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Original Research Article

Comparison of Thrombolysis in Myocardial Infarction Score and Heart Score in risk stratification of acute myocardial infarction patients, prognostic accuracy and arrhythmia incidence

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ABSTRACT

Background: To compare TIMI & HEART SCORE for their risk stratification in Acute Myocardial Infarction Patients, prognostic accuracy and Arrhythmia incidence.
Methods: This observational study is conducted in a Tertiary care hospital over a period of 2 years from August 2017 to July 2019. A total of 100 patients presented to ER with Chest Pain are selected for study. Patients were monitored for a period of one month in ICCU.
Results: In present study out of 61 cases with TIMI score ≥5, mortality of 11.5%(7 cases, p value 0.028). Heart score more than 6 constitutes high risk group, out of which mortality was observed in 7.45% cases (p=0.48). Most of the arrhythmias (70.49%) in present study observed in patients with TIMI score ≥5 (High risk group) which is statistically significant with p value 0.002. Most of the arrhythmias in present study observed in patients with HS ≥8 which is not statistically significant with p value 0.135.
Conclusions: In present study, overall mortality rate was 7% and these patients who died constitutes to high risk group with TIMI. HEART SCORE identified more patients as low risk compared to TIMI SCORE. TIMI SCORE is a good predictor of arrhythmia incidence.

Keywords: Thrombolysis in myocardial infarction score, Heart score, Risk stratification in acute myocardial infarction patients

INTRODUCTION

Risk stratification of Myocardial infarction patients is vitally important in the overall investigation and management of patients both acutely and long term. Risk stratification is particularly important during first 30 days after Acute Myocardial infarction, the period during which the risk of recurrent infarction and sudden death is greatest.

Over the past decade, a multitude of risk scores have been proposed to facilitate risk assessment. These scores are based on presenting clinical history and electrocardiographic and initial laboratory tests that enable early risk stratification on admission. One of the first validated and clinically useful risk scores was the Thrombolysis in Myocardial Infarction (TIMI) score for STEMI, derived from fibrinolytic therapy trials.[1]

The Controlled Abciximab and Device Investigation to Lower Late Angioplasty complications (CADILLAC) risk score uses both clinical and angiographic parameters.[2] The CADILLAC risk score can be calculated only after inter- pretation of angiographic

results and PCI, angio- graphic parameters included in the score have an important additive value to clinical variables.[2]

The TIMI risk score (2000) (Table 1) is derived from the Thrombolysis in Myocardial Infarction (TIMI)-11B trial, a multinational, randomized clinical trial, comparing unfractionated heparin to enoxaparin, which included all patients with confirmed ACS.[3]

Table 1: TIMI score for stemi.

TIMI risk score for stemi	Points
Historical	
AGE 65-75	2 Points
>/= 75	3 Points
DM/HTN or Angina	1 Point
Examination	
SBP < 100	3 Points
HR >100	2 Points
Killip II - IV	2 Points
Weight < 67 KG	1 Point
Presentation	
Anterior STE or LBBB	1 Point
Time to rx >4hrs	1 Point
Risk score = total	(0-14)
Risk score	**Odds of death by 30 days**
0	0.1 (0.1-0.2)
1	0.3 (0.2-0.3)
2	0.4 (0.3-0.5)
3	0.7 (0.6-0.9)
4	1.2 (1.0-1.5)
5	2.2 (1.9-2.6)
6	3.0 (2.5-3.6)
7	4.8 (3.8-6.1)
8	5.8 (4.2-7.8)
>8	8.8 (6.3-12)

Odds of death referenced to average mortality (95% confidence intervals).

