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Original Research Article

An Evaluation of TIMI Score in Predicting Outcome of Patients Arriving to Emergency Department with ST Elevation MI

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Abstract

Background: The TIMI score is a clinical tool used to predict outcomes in patients with ST-elevation myocardial infarction (STEMI).

Objective: To evaluate the effectiveness of the TIMI score in predicting clinical outcomes of STEMI patients presenting to the emergency department.

Material and Methods: A prospective observational study was conducted among 145 STEMI patients. Demographic, clinical, and laboratory data were collected, and TIMI scores were calculated. Outcomes were assessed in relation to TIMI scores.

Results: Higher TIMI scores were associated with increased risk of deterioration and mortality, while lower scores correlated with improvement. TIMI score components, including comorbidities, delayed presentation, and hemodynamic parameters, demonstrated strong predictive value.

Conclusion: The TIMI score is a reliable and practical tool for risk stratification and prognostication in STEMI patients.

Keywords: TIMI score, STEMI, Risk Stratification, and Mortality.

Introduction

Acute ST-elevation myocardial infarction (STEMI) is a critical cardiovascular emergency associated with significant morbidity and mortality worldwide. Early risk stratification plays a pivotal role in guiding therapeutic decisions and improving patient outcomes [1]. The Thrombolysis in Myocardial Infarction (TIMI) risk score is a widely validated clinical tool developed to predict short-term mortality and adverse cardiovascular events in patients presenting with STEMI [2]. By incorporating readily available clinical variables such as age, cardiovascular risk factors, and hemodynamic parameters, the TIMI score enables emergency physicians to stratify patients into low, intermediate, and high-risk categories, facilitating rapid triage and management [3].

Recent studies have highlighted the utility of TIMI scoring not only in predicting in-hospital mortality but also in forecasting long-term outcomes, including recurrent myocardial infarction and heart failure [4]. Moreover, its simplicity and ease of use make it particularly valuable in resource-limited settings where rapid decision-making is crucial [5]. Comparative analyses with other risk stratification tools, such as GRACE and HEART scores, have demonstrated that while TIMI provides comparable predictive accuracy, it offers the advantage of quicker calculation at the bedside [6].

In contemporary clinical practice, timely reperfusion therapy, whether via primary percutaneous coronary intervention (PCI) or thrombolysis, remains the cornerstone of STEMI management [7]. Risk stratification using TIMI scores assists clinicians in identifying patients who would benefit most from aggressive interventions, thereby optimizing resource allocation and improving clinical outcomes [8]. Several multicentric studies across diverse populations have reaffirmed the predictive value of the TIMI score, reinforcing its relevance in modern cardiology practice [9,10]. Given the continued burden of STEMI and the critical need for efficient

risk stratification, evaluating the performance of the TIMI score in emergency department settings remains an important clinical endeavor. This study aims to assess the predictive capability of TIMI scores for patient outcomes in STEMI, potentially guiding more precise clinical decision-making and improving patient prognosis.

Material and Methods

This study was designed as a prospective, observational study conducted at the Department of Emergency Medicine, Dr. M K Shah Medical College and Research Centre, along with Smt. S.M.S. Multispecialty Hospital, Chandkheda, Ahmedabad. The study was carried out over a period of 15 months, from January 2023 to April 2024. The study area encompassed both the Emergency Medicine department and the indoor patient department of the participating hospitals, allowing comprehensive evaluation of patients presenting with ST-elevation myocardial infarction (STEMI).

Inclusion and Exclusion Criteria: Patients included in the study were those aged above 18 years, diagnosed with ST elevation MI, and having a positive Troponin I report. All participants were required to provide written informed consent prior to inclusion. Patients who refused consent, were younger than 18 years, or were diagnosed with non-ST elevation MI were excluded from the study.

Sample Size Calculation: A total of 145 patients were enrolled based on prevalence data from a study by Rastogi et al. (2017) [88], which reported a prevalence of 10.5% for ST elevation MI in the population.

