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Original Research Article

Study of in-hospital outcome in acute myocardial infarction in correlation with thrombolysis in myocardial infarction risk score

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ABSTRACT

Background: The Thrombolysis in Myocardial Infarction (TIMI) risk score is purportedly an integral score for mortality risk prediction in fibrinolysis-eligible patients with STEMI. Attempt was made to evaluate the same by correlating risk stratification by TIMI score with hospital outcome of such patients.
Methods: There were 145 cases of STEMI were studied and TIMI risk scores were calculated and analysed vis-à-vis various relevant parameters. The patients were divided into three risk groups: 'low-risk', 'moderate-risk' and 'high-risk' based on their TIMI scores. All patients received routine anti-ischemic therapy and were thrombolysed subsequently, monitored in ICCU and followed during hospital stay for occurrence of post-MI complications.
Results: There were 79 patients (54.5%) belonged to low-risk group, 48 (33.1%) to moderate-risk group and 18 (12.4%) to high-risk group according to TIMI risk score. The mortality (total 17 deaths) was observed to be highest in the high-risk group (55.6%), followed by moderate-risk (12.2%) and low-risk group (1.28%) respectively. Out of the 7 potentially suspect variables studied, Killips classification grade 2-4 had the highest relative risk (RR-15.85), followed by systolic BP <100mmHg (RR- 10.48), diabetes mellitus (RR- 2.79) and age >65 years (RR- 2.59).
Conclusions: The TIMI risk scoring system seems to be one simple, valid and practical bed side tool in quantitative risk stratification and short-term prognosis prediction in patients with STEMI.

Keywords: AMI, In-hospital outcome, Myocardial infarction, TIMI score, STEMI

INTRODUCTION

Ischemic Heart Disease (IHD) remains leading cause of mortality worldwide with the epidemic curve on the way up.[1] IHD and stroke collectively killed 12.5 million people in the year 2010 or 1 in 4 deaths worldwide, compared to 1 in 5 deaths in the year 1990; with IHD being topmost in the ranking of Years of Life Lost (YLL) in the year 2010 in comparison to being 4th in the year 1990.[1] Worse, cardiovascular diseases (CVD) affects Indians around a decade earlier than their western counterparts, with IHD constituting the majority of CVD mortality in India (83%).[2-4]

Inspite of therapeutic advances in MI management, large scale randomised clinical trials reported 6-9% early mortality rates (30-35 days), even for patients receiving thrombolytic therapy within 6 hours of symptom onset.[5,6] Careful attention to pivotal factors that increase the risk of early mortality may further elaborate the role of early invasive therapeutics that would lower the fatality rate of ST Elevation Myocardial Infarction (STEMI). Effective risk stratification is integral to management of acute coronary syndromes. The Thrombolysis in Myocardial Infarction (TIMI) risk score for STEMI is one such simple integral score purported to be a robust clinical tool for mortality risk prediction in fibrinolysis-eligible

patients with STEMI.[7] It's validation in local population is, however, largely untested.

The present study attempted to evaluate the prognostic significance of TIMI risk score in selected local population consisting of group of acute STEMI patients eligible for thrombolytic therapy, by correlating risk stratification by TIMI score with hospital outcome of above such patients.

METHODS

The present study was a prospective observational one, carried out at a tertiary care government hospital in central India over 2 years from December 2010 to December 2012. All adult patients of either gender more than 18 years of age, presenting to Medicine/Cardiology OPD or emergency department and with cardiac condition compelling admission to ICCU; while satisfying the following inclusion criteria were enrolled.

Inclusion criteria

- Patients with ST Elevation Myocardial Infarction (STEMI) presenting for the first time.
- Patients with ST Elevation Myocardial Infarction (STEMI) eligible for thrombolysis. (As per the ACC/AHA STEMI Management Guideline).[8]

Exclusion criteria

- Patients with Non- ST Elevation Myocardial Infarction.
- Patients with ST Elevation Myocardial Infarction (STEMI) in which thrombolysis is contraindicated due to any reason.
- Unwilling for consent.

An informed written consent was elicited from each participant before enrollment. All patients such enrolled were thoroughly evaluated; with detailed history (especially with respect to chest pain and risk factors), clinical examination, clinically indicated laboratory investigations and ECG. The diagnosis of STEMI was considered if the patient fulfilled following 2 criteria-

- Presence of chest pain or other symptoms suggestive of acute MI.
- ST elevation on admission or during hospital evaluation in two or more contiguous leads (greater than 0.2mv in lead V1, V2 and V3 or greater than 0.1mv in other leads).

