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***Original research article***

# PREDICTIVE VALUE OF TIMI SCORE IN PATIENTS WITH NON-ST ELEVATION MYOCARDIAL INFARCTION

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**Abstract:** *This retrospective study was conducted in the Department of Cardiology in tertiary care hospitals during June 2022 and June 2023 to evaluate the power of TIMI risk score in predicting 14-day mortality in patients with NSTEMI presenting in the cardiac center of a local hospital for determining prognostic value to the score in our cohort. The study included 250 patients aged > 18 years presenting with NSTEMI. A proforma was used to collect data, including demographic data, baseline investigations, detailed history, TIMI score at the time of presentation, and patient status after 14 days of hospital stay. All patients followed ACS protocol, and NSTEMI was managed according to current guidelines. Results showed that the predictive value of the TIMI score, AUC, was 0.788 (95% CI: .688-.886), its sensitivity was 77.80%, and its specificity was 68.08%. In subjects with a TIMI score ≥4 (11.2%, n=12/105), the 14-day mortality rate was more significant than those with a TIMI score <4 (3.4%, n=5/145) (P<0.001). Multivariate analysis reveal that TIMI risk and cardiac arrest were independent predictors of 14-day mortality. TIMI risk score is a simple and useful tool for risk stratification in NSTEMI patients. Its use will enable clinicians to adopt precise and strategic interventions for these patients.*

**Keywords:** Acute Coronary Syndrome, Non-ST Elevation Myocardial Infarction, TIMI risk score, Prognosis

## Introduction

Acute coronary syndrome (ACS), including unstable angina (UA) and acute myocardial infarction (AMI), is associated with a high mortality rate (Ralapanawa and Sivakanesan, 2021). AMI is classified into ST-elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI). NSTEMI accounts for about 70% of cases of ACS (Keykhaei et al., 2021) and is more challenging to treat (Yang et al., 2022). NSTEMI is associated with a higher risk of complications than STEMI (Tyler et al., 2022). Though therapeutic interventions have improved over time, NSTEMI has a considerable morbidity and mortality rate (Naghavi, 2019). Thus, it is crucial to adequately assess potential risk factors for cardiac complications. This will help reduce mortality by providing timely and accurate treatment to individuals at the highest risk of fatal complications (Bashiruddin et al., 2019; Collet and Thiele, 2021).

Multiple studies have suggested the effectiveness of the Thrombolysis in Myocardial Infarction (TIMI) risk score in predicting 14-day mortality or in-hospital mortality in patients with NSTEMI (Ramos and Wolek, 2023; Zafrir et al., 2019). TIMI score has been widely used as a risk stratification tool among NSEMI patients. However, validation of the TIMI score is mainly based on data from developed countries, and literature is scarce from developing countries despite the higher disease burden. Undeveloped countries like Pakistan have different healthcare services, lifestyles, and genetic makeup. Thus, in this study, we will evaluate the power of the TIMI risk score in predicting 14-day mortality in patients with NSTEMI presenting in the cardiac center of a local hospital for determining prognostic value to the score in our cohort.

## Methodology

This retrospective study was conducted in the Department of Cardiology in tertiary care hospitals during June 2022 and June 2023. An ethical review board of the hospital approved the study. The study included patients aged > 18 years presenting with NSTEMI. Patients with a history of cardiac surgery were excluded. Informed consent of the participants was taken. A proforma was used to collect data, including demographic data, baseline investigations, detailed history, TIMI score at the time of presentation, and patient status after 14 days of hospital stay. All patients followed ACS protocol, and NSTEMI was managed according to current guidelines.

SPSS version 21 was used for data analysis. Receiver operating characteristic (ROC) curve analysis, area under the curve (AUC), and 95% CI were calculated. Mann-Whitney U or Chi-square tests assessed the association between demographic and clinical characteristics and survival after 14 days. The strength of the association was assessed by performing univariate and multivariate analyses. P value < 0.05 was considered statistically significant.

## Results

The study was conducted on 250 patients, 76% male and 24% female. The mean age of the participants was 58.05 ± 10.86 years. The 14-day mortality rate was 6.5% (n=17). The mortality rate was significantly higher in people with diabetes (P=.007) than in those with cardiac arrest (P<.001). There was a significant association between 14-day

mortality and a higher presentation rate (P=.034). A higher TIMI score was also significantly associated with mortality (P <.001). Baseline characteristics and outcomes after 14 days are summarized in Table I. The ROC curve is shown in Figure 2. The predictive value of the TIMI score, AUC, was 0.788 (95% CI: .688-.886), its sensitivity was 77.80%, and its specificity was 68.08%. In subjects with a TIMI score ≥4 (11.2%, n=12/105), the 14-day mortality rate was significantly higher than those with a TIMI score <4 (3.4%, n=5/145) (P<.001).Results of univariate and multivariate regression analysis are summarized in Table II. According to univariate analysis, factors such as cardiac arrest, heart rate (5 bpm), diabetes, and Killip class III or IV were significantly associated with increased risk of mortality. Multivariate analysis reveal that TIMI risk and cardiac arrest were independent predictors of 14-day mortality

