The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 3, 2025

# VALIDATION OF TIMI RISK SCORE FOR ST-ELEVATION MYOCARDIAL INFARCTION IN A TERTIARY CARE HOSPITAL IN PAKISTAN

**Muhammad Abair Ul Haq[1], Khawar Naeem Satti[2], Tanvir Ahmed Raja[3], Muhammad Mohsin[4], Hafsa Shahid Malik[5], Saleha Haroon[6]**

[1]*MBBS, FCPS (Cardiology), Senior Registrar Department of Cardiology Rawalpindi Institute of Cardiology*
[2,3,4,5,6] *MBBS, FCPS (Cardiology), FCPS (Interventional Cardiology), Senior Registrar Department of Cardiology Rawalpindi Institute of Cardiology*

[*4]mohsin.doctor21@gmail.com

**DOI:** https://doi.org/10.5281/zenodo.15141397

**Keywords**
*ST-segment elevation myocardial infarction, STEMI, TIMI risk score, In-Hospital mortality*

**Article History**
Received on 15 February 2025
Accepted on 15 March 2025
Published on 21 March 2025

**Copyright** @Author
**Corresponding Author:** *

## Abstract

***Introduction:*** *Cardiovascular disease (CVD) constitutes a significant public health problem worldwide accounting for 35% of global deaths. TIMI score is a rapid, effective tool for stratifying risk in ST elevation myocardial infarction (STEMI) patients who receive fibrinolytic therapy. It is a convenient bedside method used for predicting 30-day mortality in these patients. However, the data on the validation of TIMI score is scarce in STEMI patients who do not undergo any reperfusion therapy or primary PCI. This study was designed to evaluate the efficacy and prognostic performance of TIMI score in STEMI patients to determine the optimal revascularization strategy. The study also determined the association of TIMI score with the in-hospital mortality. This will help in improved patient care and selection of better treatment options for these patients.*

***Methodology:*** *It was a prospective, cross-sectional study conducted at the Emergency Department of Rawalpindi Institute of Cardiology, Rawalpindi from 01-07-2024 to 31-12-2024. The study was approved by the Ethical Committee of the Hospital. Ninety four patients with the diagnosis of acute ST-segment elevation myocardial infarction were enrolled in the study by convenient sampling technique. The TIMI risk score was calculated for each patient. The patients were followed-up for 30 days mortality. The data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 25.*

***Results:*** *The majority (24.5%) of the patients had a TIMI score of 2 followed by score 6(23.4%) and 3(14.9%). Mortality at 30 days occurred in 9(9.6%) out of 94 patients. Out of these 9 patients, 6 patients had a TIMI score of 6, 2 patients had a TIMI score of 4 and 1 patient had a TIMI score of 2. There was a significant association between the TIMI score and 30-days mortality with a p-value of 0.03.*

***Conclusion:*** *TIMI score is a robust, effective tool for risk stratification in patients with STEMI who do not receive any reperfusion therapy or primary coronary revascularization. There is a positive correlation between higher TIMI risk score and in-hospital mortality among patients presenting with acute ST-segment elevation myocardial infarction.*

## INTRODUCTION

Cardiovascular disease (CVD) constitutes a significant public health problem worldwide accounting for 35% of global deaths. These diseases also lead to prolonged disability, complications and reduced productivity in the healthcare system [1]. Myocardial infarction (MI) contributes to a major burden of cardiovascular disease [2]. Cardiovascular disease accounts for 17 million annual deaths worldwide and 7.6 million of these deaths are caused by coronary heart disease [3]. Myocardial infarction is the necrosis of cardiomyocytes with the combined increase and decrease in the levels of biochemical markers and presents either with symptoms of ischemia or ECG changes. Troponin T or I are the most specific and reliable markers in MI [2].

Effective risk stratification is of prime importance in managing the acute coronary syndromes [4]. Triage is important for the immediate care of ST-elevation myocardial infarction (STEMI) patients [5]. The treatment modalities for myocardial infarction are known but effective risk stratification affects the short and long-term medical decisions regarding therapeutic options and patient care. The patients with myocardial infarction have different complex risk profiles. Additionally, there is a marked difference in short-term mortality risk in these patients. So, the reliable risk assessment is of utmost importance [4,6].

