Comparison of In-Hospital Outcomes of Anterior Wall Versus Inferior Wall ST Elevation Myocardial Infarction Following Percutaneous Coronary Intervention: A Descriptive Cross-Sectional Study

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Abstract:-

➢ *Introduction*

ST-elevation myocardial infarction (STEMI) is a critical condition affecting many individuals worldwide, posing significant risks to patient health and outcomes. Different types of STEMI, such as anterior wall and inferior wall STEMI, can lead to varying in-hospital outcomes following percutaneous coronary intervention (PCI). Understanding these differences is crucial for improving patient care and treatment strategies. This study aimed to compare the in-hospital outcomes of anterior and inferior wall STEMI in patients undergoing PCI at a tertiary care center.

➢ *Methods*

This descriptive cross-sectional study included 70 patients who underwent PCI for either Anterior or inferior wall STEMI at Chitwan Medical College Teaching Hospital (CMCTH) and were admitted to the Critical Care Unit (CCU) from February 5th 2021 to March 4th 2022. Anterior wall or inferior wall STEMI was diagnosed using a surface Electrocardiogram (ECG) and in-hospital outcomes were recorded using structured Proforma. Data was entered and analyzed with SPSS-26.

➢ *Results*

Among the 70 patients included in the study, the mean age was 64.50 ± 9.818 years. The majority (77.1%) of patients were male and 22.9% of the patients were female. Among the patients of anterior wall MI who underwent PCI, 11 patients (15.7%) had cardiogenic shock, 21 patients (30.0%) had AKI, 2 patients (2.9%) had CVA, and 2 patients (2.9%) had death.

➢ *Conclusion*

Patients with anterior wall STEMI following PCI had worse in-hospital outcomes compared to those with inferior wall STEMI.

I. INTRODUCTION

The term myocardial infarction (MI) should be used when there is evidence of myocardial injury   (defined as an elevation of cardiac troponin values with at least one value above the 99th   percentile upper reference limit) with necrosis in a clinical setting consistent with myocardial ischemia. [1]

Anterior Myocardial Infarction is associated with a decrease in blood supply to the anterior wall of the heart supplied by the Left Anterior Descending (LAD) coronary artery due to its occlusion. Coronary Artery Disease (CAD)/ischemic heart disease (IHD) is the single most common cause of death worldwide and its frequency is increasing. Although CAD is showing a declining trend in western developed countries, the incidence is rising rapidly in developing countries like Nepal[2].

The study aimed to investigate the in-hospital outcomes of patients undergoing PCI for anterior and inferior wall MI at a tertiary care center.

II. METHODS

A descriptive cross-sectional study was conducted in Chitwan Medical College and Teaching Hospital (CMCTH) after receiving ethical approval from the Chitwan Medical College-Institutional Review Committee (CMC-IRC) 078 / 079 - 208. Data were collected from patients diagnosed with anterior or inferior wall STEMI who underwent PCI and were admitted to the Coronary Care Unit (CCU) from February 5th, 2021, to March 4th, 2022. All patients who gave consent during this period were included in the study.

A total of 70 cases, comprising consecutive 35 patients each for anterior wall STEMI and inferior wall STEMI, were included in the study. The exclusion criteria included who did not give consent to the study. A convenience sampling method was used.

The sample size was calculated by using the following formula:

$$n = Z^2 \times \frac{p \times q}{e^2}$$

Where,
n= minimum required sample size

Z= 1.96 for 95% Confidence Interval (CI)
p= prevalence
q= 1-p
e= margin of error, 5%
However, the final sample size taken was 70.

All the above data were collected and recorded in a standard proforma. Statistical analysis was carried out with the help of SPSS software version 26. The qualitative variables are expressed as counts and percentages. The analyzed data were presented in the form of tables, graphs, and other relevant formats. The statistical significance of the result was assessed using Pearson Chi-square test or Fishers Exact test. $P < 0.05$ was considered statistically significant.

III. RESULTS

Among the 70 patients included in the study, the mean age was 64.50 ± 9.818 years.

Table 1: Age distribution of the Patients Studied

Age Group	Frequency	Percentage
<49	5	7.14
50-59	17	24.28
60-69	25	35.71
>70	23	32.85
Mean ± SD	64.50±9.818	

In our study, the majority of 54 (77.14%) of patients were male and 16(22.85%)of the patients were female. 15 (21.42%) of the patients had a family history of CAD.In our study, majority 50(71.42%) of the patients were smokers.In our study, majority 45(64.28%) of the patients had a history of HTN.In our study, more than one half 37 (52.85%) of the patients had History of DM.

