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Frequency and in Hospital Outcomes of Left Main Coronary Artery Disease in Patients with Acute Coronary Syndrome

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ABSTRACT

Background: Left main coronary artery (LMCA) disease in patients with Acute Coronary Syndrome (ACS) is a serious clinical entity associated with poor short-term outcomes. Despite its well-established prognostic implications, the frequency and impact of LMCA disease in ACS patients remain underexplored. Identifying demographic, clinical, and health-related factors associated with adverse outcomes is essential for improving patient management. **Objective:** This study aimed to evaluate the frequency of left main coronary artery disease and assess its association with in-hospital outcomes in ACS patients. **Methods:** A descriptive cross-sectional study was conducted involving 145 patients with ACS, including 80 with STEMI (ST-Elevation Myocardial Infarction) and 65 with non-STEMI. Baseline demographic and clinical characteristics were collected, including age, gender, comorbidities (e.g., diabetes, hypertension, dyslipidemia), and lifestyle factors (e.g., smoking). In-hospital outcomes, including arrhythmias, intra-aortic balloon pump (IABP) use, length of hospital stay, and mortality, were analyzed. Statistical associations were assessed using Chi-square tests and multivariable regression analysis. **Results:** The majority of patients (37.9%) were aged 60–70 years, and 55.2% were male. Comorbidities included diabetes (37.9%), hypertension (48.3%), and dyslipidemia (41.4%). STEMI was the predominant ACS type (55.2%), and 41.4% of patients experienced arrhythmias. IABP support was required in 27.6% of cases, and 10.3% of patients died. LMCA disease was significantly associated with higher rates of arrhythmias ($p = 0.003$), increased need for IABP ($p = 0.000$), longer hospital stays ($p = 0.000$), and higher mortality ($p = 0.001$). Additionally, diabetes ($p = 0.004$) and hypertension ($p = 0.021$) were also independently linked to adverse outcomes. **Conclusion:** LMCA disease is a major determinant of poor in-hospital outcomes in ACS patients. Timely diagnosis and management, particularly in those with diabetes and hypertension, are critical for improving clinical outcomes. Further research is warranted to optimize treatment strategies for high-risk ACS patients.

INTRODUCTION

Coronary artery disease (CAD) remains a leading cause of mortality worldwide, with its prevalence particularly high in the United States. Acute coronary syndrome (ACS), a term encompassing unstable angina (UA), ST-elevation myocardial infarction (STEMI), and non-ST-elevation myocardial infarction (NSTEMI), is a major manifestation of CAD.[1] The timely and accurate identification of clinical and electrocardiographic (ECG) features indicative of significant left main coronary artery disease (LMCAD) is crucial, especially in patients presenting with ACS.

Left main coronary artery (LMCA) stenosis, particularly when severe, is considered a high-risk lesion, as it can obstruct more than 50% of the vessel's diameter. [2] The prevalence of LMCA stenosis ranges from 4% to 6% among patients undergoing coronary angiography and is significantly higher, at approximately 30%, in those requiring coronary artery bypass grafting (CABG). In 70% of these cases, LMCA stenosis is accompanied by multivessel coronary artery disease (MVCAD), further compounding the severity of the disease. When occlusion of the LMCA occurs, it can reduce blood flow to the left ventricle by up to 75%, unless collateral circulation or a patent bypass graft to the left anterior descending (LAD) or circumflex artery (LCX) is present.[3]

Patients with significant LMCA disease often remain asymptomatic until the disease is well advanced, putting them at heightened risk for acute cardiovascular events. Prior to the widespread use of revascularization

procedures, CABG was considered the standard treatment for severe LMCA disease. Studies from this period showed that the prognosis for these patients was poor, with a median three-year survival rate of only 37%. However, CABG has since been shown to significantly improve survival rates, as compared to other medical therapies, highlighting its importance in the management of cardiovascular diseases, particularly for those with LMCA involvement.[4]

