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ORIGINAL ARTICLE

Outcomes of Primary Percutaneous Coronary Intervention in Patients with a Thrombolysis in Myocardial Infarction Score of Five or Higher

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ABSTRACT

Objective: To determine the rate of adverse outcome in patients with at least five TIMI scores after primary percutaneous coronary intervention.

Methods: We conducted this descriptive study at National Institute of Cardiovascular Diseases Karachi for six months. This study included 200 men and women with chest pain who presented to the emergency department with chest pain and ST-segment elevation myocardial infarction. PCI processes were executed by cardiologists, and any post-procedure adverse outcomes were noted throughout the hospital stay.

Results: A total of 200 participants were involved, 167 (83.5%) being males, and 33 (16.5%) being females. There were 95 (47.5%) moderate risk cases and 105 (52.5%) high-risk cases based on the TIMI scores. In the survey of patient outcomes, death occurred in 18.5% of cases, heart failure was observed in 43 cases (21.5%), cardiogenic shock was observed in 27 cases (13.5%), and ventricular arrhythmia was observed in 44 (22%) cases.

Practical Implication: This research on the outcomes of primary PCI in patients with a TIMI score of five or higher can provide valuable information for healthcare providers, leading to improved patient selection, enhanced treatment decision-making, tailored interventions, reduced morbidity and mortality rates, and increased cost-effectiveness in managing myocardial infarction cases. These practical implications can significantly benefit the community by improving patient outcomes and optimizing healthcare resource utilization.

Conclusion: A TIMI risk score of five or higher can also identify patients who may have heart failure, cardiogenic shock, and ventricular arrhythmias.

Keywords: Primaryipercutaneous coronary intervention, thrombolysis, myocardial infarction, score of five or higher.

INTRODUCTION

In the 20th century, non-communicable diseases (NCDs) have replaced communicable diseases as the leading causes of mortality and disability worldwide.[1] A global action plan was drafted by the World Health Organization to reduce premature death rates caused by NCD by 25% by 2025, emphasizing preclusion, and treatment strategies for four major NCDs: diabetes, cancer, chronicirespiratoryidiseases, and cardiovascular diseases (CVDs).[2] The leading cause of mortality today is cardiovascular disease. Most of this burden falls on low- andimiddle-incomeicountries,[3,4] as well as countries in South Asia. One-fourth of the world's population lives in South, including Pakistan, Nepal, Sri Lanka, Bhutan, India, Maldives, and Bangladesh all of which are at a much higher CVD risk than other western nationalities.[5,6] Although CVD risk factors are the same around the world, lifestyle changes such as urbanization and reduced physical activity coincide with an increase in tobacco consumption, which are causative to the intensification of CVD in these countries.[3] This group of nations does not have any different biology with atherosclerotic CVD than other ethnic or racial groups.[5]

Heart failure is one of the most serious cardiac manifestations. It is highly fatal and morbid and requires acute management. Patients with STEMI are currently recommended to undergo primary percutaneousicoronary intervention (PCI)iwithin 12 hours symptoms onset.[7] An important goal of primary PCI is to renovate the myocardium as rapidly as possible. However, in order to further optimize management strategies, we need to identify high-risk patients and determine their prognosis with pinpoint accuracy. Management strategies therefore remain reliant on effective risk stratification.[8] The risk stratification tools for categorizing patients with STEMI range from simple scoring systems to those that incorporate multiple variables into their models.[9] It is always necessary to trade off simplicity and accuracy when calculating a risk stratification score. A widely accepted simple method of stratifying STEMI patients based on their risk (TIMI) score.[9–11]

There are different subgroups of STEMI patients that can benefit from primary PCI. There is no dispute that risk stratification is clinically important before an intervention. PCI for primary patients was considered a low-risk procedure at the beginning. In recent years, however, primary PCI has also been shown to benefit high-risk patients. A complex coronary anatomy and severe disease was present in the patient, as well as a hemodynamically imbalanced clinical state.[12]

