Validation of TIMI risk score for STEMI patients visiting a tertiary care hospital of western Nepal

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ABSTRACT

Introduction: Cardiovascular disease is the leading cause of death globally, and ST elevation myocardial infarction remains main contributor to this mortality. Thrombolysis in myocardial infarction risk score which was derived from randomized clinical trials has been validated in non-selected western patient populations. The objective of this study was to find out the applicability of Thrombolysis in myocardial infarction risk score in our study population. **Methods:** A prospective observational study was conducted in admitted patients of cardiology unit, Manipal teaching hospital from February 25, 2020 to December 31, 2021. All consecutive patients admitted with diagnosis of acute ST elevation myocardial infarction were selected. Patients admitted with diagnosis of ST segment elevation myocardial infarction and undergone either primary, rescue or elective coronary reperfusion therapy were included for analysis. **Results:** Total of 339 cases with mean age of 60.62 ±12.64 were diagnosed to have acute ST elevation myocardial infarction and undergone coronary reperfusion therapy. Nearly two third cases were male and majority (61.35%) cases were below age of 65 years. Age of 65 years and above, Killip class III-IV [OR:20.54 (CI: 8.63–48.87), p<0.001], low HDL [(OR:0.481 (CI: 0.23 – 0.97) p= 0.038], heart rate >100 beats/ min [(OR: 5.79 (CI: 2.81 – 11.92), p<0.001] and anterior wall involvement [(OR: 2.8 (CI: 1.39–6.41), p=0.004] were significantly associated with 30 days mortality. **Conclusions:** Thrombolysis in myocardial infarction risk score is applicable in clinical practice for better risk stratified treatment in our setting.

Keywords: Coronary re-perfusion, myocardial infarction, risk scores, validation.

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INTRODUCTION

Cardio-vascular diseases (CVD) are the leading cause of death and nearly 80% of CVD burden is contributed by low to middle income countries.[1,2] Of the CVD, Acute ST elevation myocardial infarction (STEMI) is the leading cause of morbidity and mortality that require better strategy of diagnosis and management. Risk stratification in acute coronary syndrome is essential for proper patient management and optimum treatment outcome. It provides prognostic information to patient and guide clinician for aggressiveness of treatment.[3-6]

STEMI is one of the spectrums of acute coronary syndrome (ACS) and optimum treatment outcomes are achieved with primary percutaneous intervention (PCI).[3,7-10] In resource limited countries, there is a challenge to provide all guidelines directed management in all patients. We have to select patients who benefit most with interventional treatment. For this purpose, risk stratification is more important in developing countries with limited manpower and resources. A bedside tool, i.e. thrombolysis in myocardial infarction (TIMI) risk score was developed to stratify the STEMI patients who are eligible for reperfusion therapy.[11]

TIMI risk score had been validated in non-selected populations of western countries.[12] It is not known whether TIMI score can predict

mortality in our population. The objective of the study was to find out the applicability of TIMI risk score using 30 days mortality in our study population.

METHODS

A prospective observational study was conducted in admitted patients of cardiology unit, Manipal teaching hospital from February 25, 2020 to December 31, 2021. Ethical clearance was obtained from the Institutional Review Committee, Manipal, Pokhara (MEMG/IRC/306/GA). Informed written consent was taken prior to collection of the data. Convenient technique for the setting of study and enumerative sampling used for the case selection. All consecutive cases of acute STEMI who have undergone either primary, rescue or elective coronary reperfusion therapy during study period were selected for the study. Data was recorded by residents / interns from coronary care unit (CCU) and verified by the investigator during CCU rounds. Every patient was advised to follow up after one month. Those who did not turned up, the information was taken by telephonic conversation. TIMI scores computed based on points given by Morrow et al. (Table 1)[11]

A predesigned semi-structured proforma was used to collect the required data. Independent variables were age, sex, blood pressure, heart rate, Killip class, weight, reperfusion time, diabetes, hypertension, angina and wall involvement in ECG while 30 days mortality was dependent variable. The collected data were made available only to investigator to maintain confidentiality.