The patients were divided into three risk groups, namely 'low-risk', 'moderate-risk' and 'high-risk' based on their TIMI scores (0-4 low risk, 5-8 moderate risk, 9-14 high risk). All patients received routine anti-ischemic therapy and were thrombolysed subsequently with 1.5 million IU of Streptokinase in 100 ml of normal saline over 60 minutes followed by routine post MI management. The patients were closely monitored in ICCU and followed during their hospital stay for occurrence of post-MI complications including death. Ethical approval was obtained from Institutional Ethics Committee before proceeding with the study.

Statistical analysis was performed using chi-square test for comparing variables between three TIMI score groups. Relative risks (RR) were calculated wherever suitable. P-value <0.05 was considered statistically significant. STATA version 10.0 was used to perform statistical analysis.

RESULTS

In all, a total of 145 cases of ST Elevation Myocardial Infarction (STEMI) fulfilling the inclusion criteria were considered for the analysis and TIMI scores calculated for further grouping and analysis.

The mean age of participants was 57.9±11.2 years, which was more in females (63.3±7.5 years, n=34) than males (56.0±11.8 years, n=111). Chest pain was the commonest symptom being reported by all the patients, followed by presence of constellation of symptoms (136, 93.8%), sweating (63, 43.4%), vomiting (34, 23.4%), breathlessness (32, 22.1%) and palpitation (17, 11.7%). The average elapsed time before patient could reach the medical facility was observed to be 10.4±11.3 hours median; with as many as 106 (73.1%) participants having elapsed time >4 hours and remaining 39 (26.9%) being attended within 4 hours.

Out of 145 patients, 79 (54.5%) belonged to low-risk group, 48 (33.1%) to moderate-risk group and 18 (12.4%) to high-risk group according to TIMI risk score. The mortality (total 17 deaths) was observed to be highest in the high-risk group (55.6%), followed by moderate-risk (12.2%) and low-risk group (1.28%) respectively (Table 1).

Table 1: Distribution of patients according to TIMI risk scores.

TIMI risk group	Patients		Mortality among group	
	Number	%	Number	%
Low risk	79	54.5%	1	1.3%
Moderate risk	48	33.1%	6	12.2%
High risk	18	12.4%	10	55.6%

Hypertension (79, 54.5%) was the most common risk factor, followed by smoking (61, 42.1%), dyslipidemia (39, 26.9%), diabetes mellitus (36, 24.8%) and presence of family history of AMI (34, 23.4%). The subsequent mortality and TIMI risk score grouping revealed significant associations for all the mentioned risk factors (Table 2).

Anterior wall MI (92, 63.4%) was observed to be more common than others (inferior wall MI- 26.2%, mixed MI-10.4%). Anterior wall MI was more lethal as well, with 13 (14.1%) patients succumbing to the episode. P-value was significant for trend of TIMI risk scores across the various types of MIs. Forty-four cases (30.3%) belonged to Killips classification grade 2-4, with significant association with TIMI risk score. As many as 16 out of 44 (36.4%) belonging to Killips classification grade 2-4 expired.

Table 2: TIMI Risk score groups and association of various risk factors.

Risk factor	Mortality	TIMI risk score			
		Low	Moderate	High	P-value
Hypertension (n=79)	12 (11.4%)	36 (45.6%)	28 (35.4%)	15 (19.0%)	0.015
Smoking (n=61)	10 (16.4%)	33 (54.1%)	16 (26.2%)	12 (19.7%)	0.026
Dyslipidemia (n=39)	10 (25.6%)	16 (41.0%)	14 (35.9%)	9 (23.1%)	0.015
Diabetes Mellitus (n=36)	8 (22.2%)	24 (66.6%)	6 (16.7%)	6 (16.7%)	0.011
AMI family history (n=34)	9 (26.5%)	13 (38.2%)	12 (35.3%)	9 (26.5%)	0.037

Potentially suspect variables were checked for association with mortality amongst study participants. Out of the 7 variables studied, Killips classification grade 2-4 had the highest relative risk (RR-15.85) which was significant. Other variables with significant relative risks signifying association with morality were systolic BP <100mmHg (RR- 10.48), diabetes mellitus (RR- 2.79) and age >65 years (RR- 2.59) (Table 3).

Table 3: Variables associated with in-hospital mortality amongst participants.

