

COMPARATIVE ANALYSIS OF IN-HOSPITAL CLINICAL OUTCOMES
AMONG PATIENTS WITH ACUTE ANTERIOR AND INFERIOR WALL ST-
SEGMENT ELEVATION MYOCARDIAL INFARCTION AT A TERTIARY
CARE HOSPITAL, PESHAWAR

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Abstract

Acute myocardial infarction (AMI) remains a major cause of morbidity and mortality worldwide, and anterior wall myocardial infarction (AWMI) and inferior wall myocardial infarction (IWMI) exhibit distinct clinical characteristics and in-hospital outcomes. Local, region-specific comparative data from Pakistan remain limited. This study aimed to compare in-hospital clinical outcomes among patients with acute AWMI and IWMI admitted to a tertiary care hospital in Peshawar. A comparative cross-sectional study was conducted on 384 patients with confirmed ST-segment elevation myocardial infarction (STEMI), comprising 192 patients with AWMI and 192 with IWMI, recruited by non-probability convenience sampling. Data were collected using a structured proforma and analyzed using IBM SPSS version 26; the Chi-square test was used for categorical variables and the independent-samples t-test for continuous variables, with $p \leq 0.05$ considered significant. The AWMI group had a mean age of 58 ± 10 years (150, 78.1% male) and the IWMI group a mean age of 56 ± 11 years (155, 80.7% male). Hypertension was present in 57.3% of AWMI and 56.3% of IWMI patients, and diabetes mellitus in 44.3% and 42.7%, respectively. Patients with AWMI experienced a higher frequency of adverse outcomes than those with IWMI: cardiogenic shock (15.6% vs 10.4%), acute heart failure (20.8% vs 12.5%), cardiac arrest (5.2% vs 2.6%), and in-hospital mortality (12.0% vs 8.9%). Left bundle branch block was more common in AWMI (14.1% vs 2.6%), whereas atrioventricular block was more frequent in IWMI (16.7% vs 2.1%). The association between MI type and heart failure was statistically significant ($\chi^2 = 4.79$, $p = 0.029$), and hospital stay was significantly longer in AWMI patients (5.59 ± 2.51 vs 3.50 ± 2.50 days; $t = 8.10$, $p < 0.001$). These findings indicate that patients with acute AWMI have poorer in-hospital outcomes and a higher risk of major complications and mortality than those with IWMI, underscoring the need for early risk stratification and prompt reperfusion.

therapy, particularly in resource-limited settings.

INTRODUCTION

Changing modern lifestyles characterized by high consumption of processed foods rich in saturated fats, elevated intake of simple carbohydrates, and increasingly sedentary routines are driving a progressive rise in the prevalence of acute myocardial infarction (AMI) and its adverse cardiovascular risk profile across the regional population (Ahmad et al., 2024). AMI, commonly known as a heart attack, is fundamentally a disease of the coronary vasculature; disruption of coronary blood flow shifts myocardial metabolism from aerobic to anaerobic pathways, and when a region of myocardium can no longer sustain basic cellular function, that region becomes infarcted (Dutta et al., 2023).

Clinically, AMI is diagnosed according to international consensus guidelines when there is a rise and/or fall in cardiac biomarkers, most notably high-sensitivity troponins, together with objective evidence of acute myocardial ischemia – typical anginal symptoms, characteristic ECG changes (hyperacute T-waves, ST-segment elevation, or pathological Q-waves), or imaging evidence of new regional wall motion abnormality (StatPearls Publishing, 2025). The anatomical location of injury depends on which coronary artery is occluded: anterior wall myocardial infarction (AWMI) most commonly results from thrombotic occlusion of the left anterior descending (LAD) artery, which supplies a large territory of the anterior left ventricle, septum, and apex, while inferior wall myocardial infarction (IWMI) usually results from occlusion of the right coronary artery (RCA) or, less commonly, the left circumflex (LCx) artery, which supplies the diaphragmatic surface of the heart (StatPearls Publishing, 2025; Sadanandan et al., 2024).

AWMI is classically associated with worse outcomes, including higher in-hospital mortality and morbidity, owing to a larger infarct size and greater impairment of left ventricular systolic

function, which precipitates remodeling and pump failure (StatPearls Publishing, 2025). Primary percutaneous coronary intervention (PCI) is the gold-standard emergency reperfusion strategy for ST-segment elevation myocardial infarction (STEMI), aiming to restore TIMI-3 flow and prevent major adverse cardiac events. IWMI, while historically regarded as more benign, is not without risk: approximately 30–50% of inferior infarctions involve the right ventricle, which increases hemodynamic instability and the risk of cardiogenic shock (Sadanandan et al., 2024). IWMI is also more frequently complicated by sinus bradycardia and high-degree atrioventricular (AV) conduction block due to ischemia of the nodal tissue supplied by the RCA, whereas AWMI patients more often develop bundle branch block from septal involvement (Khan et al., 2021; Dutta et al., 2023).