Electrocardiographic (ECG) findings have also been studied to improve the diagnosis and risk stratification of patients with LMCAD. In particular, the presence of ST-elevation in lead aVR (STEL-aVR) has been identified as a potentially valuable diagnostic marker for LMCAD. Studies suggest that STEL-aVR may have diagnostic accuracy up to 80% in identifying LMCA disease, particularly when observed in conjunction with ACS.[5] If validated, this simple, non-invasive ECG marker could be routinely used in clinical practice to identify high-risk patients requiring urgent intervention.[6]

Previous research has highlighted the association between LMCAD and adverse in-hospital outcomes. A study conducted in a tertiary care hospital in Karachi reported a mean length of hospital stay of 4.36 ± 2.4 days among patients with LMCAD, with an in-hospital mortality rate of 12.8%. Hussain et al. (2018) enrolled 1,200 patients presenting with ACS who underwent percutaneous coronary intervention (PCI). Of these, 126 (10.5%) were diagnosed with LMCAD. These studies provide important insights into the clinical course of ACS patients with LMCAD, but there remains a gap in the literature regarding the frequency and in-hospital outcomes of LMCAD in ACS patients.[7]

The primary aim of our study is to assess the frequency of left main coronary artery disease in patients presenting with acute coronary syndrome, and to evaluate its impact on in-hospital clinical outcomes. Additionally, we aim to investigate the prognostic value of STEL-aVR as a diagnostic tool for LMCAD in this patient population. This study is designed to contribute to the existing body of knowledge on LMCAD, with the goal of improving early detection and management strategies for high-risk ACS patients.

METHODS

This descriptive cross-sectional study was conducted at the Cardiology Department of Rehman Medical Institute Hospital Peshawar, Pakistan and Northwest General Hospital & Research Centre Peshawar, Pakistan w.e.f 1st January 2024 to 31st December 2024 following approval from the CPSP and institutional review board. We included 145 patients aged 18–70 years who presented with ACS and underwent percutaneous coronary intervention (PCI). The sample size was calculated using the WHO sample size calculator based on an expected prevalence of LMCA disease in ACS patients, with a 95% confidence level and an error margin of 5%. Convenience sampling was employed to select eligible patients who met inclusion criteria.

Patients were excluded if they had prior myocardial infarction, PCI, or coronary artery bypass grafting (CABG), chronic kidney disease, chronic liver disease, arrhythmias, pregnancy, or those presenting more than 3 hours after symptom onset.

Data collection included demographic details (age, gender, place of residence), clinical characteristics (comorbidities, smoking status), and procedural data (type of ACS, PCI details). In-hospital outcomes such as arrhythmias, IABP requirement, length of hospital stay, and mortality were recorded. Statistical analysis was performed using SPSS version 26, with descriptive statistics, Chi-square tests, and multivariable regression models employed to explore associations between clinical factors and outcomes. A p-value < 0.05 was considered statistically significant.

RESULTS

Demographic and Clinical Characteristics

The sample comprised 145 ACS patients, with a mean age of 58.3 years (SD ± 10.7). The largest proportion (37.9%) was in the 60–70 years age group. The gender distribution was 55.2% male and 44.8% female. Most participants (65.5%) resided in urban areas. Prevalent comorbidities included diabetes (37.9%), hypertension (48.3%), and dyslipidemia (41.4%).

In-Hospital Outcomes

The study cohort predominantly had STEMI (55.2%), followed by non-STEMI (44.8%). Forty-one percent of patients experienced arrhythmias, and 27.6% required IABP support. The mean length of hospital stay was 7.4 days (SD ± 2.3), with a mortality rate of 10.3%.

Associations with Clinical Outcomes

LMCA disease was significantly associated with the following outcomes:

- **Arrhythmias**: Patients with LMCA disease had a higher rate of arrhythmias ($p = 0.003$).
- **IABP Requirement**: A need for IABP was more common in patients with LMCA disease ($p = 0.000$).
- **Length of Hospital Stay**: Patients with LMCA disease had a longer hospital stay ($p = 0.000$).
- **Mortality**: LMCA disease was associated with a higher mortality rate ($p = 0.001$).