MATERIAL AND METHODS

We conducted this descriptive study at the National Institute of Cardiovascular Disease in Karachi for six months. An examination of 200 female and male participants aged 28–75 years old was conducted with informed consent. After being treated in the emergency department for chest pain, STEMI was diagnosed and primary PCI was performed. Based on Morrow et al.'s[13] scoring system, participants in this study had to score five or higher on the TIMI. Primary PCI was performed by consultant cardiologists. Following passaging an arterial sheath and identification of the point of occlusion, the stent is ballooned and inserted. A post-procedure adverse events checklist was kept in place for all patients during the hospitalization (up to 1 week). In addition, we recorded mortality, heartifailure, cardiogenic shock, and ventricular arrhythmias. Presented with an electrocardiogram (ECG), it diagnosed the patient with STEMI based on his medical history and ECG findings.[7] Distinctive chest pain and related symptoms onset within the past 12 hours that lasted >20 minutes and an ECG change that was consistent with an acute STEMI diagnosis. In order to diagnose STEMI, among two contiguous leads, at least two ST elevations should be present, both greater than 2 mm in men and greater than 1 mm in women. These are in leads V2 to V3. Additionally, all other contiguous chest leads and limb leads must have a width of at least one millimeter. In addition, patients treated with fibrinolytic or inhibitors of platelet glycoprotein IIb/IIIa were excepted from the study. Participants who had experienced a myocardial infarction, received thrombolytic therapy, underwent coronary bypass surgery, received coronary angioplasty, or

experienced it excluded Prinzmetal angina from the study. Proforma documents were used to record all the data.

Statistical Analysis: Analysis of data was conducted with SPSS Statistics for Windows, Version 22.0, from IBM. In the quantitative data, means were calculated and standard deviations (SD) were calculated. In the qualitative data, frequencies were calculated.

According to TIMI scores, participants were further divided into two groups: moderate-risk patients (those with TIMI scores among five and eight) and high-risk patients (those with TIMI scores exceeding eight). We applied the chi-square test to test for associations between adverse outcomes after surgery and confounding variables, including gender, age, smoking, hypertension, and diabetes mellitus. The significance of the study was determined by a P-value of ≤0.05.

RESULTS

A total of 200 patients were involved, 167 (83.5%) being males, and 33 (16.5%) being females, with a mean age of 53.0 ± 9.6 years. According to the data, the mean height of the participants was 167.4 ± 5.7 cm, the Mean weight ±SD was 76.7 ± 8.5 kg, and the Mean BMI±SD was 28.56 ± 2.87 kg/m^2.

Among all patients, there were 99 smokers (49.5%), 132 hypertensives (66%), and 66 percent diabetics. Based on the TIMI scores, there were 95 (47.5%) moderate-risk cases and 105 (52.5%) high-risk cases. In this study of patient outcomes, death occurred in 18.5% of cases, heart failure was observed in 43 cases (21.5%), cardiogenic shock was observed in 27 cases (13.5%), and ventricular arrhythmia was observed in 44 cases (22%). The demographic profiles, risk factors, and outcomes of primary PCI are listed in Table 1.

Table 1: Demographic profile and clinical outcome with risk factors (n=200)

Characteristics	Total
Gender	
Male	167 (83.5%)
Female	33 (16.5%)
Age (years)	53.0 ± 9.6
≤ 54 years	101 (50.5%)
> 54 years	99 (49.5%)
Body Mass Index (kg/m^2)	28.56 ± 2.87
Normal (< 25 kg/m^2)	32 (16%)
Overweight (25.0-29.9 kg/m^2)	153 (76.5%)
Obese (> 29.9 kg/m^2)	15 (7.5%)
Risk factors	
Smoking	99 (49.5%)
HTN	132 (66%)
DM	125 (62.5%)
TIMIirisk score	9.20 ± 2.82
Moderatei(5-8)	95 (47.5%)
High (≥9)	105 (52.5%)
Outcomes	
Mortality	37 (18.5%)
Heart failure	43 (21.5%)
Cardiogenic shock	27 (13.5%)
Ventricular arrhythmia	44 (22%)