Despite these well-recognized pathophysiological differences, local Pakistani data directly comparing in-hospital outcomes, procedural utilization, and conduction complications between AWMI and IWMI remain limited. International guidelines are largely derived from Western data with different demographic profiles and more optimized emergency transport networks; in local public tertiary care settings, patients often present after prolonged pre-hospital delay with advanced multivessel disease and heavier comorbidity burden, which may alter the standard complication profile of both infarct types. This gap justifies the need for localized comparative evidence to guide early risk stratification and resource allocation in high-volume public-sector cardiology units in Khyber Pakhtunkhwa, where catheterization laboratory and bed capacity are limited.

This study therefore aimed to compare the in-hospital outcomes of patients presenting with acute AWMI versus acute IWMI, with specific objectives to: (1) compare the frequency of mechanical complications (cardiogenic shock and

acute heart failure) between the two groups; (2) determine the occurrence of conduction disturbances, including AV block and bundle branch block; (3) evaluate the requirement for temporary pacemaker implantation; (4) compare the proportion of patients undergoing permanent pacemaker implantation before discharge; and (5) assess the frequency of PCI utilization in both groups.

Methodology

A comparative cross-sectional study was conducted in the Cardiology Department of a government tertiary care hospital in Peshawar equipped with a coronary care unit and interventional cardiology services, over a period of six months, following approval from the Institutional Ethical Committee. Patients were categorized into two groups according to ECG findings and clinical diagnosis (AWMI vs IWMI), and in-hospital outcomes and complications were assessed and compared between the groups during the index hospitalization.

The sample size was calculated using Daniel's formula for cross-sectional studies ($n = Z^2p(1-p)/e^2$), assuming a 95% confidence level ($Z = 1.96$), an expected proportion of 50%, and a 5% margin of error, yielding a sample of 384 patients, with equal representation of AWMI ($n = 192$) and IWMI ($n = 192$). Participants were recruited using non-probability convenience sampling.

Patients aged 25 years and above with a confirmed diagnosis of acute AWMI or IWMI based on clinical presentation, ECG changes, and cardiac biomarkers, presenting within 24 hours of symptom onset, and providing informed consent were included. Patients with non-ST-

elevation myocardial infarction (NSTEMI), a previous permanent pacemaker, prior coronary artery bypass grafting, or incomplete medical records were excluded.

Data were collected using a structured questionnaire covering demographic characteristics (age, sex, comorbidities), clinical variables (infarct type, reperfusion strategy, time to treatment), electrocardiographic and echocardiographic findings, and in-hospital complications (heart failure, arrhythmia, cardiogenic shock, mortality) and length of stay, supplemented by medical records, laboratory reports, and ECG documentation. Collected data were anonymized to ensure confidentiality.

Data were coded, entered, and analyzed using IBM SPSS Statistics version 26. Categorical variables (gender, infarct location, complications, pacemaker requirement, PCI) were summarized as frequencies and percentages, and continuous variables (age, ejection fraction, hospital stay) as mean $\pm$ standard deviation. The Chi-square test was used to compare categorical variables between the AWMI and IWMI groups, and the independent-samples t-test was used for continuous variables. A p-value ≤ 0.05 was considered statistically significant.

Results

A total of 384 patients with confirmed STEMI were included, with 192 (50.0%) patients in each of the AWMI and IWMI groups. Overall, 305 (79.4%) patients were male and 79 (20.6%) were female, reflecting a marked male predominance. The overall mean age was approximately 57 ± 10 years, and most patients were older than 50 years (72.9% of AWMI, 68.8% of IWMI).