Table 2: In-Hospital Outcomes of Patients Who Underwent PCI for Anterior Wall MI

Variables	PCI for AWMI		P-Value
Cardiogenic Shock	**Yes**	**No**	
Yes	11(15.71%)	4(5.71%)	0.041*
No	24(34.28%)	31(44.28%)	
AKI			
Yes	21(30.00%)	10(14.28%)	0.008*
No	14(20.00%)	25(35.71%)	
CVA			
Yes	2(2.85%)	0(0.00%)	0.493
No	33(47.14%)	35(50.00%)	
Death			
Yes	2(2.85%)	1(1.42%)	1.000**
No	33(47.14%)	34(48.57%)	

* Values have reached statistical significance.
** Fisher's Exact Test

Table 2 shows that among the patients of anterior wall MI who underwent PCI, 11 patients (15.71%) had Cardiogenic Shock (p=0.041), 21 patients (20.00%) had AKI (p=0.008) and 2 patients (2.85%) had Death (p=1.000) and 2 patients had CVA (p=0.493). The in-hospital outcomes of cardiogenic shock, AKI and death were statistically significant whereas in-hospital outcome of CVA didn't reach statistical significance.

Table 3: In-Hospital Outcomes of Patients Who Undergo PCI for Inferior Wall MI(IWMI).

Variables	PCI for IWMI		P-Value
Cardiogenic Shock	**Yes**	**No**	
Yes	4(5.71%)	11(15.71%)	0.041*
No	31(44.28%)	24(34.28%)	
AKI			
Yes	10(14.28%)	21(30.00%)	0.008*
No	25(35.71%)	14(20.00%)	
CVA			
Yes	0(0.00%)	2(2.85%)	0.493
No	35(50.00%)	33(47.14%)	
Death			
Yes	1(1.42%)	2(2.85%)	1.000**
No	34(48.57%)	33(47.14%)	

* Values have reached statistical significance.
** Fisher's Exact Test

Table 3 shows that among the patients who underwent PCI for inferior wall MI, 4 patients (5.71%) had cardiogenic shock (p=0.041), 10 patients (14.28%) had AKI (p=0.008), O patients had CVA (p=0.493) and 1 patient had death (p=1.000). In-hospital outcomes of Cardiogenic Shock, AKI and Death are statistically significant and in-hospital outcome of CVA is not statistically significant.

Table 4: Comparison of In-Hospital Outcomes between Patients Who Underwent PCI for Anterior and Inferior Wall MI

Variables	Type of STEMI		P-Value
	AWMI	**IWMI**	
Arrythmia			
Yes	24(34.28%)	13(18.57%)	0.008*
No	11(15.71%)	22(31.42%)	
If Arrythmia Present, its Type (n=37)			
Ventricular Tachycardia (VT)	8(21.62%)	3(8.10%)	
Premature Ventricular Contractions (PVCs)	5(13.51%)	3(8.10%)	
Atrial Fibrillation (AF)	7(18.91%)	2(5.40%)	0.434
Supraventricular Tachycardia (SVT)	4(10.81%)	3(8.10%)	
Ventricular Fibrillation (VF)	0(0.00%)	1(2.70%)	
Combined AF and VT	0(0.00%)	1(2.70%)	
Cardiogenic Shock			
Yes	11(15.71%)	4(5.71%)	0.041*
No	24(34.28%)	31(44.28%)	
AKI			
Yes	21(29.16%)	10(14.28%)	0.008*
No	14(19.44%)	25(35.71%)	
CVA			
Yes	2(2.85%)	0(0.00%)	0.493
No	33(47.14%)	35(50.00%)	
Death			
Yes	2(2.85%)	1(1.42%)	1.000**
No	33(47.14%)	34(48.57%)	

* Values have reached statistical significance.
** Fisher's Exact Test

Table 4 shows the different in-hospital outcomes of patients who underwent PCI for either AWMI or IWMI. 24 patients (34.28%) with AWMI had arrhythmias whereas 13 patients (18.57%) with IWMI had arrhythmias which was statistically significant. (P=0.008). The occurrence of type of arrhythmias in AWMI and IWMI respectively was Ventricular Tachycardia (VT) - 8 patients (21.62%) vs. 3 patients (8.10%), Premature Ventricular Contractions(PVCs) – 5 patients(13.51%) vs. 3 patients (8.10%), Atrial Fibrillations (AF) – 7 patients (18.91%) vs. 2 patients (5.40%), Supraventricular Tachycardia(SVT) – 4 patients (10.81%) vs. 3 patients (8.10%), Ventricular Fibrillation (VF) – 0 patients vs. 1 patient (2.70%). 1 patient (2.70%) with IWMI had combined AF and VT. Other outcomes in AWMI and IWMI patients are cardiogenic shock – 11 patients (15.71%) vs. 4 patients (5.71%), AKI – 21 patients(29.16%) vs 10 patients(14.28%), CVA – 2 patients(2.85%) vs 0 patients and lastly Death – 2 patients (2.85%) vs 1 patient (1.42%). The outcomes of cardiogenic shock (P=0.041), AKI (P=0.008), and Death(P=1.000, Fisher's exact test) have reached statistical significance i.e. P<0.05 whereas the outcome of CVA (P=0.493) is not statistically significant i.e. P>0.05.