All patients aged ≥18 years who are diagnosed to have ST elevation Myocardial infarction who underwent primary, rescue or elective coronary intervention after thrombolysis were included. Patients with adequate information for TIMI risk score

calculation were included. Who refused coronary angiography (CAG) or PCI despite CAG showing 100% coronary artery occlusion, unable to give written informed consent, overt heart failure, severe left ventricular dysfunction, cardiogenic shock, hemodynamic instability and unstable ventricular arrhythmia, triple vessel disease (TVD) and who were referred for coronary artery bypass graft (CABG) were excluded.

Table 1: TIMI Risk Score[11]

Age between 65-74 years old	2 Points
Age ≥ 75 years old	3 Points
History of diabetes, hypertension or angina	1 Points
Systolic blood pressure < 100 mmHg	3 Points
Heart rate >100 bpm	2 Points
Killip classification II to IV	2 Points
Weight < 67 Kg	1 Point
ST segment elevation in anterior wall or left bundle branch block	1 Point
Reperfusion time > 4 hours	1 Point

PCI procedures were performed by consultant cardiologist. Coronary reperfusion was established either by primary PCI, done within 12 hours of chest pain or by elective PCI, done after 3-24 hours after thrombolysis. Any mortality during hospital stay or within 30 days was recorded. Data were entered in the excel sheet which is reconverted to Statistical Package for the Social Sciences (SPSS) for windows version 20 for statistical analysis. Categorical data were analyzed using chi-square test to find out the association between risk factors with 30 days mortality. The risk estimate was calculated using relative risk or Odds ratio as appropriate. Discriminatory power of risk factors was defined by using ROC curve which provides sensitivity and specificity and area under curve (AUC). Differences was considered significant at a predetermined α level of 5%. Confidentiality and anonymity were maintained by removing personal identifiers and not disclosing information to anyone except for research purpose.

RESULTS

Total of 339 cases with mean age of 60.62±12.64 were diagnosed to have acute STEMI and undergone coronary reperfusion therapy. Almost two third cases were male and majority (61.35%) cases were below age of 65 years. Age of respondents, Killip class III-IV, Low HDL, heart rate >100 beats/ min and anterior wall involvement were significantly associated with 30 days mortality at p value<0.05 (Table 2).

Table 2: Risk factors and 30 days mortality among the patients visiting Manipal, Pokhara (N=339)

Characteristics	Total (N= 339)	Death (%)	OR (95% CI)	p-value
Age (in years)				
< 65	208 (61.35)	12 (3.5)	Ref.	
65-74	74 (21.82)	11 (3.24)	2.61(1.11 – 6.13)	0.02
≥ 75	57 (16.81)	13 (3.83)	4.43(1.92 – 10.21)	0.002*
Sex				
Female	125(37.2)	17(5.01)	0.61(0.30 – 1.24)	0.17
Male	214(63.12)	19(5.60)	Ref.	
Weight (< 67kg)	129(64.6)	11(3.24)	0.69(0.32 – 1.45)	0.36
Killip Class (III & IV)	29(8.55)	17(5.01)	20.54(8.63 – 48.87)	<0.001*
Time to treatment (> 4 hr)	283(83.48)	32(9.44)	1.30(0.48 – 3.49)	0.60
Risk factors				
Smoking	177(52.21)	16(4.72)	0.70(0.352 – 1.41)	0.70
HTN	215(63.42)	23(6.78)	1.02(0.49 – 2.09)	0.95
DM	106(31.26)	12(3.54)	1.11(0.53 – 2.31)	0.77
Low HDL	196(57.82)	15(4.42)	0.48 (0.23 – 0.97)	0.03*

High TG	82(24.18)	11(3.24)	1.05(0.47– 2.33)	0.90
HR> 100 b/m	68(20.05)	19(5.60)	5.79 (2.81 – 11.92)	<0.001*
Anterior wall involvement	167(49.26)	26(7.67)	2.98(1.39 – 6.41)	0.004*

*statistical significance at p<0.05

TIMI risk score applied in our population of STEMI who have undergone coronary intervention, with increasing TIMI risk score, there is increased 30 days mortality. With a score of zero and 1, there were no mortality, score of 2 had mortality of 2% and 41.7% for score of ≥8 (Fig. 1).