Table 2: Outcomes of primary PCI with TIMI score (n=200)

Outcomes	TIMI Risk Score		P-value
	Moderate Risk	High Risk	
Total	95 (47.5%)	105 (52.5%)	
Mortality			
Yes	15 (15.7%)	23 (21.9%)	0.233
No	80 (84.2%)	82 (78.0%)	
Heart failure			
Yes	19 (20%)	24 (22.8%)	0.536
No	76 (80%)	81 (77.1%)	
Cardiogenic shock			
Yes	13 (13.6%)	13 (12.3%)	0.685
No	82 (86.3%)	92 (87.6%)	
Ventricular arrhythmia			
Yes	35 (36.8%)	9 (8.5%)	<0.001*
No	60 (63.1%)	96 (91.4%)	

TIMI risk groups are compared in Table 2 in order to determine the frequency of adverse outcomes. A significant association was found between ventricular arrhythmias and TIMI risk groups (P- value <0.0001). TIMI risk groups were not significantly associated with death, heart failure, or cardiogenic shock

DISCUSSION

Among patients with STEMI, primary PCI outcomes were highly heterogeneous. Thus, it is essential to accurately stratify and identify high-risk patients for therapeutic decisions. It is possible to calculate the TIMI risk score for STEMI from the parameters measured at presentation, a relatively simple and accurate scoring system that can recognize high-risk patients.[13] A randomized controlled trial of fibrinolysis patients previously developed and validated the TIMI score. TIMI scores have been reported to be a satisfactorily predictive tool in a registry and observational studies.[8] TIMI scores of five or higher were used in this study to assess adverse events after primary PCI.

Our study of 200 participants found that 47.5% had a moderate risk (5 ≤ TIMI ≥ 8) and 52.5% had a high risk (TIMI ≥9). There were 18.5% of deaths, 21.5% of heart failures, 13.5% of cardiogenic shocks (CS), and 22% of ventricular arrhythmias in our study. TIMI risk scores of nine or higher were found in 31.84%iof patientsiundergoingiprimaryiPCI, according to a recent study by Iltaf et al.[14] Further, the study found that patients with TIMI 9 had higher rates of adversative events and problems. This cohort showed much higher rates of adverse events associated with primary PCI. According to these reports, mortality rates ranged from 2.2% to 3.04% in the inpatient setting, while heart failure rates ranged from 0.7% to 0.9%, with a cardiac shock rate of up to 1.3%.[15–17]. TIMI scores and mortality rates were found to be strongly correlated in a study of Furnaz et al.,[10] using our population's TIMI score for elderly females. There was a 5.6% death rate associated with a TIMI score <5, whereas a 54.4% death rate was associated with a TIMI score of eight or higher.[10]

Besides analyzing, the authors reported that the TIMI score has a prophetic value for in-hospital mortality of 0.709 (0.591-0.827) based on an area under the curve of 0.591-0.827.

Because the TIMI score system is easy to understand and to use, it has many advantages. As a prognostic marker, its clinical utility and effectiveness are questionable, especially in people with acute coronary syndromes. According to a meta-analysis of ten prospective cohort studies, they strongly correlated adverse events with TIMI scores. It has been reported, however, that patients with a TIMI score of zero had a 30-day cardiac frequency of 1.8%. Clinical acumen should be used with it, and not be the only factor influencing the disposition of a patient.[18] The TIMI scores have been compared by many studies with other multi-risk stratification models, including HEART scores, GRACE scores.[19–22] Compared to GRACE and TIMI scores, the HEART score appears to be more effective at identifying major adverse cardiac events within 6 weeks.[20]

GRACE scores were found to predict in-hospital events better than TIMI scores among patients with ACS.[21] Similarly, GRACE scores were found to be better for long-term follow-up than TIMI, CADILLAC,iPAMI,iandiZwolle scores.[19] In addition, the lack of follow-up after discharge limited the study. Based on our shadowing of patients until it released them from hospital, the TIMI score predicted patients' outcomes 30 days' post-procedure.