Thrombolysis is recommended in STEMI patients if they reach the hospital within 12 hours. Many studies have demonstrated that primary percutaneous coronary intervention (PCI) is better than fibrinolysis [7,8]. However, the benefit of primary PCI varies with the highest benefit in high-risk patients. Assessment of risk before deciding the treatment modality will recognize the high-risk patients and help in optimizing the management [9]. The patients with STEMI can develop complications such as no-reflow phenomenon, arrhythmias and heart failure [10]. Primary PCI cannot prevent the complications [11]. The high-risk patients are more prone to develop these complications. Identifying at-risk patients would help in the implementation of preventive measures to prevent the development of complications [12].

There are many models available that predict the chances of death in STEMI. These models have up to 45 variables but the variables which are the strongest predictors are advanced age, decreased blood pressure and increased heart rate [5]. The various scores designed to predict the adverse events after coronary heart disease are GRACE, Zwolle, TIMI and CADILLAC risk scores [13]. The CADILLAC (Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications) score has the highest accuracy in predicting the mortality in primary PCI patients but it has clinical as well as angiographic indices [12]. The Thrombolysis in Myocardial Infarction (TIMI) risk score was used initially to stratify risk in unstable angina and non-ST-segment elevation myocardial infarction [14]. It is a simple robust tool which can be used at the bedside and can stratify risk in STEMI. It has been reported in the TIME II (Intravenous nPA for Treatment of Infarcting Myocardium Early) Trial that TIMI score is effective in predicting the risk of mortality in STEMI patients undergoing fibrinolysis [4]. The assessment of risk stratification with the TIMI score will help clinicians as well as researchers. The clinicians can accurately estimate the risk of short-term adverse events in STEMI patients. It can serve as a tool in adjunction with clinical assessment and imaging investigations [15].

TIMI score is a rapid, effective tool for stratifying risk in STEMI patients who receive fibrinolytic therapy. TIMI risk score calculated at the time of presentation is a convenient bedside method used for predicting 30-day mortality in patients diagnosed with STEMI. However, the data on the validation of TIMI score is scarce in STEMI patients who do not undergo any reperfusion therapy or primary PCI. This study was designed to evaluate the efficacy and prognostic performance of TIMI score in STEMI patients to determine the optimal revascularization strategy. The study also determined the association of TIMI score with the in-hospital mortality. This will help in improved patient care and selection of better treatment options for these patients.

## OBJECTIVES:

- To validate the TIMI risk score in patients presenting with ST-segment elevation myocardial infarction in the Emergency

Department of Rawalpindi Institute of Cardiology (RIC), Rawalpindi
- To determine the association of TIMI score with in-hospital mortality in STEMI patients

## METHODOLOGY:

It was a prospective, cross-sectional study done at the Emergency Department of Rawalpindi Institute of Cardiology, Rawalpindi from 01-07-2024 to 31-12-2024 after approval by the Hospital Ethical Committee. Ninety four patients with acute STEMI were included in the study by convenient sampling technique. The patients were diagnosed with the help of electrocardiographic (ECG) findings and troponin I or T. After initial management of each patient with aspirin and clopidogrel, the TIMI score was estimated. The patients with TIMI scores ranging between 0-4 were labeled as low risk and those with score ≥5 as high risk. The patients were followed-up during the course of hospital stay and later on through OPD visits for 30-days mortality. These outcomes were correlated with the initial TIMI score.

The TIMI score has 8 indices and each index has a score of 1-3. The total score can range from 0 to 14. The TIMI indices with their score are given in table 1.

**Table 1: TIMI Score for SEMI** [12]

| TIMI risk score for STEMI | |
|---|---|
| **Criteria** | **Points** |
| Age ≥ 75 | 3 |
| 65–74 | 2 |
| DM or HTN or angina | 1 |
| SBP < 100 mmHg | 3 |
| HR > 100 bpm | 2 |
| Killip class 2–4 | 2 |
| Weight < 67 kg (150 lb) | 1 |
| Anterior STE or LBBB | 1 |
| Time to treatment > 4 h | 1 |
| Total points (0–14) | |

## STATISTICAL ANALYSIS:

Data analysis was done by the Statistical Package for Social Sciences (SPSS) version 25. Qualitative variables such as gender, TIMI indices, TIMI score and in-hospital mortality were calculated in frequency and percentage. The mean and standard deviation (SD) were used for quantitative variables. The association between TIMI score and in-hospital mortality was assessed using a Chi-square test. A p-value of ≤0.05 was statistically significant.