The TIMI risk score for STEMI may be readily applied at the bedside at the time of hospital presentation and captures the majority of prognostic information offered by a full logistic regression model. This risk assessment tool is likely to be clinically useful in the triage and management of patients eligible for fibrinolytic therapy and may also serve as a valuable aid in clinical research.[1,3] A dynamic risk score that can provide both an initial risk assessment and subsequent discharge reclassification could help clinicians to make decisions about the postdischarge care of STEMI patients. Physicians caring for patients post STEMI could use the dynamic TRS to inform frequency of follow-up and decide on the threshold for a monitored trial of treatment withdrawal. The risk-benefit ratio for the use of therapeutic devices and drugs varies with a patient's estimated mortality and morbidity.[3,4]

The HEART risk score (Table 2) was developed for risk stratification of chest pain patients presenting to the ED. It quickly identifies both a large proportion of low-risk patients, in whom early discharge without additional testing goes with a risk of MACE of only 1.7%, and highrisk patients who are potential candidates for early invasive strategies.[5] Utilization of the HEART score provided excellent determination of risk for 30- day MACE, comparing well with the TIMI score.[6]

Table 2: Heart score.

Clinical history and lab criteria		Points
History	High suspicious	2 points
	Moderately suspicious	1 point
	Slightly or non-suspicious	0 point
ECG	Significant ST-depression	2 points
	Nonspecific repolarisation	1 point
	Normal	0 point
Age	≥ 65 years	2 points
	> 45 - < 65 years	1 point
	≤ 45 years	0 point
Risk factors	≥ 3 Risk factors or history of CAD	2 points
	1 or 2 Risk factors	1 point
	No Risk factors	0 point
Troponin	≥ 3x Normal limit	2 points
	>1 < 3x Normal limit	1 point
	≤ Normal limit	0 point

Risk factors: DM, current or recent (<one month) smoker, HTN,HLP, family history of CAD, and obesity,
Score 0 - 3: 2.5% MACE over next 6weeks→ Discharge Home,
Score 4 - 6: 20.3% MACE over next 6weeks→ Admit for Clinical Observation,
Score 7 - 10:72.7% MACE over next 6weeks→ Early Invasive Strategies.

The Global Registry for Acute Coronary Events (GRACE) score, based on a large registry of patients across the spectrum of acute coronary syndromes (ACS) incorporates clinical and electrocardiographic characteristics to determine risk. The GRACE risk score was shown to be of predictive value for all forms of ACS.[7] The CADILLAC and TIMI risk scores had high predictive value for mortality in hospital and at 1 year. The CADILLAC risk score was superior to the GRACE and TIMI risk score for MACE in hospital.[8]

The TIMI risk score is an easy to use tool and its use should be primarily for predicting risk of very near-term events. The CADILLAC score is not useful in the decision making before angiography; however, it is very useful for pre- dicting risk in patients undergoing PCI for ACS. The GRACE risk score can be used for all types of ACS patients in clinical practice.[8]

Comparing the composition of the three risk scores, all included the components of age and Killip's classification, consistently shown to be important predictors of survival in patients with STEMI.[9,10]

The risk of MACE in patients with a HEART score ≤3 is 0.9%, 12% in patients with HEART score 4-6 and 65% in patients with a HEART score ≥7.[11] The risk of death during the first 30 days after a STEMI in the literature was highest in patients who presented with advanced age, raised biomarkers, and high Killip class. Knowledge of the highest risk period for patients after PCI for STEMI will guide the clinician in structuring patient teaching, follow-up appointments, and diagnostic tests.[12]

METHODS

This observational study is conducted in a Tertiary care hospital over a period of 2 years from August 2017 to July 2019. A total of 100 patients presented to ER with Chest Pain are selected for study. Patients were monitored for a period of one month in ICCU.

Inclusion criteria

- Patients 18 years of age or above presented to the emergency room with acute myocardial infarction.
- Myocardial infarction <48 hours old
- Presence of new on set Left Bundle Branch Block with rise of cardiac biomarkers.
- Presence of classical ECG changes of Hyperacute or Acute Myocardial infarction with transient rise in cardiac biomarkers.
- Presence of wall motion abnormality in 2D ECHO.
- Presence of pathological q-waves accompanied by ST-Segment elevation and Symmetrical T-Waves with rise in cardiac enzyme levels.

Exclusion criteria

- Patient is <18 years of age.
- Myocardial infarction 48 hours old or more.

A total of 100 patients were recruited on admission to the emergency room in tertiary care hospital. They include 78 males and 22 females. Patient with confirmed diagnosis of acute myocardial infarction and satisfying the inclusion and exclusion criteria were included in the study. All patients have been evaluated for risk factors like diabetes, alcohol, hypertension, hypercholesteremia and smoking. Risk stratification done by calculation TIMI SCORE and HEART SCORE.