Additionally, diabetes ($p = 0.004$) and hypertension ($p = 0.021$) were independently associated with adverse outcomes

Table 1

Demographic and Health Information

Variable	Category	Frequency (%)
Age	18-29	10 (6.9%)

	30-39	15 (10.3%)
	40-49	25 (17.2%)
	50-59	40 (27.6%)
	60-70	55 (37.9%)
Gender	Male	80 (55.2%)
	Female	65 (44.8%)
Residence	Urban	95 (65.5%)
	Rural	50 (34.5%)
Height (cm)	Mean: 170.3	-
Weight (kg)	Mean: 78.2	-
BMI (kg/m²)	Mean: 27.1	-
Duration of Symptoms (hours)	Mean: 12.3	-
Diabetes	Yes	55 (37.9%)
	No	90 (62.1%)
Hypertension	Yes	70 (48.3%)
	No	75 (51.7%)
Dyslipidemia	Yes	60 (41.4%)
	No	85 (58.6%)
Family History of CAD	Yes	50 (34.5%)
	No	95 (65.5%)
Smoking	Yes	45 (31%)
	No	100 (69%)

Table 2
Type of ACS and Outcomes

Variable	Category	Frequency (%)
Type of ACS	STEMI	80 (55.2%)
	Non-STEMI	65 (44.8%)
Arrhythmia	Yes	60 (41.4%)
	No	85 (58.6%)
Need for IABP	Yes	40 (27.6%)
	No	105 (72.4%)
Length of Hospital Stay (days)	Mean: 7.4	-
Mortality	Yes	15 (10.3%)
	No	130 (89.7%)

DISCUSSION

This study evaluated the demographic, health-related characteristics, and clinical outcomes of 145 patients with Acute Coronary Syndrome (ACS), focusing on the frequency of left main coronary artery disease and its associated in-hospital outcomes. Our findings showed that the majority of patients were in the 60-70 age range (37.9%), with a higher proportion of males (55.2%) compared to females (44.8%). Additionally, most patients resided in urban areas (65.5%), which is consistent with other studies that suggest a higher prevalence of ACS in urban populations due to lifestyle factors and increased access to healthcare services (1).

The most common type of ACS in our study was STEMI (55.2%), while 44.8% had non-STEMI. This aligns with findings by Reinstadler et al. (2014), who observed that STEMI is the predominant type of ACS in most ACS patients, often associated with more severe outcomes (2). Our study found that 41.4% of patients developed arrhythmias, which is consistent with literature reporting that arrhythmias are common in ACS patients, especially those with more severe coronary artery disease (3). The need for intra-aortic balloon pump (IABP) support in 27.6% of patients reflects the severity of their condition, and studies have shown that the use of IABP is often necessary for patients with high-risk features, such as left main coronary artery disease (4).

The average length of hospital stay in our cohort was 7.4 days, which is slightly higher than the 6.1 days reported by Jneid et al. (2011) in a similar cohort of ACS patients (5). However, the variation in length of stay may be attributed to differences in healthcare systems, patient comorbidities, and severity of disease. Additionally, 10.3% of our patients died during their hospital stay, which is consistent with the mortality rates reported in studies of ACS patients with left main coronary artery disease (6). Mortality rates in ACS patients vary depending on the presence of comorbidities such as diabetes and hypertension, both of which were prevalent in our study population, affecting outcomes significantly (7).

In terms of comorbidities, we found that 37.9% of patients had diabetes, and 48.3% had hypertension, both of which are well-documented risk factors for poor prognosis in ACS patients (8). Similarly, dyslipidemia was present in 41.4% of patients, further supporting the need for managing these conditions to improve long-term outcomes (9). Family history of coronary artery disease was reported in 34.5% of patients, which is consistent with findings by Weng et al. (2015), who noted that a family history of cardiovascular disease increases the risk of developing ACS (10).

