ASSESSMENT OF MORTALITY RISK IN HOSPITALISED STEMI PATIENTS USING TIMI AND GRACE RISK SCORING SYSTEMS – AN OBSERVATIONAL STUDY

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Abstract-
BACKGROUND: This study aimed to assess the mortality risk in hospitalized STEMI patients using risk scoring system.
METHODS: It was an observational study performed in single Centre tertiary care hospital in STEMI patients undergone PCI admitted in CCU department. The patient data were collected for initial assessment. The data was introduced to TIMI and GRACE risk scoring systems and 30 day mortality risk was determined. Compared the feasibility of these two scoring systems.
RESULTS: A total 106 patients were included in the study. Out of these most were male (72.64%), and have smoking history (26.41%), alcoholic (16.07%), hypertension (63.20%), diabetes mellitus (60.37%), CKD (4.71%), hypothyroidism (5.66%) and dyslipidemia (3.77%) as their risk factor. 10(9.43%) were had in hospital mortality. The commonly seen STEMI was AWMI (46.22%), out of this AWMI (3.77%) carried high risk of mortality. For each patient TIMI and GRACE risk score was calculated and 30-day mortality risk were assessed. TIMI and GRACE risk scoring systems showed an excellent predictive value for 30 day mortality in patient treated with PCI.
CONCLUSION: Risk stratification of patients with STEMI undergone PCI can be done using risk scoring systems. However in our study, GRACE predicted the 30 day mortality over TIMI risk scoring system. This study emphasizes on the importance of good planning and predicting of STEMI in advance as a way to prevent the mortality and morbidity or lower its risk in individual by studying the risk factors and calculating the risk using TIMI and GRACE risk scoring systems.

***Key words*: ACS- Acute Coronary Syndrome, TIMI- Thrombolysis in Myocardial Infarction, GRACE- Global registry of acute coronary events, PCI- Percutaneous Coronary Intervention, STEMI- ST elevated Myocardial Infarction**

INTRODUCTION

Acute coronary syndrome (ACS) is the leading cause of death in patients with cardiovascular disease**.** The incidence of acute coronary syndromes (ACS) increases progressively with aging, being the main cause of mortality and morbidity in this population[1],in which Patients with ST-elevation myocardial infarction (STEMI) are a diverse group with variable risks of mortality and morbidity.[2]Hence early risk stratification is crucial for efficient patient care and the best possible treatment outcome. It gives patients prognostic information and directs clinicians in terms of how aggressively to treat patients.[3] Our objective is to provide a novel approach to STEMI risk stratification that includes initial risk assessment.[4]Global registry of acute coronary events (GRACE) and Thrombolysis in Myocardial Infarction (TIMI) are the most widely used to derive regression models to predict death in hospital.[5] Risk stratification using the Thrombolysis in Myocardial Infarction (TIMI) risk score for STEMI is a simple assessment based on clinical data at the time of patient arrival at the hospital.[12] GRACE risk score should be preferred to all other risk score because of its superior accuracy. The GRACE risk score was developed from a large multinational prospective patient registry and validated in several studies for the prediction of in hospital mortality.[13] GRACE score was calculated on admission based on the following variables: age, heart rate, systolic blood pressure, initial serum creatine, Killip classification, cardiac arrest at presentation, initial cardiac enzyme positive, and ST-segment deviation. Patients who scored≤108 points were low-risk, 109–139 points were medium-risk, ≥140 points were high-risk.[6] The Thrombolysis in Myocardial Infarction risk score is based on eight prognostic factors scored between 0-14 that are utilised at the bedside to determine the level of underlying risk related to STEMI. However both the risk scoring systems gives the first 30 day mortality.[7-

8]This study aimed to evaluate the efficacy of TIMI and GRACE risk stratification in STEMI patients at a tertiary care hospital and investigate the possibility of using these risk stratifications to predict long-term outcomes when they were estimated at admission.[9]

METHODOLOGY

Study design

This was an observational study

Study site

This study was conducted in cardiac care unit department, at a tertiary care hospital, India.

Study period

The study was conducted during a period of 6 month (Feb 2022 - July 2022)

Study criteria

(i) Inclusion criteria

- STEMI patients
- Patient who are >18 years
- Patient undergone PCI

(ii) Exclusion criteria

- Pregnant and lactating women
- All NSTEMI Patients
- Unstable Angina

Patient and diagnosis criteria:

A total 106 patients with STEMI were screened out.