## RESULTS:

The average age of the study participants was 58.85±11.364 years. Out of 94 patients, 80(85.1%) patients were males and 14(14.9%) patients were females. The majority (67%) of the participants were <65 years old while 25(26.6%) and 6(6.4%) patients were 65-74 and >75 years old, respectively. Forty seven (50%) patients had hypertension (HTN) or diabetes mellitus (DM) or angina while 47(50%) patients had no history of any of these diseases. Eleven (11.7%) patients had a systolic blood pressure (SBP) of <100 mmHg while the rest (88.3%) of them had systolic BP > 100mmHg. Only 7(7.4%) patients had heart rate >100/min and 87(92.6%) patients had heart rate <100/min. Eleven (11.7%) patients had Killip class 2-4 and 83(88.3%) patients had Killip class 1. Forty (42.6%) patients had a bodyweight of <67 kg in contrast to 54(57.4%) patients who had a bodyweight >67 kg. Sixty four (68.1%) patients presented with anterior wall myocardial infarction while 30(31.9%) patients had inferior wall MI. Most (52.1%) of the patients presented in the hospital after 4 hours of acute MI and 45(47.9%) patients arrived within 4 hours of MI episode. Table 1 shows the patients who fulfilled the various criteria of the TIMI score.

**Table 1: Percentage of Study Participants Fulfilling the TIMI Indices**

| TIMI Indices | Frequency (Percent) |
|---|---|
| Age > 75 years | 6(6.4%) |
| 65-74 years | 25(26.6%) |
| DM or HTN or Angina | 47(50%) |
| SBP < 100 mmHg | 11(11.7%) |
| Heart rate > 100/min | 7(7.4%) |
| Killip class 2-4 | 11(11.7%) |
| Weight < 67 kg | 40(42.6%) |
| Anterior STE or LBBB | 64(68.1%) |
| Time to treatment > 4 h | 49(52.1%) |

The majority (24.5%) of the patients had a TIMI score of 2 followed by score 6(23.4%) and 3(14.9%). These results are shown in table 2 and figure 2.

**Table 2: TIMI Score of the STEMI Patients**

| TIMI Score | Frequency (Percent) |
|---|---|
| 0 | 5(5.3%) |
| 1 | 10(10.6%) |
| 2 | 23(24.5%) |
| 3 | 14(14.9%) |
| 4 | 12(12.8%) |
| 5 | 8(8.5%) |
| 6 | 22(23.4%) |
| **Total** | **94(100%)** |

Sixty four (68.1%) patients were treated conservatively and 40(62.5%) of them received streptokinase injection. Sixteen (17%) patients underwent primary percutaneous coronary intervention while 14(14.9%) patients presented late for thrombolysis.

Out of 94 STEMI patients, 30 days mortality occurred in 9(9.6%) patients. Out of these 9 patients, 6 patients had a TIMI score of 6, 2 patients had a TIMI score of 4 and 1 patient had a TIMI score of 2. The association of the TIMI score was statistically significant with 30-days mortality (p-value = 0.03) (Table 3, Figure 3).

**Table 3: Correlation of TIMI Score with 30-Days Mortality**

| | Outcome | | |
|---|---|---|---|
| TIMI Score | Alive | Expired | Total |
| 0 | 5(5.3%) | 0 | 5(5.3%) |
| 1 | 10(10.6%) | 0 | 10(10.6%) |
| 2 | 22(23.4%) | 1(1.1%) | 23(24.5%) |
| 3 | 14(14.9%) | 0 | 14(14.9%) |
| 4 | 10(10.6%) | 2(2.1%) | 12(12.8%) |
| 5 | 8(8.5%) | 0 | 8(8.5%) |
| 6 | 16(17%) | 6(6.4%) | 22(23.4%) |
| **Total** | **85(90.4%)** | **9(9.6%)** | **94(100%)** |

**DISCUSSION:**

A major problem that arises in managing the STEMI patients is their varying risk of developing adverse events. Therefore, accurate stratification of risk is mandatory for taking optimal therapeutic decisions and assessing their prognosis. A perfect score for risk stratification is simple, fast and assesses the prognosis [12]. The TIMI score is the most commonly used scoring system for acute coronary syndromes [16]. It categorizes the patients into low, moderate and high risk. It was established to create an effective and convenient risk assessment tool to be used at patient presentation. The TIMI score uses the information available at bedside at hospital admission without the need for a computer [4].