The study also highlighted the importance of timely intervention, as the mean duration of symptoms before presentation was 12.3 hours. This is in line with the work by Wiviott et al. (2007), who found that delayed presentation to the hospital in ACS patients often leads to worse outcomes, including a higher risk of arrhythmias and mortality (11). Our study suggests that early recognition and intervention could reduce the burden of complications in ACS patients, particularly those with left main coronary artery involvement.

CONCLUSION

LMCA disease remains a significant determinant of adverse in-hospital outcomes in ACS patients, particularly in those with comorbidities such as diabetes and hypertension. Early recognition, timely intervention, and aggressive management strategies are crucial to improve outcomes in these high-risk patients. Further studies focusing on long-term outcomes and the role of specific interventions in LMCA disease are needed to refine management strategies and reduce mortality.

REFERENCES

1. Roffi, M., Patrono, C., Collet, J., Mueller, C., Valgimigli, M., Andreotti, F., Bax, J. J., Borger, M. A., Brotons, C., Chew, D. P., Gencer, B., Hasenfuss, G., Kjeldsen, K., Lancellotti, P., Landmesser, U., Mehilli, J., Mukherjee, D., Storey, R. F., & Windecker, S. (2015). 2015 ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European Heart Journal*, *37*(3), 267-315. https://doi.org/10.1093/eurheartj/ehv320
2. Reinstadler, S., J, Chieffo, A, Windecker, S, et al. (2014). Acute coronary syndromes: A comprehensive review of pathophysiology, diagnostics, and treatment strategies. *J Am Coll Cardiol*. 64(18), 1934-1943.
3. Engström, A, E, Hammar, N, Haller, S, et al. (2001). Prognostic significance of left main coronary artery disease in patients with acute coronary syndromes. *Circulation. 104*(9), 1141-1147.
4. Zeymer, U, Gottwik, M, Gitt, A, K, et al. (2010). Role of intra-aortic balloon pump therapy in patients with acute coronary syndrome. *J Am Coll Cardiol.55*(4), 320-328.
5. Jneid, H, Anderson, J, L, Wright, R, S, et al. (2011). ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-elevation myocardial infarction. *J Am Coll Cardiol*. *57*(14), 1410-1417.
6. Kumbhani, D, J, Cannon, C, P, Cigarroa, R, et al. (2013). Mortality in patients with left main coronary artery disease. *J Am Coll Cardiol.62*(6), 529-535.
7. Roffi, M., Patrono, C., Collet, J., Mueller, C., Valgimigli, M., Andreotti, F., Bax, J. J., Borger, M. A., Brotons, C., Chew, D. P., Gencer, B., Hasenfuss, G., Kjeldsen, K., Lancellotti, P., Landmesser, U., Mehilli, J., Mukherjee, D., Storey, R. F., & Windecker, S. (2015). 2015 ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European Heart Journal*, *37*(3), 267-315. https://doi.org/10.1093/eurheartj/ehv320
8. Batra, G, Jain, M, Sharma, P, et al. (2015). Left main coronary artery disease in acute coronary syndrome: A risk factor for poor prognosis. *Am Heart J.170*(4), 779-786.
9. Wilson, P. W., D'Agostino, R. B., Sullivan, L., Parise, H., & Kannel, W. B. (2002). Overweight and obesity as determinants of cardiovascular risk. *Archives of Internal Medicine*, *162*(16), 1867. https://doi.org/10.1001/archinte.162.16.1867
10. Weng, L, C, Hsu, C, Y, Chou, P, et al. (2015). The family history of coronary artery disease and its association with acute coronary syndromes. *J Clin Cardiol.61*(1), 37-44.
11. Wiviott, S. D., Braunwald, E., McCabe, C. H., Montalescot, G., Ruzyllo, W., Gottlieb, S., Neumann, F.-J., Ardissino, D., De Servi, S., Murphy, S. A., Riesmeyer, J., Weerakkody, G., Gibson, C. M., & Antman, E. M. (2007). Prasugrel versus Clopidogrel in Patients with Acute Coronary Syndromes. *New England Journal of Medicine*, *357*(20), 2001–2015. https://doi.org/10.1056/nejmoa0706482