Source of data and material:

The data is collected from the patient case sheet which includes:

- Initial Assessment chart
- Demographic data
- Vital signs
- Laboratory data
- Comorbidities

Method of collection of data:

106 patients with diagnosis as STEMI were enrolled to the study, the method of collecting the data for the study involved checking the initial assessment of the patient which includes basic demographic data like age, gender, diagnosis, comorbidities, personal history, HR at admission, BP at time of admission, serum creatinine, killip class, cardiac arrest, elevated cardiac markers, weight, PCV, patient undergone PCI, these were all data collected in data collection form.

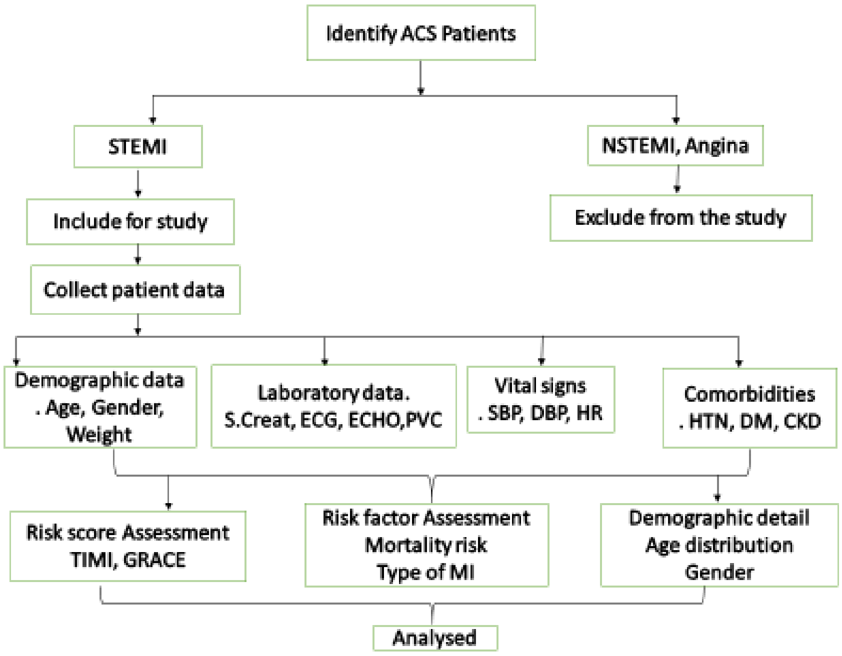
Study procedure:

- This study involved evaluating basic demographic data distribution in STEMI patients who undergone PCI.
- The data for calculating the risk scores were collected directly from the patient's medical record, subsequent laboratory and diagnostic test data were used to calculate 30 day risk scores. In hospital data included admission ECG, hematology results, in hospital diagnostic tests, Serum creatinine, vitals, demographic details, medical interventions were collected.
- Assessed risk scoring systems according to low risk, moderate risk and high risk according to the risk scores in each risk scales.
- Compared the feasibility of risk scoring systems. Based on death patients who were carrying high risk score was separated.
- Analysed which type of MI had higher mortality.
- Found which risk factor was common in patients with STEMI undergone PCI.

Study outcome

Both risk scoring systems will be observed and assessed. Comparing the feasibility of risk scoring systems in STEMI patients undergone PCI, demographic details, risk factors, type of MI, of the study population was estimated.

FLOW CHART:



RESULT

TABLE 1: Demographic details

DEMOGRAPHIC DETAIL		
Age (years)	20-39	6 (5.66%)
	40-59	36 (33.96%)
	60-89	64 (60.37%)
Gender	Male	77 (72.64%)
	Female	29 (27.35%)
Vital signs	SBP <100 mmHg	16 (15.09%)
	DBP <60 mmHg	16 (15.09%)
	HR >100 bpm	20 (18.86%)
	Weight < 67 kg	63 (59.43%)