Statistical analysis

The data has been entered into MS EXCEL and Statistical Analysis has been done using IBM SPSS Version 22.0 for Categorical variables, the data values are represented as number and percentages. To test the association between groups Chi-Square Test was used. For continuous variables, the data values are shown as Mean and Standard Deviation. All the P Values having less than 0.05 are considered as statistically significant.

RESULTS

Among the 100 patients, the maximum incidence of AMI in males was in 61-70 years of age group and in females it was in those who were older than 50 years.

There were only 10% cases below the age 40 years, and all were males. Overall, 78% cases were males and females constitute 22% of study (Figure 1).

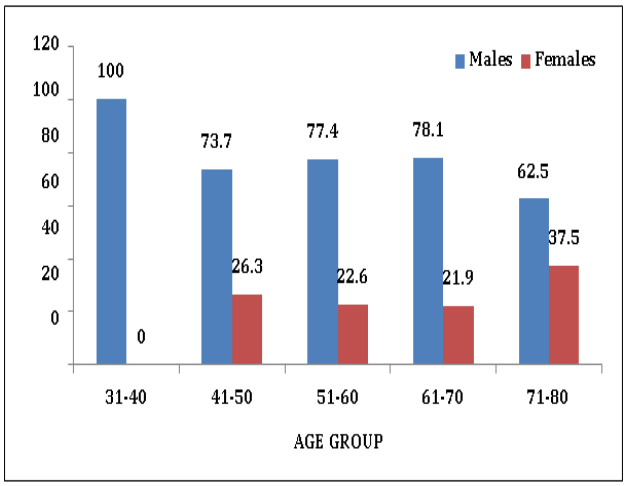

Figure 1: Age and gender incidence.

In present study, majority of cases were smokers (53%), 50% of cases were hypertensive and 48% had diabetes and alcoholics constitutes 31% of the study (Figure 2).

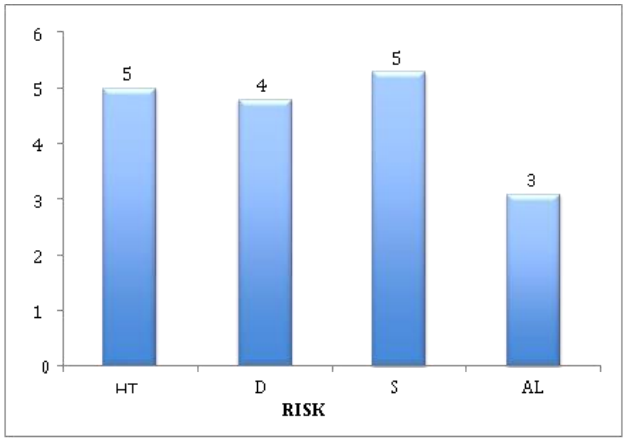

Figure 2: Risk factors associated with AMI.

In present study 18 cases with AMI had comorbiditiess of which CKD (33.3%), CVA (33.3) constitutes the majority of cases. Hypothyroidism is seen in 11.1% of patients with AMI (Figure 3).

Most of the arrhythmias (70.49%) in present study observed in patients with TIMI score ≥5 (High risk group) which is statistically significant with P value 0.002 (Table 3).

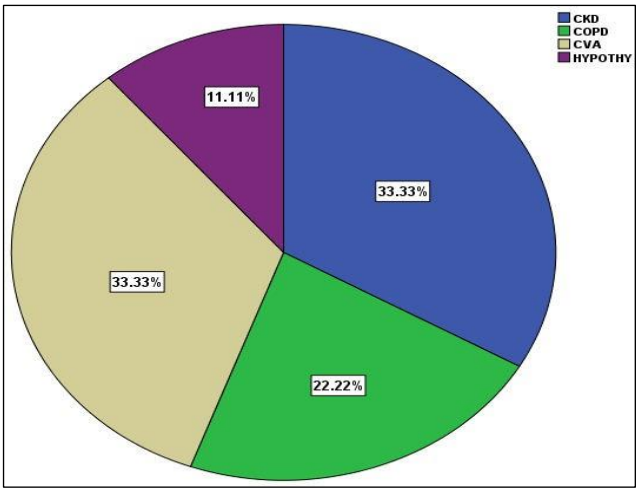

Figure 3: Co-Morbidities in AMI.

