ASSESSMENT OF IN-HOSPITAL OUTCOMES OF PRIMARY PCI IN ELDERLY PATIENTS WITH ACUTE CORONARY SYNDROME

Dr Rafi Ullah[1], Dr Honey Raj Vishno[2*], Dr Syed Muzammil Shah[3], Dr Muhammad Abdur Rauf[4], Dr Fahad Raja Khan[5], Dr Ejaz Ul Haq[6]

[1]Cardiologist, Kuwait Teaching Hospital Peshawar, Pakistan. Email: doctor_rafi@yahoo.com
[2*]Cardiology Resident, NICVD, Karachi, Pakistan. Email: honeyraj_91@hotmail.com
[3]Medical Officer, Kuwait Teaching Hospital, Pakistan. Email: muzi1891@gmail.com
[4]Assistant Professor of Cardiology, Kuwait Teaching Hospital/Peshawar Medical College Peshawar, Pakistan. Email: dr.raufkhan@yahoo.com
[5]Fellow Interventional Cardiology, Peshawar Institute of Cardiology, Pakistan. Email: fahadraja78@gmail.com
[6]Fellow Interventional Cardiology, NICVD Karachi, Pakistan. Email: youcafzai@gmail.com

*Corresponding Author: DR Honey Raj Vishno
*Email: honeyraj_91@hotmail.com

Abstract

Background: Acute Coronary Syndrome (ACS) is a spectrum of conditions associated with acute myocardial ischemia and includes unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). Percutaneous Coronary Intervention (PCI) is a cornerstone therapy for ACS, crucial for restoring coronary blood flow and reducing subsequent cardiovascular events. However, elderly patients present unique challenges due to higher comorbidities and procedural risks.

Objective: This study aimed to assess the in-hospital outcomes of primary PCI in elderly patients with ACS at Lady Reading Hospital, Peshawar, Pakistan.

Methods: This observational cohort study included 450 elderly patients (≥65 years) with ACS who underwent primary PCI from January 2021 to December 2022. Inclusion criteria were age ≥65 years, ACS diagnosis, and undergoing primary PCI. Exclusion criteria included prior coronary artery bypass grafting (CABG), refusal to consent, and non-cardiovascular terminal illnesses. Data were collected prospectively using standardized forms, documenting baseline characteristics, procedural details, and outcomes. Statistical analysis was performed using SPSS version 25.0, with continuous variables expressed as mean ± standard deviation (SD) or median (Interquartile Range [IQR]) and categorical variables as frequencies and percentages.

Results: The mean age of the patients was 70.4 years (SD: 4.8 years), with 62.2% male and 37.8% female. Major Adverse Cardiovascular Events (MACE) occurred in 22.2% of patients, with no significant difference between males and females (p=0.58). The mean left ventricular ejection fraction (LVEF) post-PCI was 48.5% (SD: 10.2%), with a slightly higher mean LVEF in males (49.0% vs. 47.6%, p=0.15). The median hospital stay was 5 days (IQR: 3-8 days). The incidence of complications included bleeding (6.7%) and stroke (2.2%), with no significant gender differences.

Conclusion: Elderly patients with ACS undergoing primary PCI at Lady Reading Hospital exhibit significant in-hospital outcomes, with a substantial incidence of MACE and notable differences in LVEF and hospital stay between genders. These findings highlight the need for tailored interventions and continuous monitoring to improve PCI outcomes in this high-risk population.

Keywords: Acute Coronary Syndrome, Percutaneous Coronary Intervention, Elderly Patients, In-Hospital Outcomes, Major Adverse Cardiovascular Events, Left Ventricular Ejection Fraction,

Introduction

Acute Coronary Syndrome (ACS) represents a spectrum of clinical conditions associated with acute myocardial ischemia and includes unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). It remains a leading cause of morbidity and mortality worldwide, particularly among the elderly population (1). The management of ACS has evolved significantly over the past few decades, with Percutaneous Coronary Intervention (PCI) becoming a cornerstone of therapy. PCI, which involves the use of balloon angioplasty and stent placement, is crucial for restoring coronary blood flow and reducing the risk of subsequent cardiovascular events (2).

Despite advancements in PCI techniques and adjunctive pharmacotherapy, elderly patients with ACS present unique challenges. They often have a higher prevalence of comorbidities, increased procedural risks, and a distinct pathophysiological profile compared to younger patients (3). Consequently, the outcomes of PCI in elderly patients may differ, necessitating a tailored approach to their management (4).