Table 1: Gender and Age Distribution of AMI Patients (n = 384)

Variable	AWMI (n = 192)	IWMI (n = 192)	Total (n = 384)
Male	150 (78.1%)	155 (80.7%)	305 (79.4%)
Female	42 (21.9%)	37 (19.3%)	79 (20.6%)
Mean age (years)	58 ± 10	56 ± 11	57 ± 10

Age > 50 years	140 (72.9%)	132 (68.8%)	272 (70.8%)
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Table 2: Cardiovascular Risk Factors in Patients with AWMi versus IWMI (n = 384)

Risk Factor	AWMI n (%)	IWMI n (%)
Hypertension	110 (57.3%)	108 (56.3%)
Diabetes mellitus	85 (44.3%)	82 (42.7%)
Current smoker	62 (32.3%)	68 (35.4%)
Former smoker	54 (28.1%)	60 (31.3%)
Never smoked	76 (39.6%)	64 (33.3%)
Dyslipidemia	70 (36.5%)	65 (33.9%)
Family history of CAD	35 (18.2%)	32 (16.7%)
Obesity (BMI > 30)	58 (30.2%)	49 (25.5%)
Prior stroke/TIA	20 (10.4%)	17 (8.9%)

*Selected p-values from Chi-square analysis reported in Table 6.

Chest pain was the most common presenting symptom in both groups (99.0% AWMi vs 97.9% IWMI). Dyspnea (37.5% vs 43.8%), nausea or vomiting (19.8% vs 29.2%),

diaphoresis (33.3% vs 40.6%), palpitations (11.5% vs 17.7%), and syncope (6.3% vs 12.5%) were all more frequent among IWMI patients.

Table 3: Reperfusion Therapy and Conduction Abnormalities among Patients with AWMi and IWMI (n = 384)

Variable	AWMI n (%)	IWMI n (%)	Total
PCI performed(Primary+ Rescue)	163 (84.9%)	154 (80.2%)	317 (82.5%)
Fibrinolytic therapy received	108(56.3%)	98(51.0%)	206(53.6%)
No reperfusion therapy	84(43.8%)	94(49.0%)	178(46.4%)
AV block	2.1%	16.7%	
LBBB	14.1%	2.6%	
RBBB	7.8%	4.2%	
Ventricular tachycardia (VT)	3.6%	1.6%	
Ventricular fibrillation (VF)	4.2%	1.0%	
Atrial fibrillation (AF)	5.2%	3.6%	

Mean door-to-balloon time for patients undergoing primary PCI was 74.1 ± 24.2 minutes, and mean door-to-needle time for fibrinolysis was 38.6 ± 12.5 minutes.

Table 4: Pharmacological and Device-Based Management in AWMi and IWMI (n = 384)

Management	AWMI n (%)	IWMI n (%)
Antiplatelet therapy	182 (94.8%)	184 (95.8%)
Beta-blockers	163 (84.9%)	171 (89.1%)
Statins	134 (69.8%)	125 (65.1%)
Temporary pacemaker implantation	5 (2.6%)	14 (7.3%)
Permanent pacemaker implantation	16 (8.3%)	3 (1.6%)

Table 5: In-Hospital Complications, Mortality, and Length of Stay in AWMi and IWMI Patients (n = 384)

Outcome	AWMI n (%)	IWMI n (%)
Acute heart failure	40 (20.8%)	24 (12.5%)
Cardiogenic shock	30 (15.6%)	20 (10.4%)
Arrhythmias	30 (15.6%)	20 (10.4%)
Cardiac arrest	10 (5.2%)	5 (2.6%)
In-hospital mortality	~23 (12.0%)	~17 (8.9%)
Mean length of stay (days)	5.59 ± 2.51	3.50 ± 2.50

Overall, in-hospital mortality occurred in 40 (10.4%) of the 384 patients, while 344 (89.6%) survived to discharge; the mean overall length of hospital stay was 5.59 ± 2.51 days.

Table 6: Chi-Square Test Results for Risk Factors versus In-Hospital Complications

Association Tested	χ^2	df	p-value
Diabetes mellitus vs acute heart failure	0.000	1	1.000
Hypertension vs cardiogenic shock	0.442	1	0.506
Smoking status vs arrhythmias	0.004	1	0.949
MI type (AWMI vs IWMI) vs heart failure	4.79	1	0.029*

*Statistically significant at $p \leq 0.05$.

Table 7: Independent-Samples t-Test Results

Comparison	t-value	p-value
Length of hospital stay: AAMI vs IAMI	8.10	<0.001*
Age: survivors vs in-hospital deaths	−1.008	0.315

*Statistically significant at $p \leq 0.05$.

Taken together, these results show that AAMI patients experienced a significantly higher burden of mechanical complications (heart failure, cardiogenic shock, cardiac arrest) and a significantly longer hospital stay than IAMI patients, while IAMI patients more frequently developed AV block and required temporary pacing. The association between infarct type and heart failure reached statistical significance ($p = 0.029$), whereas the tested associations between individual risk factors (diabetes, hypertension, smoking) and specific complications did not.