The average age of the study participants was 58.85±11.364 years in our study. Similarly, the average age of the participants was 57.9 ±11.6 years in a study by Gonzalez-Pacheco et al. [12]. In another study, patients had a average age of 69±14 years [4]. Our results showed that the most of the patients (85.1%) were males. In another study, 84.6% of the patients were males [12]. Morrow et al. reported that 59.5% of patients with STEMI were males [4]. In our study, 26.6% of patients were 65-74 years old and 6.4% of patients were >75 years old. Forty (42.6%) patients had a bodyweight of <67 kg. Fifty percent of patients had hypertension or diabetes mellitus or angina. A study reported that 19.6% of patients with STEMI were 65-74 years of age and 8.9% were >75 years of age. Nineteen percent of patients had a bodyweight of <67 kg. Fifty percent of patients had hypertension, 30.1% had diabetes mellitus and 19.8% had angina [12]. In a study by Morrow et al., 38.3% of patients were >75 years old and 28% of the patients had <67 kg bodyweight. Fifty four percent of patients had a history of hypertension whereas 27.2% and 23.3% of the patients had DM or ischemic heart disease [4].

Our study showed that 11.7% of patients had a systolic blood pressure of <100 mmHg and 7.4% of patients had a heart rate >100/min. Eleven (11.7%) patients had Killip class 2-4. Similar results were reported in another study with 12.2% of patients having SBP <100 mmHg. Fifteen prevent patients had heart rate >100/min and 19.3% of the patients had Killip class 2-3 [12]. Morrow et al. reported that 8.7% of patients had a SBP of less than 100 mmHg, 23.8% of the cases had a heart rate >100/min and 25.1% of the patients had Killip class 2-4 [4]. In our study, 68.1% of patients presented with anterior wall MI whereas 48.6% and 48.3% of the patients presented with anterior wall MI in two studies [4,12].

Our results showed that the majority (24.5%) of the patients had a TIMI score of 2 followed by score 6(23.4%) and 3(14.9%). According to another study, most (20.3%) of the patients had TIMI score 2 followed by score 1 (15.6%) and score 4 (14.8%) [12]. In our study, 68.1% of patients were treated conservatively, 17% of patients underwent primary PCI while 14.9% of patients presented late for thrombolysis. In another study, 48% of the patients received pharmacological or mechanical reperfusion therapy and 38% of the patients underwent primary PCI [4].

In our study, the 30-days mortality occurred in 9(9.6%) of the study population. Out of these 9 patients, 6 patients had a TIMI score of 6, 2 patients had a TIMI score of 4 and 1 patient had a TIMI score of 2. According to another study, in-hospital mortality was seen in 12.6% of the patients. The patients with a score of ≥8 had 30 times higher mortality risk than those with score 0 [4]. Another study was conducted in which the TIMI score was used to predict the 30-day mortality in STEMI patients undergoing fibrinolytic therapy. About 6.7% of patients had died by 30 days. The mortality risk was 40-fold increased in patients with the score of >8. About 12% of patients with score > 5 had a 2-fold greater mortality risk. On the other hand, the mortality rate was <1% in 12% of patients with a 0 score [17]. Gonzalez-Pacheco et al. estimated the TIMI and CADILLAC scores of STEMI patients who underwent primary PCI. Thirty-two percent of patients had a TIMI score of ≥5. The in-hospital mortality in these patients was 14.8% in contrast to 2.1% in patients with a score of <5 [12].

**CONCLUSION:**

TIMI score is a rapid, effective tool for risk stratification in STEMI patients who undergo fibrinolytic treatment. There is a positive correlation between higher TIMI risk score and in-hospital mortality in patients presenting with acute STEMI. Out of these 9 patients who died, 6(6.4%) patients had a TIMI score of 6, 2(2.1%) patients had a TIMI score of 4 and 1)1.1%) patient had a TIMI score of 2.

TIMI score should be used for risk stratification in patients with STEMI who undergo fibrinolytic treatment. Further research should be conducted in this aspect with a multicenter study and larger sample size.

**REFERENCES:**

Mohseni J, Kazemi T, Maleki MH, Beydokhti H. A systematic review on the prevalence of acute myocardial infarction in Iran. Heart views. 2017 Oct-Dec; 18(4):125-32. doi: 10.4103/HEARTVIEWS.HEARTVIEWS-71-17.

Roger VL. Epidemiology of myocardial infarction. Med Clin North Am. 2007 Jul; 91(4):537. doi: 10.1016/j.mcna.2007.03.007.

