Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1229
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1229*
Original Research Article

IN-HOSPITAL OUTCOMES AMONG PATIENTS PRESENTED WITH ST-ELEVATION MYOCARDIAL INFARCTION TREATED WITH PRIMARY PERCUTANEOUS CORONARY INTERVENTION

JAN MT[1], KHAN MA[*1], NOMAN M[2], ULLAH H[3], ALAM K[4], RIAZ M[5]

[1]*Department of Cardiology, Hayatabad Medical Complex Peshawar, Pakistan*
[2] *Department of Cardiology, Lady Reading Hospital Peshawar, Pakistan*
[3]*Department of Cardiology, Government Timergara Teaching Hospital Dir Lower, Pakistan*
[4]*Department of Medicine, St. Francis Medical Center Richmond Virginia, USA*
[5] *Department of Radiology, Peshawar Institute of Cardiology Peshawar, Pakistan*
**Corresponding author`s email address:* link2axidkhan@gmail.com

(Received, 04th June 2024, Revised 05th October2024, Published 20th October 2024)

Abstract: *Primary Percutaneous Coronary Intervention (PCI) is considered the gold standard treatment for patients with ST-elevation myocardial Infarction (STEMI). Prompt intervention, aimed at restoring blood flow, plays a critical role in improving survival and minimizing complications in these patients.* ***Objective:*** *The objective of this study was to evaluate in-hospital outcomes among patients diagnosed with STEMI and treated with Primary PCI.* ***Methods****: This cross-sectional study was conducted in the Cardiology Department over one year. The study included patients aged 50 years and older who were diagnosed with STEMI based on electrocardiographic criteria and presented within 12 hours of symptom onset. Demographic information, clinical characteristics, comorbidities, and in-hospital outcomes were recorded. Statistical analyses were performed using relevant descriptive measures.* ***Results:*** *A total of 150 patients were included in the study. The mean age of patients was 60.89 ± 5.65 years, with 64.4% being male. The average door-to-balloon time was 89.93 ± 18.12 minutes. Successful reperfusion, defined as achieving a TIMI grade 3 flow, was observed in 87.8% of the patients. In-hospital mortality was recorded at 4.4%, while 3.3% of patients developed infections during their hospital stay.* ***Conclusion****: The study demonstrated favourable in-hospital outcomes for STEMI patients treated with Primary PCI, with a high success rate in achieving TIMI grade 3 flow and a relatively low in-hospital mortality rate. These findings underscore the efficacy of timely PCI in improving survival and procedural outcomes in STEMI patients, particularly when door-to-balloon time is minimized.*

Keywords: ST-Elevation Myocardial Infarction, Primary Percutaneous Coronary Intervention, In-Hospital Outcomes, TIMI Flow, Door-to-Balloon Time, Mortality

Introduction

Primary percutaneous coronary intervention (PPCI) has emerged as the fundamental approach for managing patients with ST-elevation myocardial infarction (STEMI), signifying a notable progression in interventional cardiology (1). This minimally invasive method seeks to rapidly and effectively restore coronary blood flow in patients experiencing acute coronary blockage, therefore reducing myocardial damage and enhancing clinical outcomes. For individuals suffering from STEMI, the preferred and advised course of treatment is immediate percutaneous coronary revascularization, either with or without stenting (2, 3). PPCI has grown widely used, and this has greatly improved patient outcomes and survival.1. The majority of STEMI patients now have better outcomes thanks to developments in the mechanical as well as pharmacological elements of percutaneous treatments (4-6). The projected yearly rate of myocardial infarction (MI) in a study was 550,000 new cases and 200,000 recurrent cases. 6 In 2013, 116,793 individuals in the United States experienced a fatal myocardial infarction, with 57% occurring among men and 43% in women. Approximately 38% of patients admitted to the hospital having acute coronary syndrome have ST-elevation myocardial infarction (7).

One of the main consequences of coronary artery disease (CAD) is STEMI, which has a very high morbidity and mortality rate. High fatality rates from STEMI are possible in elderly patients with comorbidities. According to one study, an elevated incidence of myocardial infarction (MI) factors accounts for the burden of heart disease that affects over 30% of Pakistani citizens (8, 9).