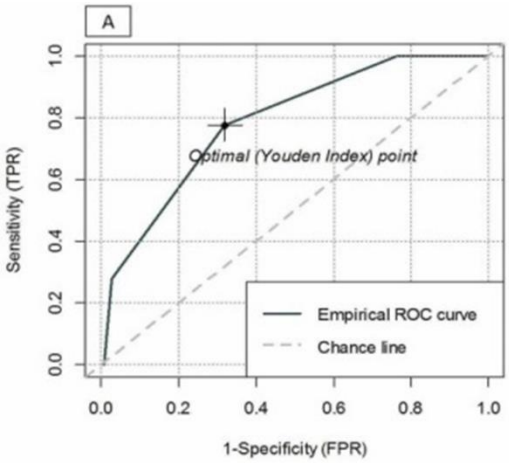


**Figure 2:ROC curve**

**Table I Baseline characteristics and 14-day outcomes in the study population**

| Characteristics | Outcome after 14 days | | P value |
|---|---|---|---|
| | Survived (n=233) | Expired (n=17) | |
| **Gender** | | | 0.301 |
| **Female** | 53 (22.7%) | 5 (29.4%) | |
| **Male** | 180 (77.2%) | 12 (70.5%) | |
| **Age** | | | 0.080 |
| **<50** | 60 (25.7%) | 5 (29.4%) | |
| **51-65** | 118 (50.6%) | 6 (35.2%) | |
| **>65** | 55 (23.6%) | 6 (35.2%) | |
| **Risk factors** | | | |
| **Hypertension** | 193 (82.8%) | 15 (88.2%) | 0.224 |
| **Diabetes** | 93 (39.9%) | 12 (70.5%) | 0.007 |
| **Family history of CAD** | 24 (10.3%) | 3 (17.6%) | 0.428 |
| **Smoking** | 64 (27.4%) | 4 (23.5%) | 0.616 |
| **Obesity** | 20 (8.5%) | 2 (11.7%) | 0.747 |
| **Dyslipidemia** | 34 (14.5%) | 2 (11.7%) | 0.608 |
| **Sedentary lifestyle** | 69 (29.6%) | 6 (35.2%) | 0.825 |
| **Killip class** | | | <.001 |
| **I** | 195 (83.6%) | 3 (17.4%) | |
| **II** | 30 (12.8%) | 9 (52.9%) | |
| **III** | 4 (1.7%) | 4 (23.5%) | |
| **IV** | 4 (1.7%) | 1 (0.4%) | |
| **Cardiac arrest** | 2 (0.8%) | 9 (52.9%) | <0.001 |
| **Heart rate (bpm)** | 77.33 ± 14.65 | 84.33 ± 18.09 | 0.034 |
| **SBP (mmHg)** | 120.59 ± 16.21 | 122.72 ± 20.79 | 0.488 |
| **Serum creatinine (ng/dL)** | 1.44 ± 6.65 | 1.62 ± 0.67 | 0.922 |
| **Troponin (ng/dL)** | 6.2 ± 17.81 | 10.68 ± 12.4 | 0.389 |
| **TIMI score** | 3.13 ± .84 | 4.07 ± .74 | <0.001 |