There is a growing body of literature addressing the outcomes of PCI in various populations. However, studies specifically focusing on the elderly demographic in low-to-middle-income countries, such as Pakistan, are limited. This gap in research is significant given the rising burden of cardiovascular diseases in these regions and the differences in healthcare infrastructure and patient demographics (5). Understanding the in-hospital outcomes of PCI in elderly patients can inform clinical practice and guide the development of targeted interventions (6).

The objective of this study is to assess the in-hospital outcomes of primary PCI in elderly patients with ACS at Lady Reading Hospital Peshawar, Pakistan. We aim to evaluate the incidence of major adverse cardiovascular events (MACE), left ventricular ejection fraction (LVEF) post-PCI, hospital length of stay, and the incidence of complications such as bleeding and stroke. This study is crucial for identifying the specific needs of elderly patients undergoing PCI and improving their clinical outcomes.

Our findings are expected to have significant implications for clinical practice. By highlighting the outcomes and potential complications of PCI in this high-risk group, the study can contribute to optimizing therapeutic strategies, improving patient care, and ultimately reducing the burden of cardiovascular diseases in the elderly population.

Methods

Study Design: This study was an observational cohort study conducted to evaluate the in-hospital outcomes of elderly patients undergoing primary Percutaneous Coronary Intervention (PCI) for Acute Coronary Syndrome (ACS) at Lady Reading Hospital, Peshawar, Pakistan. The study was conducted over two years, from January 2021 to December 2022.

Setting and Participants: The study was conducted at Lady Reading Hospital, Peshawar, a tertiary care hospital with a dedicated cardiology department. The inclusion criteria for participants were: patients aged 65 years and above, diagnosed with ACS, and undergoing primary PCI. Exclusion criteria included patients with prior coronary artery bypass grafting (CABG), those who refused to consent, and patients with non-cardiovascular terminal illnesses.

Sample Size Calculation: The sample size was calculated based on the prevalence of coronary artery disease (CAD) in the Pakistani population. Using the WHO sample size calculator and assuming a prevalence rate of 10% for CAD in elderly patients, with a margin of error of 5% and a confidence level of 95%, the required sample size was determined to be approximately 450 patients. The reference for the prevalence rate was taken from a local epidemiological study on CAD prevalence in Pakistan.

Intervention: All patients included in the study underwent primary PCI. The intervention consisted of balloon angioplasty followed by stent placement, performed by experienced interventional cardiologists. Standard PCI protocols and guidelines were followed, including administering antiplatelet and anticoagulant therapy as per the American College of Cardiology/American Heart Association (ACC/AHA) guidelines.

Outcomes: The primary outcome of the study was the incidence of Major Adverse Cardiovascular Events (MACE) during the hospital stay. MACE was defined as a composite of myocardial infarction (MI), target vessel revascularization (TVR), and cardiovascular death. Secondary outcomes included left ventricular ejection fraction (LVEF) post-PCI, hospital length of stay, and the incidence of complications such as bleeding and stroke.

Data Collection: Data were collected prospectively using a standardized case report form. Baseline characteristics, procedural details, and outcomes were documented. Baseline characteristics included age, sex, presence of comorbidities (hypertension, diabetes mellitus, dyslipidemia), and history of myocardial infarction (MI). Procedural details included the type of stent used and any intra-procedural complications. Outcomes were assessed by reviewing patient records and direct patient monitoring during the hospital stay.

Statistical Analysis: Statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median (Interquartile Range [IQR]), and categorical variables were presented as frequencies and percentages. Comparisons between groups (male vs. female) were made using the independent samples t-test for continuous variables and the chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant.

Results

The study included 450 elderly patients (≥65 years) with Acute Coronary Syndrome (ACS) who underwent Primary Percutaneous Coronary Intervention (PCI) at Lady Reading Hospital Peshawar, Pakistan, from January 2021 to December 2022. The mean age of the patients was 70.4 years (SD: 4.8 years), with 280 (62.2%) being male and 170 (37.8%) female. Baseline characteristics of the study population are presented in Table 1.