TABLE 2: Baseline characteristics

RISK FACTORS	Hypertension	67 (63.20%)
	Diabetes Mellitus	64 (60.37%)
	Dyslipidaemia	4 (3.77%)
	CKD	5 (4.71%)
	IHD	4 (3.77%)
	Hypothyroidism	6 (5.66%)
TYPE OF MI	AWMI	49 (46.22%)
	IWMI	24 (22.64%)
	IPWMI	14 (13.20%)
	ALWMI	5 (4.71%)
	ILPWMI	4 (3.77%)
	ILWMI	3 (2.83%)
	PLWMI	3 (2.83%)
	LWMI	2 (1.88%)
	PWMI	2 (1.88%)

FIGURE 1: TIMI risk score distribution according to risk group within the study population

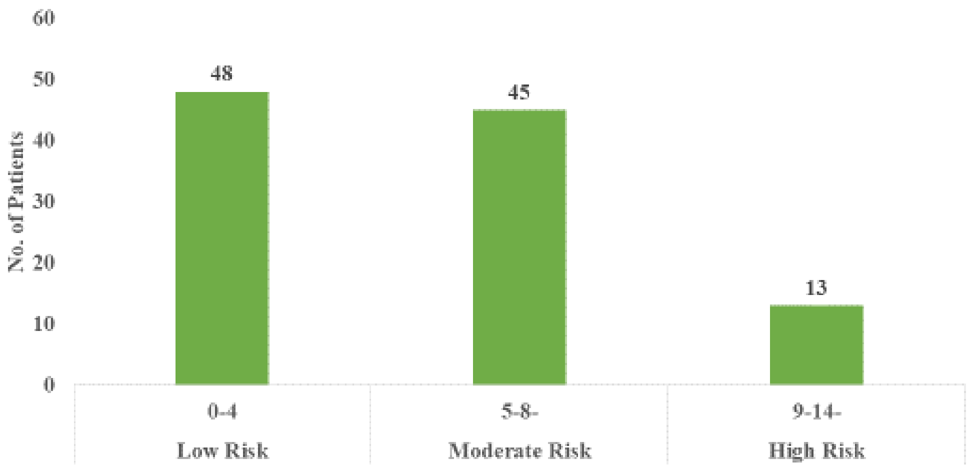


FIGURE 2: GRACE Risk score distribution according to risk group within the study population

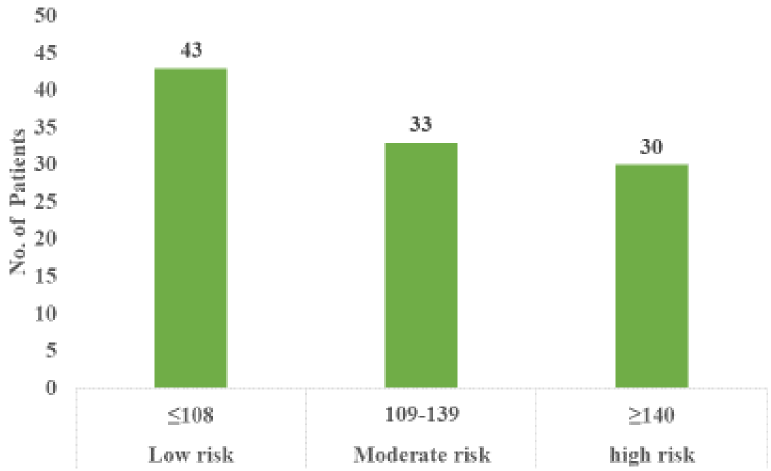
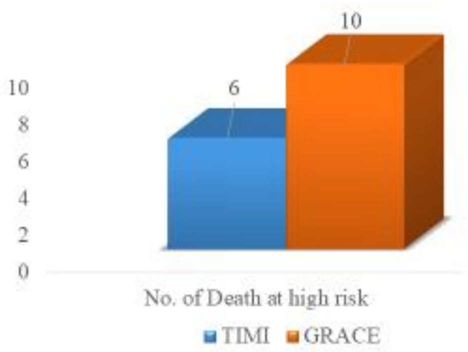


FIGURE 3: Predicted 30 day mortality according to risk scoring systems



DISCUSSION

In total of 106 patients, analysis of age, gender, social history, risk factor, diagnosis, vitals were performed. The total average age of young patient was 36.1 years, average age of middle age patient was 51.3 years and average age of elderly patient was 67.5 years. The total percentage of male in present study population was 72.64% and female was 27.35%.