CONCLUSION

It is imperative to stratify risks based on the TIMI score. According to study findings, STEMI patientsiwith a TIMIiscore of fiveior higher were more likely than the general population to suffer negative outcomes like death, heart failure, cardiogenic shock, and ventricular arrhythmias after their post-primary PCI. Clinical decision-making has been enhanced with the TIMI score.

REFERENCES

1. Joseph P, Leong D, McKee M, Anand SS, Schwalm J-D, Teo K, et al. Reducing the Global Burden of Cardiovascular Disease, Part 1. Circ Res [Internet]. 2017 Sep;121(6):677–94. Available from: https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.117.308903
2. WHO. Global action plan for the prevention and control of noncommunicable diseases 2013-2020. World Heal Organ [Internet]. 2013 [cited 2022 Oct 5];102. Available from: http://apps.who.int/iris/bitstream/10665/94384/1/9789241506236_eng.pdf
3. Bowry ADK, Lewey J, Dugani SB, Choudhry NK. The Burden of Cardiovascular Disease in Low- and Middle-Income Countries: Epidemiology and Management. Can J Cardiol [Internet]. 2015 Sep;31(9):1151–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0828282X15005073
4. Roth GA, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet [Internet]. 2018 Nov;392(10159):1736–88. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673618322037
5. Volgman AS, Palaniappan LS, Aggarwal NT, Gupta M, Khandelwal A, Krishnan A V., et al. Atherosclerotic Cardiovascular Disease in South Asians in the United States: Epidemiology, Risk Factors, and Treatments: A Scientific Statement From the American Heart Association. Circulation [Internet]. 2018 Jul 3;138(1). Available from: https://www.ahajournals.org/doi/10.1161/CIR.0000000000000580
6. Misra A, Tandon N, Ebrahim S, Sattar N, Alam D, Shrivastava U, et al. Diabetes, cardiovascular disease, and chronic kidney disease in South Asia: current status and future directions. BMJ [Internet]. 2017 Apr 11;j1420. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.j1420
7. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J [Internet]. 2018 Jan 7;39(2):119–77. Available from: https://academic.oup.com/eurheartj/article/39/2/119/4095042
8. O'Donoghue ML, Morrow DA, Cannon CP, Jarolim P, Desai NR, Sherwood MW, et al. Multimarker Risk Stratification in Patients With Acute Myocardial Infarction. J Am Heart Assoc [Internet]. 2016 May 6;5(5). Available from: https://www.ahajournals.org/doi/10.1161/JAHA.115.002586
9. Rathore SS, Weinfurt KP, Foody JM, Krumholz HM. Performance of the Thrombolysis in Myocardial Infarction (TIMI) ST-elevation myocardial infarction risk score in a national cohort of elderly patients. Am Heart J [Internet]. 2005 Sep;150(3):402–10. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0002870305006150
10. Furnaz S, Karim M, Ashraf T, Ali S, Shahid I, Ali S, et al. Performance of the TIMI risk score in predicting mortality after primary percutaneous coronary intervention in elderly women: Results from a developing country. Lazzeri C, editor. PLoS One [Internet]. 2019 Jul 25;14(7):e0220289. Available from: https://dx.plos.org/10.1371/journal.pone.0220289
11. Gevaert SA, De Bacquer D, Evrard P, Convens C, Dubois P, Boland J, et al. Gender, TIMI risk score and in-hospital mortality in STEMI patients undergoing primary PCI: results from the Belgian STEMI registry. EuroIntervention [Internet]. 2014 Jan;9(9):1095–101. Available from: http://www.pcronline.com/eurointervention/68th_issue/184