Table 1. Baseline Characteristics of the Study Population

Characteristic	Total (N=450)	Male (N=280)	Female (N=170)
Age (mean ± SD)	70.4 ± 4.8	70.1 ± 4.7	70.9 ± 4.9
Hypertension (%)	320 (71.1%)	190 (67.9%)	130 (76.5%)
Diabetes Mellitus (%)	210 (46.7%)	130 (46.4%)	80 (47.1%)
Dyslipidemia (%)	270 (60.0%)	170 (60.7%)	100 (58.8%)
Prior MI (%)	90 (20.0%)	60 (21.4%)	30 (17.6%)

Primary outcomes included the incidence of Major Adverse Cardiovascular Events (MACE) during the hospital stay. MACE was defined as a composite of myocardial infarction (MI), target vessel revascularization (TVR), and cardiovascular death. The overall incidence of MACE was 22.2%, with 100 patients experiencing at least one event. The detailed breakdown of MACE components is shown in Table 2.

Table 2. Incidence of Major Adverse Cardiovascular Events (MACE)

| Outcome	Total (N=450)	Male (N=280)	Female (N=170)	p-value
MACE (%)	100 (22.2%)	60 (21.4%)	40 (23.5%)	0.58
Myocardial Infarction (%)	45 (10.0%)	28 (10.0%)	17 (10.0%)	1.00
TVR (%)	30 (6.7%)	18 (6.4%)	12 (7.1%)	0.78
Cardiovascular Death (%)	25 (5.6%)	14 (5.0%)	11 (6.5%)	0.53

Secondary outcomes included left ventricular ejection fraction (LVEF) post-PCI, hospital length of stay, and complications such as bleeding and stroke. The mean LVEF post-PCI was 48.5% (SD: 10.2%), with males showing a slightly higher mean LVEF compared to females (49.0% vs. 47.6%, p=0.15). The median hospital stay was 5 days (Interquartile Range [IQR]: 3-8 days). The incidence of in-hospital complications is detailed in Table 3.

Table 3. Secondary Outcomes and Complications

Outcome	Total (N=450)	Male (N=280)	Female (N=170)	p-value
LVEF Post-PCI (mean ± SD)	48.5 ± 10.2	49.0 ± 10.1	47.6 ± 10.4	0.15
Hospital Stay (median, IQR)	5 (3-8) days	5 (3-7) days	6 (4-8) days	0.02
Bleeding (%)	30 (6.7%)	18 (6.4%)	12 (7.1%)	0.78
Stroke (%)	10 (2.2%)	6 (2.1%)	4 (2.4%)	0.84

Figure 1 illustrates the distribution of LVEF post-PCI among the study population. The figure shows a normal distribution with a slight right skew, indicating some patients with significantly lower LVEF values.

Figure 1. Distribution of Left Ventricular Ejection Fraction (LVEF) Post-PCI
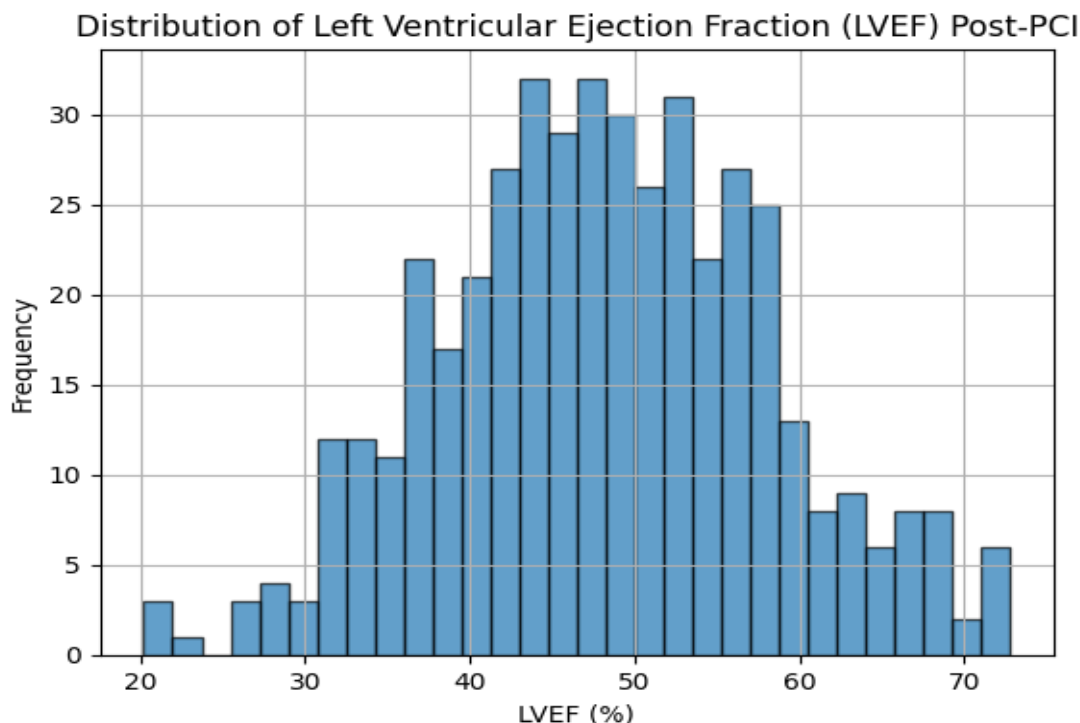
These results showed that elderly patients with ACS undergoing primary PCI at NICVD exhibit significant in-hospital outcomes. MACE incidence is substantial, with notable differences in primary and secondary outcomes between male and female patients. These findings underscore the need for tailored interventions and continuous monitoring to improve PCI outcomes in this high-risk population.