The rationale for studying in-hospital outcomes among patients presenting with STEMI treated with primary percutaneous coronary intervention (PCI) lies in the critical need to evaluate and enhance the effectiveness of this life-saving intervention in real-world clinical settings. STEMI is a time-sensitive condition that necessitates rapid reperfusion to minimize myocardial damage and improve patient prognosis, assessing in-hospital outcomes essential for understanding the immediate impact of timely PCI.

Methodology

This cross-sectional study was conducted at the Cardiology Department of Hayatabad Medical Complex, Peshawar, Pakistan. The study took place over one year from May

[Citation Jan, M.T., Khan, M.A., Noman, M., Ullah, H., Alam, K., Riaz, M. (2024). In-hospital outcomes among patients presented with st-elevation myocardial infarction treated with primary percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1229*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1229]

2023 to May 2024, focusing on patients admitted during this time. Patients 50 years of age or older, who had an electrocardiogram (ECG) showing ST-segment elevation were included. All patients who met the criteria and underwent primary PCI were included in the study.
Exclusion criteria involved patients who presented more than 12 hours after symptom onset, those who had undergone rescue PCI after thrombolysis, or patients with a diagnosis other than STEMI. Additionally, patients with incomplete medical records
or those who refused consent were excluded from the analysis.
Information regarding patient demographics, clinical characteristics and in-hospital outcomes was gathered. Variables collected included age, gender, the presence of hypertension and diabetes, smoking history, door-to-balloon time, and procedural success as measured by achieving Thrombolysis in Myocardial Infarction (TIMI) grade 3 flow. In-hospital complications, including mortality and infections, were also recorded.
Data analysis using SPSS 24, involved the use of descriptive statistics for qualitative variables and mean and standard deviation for quantitative variables.

Results

The patients in the study had a mean age of 60.89 ± 5.65 years. The mean door-to-balloon time, was 89.93 ± 18.12 minutes. Regarding the demographic characteristics, 58 of the patients were male (64.4%) and 32 were female (35.6%). Hypertension was present in 70 patients (77.8%), while 20 patients (22.2%) did not have hypertension. Additionally, 64 patients (71.1%) were diagnosed with diabetes, with 26 patients (28.9%) being non-diabetic. Smoking history was reported in 36 patients (40.0%), while 54 patients (60.0%) had no history of smoking.

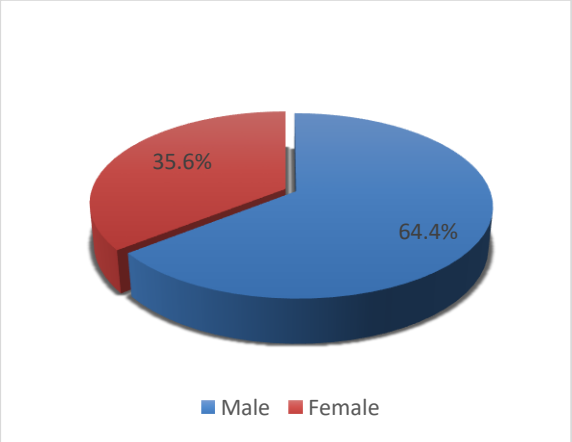

Figure 1 Gender distribution

In terms of in-hospital outcomes, there were 4 cases of in-hospital mortality, accounting for 4.4% of the study population, while the remaining 86 patients (95.6%) survived their hospital stay. Infections were noted in 3 patients (3.3%), and 87 patients (96.7%) did not experience any infections. The restoration of normal coronary blood flow (TIMI grade flow 3) was achieved in 79 patients (87.8%), whereas 11 patients (12.2%) did not reach this flow grade.

Table 1 Demographics

Demographics		Frequency	Percentage
Gender	Male	58	64.4%
	Female	32	35.6%
Hypertension	Yes	70	77.8%
	No	20	22.2%
Diabetes	Yes	64	71.1%
	No	26	28.9%
Smoking	Yes	36	40.0%
	No	54	60.0%

Table 2 in-hospital outcomes

In hospital outcomes		Frequency	Percentage
In hospital mortality	Yes	4	4.4%
	No	86	95.6%
Infection	Yes	3	3.3%
	No	87	96.7%
TIMI grade flow 3	Yes	79	87.8%
	No	11	12.2%

