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### **RESEARCH ARTICLE**

#### **MORTALITY OF ACUTE MYOCARDIAL INFARCTION IN RELATION WITH TIMI RISK SCORE**

**Owais Ahmed Wani<sup>1</sup>, Nasir Ali<sup>2</sup>, Ouber Qayoom<sup>1</sup> and Rajveer Beniwal<sup>1</sup>**

1. Dr NB Cardiology, SSH, GMC Jammu.
2. Consultant Cardiology, SSH, GMC Jammu.

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#### **Abstract**

**Background:** The Thrombolysis in Myocardial Infarction (TIMI) risk score is said to be an important factor in predicting mortality risk in fibrinolysis-eligible STEMI patients. An attempt was made to assess the situation by comparing risk stratification based on the TIMI score with the hospital outcome of such individuals.

**Methods:** 145 STEMI patients were included in this study , TIMI risk scores were calculated and analysed vis-à-vis various relevant parameters.. Based on their TIMI scores, the patients were placed into three risk groups: 'low-risk,' 'moderate-risk,' and 'high-risk.' All patients received standard anti-ischemic medication, were thrombolyzed, monitored in the ICCU, and monitored throughout their hospital stay for post-MI sequelae.

**Results:** According to the TIMI risk score, 79 patients (54.5%) had low-risk , 48 (33.1%) to the moderate-risk , and 18 (12.4%) to the high-risk . The highest mortality rate (total 17 deaths) was found in the high-risk group (55.6%), followed by moderate-risk (12.2%) and low-risk (1.28%) groups, respectively. Killips categorization grade 2-4 had the highest relative risk (RR-15.85) of the seven potentially dubious variables evaluated, followed by systolic BP 100mmHg (RR-10.48), diabetes mellitus (RR-2.79), and age >65 years (RR- 2.59).

**Conclusions:** In patients with STEMI, the TIMI risk scoring system appears to be a straightforward, valid, and practical bedside tool for quantitative risk classification and short-term prognosis prediction.

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#### **Introduction:-**

Ischemic Heart Disease (IHD) is still the biggest cause of death worldwide, and the epidemic is on the rise. IHD and stroke combined killed 12.5 million people in 2010, accounting for 1 in every 4 deaths worldwide, compared to 1 in every 5 deaths in 1990; IHD ranked first in terms of Years of Life Lost (YLL) in 2010, compared to fourth in 1990.<sup>1</sup> Worse, Indians are affected by cardiovascular diseases (CVD) a decade earlier than their western counterparts, with IHD accounting for the majority of CVD death in India (83 percent ).<sup>2-4</sup>

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.<sup>5,6</sup> 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

**Corresponding Author:- Owais Ahmed Wani**

Address:- Dr NB Cardiology, SSH , GMC Jammu.

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.<sup>7</sup> Its validation in local population is, however, largely untested.

The purpose of this study was to determine the predictive importance of the TIMI risk score in a local community of acute STEMI patients who were eligible for thrombolytic therapy, by connecting risk stratification by TIMI score with hospital outcomes of these patients.

### **Methods:-**

The current study was a prospective observational study that lasted two years, from September 2019 to September 2021. It was conducted at a tertiary care government hospital in North India. All adult patients over the age of 18 who presented to the Cardiology OPD or emergency department and with cardiac condition compelling admission to ICCU; while satisfying the following inclusion criteria were enrolled.

#### **Inclusion criteria**

1. Patients with ST Elevation Myocardial Infarction (STEMI) presenting for the first time.
2. Patients with ST Elevation Myocardial Infarction (STEMI) eligible for thrombolysis. (As per the ACC/AHA STEMI Management Guideline).<sup>8</sup>

#### **Exclusion criteria**

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

An informed written consent was elicited from each participant before enrollment. All patients were thoroughly evaluated; with detailed history, clinical examination, clinically indicated laboratory investigations and ECG. The diagnosis of STEMI was considered if the patient fulfilled following 2 criteria-

1. Presence of chest pain or other symptoms suggestive of acute MI.
2. 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 total, 145 ST-Elevation Myocardial Infarction (STEMI) cases met the inclusion criteria, and TIMI scores were generated for further categorization and analysis..

The participants' average age was 57.9±11.2 years, with females (63.3±7.5 years, n=34) having a higher age than males (56.0±11.8 years, n=111). The most prevalent symptom reported by all patients was chest discomfort (136, 93.8 percent), which was followed by perspiration (63, 43.4 percent), vomiting (34, 23.4 percent), dyspnea (32, 22.1 percent), and palpitation (32, 22.1 percent) (17, 11.7 percent). The median elapsed time before a patient could reach a medical facility was 10.4±11.3 hours, with 106 (73.1%) individuals having an elapsed time of more than 4 hours and 39 (26.7%) being seen 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 AMOUNG GROUP	
	NUMBER	%	NUMBER	%
LOW RISK	79	54.50%	1	1.30%
MODERATE RISK	48	33.1	6	12.20%
HIGH RISK	18	12.4	10	55.60%

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

Anterior wall MI was shown to be more prevalent than other types of MI (92, 63.4 percent) (inferior wall MI- 26.2 percent , mixed MI- 10.4 percent ). Anterior wall MI was also more deadly, with 13 (14.1%) patients dying as a result of the incident. P-value was significant for trend of TIMI risk scores across thevarious 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	TIMI Risk score				P Value
	Mortality	Low	Moderate	High	
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	72 (92.8)	41 (83.67)	12 (70.58)

hrs			
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:-

In every acute coronary episode, early recognition is critical. Over the years, a variety of risk scores have been offered. The Thrombolysis in Myocardial Infarction (TIMI) risk score, obtained from clinical trial populations, and the Global Registry of Acute Coronary Events Risk Score (GRACE RS), derived from an international registry, are two of the most renowned.<sup>7,9</sup> However, their effectiveness has not been sufficiently verified in representative patient populations, necessitating this research.

A total of 145 confirmed STEMI cases were investigated, with TIMI risk scores calculated and analysed in relation to several relevant parameters. The age and gender distribution of the participants in this study was mainly similar to that of past similar studies, allowing for fair comparisons.<sup>10-12</sup>

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.<sup>13,14</sup> 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.<sup>10,15</sup> 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.

According to the TIMI risk score, 54.5 percent of the 145 patients were in the low-risk group, 33.1 percent in the moderate-risk group, and 12.4% in the high-risk group, with the high-risk group having the highest mortality (55.6 percent ).

Previous studies have found a similar distribution of TIMI risk scores among MI patients, as well as similar high mortality rates, adding to the evidence that TIMI risk score is a predictor of mortality in the studied scenario.<sup>10-12,16</sup>

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.<sup>14-16</sup> 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.<sup>10,11</sup> 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%.<sup>10,17</sup> 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.<sup>10,11,18</sup>

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.<sup>10,12,15-17</sup> The discriminatory capacity of the TIMI risk score was further confirmed by the significant area under ROC curve (0.86).

### Conclusion:-

The study concludes that in STEMI cases, the greater the TIMI risk score upon admission, the worse the prognosis. The TIMI risk score system appears to be a straightforward, valid, and useful bedside tool for quantitative risk classification and short-term prognosis prediction in STEMI patients, and it is recommended for this purpose.

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**Conflict of interest:**

None declared

**Ethical approval:**

The study was approved by the Institutional Ethics Committee

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