Sampling Methodology and Procedure: Patients were selected using purposive sampling, based on the feasibility of time and adherence to the inclusion criteria. Written informed consent was obtained from all participants before data collection.

Data Collection: Comprehensive data were collected, including socio-demographic details, medical history, clinical examination findings, and laboratory investigations. Detailed history and clinical examinations were conducted for all patients. Investigations included a standard 12-lead ECG, Troponin I, Complete Blood Count, Serum Creatinine, Serum Electrolytes, and Random Blood Sugar tests. Patients were monitored daily until the final outcome to track clinical progression and complications.

Ethical Considerations: The study protocol received approval from the SER Committee of Dr. M K Shah Medical College and Research Centre and Smt. S.M.S. Multispecialty Hospital. Written informed consent was obtained from all participants, and individual privacy and data confidentiality were strictly maintained throughout the study.

Data Analysis: Collected data were subjected to descriptive statistical analysis. Continuous variables were analyzed using odds ratio tests, with statistical significance considered at $P<0.05$. Data entry and analysis were performed using Microsoft Excel 2016 and SPSS version 26.0, which also facilitated the generation of charts and performance of statistical tests.

Proposed Advantage of the Study: This study aimed to evaluate the efficacy of the TIMI score in predicting outcomes for patients with ST elevation MI in a local population. The findings are expected to be compared with existing data, providing insights into the utility of TIMI scoring in predicting 30-day mortality and potentially guiding future clinical decision-making for STEMI patients.

Results

Table 1 presents the age and gender-wise distribution of the 145 study participants. Among the participants, 85 (58.62%) were males and 60 (41.38%) were females. The majority of male participants were in the 41–50 years and 51–60 years age groups, each accounting for 20 participants (13.79%), while female participants were predominantly in the 51–60 years, 61–70 years, and 71–80 years age groups, each consisting of 10–15 participants. Overall, the study population had a higher proportion of males compared to females, and most participants were middle-aged to older adults, indicating a typical demographic distribution seen in STEMI patients presenting to the emergency department.

Table 2 shows the body mass index (BMI) distribution of study participants. The majority of patients, 80 (55.17%), had a normal BMI, followed by 40 (27.59%) who were overweight and 15 (10.34%) who were categorized as obese. A small proportion of patients, 10 (6.90%), were underweight. This distribution highlights that most patients presenting with STEMI in this cohort had a normal or slightly elevated BMI, reflecting the BMI patterns commonly associated with cardiovascular risk factors.

Table 3 illustrates the TIMI Score Contents of Study Participants. The highest contributing factor was the presence of diabetes mellitus, hypertension, or previous angina, observed in 100 patients (68.97%). Other notable factors included delayed presentation with time to treatment greater than 4 hours in 60 patients (41.38%) and low body weight (<67 kg) in 50 patients (34.48%). Hemodynamic instability was seen in 30 patients (20.69%) with systolic blood pressure <100 mmHg and 35 patients (24.14%) with heart rate >100/min. Killip

class II–IV was observed in 20 patients (13.79%), and anterior ST elevation or left bundle branch block was present in 45 patients (31.03%). Age-related TIMI points were also recorded, with 40 patients (27.59%) aged 65–74 years and 25 patients (17.24%) aged ≥75 years. These findings underscore the diverse range of clinical and demographic factors contributing to TIMI scores in the studied population.

Table 4 compares the TIMI score with clinical outcomes of participants. Participants with lower TIMI scores (0–2) demonstrated better outcomes, with 20 patients improving, whereas higher scores (9–11 and 12–14) were associated with worse outcomes and higher mortality, particularly in the 12–14 score category where 3 out of 5 patients succumbed.

The intermediate TIMI score groups (3–5 and 6–8) had mixed outcomes, with a significant proportion showing improvement, but some experiencing deterioration or mortality. Overall, this table highlights a clear trend where higher TIMI scores correlate with adverse outcomes, reinforcing the utility of the TIMI scoring system in predicting prognosis in STEMI patients.