Discussion

In our study, patients had a mean age of 60.89 ± 5.65 years, and the door-to-balloon time averaged 89.93 ± 18.12 minutes. Male patients were 64.4%, and 71.1% of patients were diabetic. TIMI flow grade 3 was achieved in 87.8% of the cases, with an in-hospital death rate of 4.4%. These outcomes mirror certain global trends but also stand distinct in various ways.
When comparing these outcomes with the study by Akhtar A et al. in a tertiary care hospital in South Punjab, Pakistan, there are noticeable similarities and differences. Akhtar A et al. found that their cohort had a younger mean age (53.51 ± 11.37 years), and 82.5% were male (10). This significant gender disparity may influence the results, particularly given the established evidence that women often present with worse outcomes in STEMI treatment due to delayed presentations and higher rates of comorbidities. For instance, in the study by Barbosa RR et al., women with STEMI were observed to have longer door-to-balloon times (181 minutes versus 133 minutes for men) and higher in-hospital mortality (23.5% versus 8.9%) compared to men (11). These gender-specific findings stand in contrast with our cohort, where a smaller proportion of women (35.6%) presented but had no gender-specific mortality differences noted.
The door-to-balloon time in our study was similar to Akhtar A et al. 89.93 minutes compared to approximately 90 minutes (10). However, the higher rate of TIMI flow grade 3 achievement in our study (87.8%) compared to Akhtar A et al. 80% could be attributed to differences in patient characteristics, including age and comorbidities. Akhtar A et al.'s cohort had a higher incidence of smokers (57.6%), which may have negatively impacted the procedural success.
Looking at the broader comparison, Cornara S et al. noted that in their cohort of 1,911 STEMI patients, 11.4%

[Citation Jan, M.T., Khan, M.A., Noman, M., Ullah, H., Alam, K., Riaz, M. (2024). In-hospital outcomes among patients presented with st-elevation myocardial infarction treated with primary percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1229*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1229]

experienced significant bleeding, and bleeding was an independent predictor of mortality within the first 30 days (12). Although our study did not document bleeding complications extensively, Cornara Et al.'s Findings align with general concerns about post-PCI bleeding complications in STEMI treatment. In contrast, our study showed lower overall mortality (4.4%) compared to the 10.3% 30-day mortality found in the aforementioned study (12). This might reflect the absence of major bleeding complications in our cohort, supporting Cornara Et al.'s conclusion that bleeding is a critical determinant of early mortality.

Piccaro de Oliveira P et al. further explored the complication of infections in STEMI patients post-PCI, reporting that 3.9% of their cohort experienced serious infections, which significantly increased the risk of mortality (13). In our study, the infection rate was slightly lower (3.3%), and it did not correlate with an increase in mortality. This difference may be explained by the smaller sample size of our cohort or different hospital infection control protocols. In contrast, Piccaro de Oliveira P et al.'s cohort had worse angiographic outcomes among those who developed infections, which was not a significant concern in our group (13).

Another interesting point of comparison is Garberich RF et al.'s work, which focused on STEMI patients diagnosed after hospital admission. They observed a higher door-to-balloon time (76 minutes) for in-hospital STEMI patients compared to those admitted via emergency services [14]. Our study aligns with these findings in terms of door-to-balloon times, with our cohort averaging slightly below the target of 90 minutes. However, Garberich RF et al.'s study reported a higher 1-year mortality rate (16.9%) among in-hospital STEMI patients, compared to the lower in-hospital mortality rate of 4.4% in our cohort. This discrepancy could stem from Garberich RF et al.'s focus on patients who developed STEMI after hospital admission, typically a more vulnerable population with more comorbidities and complications (14).

Moreover, the study by Piccaro de Oliveira P et al. observed that patients who experienced infections post-PCI had a lower TIMI flow grade 3 rate (76% vs. 91% for those without infections).[13] This emphasizes how infections can lead to worse angiographic outcomes, which did not emerge as a significant issue in our study, where the TIMI flow grade 3 rate was relatively high.