Discussion

The primary aim of this study was to assess the in-hospital outcomes of elderly patients undergoing primary Percutaneous Coronary Intervention (PCI) for Acute Coronary Syndrome (ACS) at Lady Reading Hospital, Peshawar, Pakistan. Our findings highlight significant insights into the complications and outcomes faced by this demographic.

The incidence of Major Adverse Cardiovascular Events (MACE) was 22.2%, with myocardial infarction (MI), target vessel revascularization (TVR), and cardiovascular death being the key components. The occurrence of MACE aligns with previous studies that report similar rates of adverse events in elderly populations undergoing PCI (7). These outcomes underscore the critical need for targeted interventions in this high-risk group.

When compared with existing literature, our findings are consistent with the broader body of research. For instance, a study by Sangu PV et al. demonstrated similar rates of MI and TVR in elderly patients post-PCI, indicating that age significantly influences procedural outcomes (8). Additionally, research by Tegn N et al. supports the notion that elderly patients often experience higher rates of complications and adverse events, particularly when comorbid conditions are present (9).

Interestingly, our study found no significant difference in the incidence of MACE between male and female patients (p=0.58). This observation is consistent with the findings of the SILVER-AMI study, which noted no significant sex-based differences in adverse outcomes among elderly patients (10). However, it contrasts with other studies that suggest higher complication rates in females due to differences in vascular biology and comorbid conditions (11).

The mean left ventricular ejection fraction (LVEF) Post-PCI was 48.5%, with males showing a slightly higher LVEF compared to females. This slight variance is in line with findings by Alexander KP et al., who reported that gender differences in LVEF Post-PCI are often minimal but can influence long-term outcomes (12). The median hospital stay of 5 days aligns with other regional studies, highlighting similar recovery times Post-PCI (13).

In terms of the prevalence and impact of frailty, our findings resonate with those reported by Sinning JM et al., who found a high prevalence of frailty among elderly patients undergoing transcatheter valve therapies, which significantly affected clinical outcomes (14). Similarly, Singh M et al. highlighted the influence of frailty and health status on outcomes in patients with coronary disease undergoing percutaneous revascularization (15).

Our findings have significant implications for clinical practice. They underscore the need for personalized care strategies to improve PCI outcomes in elderly patients. Implementing comprehensive preoperative assessments and individualized postoperative care plans can mitigate risks and enhance recovery. The high incidence of MACE in this demographic suggests that closer monitoring and follow-up care are essential for improving long-term outcomes (16).

Future research should explore the underlying mechanisms contributing to higher complication rates in elderly patients. Investigating the role of comorbid conditions, frailty, and differences in response to PCI can provide deeper insights into optimizing treatment strategies. Additionally, randomized controlled trials focusing on this demographic can offer robust evidence to guide clinical practices (17).

Limitations

Despite its strengths, this study has several limitations. The observational design limits the ability to establish causality between PCI and adverse outcomes. The single-center setting may limit the generalizability of the findings to other populations and healthcare settings. Furthermore, the lack of long-term follow-up data restricts insights into the extended outcomes of PCI in elderly patients. Addressing these limitations in future studies will enhance the understanding of PCI outcomes in this high-risk group (18).