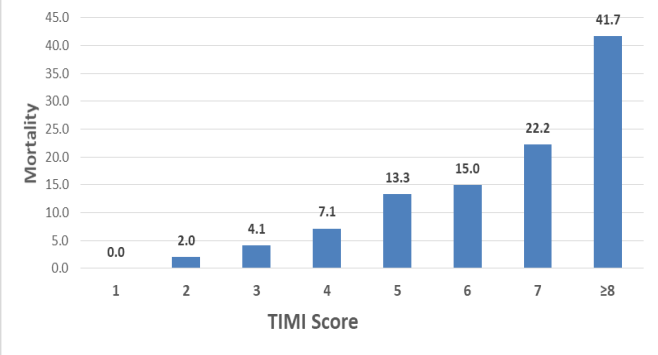
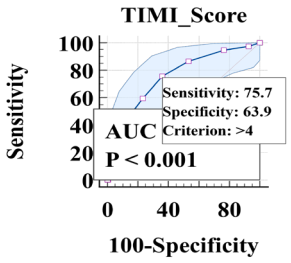


Figure 1: TIMI risk score and mortality

Figure 2 showed that discriminatory power of TIMI risk score was 0.75, with sensitivity of 75.7% and 63.9% specificity with cut-off value of ≥4 (p<0.0001).



(AUC: 0.753 (95%CI 0.703-0.789), p<0.0001, Cut off Value: ≥4)

Figure 2: ROC curve of the TIMI score for in-hospital mortality

DISCUSSION

TIMI risk score has been developed to risk stratify the patients presenting with chest pain and ST elevation in ECG i.e. acute STEMI patients. In many previous studies TIMI risk score has been shown to be reliable predictor of in-hospital and 30 days mortality. In a retrospective cohort study in Brazil by Silveira et al [13], 22.6% populations in the age group of 65 to 74 years and 13.2% were 75 years and above. Two third (66.6%) of cases were male. We found 21.82% in the age group of 65 to 74 years and 16.81% were 75 years and above. Nearly two third (63.12%) cases were male.

In this study we applied the TIMI risk score to our population of STEMI who have undergone PCI as method of reperfusion. TIMI score of 2 had mortality of 2% and 41.7% for score of ≥ 8. In a study by Morrow et al., 30 days mortality of 2.2% for score of 2, 10% for score of 5 and 29% for score of ≥8 for STEMI patents with reperfusion therapy in a cohort of 84, 29 patients was observed.[12] Similar to our study, TIMI risk score application in a cohort of 2022 patients showed 30 days mortality of 4.4% for score of 2 and 35.6 % for score of ≥8.[14] With increasing score in TIMI risk score, there is increase in the 30 days mortality which is similar to study by Pereira et al. from Brazil.[15]

TIMI risk score has been validated initially in western populations[12,16] later in few Asian countries.[3] It was compared with other different risk scores like GRACE and PAMI and shown superiority in predicting mortality with high accuracy.[17,18] Our study validates that it is applicable in our populations to predict 30 days mortality with high accuracy. Besides parameters given in TIMI risk scores, low HDL was significantly associated with 30 days mortality in our study. In a study from Brazil, diabetes mellitus and past history of cerebrovascular disease were significantly associated with 30 days mortality.[19]

The discriminatory power of TIMI Risk score was similar but had better calibration than GRACE risk score for acute STEMI patients.[19] In a prospective study of 501 consecutive patients, Abelin et al.[20] has concluded that TIMI risk score can adequately predict 30 days mortality risk in patients reperfused with primary angioplasty in the current clinical scenario.

There are few limitations of our study, our sample size was small. Due to non-probability convenient sampling and single centre study, results may not represent the general population of Nepal. As we have taken cases only from hospital and those cases not arrived to hospital were missed and selection bias could have occurred.

CONCLUSIONS

The 30 days mortality in our group of population with acute STEMI and re-perfused with coronary intervention was comparable with mortality formulated by TIMI risk score. It is applicable in clinical practice for better risk stratified treatment in our setting.

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SOURCE OF FUNDING: None

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