Conclusion

In conclusion, this study demonstrates favourable in-hospital outcomes for patients with ST-Elevation Myocardial Infarction (STEMI) treated with Primary Percutaneous Coronary Intervention (PCI). The majority of patients achieved successful reperfusion as evidenced by a high TIMI grade 3 flow rate, and the overall in-hospital mortality was low as well.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBCE

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

MUHAMMAD TUFAIL JAN
Development of Research Methodology Design, Study Design, Review of Literature
MUHAMMAD ASAD KHAN
Conception of Study, Review of manuscript, Final approval of manuscript
MUHAMMAD NOMAN
Data acquisition, critical input
Coordination of collaborative efforts.
HAMEED ULLAH
Manuscript revisions and Data analysis, Manuscript drafting.
KHAN ALAM
Data entry and Data analysis, drafting article.
MUHAMMAD RIAZ
Data acquisition, and analysis.
Coordination of collaborative efforts.

References

1. Hoole SP, Bambrough P. Recent advances in percutaneous coronary intervention. Heart. 2020;106(18):1380-6.
2. Al-Lamee RK, Nowbar AN, Francis DP. Percutaneous coronary intervention for stable coronary artery disease. Heart. 2019;105(1):11-9.
3. Pascual I, Avanzas P, Almendárez M, Lorca R, Vigil-Escalera M, Arboine L, et al. STEMI, primary percutaneous coronary intervention and recovering of life expectancy: insights from the SurviSTEMI study. Revista Española de Cardiología (English Edition). 2021;74(10):829-37.
4. Batchelor R, Liu DH, Bloom J, Noaman S, Chan W. Association of periprocedural intravenous morphine use on clinical outcomes in ST-elevation myocardial infarction (STEMI) treated by primary percutaneous coronary intervention: Systematic review and meta-analysis. Catheterization and Cardiovascular Interventions. 2020;96(1):76-88.
5. Wilson PW. Established risk factors and coronary artery disease: the Framingham Study. Am J Hypertens. 1994;7(7 Pt 2):7-12.
6. Canto JG, Kiefe CI, Rogers WJ, Peterson ED, Frederick PD, French WJ. NRMI Investigators. Number of coronary heart disease risk factors and mortality in patients with first myocardial infarction. JAMA. 2011;306(19):2120-7.
7. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al, American Heart Association

Statistics Committee. Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. Circulation. 2016;133(4):e38-360.
8. Iqbal R, Jahan N, Hanif A. Epidemiology and management cost of myocardial infarction in North Punjab, Pakistan. Iranian Red Crescent Medical Journal. 2015;17(7):28-35
9. Hafeez S, Javed A, Kayani AM. Clinical profile of patients presenting with acute ST-elevation myocardial infarction. JPMA. The Journal of the Pakistan Medical Association. 2010;60(3):190-5.
10. Akhtar A, Saleemi MS, Zarlish QM, Arshad MB, Hashmi KA, Ghafoor H. Experience and Outcomes of Primary Percutaneous Coronary Intervention in a Tertiary Care Hospital in South Punjab, Pakistan. Cureus. 2023;15(12):e50024.
11. Barbosa RR, da Silva VR, Serpa RG, Cesar FB, Mauro VF, dos Reis Bayerl DM, Veloso WU, de Almeida Cesar R, Reseck PA. Gender differences in primary percutaneous coronary intervention outcomes in patients with ST-elevation myocardial infarction. Revista Brasileira de Cardiologia Invasiva (English Edition). 2015;23(2):96-101.
12. Cornara S, Somaschini A, De Servi S, Crimi G, Ferlini M, Baldo A, et al. Prognostic Impact of in-Hospital-Bleeding in Patients With ST-Elevation Myocardial Infarction Treated by Primary Percutaneous Coronary Intervention. Am J Cardiol. 2017;120(10):1734-1741.
13. Piccaro de Oliveira P, Gonzales V, Lopes RD, Schmidt MM, Garofallo S, Santos RP, et al. Serious infections among unselected patients with ST-elevation myocardial infarction treated with contemporary primary percutaneous coronary intervention. Am Heart J. 2016;181:52-59.
14. Garberich RF, Traverse JH, Claussen MT, Rodriguez G, Poulose AK, Chavez IJ, Rutten-Ramos S, Hildebrandt DA, Henry TD. ST-elevation myocardial infarction diagnosed after hospital admission. Circulation. 2014;129(11):1225-32.

[Citation Jan, M.T., Khan, M.A., Noman, M., Ullah, H., Alam, K., Riaz, M. (2024). In-hospital outcomes among patients presented with st-elevation myocardial infarction treated with primary percutaneous coronary intervention. *Biol. Clin. Sci. Res. J.*, **2024***: 1229*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1229]