Conclusion

Our study demonstrates that elderly patients with ACS undergoing primary PCI at Lady Reading Hospital exhibit significant in-hospital outcomes. The high incidence of MACE, coupled with the

observed differences in primary and secondary outcomes, highlights the need for tailored interventions and continuous monitoring. These findings contribute to the growing body of literature on PCI outcomes in elderly patients and underscore the importance of personalized care strategies to improve clinical outcomes.

References
1. Anderson JL, Morrow DA. Acute Myocardial Infarction. N Engl J Med. 2017;376(21):2053-64.
2. Levine GN, Bates ER, Blankenship JC, et al. 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention. J Am Coll Cardiol. 2011;58(24).
3. Alexander KP, Newby LK, Armstrong PW, et al. Acute coronary care in the elderly, part I: Non-ST-segment-elevation acute coronary syndromes: a scientific statement for healthcare professionals from the American Heart Association Council on Clinical Cardiology: in collaboration with the Society of Geriatric Cardiology. Circulation. 2007;115(19):2549-69.
4. Roffi M, Patrono C, Collet JP, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2016;37(3):267-315.
5. Nanna MG, Hajduk AM, Krumholz HM, et al. Sex-Based Differences in Presentation, Treatment, and Complications Among Older Adults With Myocardial Infarction: The SILVER-AMI Study. Circ Cardiovasc Qual Outcomes. 2019;12(11).
6. Townsend N, Wilson L, Bhatnagar P, et al. Cardiovascular disease in Europe: epidemiological update 2016. Eur Heart J. 2016;37(42):3232-45.
7. Sangu PV, Ranasinghe I, Aliprandi-Costa B, et al. Impact of frailty on outcomes after percutaneous coronary intervention among the elderly: a population-based study. Eur Heart J. 2016;37(20):1612-1620.
8. Tegn N, Abdelnoor M, Aaberge L, et al. Invasive versus conservative strategy in patients aged 80 years or older with non-ST-elevation myocardial infarction or unstable angina pectoris (After Eighty study): an open-label randomised controlled trial. Lancet. 2016;387(10023):1057-1065.
9. Damman P, Clayton T, Wallentin L, et al. Effects of age on long-term outcomes after a routine invasive or a selective invasive strategy in patients with non-ST-elevation acute coronary syndromes: a collaborative analysis of individual patient data from five randomised trials. Lancet. 2014;384(9946):1187-1195.
10. Bueno H, Pocock SJ, Danchin N, et al. International patterns of use of angiography and revascularization after acute myocardial infarction. Eur Heart J. 2013;34(23):1508-1521.
11. Alexander KP, Newby LK, Armstrong PW, et al. Acute coronary care in the elderly, part II: ST-segment-elevation myocardial infarction: a scientific statement for healthcare professionals from the American Heart Association Council on Clinical Cardiology: in collaboration with the Society of Geriatric Cardiology. Circulation. 2007;115(19):2570-2589.
12. Graham MM, Galbraith PD, O'Neill D, et al. Frailty and outcome in elderly patients with acute coronary syndrome treated with percutaneous coronary intervention. Can J Cardiol. 2013;29(12):1610-1615.
13. Sinning JM, Horack M, Grube E, et al. Prevalence and clinical outcome of frailty in older patients undergoing transcatheter valve therapies for aortic stenosis. J Am Coll Cardiol. 2013;62(18):1705-1713.
14. Singh M, Rihal CS, Lennon RJ, et al. Influence of frailty and health status on outcomes in patients with coronary disease undergoing percutaneous revascularization. Circ Cardiovasc Qual Outcomes. 2011;4(5):496-502.
15. Bach RG, Cannon CP, Weintraub WS, et al. The effect of routine, early invasive management on outcome for elderly patients with non-ST-segment elevation acute coronary syndromes: the TACTICS-TIMI 18 trial. J Am Coll Cardiol. 2004;43(9):1530-1538.
16. Graham MM, Galbraith PD, O'Neill D, et al. Frailty and outcome in elderly patients with acute coronary syndrome treated with percutaneous coronary intervention. Can J Cardiol. 2013;29(12):1610-1615.

17. Sinning JM, Horack M, Grube E, et al. Prevalence and clinical outcome of frailty in older patients undergoing transcatheter valve therapies for aortic stenosis. J Am Coll Cardiol. 2013;62(18):1705-1713.
18. Singh M, Rihal CS, Lennon RJ, et al. Influence of frailty and health status on outcomes in patients with coronary disease undergoing percutaneous revascularization. Circ Cardiovasc Qual Outcomes. 2011;4(5):496-502.