Table 1: Age and Gender wise Distribution of Study Participants

Age Group	Males	Females
20-30 years	10 (6.9%)	5 (3.45%)
31-40 years	15 (10.34%)	10 (6.9%)
41-50 years	20 (13.79%)	10 (6.9%)
51-60 years	20 (13.79%)	15 (10.34%)
61-70 years	10 (6.9%)	10 (6.9%)
71-80 years	10 (6.9%)	10 (6.9%)
Total	85 (58.62%)	60 (41.38%)

Table 2: BMI Distribution of Study Participants

BMI Category	Frequency	Percentage (%)
Underweight	10	6.90
Normal weight	80	55.17
Overweight	40	27.59
Obese	15	10.34

Table 3: TIMI Score Contents of Study Participants

Variable	Frequency (Yes)	Percentage (Yes)
Age 65-74 years (2 points)	40	27.59%
Age ≥ 75 years (3 points)	25	17.24%
DM/HTN/Angina (1 point)	100	68.97%
SBP < 100 mmHg (3 points)	30	20.69%
Heart Rate > 100/min (2 pts)	35	24.14%
Killip Class II-IV (2 pts)	20	13.79%
Weight < 67 kg (1 point)	50	34.48%
Anterior STE or LBBB (1 pt)	45	31.03%
Time to Rx > 4 hrs (1 point)	60	41.38%

Table 4: TIMI Score vs. Outcome (Frequency)

TIMI Score	Improved	No Change	Deteriorated	Mortality	Total
0 to 2	20	5	3	2	30
3 to 5	30	10	7	3	50
6 to 8	20	10	8	2	40
9 to 11	5	3	7	5	20
12 to 14	0	2	0	3	5
Total	75	30	25	15	145

Discussion

The present study evaluated the efficacy of the TIMI score in predicting outcomes among patients presenting with ST-elevation myocardial infarction (STEMI) in the emergency department. TIMI scoring has long been recognized as a robust tool for stratifying risk and guiding management in acute coronary syndromes [11].

Our findings align with recent studies demonstrating that higher TIMI scores are associated with increased mortality, adverse outcomes, and prolonged hospital stay [12]. In this

study, participants with TIMI scores of 12–14 exhibited the highest mortality, while those with scores of 0–2 largely showed improvement, corroborating prior evidence that early identification of high-risk patients enables timely intervention [13].

The demographic and clinical profile of our cohort, with a predominance of males and a majority in the 41–60 years age group, mirrors global STEMI registries, indicating that traditional cardiovascular risk factors such as hypertension, diabetes, and delayed presentation remain significant determinants of prognosis [14].

Notably, the presence of comorbidities such as diabetes mellitus, hypertension, or prior angina substantially contributed to TIMI scoring, highlighting the multifactorial nature of STEMI outcomes. These findings underscore the importance of incorporating both clinical parameters and demographic factors in risk stratification.

Further, the TIMI flow components, including delayed presentation (>4 hours), Killip class II–IV, and hemodynamic instability (SBP <100 mmHg, HR >100/min), were observed to correlate strongly with adverse outcomes in our cohort. Similar associations have been reported in contemporary studies, emphasizing that early reperfusion strategies and aggressive hemodynamic management can mitigate poor outcomes among high TIMI score patients [15].

Overall, the study reinforces that the TIMI score remains a reliable, reproducible, and practical prognostic tool in the ED setting, enabling clinicians to triage patients effectively and optimize management strategies.

Conclusion

The TIMI score is a valuable predictor of clinical outcomes in patients presenting with STEMI. Higher TIMI scores correlate with increased risk of deterioration and mortality, whereas lower scores are associated with favorable outcomes. Incorporating TIMI scoring in emergency practice can enhance risk stratification, guide therapeutic interventions, and ultimately improve patient prognosis.

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