Diagnosis of STEMI patients within the study population showed, most cases were AWMI (46.22%), followed by IWMI (22.64%), IPWMI (13.20%), ALWMI (4.71%), ILPWMI (3.77%), and least were ILWMI (2.83%), PLWMI (2.83%), LWMI (1.88%) and PWMI (1.88%) [Table 2]. Along with STEMI most patients were also diagnosed with cardiogenic shock (14.15%), complete heart block (7.54%) and Cardiac arrest (1.88%). In current study we observed that 3.77% of deaths were had AWMI, followed by 1.88% were had ILPWMI, 1.88% were had IPWMI and 0.94% were had ILWMI. According to current study AWMI carried higher risk of 30-day mortality compared to other types of MI. Regarding risk factors in STEMI patients, most commonly seen risk factors were hypertension (63.20%), diabetes mellitus (60.37%), CKD (4.71%), hypothyroidism (5.66%), dyslipidaemia (3.77%) and ischemic heart disease (3.77%) [Table 2]. In current study we observed common risk factor out of 10 death 90% were had hypertension and 80% were had diabetes mellitus. Smoking increase the levels carbon monoxide (CO) in the blood of the smoker, which in turn causes damage to coronary artery lining, of the thrombocytes adhesion, allowing clotting of the coronary arteries.[14] Smokers were 26.41% compare to non-smokers and alcoholics were 16.07% compare to non-alcoholic patients, alcohol helps to absorb fat from the intestine, so increase its proportion in blood, especially cholesterol, which helps atherosclerosis and leads to blood clot.[15]

Assessment of risk score

A total of 106 patients with STEMI undergone PCI were included in the study. We analysed TIMI, and GRACE risk scoring systems. Based on TIMI risk score 48(45.28%), 45(42.45%), and 13(12.26%) patients were classifies as low, moderate and high risk groups respectively. According to TIMI risk score for STEMI 11(10.37%) elderly patients and 8(7.54%) female patients were at high risk. Based on GRACE risk score 43(40.56%), 33(31.13%), and 30(28.30%) patients were classifies as low, moderate and high risk groups respectively. According to GRACE risk score for STEMI 23(21.69%) elderly patients and 18(16.98%) male patients were at high risk compare to female. TIMI grouped majority of patients into low risk, and GRACE grouped majority of patients into low risk. The accuracy of the GRACE score is better than the TIMI score for predicting in-hospital mortality in STEMI patients.[10]

Feasibility comparison in risk scoring systems

Of 106 patients 13(12.26) and 30(28.30%) had high TIMI and GRACE risk score. In hospital death were 10(9.43%). Among these 10 deaths, in-hospital mortality were highly seen in elderly 7(6.60%). Male accounted for 3(2.83%) deaths and female accounted for 7(6.6%) deaths. Cardiogenic shock occurred in 15(14.15%) patients, Majority of death patients had risk factor hypertension and diabetes mellitus.

Among 106 patients in our study according to TIMI 13 patients had high risk of 30-day mortality. Among these 13, 7(53.84%) patients survived even though they had high risk, as per the scoring system. 6(46.15%) patients had in hospital mortality within 30 days. According to GRACE 30 patients had high risk of 30-day mortality. Among these 30, 20(66.66%) patients survived even though they had high risk, as per the scoring system. 10(33.33%) patients had in hospital mortality within 30 days. TIMI and GRACE scores are generally used in predicting 30 day mortality in patients with STEMI, however in this study GRACE scoring system predicted the 30 day mortality over TIMI risk scoring system.[11]

CONCLUSION

In current study population had average age of 60.25 years, majority of patients admitted were male, and most patients were diagnosed with AWMI followed by IWMI, IPWMI. Most of the patients were had previous history of hypertension, diabetes mellitus, dyslipidaemia, CKD, hypothyroidism etc. of total 106 patients, in hospital death were10 (9.43%). The most common risk factor in died patients were hypertension and diabetes mellitus. Female had higher mortality compared to male. AWMI had high risk of mortality compared to other type of MI. Risk stratification of patients with STEMI undergone PCI can be done using risk scoring systems. TIMI and GRACE scores are generally used in predicting 30 day mortality in patients with STEMI, GRACE predicted the 30 day mortality over TIMI risk scoring system. This study emphasizes on the importance of good planning and predicting of STEMI in advance as a way to prevent the mortality and morbidity or lower its risk in individual by studying the risk factors and calculating the risk using TIMI and GRACE risk scoring systems.

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