Variable	RR	95% CI	P- Value
Killips Grade 2-4	15.85	1.86-26.31	<0.001
Systolic BP <100 mmHg	10.48	4.03-27.27	<0.001
Diabetes mellitus	2.79	1.16-6.68	0.019
Age >65 years	2.59	1.08-6.23	0.030
Heart rate >110/min	2.14	0.86-5.30	0.092
Elapsed time >4 hours	1.71	0.52-5.65	0.36
Hypertension	1.34	0.95-1.91	0.16

Table 4: Association of variables with TIMI risk scores.

Variable	Low risk (%)	Moderate risk (%)	High risk (%)
Systolic BP <100mmHg	4 (5.12)	11 (22.44)	12 (66.67%)
HR >100/min	34 (43.58)	26 (53.06)	8 (44.44)
Elapsed time > 4 hours	51 (65.38)	40 (81.63)	15 (85.33)
Weight <67 kg	73 (93.58)	48 (97.95)	18 (100)
Extensive ant. wall MI	44 (56.41)	35 (71.42)	15 (88.23)
Hospitalisation time ≤24 hrs	72 (92.8)	41 (83.67)	12 (70.58)
Elevated blood pressure	36 (46.15)	28 (57.14)	15 (88.23)
Angina	12 (15.38)	12 (24.48)	02 (11.76)
Diabetes mellitus	24 (30.76)	05 (10.2)	05 (29.41)

Selected variables were further studied to check for association with TIMI risk scores. Frequency of all the studied variables was observed to be more in high risk group as compared to moderate and low risk groups; except in angina and diabetes mellitus, where the frequency didn't vary much (Table 4).

DISCUSSION

Early identification is pivotal in any acute coronary event. Various risk scores have been proposed towards same over years. Two most prominent ones are; the Thrombolysis in Myocardial Infarction (TIMI) risk score,

which was derived from clinical trial populations, and the Global Registry of Acute Coronary Events Risk Score (GRACE RS), which was derived from an international registry.[7,9] But their performance has not been validated well enough in representative patient populations; which necessitated the present study.

A total of 145 confirmed cases of STEMI were studied and TIMI risk scores were calculated and analysed vis-à-vis various relevant parameters. The age and gender distribution of participants in the present study was mostly similar to previous similar ones, making the comparisons valid.[10-12]

Chest pain was the ubiquitous presentation amongst participants in the current study, which is similar to the 95% positivity reported by Berg J et al and to the findings of Zucker D et al.[13,14] The average time elapsed before the patient could reach medical facility was 10.4±11.31 hours; much higher than that reported by Jacqueline L et al (6.7±8.6 hours), but comparable to the mean 10.6 hours reported by Zornoff et al in their Canadian study in 1996.[10,15] The reason of discordance here could be due to relatively lesser penetration of specialized health services in our country, apparently similar to the Canadian health services in the 1990s.

Out of 145 patients, 54.5% belonged to low-risk group, 33.1% to moderate-risk group and 12.4% to high-risk group according to TIMI risk score and the mortality was highest in the high-risk group (55.6%).

Previous similar studies have also reported similar distribution and similarly high mortality rates for TIMI risk score among MI patients, further strengthening evidence in favour of TIMI risk score a predictor of mortality in studied scenario.[10-12,16]

Hypertension and smoking were the most common risk factors in the present study and the subsequent mortality and TIMI risk score grouping revealed significant associations for all the mentioned risk factors, much in line with the available literature.[14-16] A total of 44 (30.3%) participants belonged to Killips classification grade 2-4, and with the relative risk being significant at more than 15, it was the single biggest determinant of in-hospital mortality in the present study. Previous researchers seemed to have under-grouped the Killips classified cases.[10,11] Nonetheless, there is agreement over their important predictive role, with Jacqueline L et al, among others, reporting the mortality among Killips class 2-4 to be as high as 54.8%.[10,17] Systolic BP <100 mmHg was the other significant determinant of death (RR-10.5). This is also much in-line with the available literature, reported more prominently in the elderly population.[10,11,18]

Systolic BP <100 mmHg, HR >100/min, elapsed time >4 hours, weight <67kg, extensive ant. wall MI, hospitalisation time <24hrs, elevated blood pressure was some of the variables which confirmed the discriminatory role of TIMI risk score, as their frequency was observed to be more in high risk group as compared to moderate and low risk groups. This important sits perfectly well with the findings of previous similar studies.[10,12,15-17] The discriminatory capacity of the TIMI risk score was further confirmed by the significant area under ROC curve (0.86).

CONCLUSION

It can be deducted from the study that higher the TIMI risk score at admission in STEMI cases, worse is the prognosis. The TIMI risk scoring system seems to be one simple, valid and practical bed side tool in quantitative risk stratification and short-term prognosis prediction in patients with STEMI and is recommended for the same.

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