IV. DISCUSSION

This cross-sectional study was aimed to compare the in-hospital outcomes of patients who undergo Percutaneous Coronary Intervention (PCI) as a reperfusion therapy for anterior wall STEMI and inferior wall STEMI at the catheterization lab of Chitwan Medical College Teaching Hospital, Bharatpur, Nepal. The study included 70 patients who underwent PCI for either Anterior Wall STEMI or Inferior Wall STEMI and were admitted to the Coronary Care Unit (CCU) at Chitwan Medical College Teaching Hospital, Bharatpur, Nepal.

The results of our study were similar to previous studies in that anterior wall myocardial infarction has worse outcomes than inferior wall myocardial infarction. Harold L Kennedy et al. [3] have previously shown a higher in-hospital case fatality rate for patients with anterior MI (27.51%) than for those with inferior/posterior MI (22.85%) (p<0.05) which is comparable to our study. Peter H Stone et al.[4] have also previously shown that patients experiencing anterior infarction demonstrated markedly more adverse in-hospital outcomes compared to those with inferior infarction which was substantiated by a higher prevalence of heart failure (40.7 versus 14.7%, p < 0.001), significant ventricular ectopic activity (70.2 versus 58.9%, p < 0.05), in-hospital mortality (11.9 versus 2.8%, p < 0.001), and overall cumulative cardiac mortality (27 versus 11%, p < 0.001). Samer Thanavaro et al.[5] have also previously demonstrated that patients with inferior wall Myocardial infarction (IMI) had a significantly lower in-hospital mortality rate (9.1% vs 15.6%, p = 0.0014) and significantly lower prevalences of congestive heart failure (39.4% vs 47.6%, p = 0.0066), cardiogenic shock (8.7% vs 12.6%, p = 0.0384) and conduction defects (left anterior hemiblock, right bundle branch block and intraventricular conduction defect) which was similar to our study.M E hands et al.[6] have previously

shown that even when matched for infarct size using peak creatine kinase (CK) levels, anterior infarction patients tended to have higher 1-year mortality across all CK subgroups. Early mortality (days 1 to 28 post-infarction) was greater in the anterior group (10% vs 6.4%, p = 0.03), especially when peak CK exceeded four times normal (12.4% vs 7.0%, p = 0.04). Late mortality was also higher in the anterior group (8.4% vs 4.1%, p = .04) in comparison to inferior infarction. Our study showed a higher incidence of cardiogenic shock in Patients with Anterior wall STEMI which is consistent with the study done by Tanush Gupta et al.[7] in which the incidence of cardiogenic shock was lower in IWMI (9.5%) versus AWMI (14.1%).

Our study has shown that Anterior wall STEMI has unfavorable or worse outcomes as compared to inferior wall STEMI following Percutaneous Coronary Intervention (PCI).

The study has few limitations as the study is done in a single medical institution and in a single nation, so this research cannot be generalized to all the other places. Also, since this is a descriptive cross-sectional study the causal relation with other variables cannot be identified through this research. We have the potential bias for the missing data so this might influence the overall result of this research.

V. CONCLUSION

In conclusion, our observational study at Chitwan Medical College Teaching Hospital revealed that patients with Anterior wall ST-segment elevation Myocardial infarction (STEMI) have worse in-hospital outcomes in terms of higher incidence of Arrhythmias, Acute kidney injury (AKI), cardiogenic shock, cerebrovascular accident and death in compared to the patients with Inferior Wall STEMI following PCI. The differences in outcome of arrhythmias, AKI, cardiogenic shock, and death have reached statistical significance except for cerebrovascular accidents. Awareness of this distinctive difference in in-hospital outcomes is crucial in our daily clinical practice and could finally help us to anticipate these adverse events with timely management increasing the overall morbidity and mortality of the patients admitted in coronary care unit (CCU). This insight into differences in-hospital outcomes between Anterior Wall- and Inferior Wall-STEMI following PCI also opens the door for future research endeavors.

Conflict of Interest: None.

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