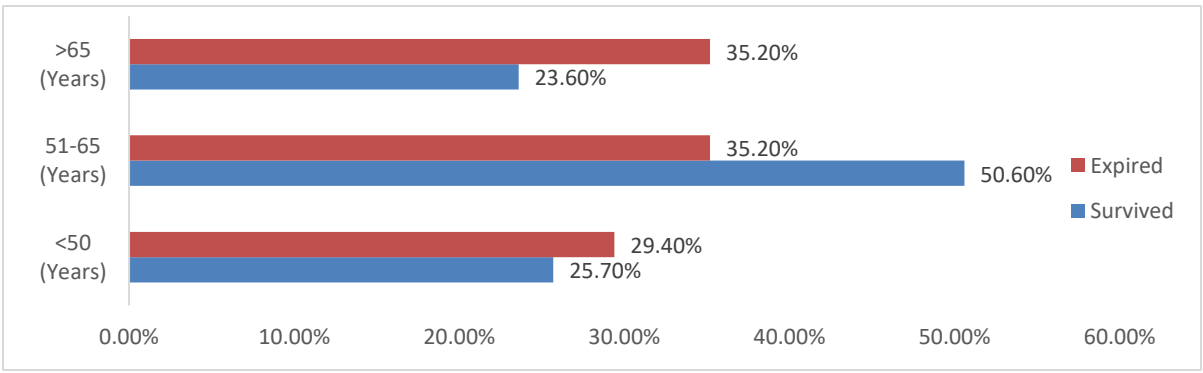


**Figure 1: Distribution of Age groups:**

**Table II Univariate and multivariate regression analysis**

| Characteristics | Univariate | | Multivariate | |
|---|---|---|---|---|
| | OR(95% CI) | P value | OR (95% CI) | P value |
| **Female** | 1.6 [.61-4.62] | 0.306 | 2.79 [.43-15.88] | 0.298 |
| **>65** | 2.16 [.78-5.3] | 0.143 | 1.13 [.21-5.2] | 0.972 |
| **Hypertension** | 3.41 [.43-25.42] | 0.25 | 10.41 [.03-3515.48] | 0.433 |
| **Diabetes** | 3.79 [1.45-12.21] | 0.012 | 2.27 [.38-12.46] | 0.382 |
| **Family history of CAD** | 1.67 [.46-6.34] | 0.433 | 5.7 [.84-37.77] | 0.076 |
| **Smoking** | .75 [.24-2.44] | 0.617 | .6 [0.6-5.81] | 0.665 |
| **Obesity** | 1.38 [.28-5.81] | 0.747 | 7.37 [.78-58.75] | 0.065 |
| **Dyslipidemia** | .68 [.15-3.14] | 0.61 | .13 [.01-1.6] | 0.118 |
| **Sedentary lifestyle** | 1.32 [.41-3.18] | 0.825 | .6 [.1-3.88] | 0.585 |
| **Killip class I-IV** | 35.67 [7.8-156.11] | <0.001 | 12.36 [.19-782.82] | 0.238 |
| **Cardiac arrest** | 361.25 [41.01-3183.94] | <0.001 | 166.49 [10.33-1921.27] | <0.001 |
| **Heart rate (bpm)** | 1.14 [1.11-1.23] | 0.038 | .94 [.67-1.22] | 0.739 |
| **Serum creatinine (ng/dL)** | 1 [.94-1.17] | 0.925 | 1.01 [.96-1.31] | 0.616 |
| **Troponin (ng/dL)** | 1.11 [.99-1.12] | 0.427 | 1.11 [.99-1.13] | 0.531 |
| **TIMI score** | 3.22 [1.73-6.12] | 0.001 | 2.77 [1.09-6.77] | 0.032 |

## Discussion

NSTEMI is associated with an increased risk of morbidity and mortality. Thus, risk stratification tools like the TIMI risk score are important for identifying patients at high risk of cardiovascular complications. In this study, we assessed the predictive power of the TIMI score for 14-day mortality in these patients. The results highlighted the significant prognostic ability of the score with an AUC value of .788 (95% CI: .688-.886), its sensitivity was 77.80%, and specificity was 68.08%. In subjects with a TIMI score ≥4 (11.2%, n=12/105), the 14-day mortality rate was significantly higher than those with a TIMI score <4 (3.4%, n=5/145) (P<.001).

A previous study reported that the TIMI risk score is a valuable predictor of mortality in NSTEMI patients. There was a significant association between the TIMI score and outcomes after 14 days of admission (including re-vascularization, recurrent MI, and death), with a positive correlation between outcome rate and TIMI risk score(Pollack et al., 2020). The current AUC value was .788, consistent with .74 reported by a previous study which validated the usefulness of the TIMI score(Anbr et al., 2023). A TIMI score of 1 or 2 was reported to be associated with a 7.6% event rate, which increased to 30.6% at a TIMI score of 6 or 7. In Pakistan, coronary artery disease is prevalent (Shabana et al., 2020). Thus, validating and subsequently adopting the TIMI score clinically is important.

The current study found that diabetes, cardiac arrest, increased heart rate, and Killip class II-IV were associated with increased 14-day mortality. A previous similarly reported association between diabetes and Killip class and increased mortality(Ryu et al., 2019). In Pakistan, about 11.6% of adults have diabetes. The TIMI risk score is an important predictive method in this cohort(Meo et al., 2016). In developing countries with limited healthcare funds cost, effective tools like the TIMI score can be effectively used for risk stratification(Khan, 2019).

Our study has a few limitations of our study. First, it is a small, single-centered study, so it is impossible to generalize findings on different populations. A larger multi-centered study is required to accurately evaluate the effectiveness of the TIMI risk score. Second, therapeutic interventions or medications, which may have influenced disease prognosis, were not considered. Further studies are recommended for more insight into TIMI score validity for NSTEMI patients in Pakistan.

## Conclusion

TIMI risk score is a simple and useful tool for risk stratification in NSTEMI patients. Its use will enable clinicians to adopt precise and strategic interventions for these patients. Proper application of this tool may lead to cost-effective and life-saving risk stratification.

## Declarations

**Data Availability statement**
All data generated or analyzed during the study are included in the manuscript.
**Ethics approval and consent to participate.**
Approved by the department Concerned.
**Consent for publication**
Approved
**Funding**
Not applicable

## Conflict of interest

The authors declared an absence of conflict of interest.

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