Table 3: Relation of arrhythmias in AMI with TIMI score.

TIMI	No ary	Ary	Total
<4	24 (61.54%)	15 (38.46%)	39 (39.0%)
>=5	18 (29.51%)	43 (70.49%)	61 (61.0%)
Total	42 (42.0%)	58 (58.0%)	100 (100.0%)

Chi-square value = 10.02, p value = 0.002 (Sig.).

Most of the arrhythmias in present study observed in patients with HS ≥8 which is not statistically significant with P value 0.135 (Table 4).

Table 4: Relation of arrhythmias in AMI with HS.

HS	No ary	Ary	Total
6	0 (0.00%)	6 (100.0%)	6 (6.0%)
7	6 (40.0%)	9 (60.0%)	15 (15.0)
8	29 (48.33%)	31 (56.67%)	60 (60.0%)
9	7 (36.84%)	12 (63.16%)	19 (19.0%)
Total	42 (42.0%)	58 (58.0%)	100 (100.0%)

Chi-square value = 5.565, p value = 0.135 (Not Sig.).

In present study out of 61 cases with TIMI score ≥5, mortality of 11.5% (7 cases) which is statistically significant with p value 0.028 (Table 5).

In present study majority of patients with AMI had Heart score more than 6 and constitutes high risk group, out of which mortality was observed in 7.45% cases, this association was found statistically not significant (Table 6).

Table 5: Association between TIMI score and mortality.

TIMI	Discharge	Death	Total
< 4	39 (100.0%)	0 (0.00%)	39 (39.0%)
>=5	54 (88.5%)	7 (11.5%)	61 (61.0%)
Total	93 (93.0%)	7 (7.0%)	100 (100.0%)

Chi-square value = 4.812, p value = 0.028 (Sig.).

Table 6: Association between HS and mortality.

HS	Discharge	Death	Total
4 - 6	6 (100.0%)	0 (0.0%)	6 (6.0%)
7 - 10	87 (92.55%)	7 (7.45%)	94 (94.0%)
Total	93 (93.0%)	7 (7.0%)	100 (100.0%)

Chi-square value = 0.49, p value = 0.488 (Not Sig.).

DISCUSSION

The TIMI risk score (2000) is derived from the Thrombolysis in Myocardial Infarction (TIMI)-11B trial, a multinational, randomized clinical trial, comparing unfractionated heparin to enoxaparin, which included all patients with confirmed ACS. In a study done by Benjamin Sun et al, HEART SCORE is more accurate than TIMI and Specifically outperforms TIMI at "Low - Risk" Thresholds.[13] In another study by William Brady et al, HEART SCORE was more likely to classify patients as low risk and safe for discharge compared to clinical GESTLAT (20% Vs 13.5%).[14] Christopher Byrne et al, have done a META - Regression analysis which revealed a strong linear relation between TIMI Risk score ($p < 0.001$) and the Cumulative incidence of Cardiac events.[15]

Maureen Chase et al, stated "patient with the lowest risk as defined by a TIMI SCORE of zero had 1.7% incidence of adverse events. Therefore, the TIMI SCORE should not be used in isolation to determine disposition of patients presenting with chest pain".[16] But this study prove TIMI RISK SCORE as a good predictor of Morbidity and mortality and also Arrhythmias incidence. The study limitation of this is study population included only 100 cases so the findings can't be applied to the general population. Only STEMI patients were included in the present study, so results can't be generalised to all patients with ACS. As it includes STEMI, NSTEMI and Unstable angina.

CONCLUSION

TIMI RISK SCORE is clinically useful bed side tool for risk stratification of acute myocardial infarction patients in emergency room. HEART SCORE identifies more patients as low risk compared to TIMI SCORE. This may lead to insufficient treatment and monitoring of patients. TIMI RISK SCORE is good predictor of arrhythmias incidence and related mortality.

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