Mendis S, Thygesen K, Kuulasmaa K, Giampaolo S, Mahonen M, Blackett KN, et al. Cardiovascular disease World Health Organization definition of myocardial infarction 2008-09 revision. Int J Epidemiol. 2011; 40:139-46. doi: 10.1093/ije/dyq165.

Morrow DA, Antman EM, Parsons L, de Lemos JA, Cannon CP, Giugliano RP, McCabe CH, Barron HV, Braunwald E. Application of the TIMI risk score for ST-elevation MI in the National Registry of myocardial infarction 3. JAMA. 2001. 286(11):1356-9. doi: 10.1001/jama.286.11.1356.

Saban M, Zaretsky L, Patito H, Salama R, Darawsha A. Round-off decision-making: Why do triage nurses assign STEMI patients with an average priority? Int Emerg Nurs. 2019 Mar;43:34-9. doi: 10.1016/j.ienj.2018.07.001.

Ahmed N, Carberry J, Teng V, Carrick D, Berry C. Risk assessment in patients with an acute ST-elevation myocardial infarction. J Comp Eff Res. 2016;5(6):581-593. doi:10.2217/cer-2016-0017.

Saleem S, Khan A, Shafiq I. Post thrombolytic resolution of ST elevation in STEMI patients. Pak J Med Sci. 2016;32(1):201-5. doi:10.12669/pjms.321.8974.

Taha R, Oraby M, Nasr G, El-Hawary A. Prevalence and causes of failure of receiving thrombolytic therapy in patients with acute ST-segment elevation myocardial infarction. Egyptian Heart J. 2013 Jun; 65(2):51-5. https://doi.org/10.1016/j.ehj.2012.05.002.

Timoteo AT, Papoila AL, Lopes JP, Oliveira JA, Ferreira ML, Ferreira RC. Is it possible to simplify risk stratification scoresfor patients with ST-segment elevation myocardialinfarction undergoing primary angioplasty? Rev Port Cardiol. 2013;32(12):967-73. http://dx.doi.org/10.1016/j.repc.2013.06.006.

Gupta S, Gupta MM. No reflow phenomenon in percutaneous coronary interventions in ST-segment elevation myocardial infarction. Indian Heart J. 2016;68(4):539-551. doi:10.1016/j.ihj.2016.04.006.

Lindholm MG, Boesgaard S, Thune JJ, Kelbaek H, Andersen HR, Kober L. Percutaneous coronary intervention for acute MI does not prevent in-hospital development of cardiogenic shock compared to fibrinolysis. Eur J Heart Fail. 2008; 10:668-74. doi: 10.1016/j.ejheart.2008.04.015.

Gonzalez-Pacheco H, Arias-Mendoza A, Alvarez-Sangabriel A, Juarez-Herrera U, Damas F, Eid-Lidt G, et al. The TIMI risk score for STEMI predicts in-hospital mortality and adverse events in patients without cardiogenic shock undergoing primary angioplasty. Arch Cardiol Mex. 2012; 82(1):7-13.

Kozieradzka A, Kaminski KA, Maciorkowska D, Olszewska M, Dobrzycki S, Nowak K, et al. GRACE, TIMI, Zwolle and CADILLAC risk scores--do they predict 5-year outcomes after ST-elevation myocardial infarction treated invasively? Int J Cardiol. 2011 Apr 1;148(1):70-5. doi: 10.1016/j.ijcard.2009.10.026.

Khalill R, Han L, Jing C, Quan H. The use of risk scores for stratification of non-ST elevation acute coronary syndrome patients. Exp Clin Cardiol. 2009;14(2):e25-e30.

Hess EP, Agarwal D, Chandra S, Murad MH, Erwin PJ, Hollander JE, et al. Diagnostic accuracy of the TIMI risk score in patients with chest pain in the emergency department: a meta-analysis. CMAJ. 2010; 182(10):1039-44. doi: 10.1503/cmaj.092119.

Mahmood M, Achakzai AS, Akhtar P, Zaman KS. Comparison of the TIMI and the GRACE risk scores with the extent of coronary artery disease in patients with non-ST-elevation acute coronary syndrome. JPMA. 2013; 63:691.

Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI risk score for ST-elevation myocardial infarction: a convenient, bedside, clinical score for risk assessment at presentation. An Intravenous nPA for Treatment of Infarcting Myocardium Early II Trial substudy. Circulation. 2000; 102:2031-7. https://doi.org/10.1161/01.CIR.102.17.2031.

IEER
Institute for Excellence in Education & Research