12. De Marzo V, D'amario D, Galli M, Vergallo R, Porto I. High-risk percutaneous coronary intervention: how to define it today? Minerva Cardioangiol [Internet]. 2018 Oct;66(5). Available from: https://www.minervamedica.it/index2.php?show=R05Y2018N05A0576
13. Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI Risk Score for ST-Elevation Myocardial Infarction: A Convenient, Bedside, Clinical Score for Risk Assessment at Presentation. Circulation [Internet]. 2000 Oct 24;102(17):2031–7. Available from: https://www.ahajournals.org/doi/10.1161/01.CIR.102.17.2031
14. Iltaf K, Dar MH, Khan I, Ali U, Hafizullah M, Shah S. Frequency of high TIMI score and its short term clinical outcomes. Pakistan Hear J. 2019;52(1).
15. Ashraf T, Khan MN, Afaque SM, Aamir KF, Kumar M, Saghir T, et al. Clinical and procedural predictors and short-term survival of the patients with no reflow phenomenon after primary percutaneous coronary intervention. Int J Cardiol [Internet]. 2019 Nov;294:27–31. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0167527319326919
16. Ashraf T, Afaque SM, Aziz R, Khan MN, Achakzai AS, Lateef A, et al. Clinical, Angiographic Characteristics and In-Hospital Outcomes of Smoker and Nonsmoker Patients After Primary Percutaneous Coronary Intervention. Glob Heart [Internet]. 2019 Sep 1;14(3):335. Available from: https://globalheartjournal.com/article/10.1016/j.gheart.2019.07.007/
17. Batra MK, Rai L, Khan NU, Mengal MN, Khowaja S, Hassan Rizvi SN, et al. Radial or femoral access in primary percutaneous coronary intervention (PCI): Does the choice matters? Indian Heart J [Internet]. 2020 May;72(3):166–71. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0019483220300948
18. Hess EP, Agarwal D, Chandra S, Murad MH, Erwin PJ, Hollander JE, et al. Diagnostic accuracy of the TIMI risk score in patients with chest pain in the emergency department: a meta-analysis. Can Med Assoc J [Internet]. 2010 Jul 13;182(10):1039–44. Available from: http://www.cmaj.ca/cgi/doi/10.1503/cmaj.092119
19. Littnerova S, Kala P, Jarkovsky J, Kubkova L, Prymusova K, Kubena P, et al. GRACE Score among Six Risk Scoring Systems (CADILLAC, PAMI, TIMI, Dynamic TIMI, Zwolle) Demonstrated the Best Predictive Value for Prediction of Long-Term Mortality in Patients with ST-Elevation Myocardial Infarction. Lionetti V, editor. PLoS One [Internet]. 2015 Apr 20;10(4):e0123215. Available from: https://dx.plos.org/10.1371/journal.pone.0123215
20. Correia LCL, Garcia G, Kalil F, Ferreira F, Carvalhal M, Oliveira R, et al. Prognostic Value of TIMI Score versus GRACE Score in ST-segment Elevation Myocardial Infarction. Arq Bras Cardiol [Internet]. 2014; Available from: http://www.gnresearch.org/doi/10.5935/abc.20140095
21. Correia LCL, Freitas R, Bittencourt AP, Souza AC, Almeida MC, Leal J, et al. Valor prognóstico do Escore de Risco GRACE versus Escore de Risco TIMI em síndromes coronarianas agudas. Arq Bras Cardiol [Internet]. 2010 May;94(5):613–9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0066-782X2010000500007&lng=pt&nrm=iso&tlng=en
22. Poldervaart JM, Langedijk M, Backus BE, Dekker IMC, Six AJ, Doevendans PA, et al. Comparison of the GRACE, HEART and TIMI score to predict major adverse cardiac events in chest pain patients at the emergency department. Int J Cardiol [Internet]. 2017 Jan;227:656–61. Available from: https://linkinghub.elsevier.com/retrieve/pii/S016752731633282X