for an individual approach to risk assessment and further therapeutic treatment and resource management. However, patients with high SYNTAX II scores should be monitored closely and their comorbidities be aggressively managed while specific measures should be taken in order to reduce risk. For example, significant gender differences have been observed in the links between the variables, and such variations make it possible to suggest that sociocultural and biological factors should be examined for their effects on the results in SHEMI patients.

However, important limitations are present, mainly due to the study design being a single-center experience with relatively short follow-up. It is therefore necessary to

perform further multicenter validation of these results and analyze the role of the score in determining long-term outcomes. The findings of this study make it evident that the SYNTAX II score should be integrated into everyday clinical practice in order to offer the best care to the patients and hence enhance the quality of life of the high-risk population.

CONCLUSION

Overall, the current study has underlined the remarkable utility of the SYNTAX II score in acute STEMI patients receiving the primary PCI since it possesses a powerful prognostic impact pointing to immediate post-interventional mortality and MACE rate. The patients with higher post-SYNTAX II scores had significantly poorer outcomes, which confirm the score's usefulness for risk assessment and therapeutic management algorithms. Taken together, anatomical and clinical value incorporated within SYNTAX II should provide a more accurate evaluation of risk in patients, which is especially important when treating complex groups such as elderly and those with increased BMI.

The results indicate the importance of individualized treatment approaches and regular surveillance in patients with high scores to enhance survival and minimize complications. Despite those inherent weaknesses of the study including single centered design and relatively short follow-up period, this study is highlighted that the SYNTAX II score as one of available tools for contemporary STEMI management. Its long-term validity for prognosis and external validity would make ideal subjects for future work.

REFERENCES

1. Akbar, H., et al., Acute ST-Segment Elevation Myocardial Infarction (STEMI). StatPearls, 2024.
2. Trimarchi, G., et al., Advanced Lung Cancer Inflammation Index as Predictor of All-Cause Mortality in ST-Elevation Myocardial Infarction Patients Undergoing Primary Percutaneous Coronary Intervention. Journal of Clinical Medicine, 2024. **13**(20): p. 6059. https://doi.org/10.3390/jcm13206059
3. Wang, J., et al., The Predictive Value of the CatLet Scoring System for Long-Term Prognosis After Percutaneous Coronary Intervention in Patients With Chronic Coronary Syndrome. Catheterization and Cardiovascular Interventions, 2024. https://doi.org/10.1002/ccd.31191
4. Lloyd-Jones, D.M., et al., Use of risk assessment tools to guide decision-making in the primary prevention of atherosclerotic cardiovascular disease: a special report from the American Heart Association and American College of Cardiology. Circulation, 2019. **139**(25): p. e1162-e1177. https://doi.org/10.1161/cir.0000000000000701
5. Wee, S.-B., et al., Contemporary State-of-the-Art PCI of Left Main Coronary Artery Disease. Circulation: Cardiovascular Interventions, 2024. **17**(11): p. e014026. https://doi.org/10.1161/circinterventions.124.014026
6. Abubakar, M., et al., Advancements in percutaneous coronary intervention techniques: a comprehensive literature review of mixed studies and practice guidelines. Cureus, 2023. **15**(7). https://doi.org/10.7759/cureus.41311
7. Herrera-Castillo, Y., et al., Performance of the TIMI and GRACE scores in identifying the risk of death from acute coronary ischemic syndrome: a retrospective study in patients with chest pain at a Peruvian Hospital. F1000Research, 2023. **12**: p. 1246. https://doi.org/10.12688/f1000research.140882.1
8. Ababneh, M.J., et al., Validity of TIMI Risk Score and HEART Score for Risk Assessment of Patients with Unstable Angina/Non-ST Elevation Myocardial Infarction Presented to an Emergency Department in Jordan. Open Access Emergency Medicine, 2023: p. 465-471. https://doi.org/10.2147/oaem.s439423
9. Aydemir, S., et al., Do Mortality Risk Scores Predict The Severity of Coronary Artery Disease In Patients With Myocardial Infarction With St Elevation? Eastern Journal of Medicine, 2023. **28**(2). https://doi.org/10.5505/ejm.2023.81557
10. Jonik, S., et al., Five-year outcomes in patients with multivessel coronary artery disease undergoing surgery or percutaneous intervention. Scientific Reports, 2024. **14**(1): p. 3218. https://doi.org/10.1038/s41598-024-53905-4
11. Rufa, M., et al., Hybrid total arterial minimally invasive off-pump coronary revascularization and percutaneous coronary intervention strategy for multivessel coronary artery disease: a cohort study with a median 11-year follow-up. Cardiovascular Diagnosis and Therapy, 2024. **14**(2): p. 272. https://doi.org/10.21037/cdt-23-413
12. Custódio, P., et al., Long-term health outcomes of young patients with low-complexity coronary disease: a weighted analysis according to revascularization strategy. European Journal of Cardio-Thoracic Surgery, 2024. **66**(5): p. ezae367. https://doi.org/10.1093/ejcts/ezae367
13. Bortnick, A.E., et al., Residual SYNTAX II Score and long-term outcomes post-ST-elevation myocardial infarction in an urban US cohort: the Montefiore STEMI Registry. Coronary artery

disease, 2022. **33**(3): p. 206-212. https://doi.org/10.1097/mca.0000000000001074
14. Khalil, M.S., et al., Association of Syntax Score with Short-Term Outcomes among Acute ST Elevation Myocardial Infarction Patients Undergoing Primary PCI. Benha Medical Journal, 2024. https://doi.org/10.21608/bmfj.2024.279038.2048
15. Li, C., et al., Prognostic values of the SYNTAX score II and the erythrocyte sedimentation rate on long-term clinical outcomes in STEMI patients with multivessel disease: a retrospective cohort study. BMC Cardiovascular Disorders, 2020. **20**: p. 1-11. https://doi.org/10.1186/s12872-020-01490-5
16. Yan, L., et al., Impact of the residual SYNTAX score on clinical outcomes after percutaneous coronary intervention for patients with chronic renal insufficiency. Catheterization and Cardiovascular Interventions, 2020. **95**: p. 606-615. https://doi.org/10.1002/ccd.28652
17. Chacko, L., et al., Effects of percutaneous coronary intervention on death and myocardial infarction stratified by stable and unstable coronary artery disease: a meta-analysis of randomized controlled trials. Circulation: Cardiovascular Quality and Outcomes, 2020. **13**(2): p. e006363.
18. Diao, Y., et al., Predictive value of N-terminal pro-B-type natriuretic peptide (NT-pro BNP) combined with D-dimer for no-reflow phenomenon in patients with acute coronary syndrome after emergency of percutaneous coronary intervention. Bioengineered, 2021. **12**(1): p. 8614-8621. https://doi.org/10.1080/21655979.2021.1988361
19. Qiao, Z., et al., High stress hyperglycemia ratio predicts adverse clinical outcome in patients with coronary three-vessel disease: a large-scale cohort study. Cardiovascular Diabetology, 2024. **23**(1): p. 190. https://doi.org/10.1186/s12933-024-02286-z