Discussion

This comparative study evaluated in-hospital outcomes among 384 patients with acute STEMI, equally distributed between AAMI and IAMI, at a tertiary care hospital in Peshawar. The mean age of the cohort (57 ± 10 years) and the marked male predominance (79.4%) are consistent with previous South Asian data indicating that AMI in this region affects a younger, predominantly male population compared with Western registries, where presentation typically occurs a decade later (Baloch et al., 2023).

Cardiovascular risk factors were highly prevalent and broadly comparable between groups: hypertension (57.3% AAMI vs 56.3% IAMI), diabetes mellitus (44.3% vs 42.7%), and smoking, consistent with prior Pakistani studies demonstrating a substantial burden of conventional risk factors in patients presenting with acute coronary syndromes (Khan et al., 2021; Rehman et al., 2019). The clustering of multiple risk factors observed here is consistent with a metabolic-syndrome pattern that has been linked to accelerated atherosclerosis and worse

post-infarction prognosis in regional and international registries.

AAMI and IAMI showed distinctly different complication profiles, consistent with their underlying coronary anatomy. AAMI, driven by LAD occlusion, involves a large myocardial territory — approximately 40–50% of left ventricular mass — and was associated with significantly higher rates of acute heart failure (20.8% vs 12.5%) and cardiogenic shock (15.6% vs 10.4%) than IAMI, in agreement with Siddique et al. (2023), who reported greater left ventricular dysfunction and pulmonary edema in anterior infarction. IAMI, in contrast, driven predominantly by RCA occlusion, was associated with a markedly higher rate of AV block (16.7% vs 2.1%), reflecting the RCA's supply to the AV node in the majority of individuals, whereas LBBB was more frequent in AAMI (14.1% vs 2.6%) as a marker of extensive septal involvement (StatPearls Publishing, 2025; Khan et al., 2021).

These electrophysiological differences translated directly into differing device requirements: temporary pacemaker implantation was more common in IAMI (7.3% vs 2.6%), reflecting the high early burden of bradyarrhythmia and AV block that frequently resolves with reperfusion within days, while permanent pacemaker implantation was more common in AAMI (8.3% vs 1.6%), likely reflecting more extensive and less reversible infra-Hisian conduction injury. This pattern reinforces the need for continuous ECG monitoring and ready access to both temporary and permanent pacing facilities in tertiary cardiac units.

Primary PCI was performed in the majority of patients overall (82.5%), reflecting improving access to interventional cardiology in Khyber

Pakhtunkhwa; however, mean door-to-balloon time (74.1 ± 24.2 minutes) and door-to-needle time (38.6 ± 12.5 minutes) indicate that pre-hospital delay and system-level bottlenecks remain relevant, consistent with earlier Pakistani data showing much lower historical PCI utilization relative to fibrinolysis (Arshad et al., 2011; Baloch et al., 2023). Given that AWMi carries the greatest risk from delayed reperfusion due to the pace of LAD-territory necrosis, minimizing total ischemic time is especially important for this subgroup.

Pharmacological management showed high guideline adherence in both groups, with antiplatelet therapy, beta-blockers, and statins used in the large majority of eligible patients, consistent with the quality-of-care indicators reported by Baloch et al. (2023). The significant difference in hospital stay between AWMi and IWMI (5.59 ± 2.51 vs 3.50 ± 2.50 days; $t = 8.10$, $p < 0.001$) is consistent with the more complicated, resource-intensive in-hospital course typically seen with anterior infarction, while the lack of a significant age difference between survivors and non-survivors ($t = -1.008$, $p = 0.315$) suggests that in this cohort, complication burden and infarct location may be more relevant to short-term mortality risk than age alone. Notably, while the overall association between individual risk factors (diabetes, hypertension, smoking) and specific complications was not statistically significant in this sample, the association between infarct type itself and heart failure was significant ($\chi^2 = 4.79$, $p = 0.029$), reinforcing infarct location as an important determinant of early outcome, independent of the traditional risk factors examined.

Conclusion

This study demonstrated that AWMi is associated with a greater burden of adverse in-hospital outcomes compared with IWMI, including higher rates of acute heart failure, cardiogenic shock, arrhythmia, cardiac arrest, in-hospital mortality, and a significantly longer hospital stay, reflecting a larger extent of

myocardial damage. IWMI, in contrast, was more frequently complicated by AV block and required temporary pacemaker implantation more often, reflecting a higher incidence of reversible conduction abnormality. These findings indicate that infarct location is an important determinant of early clinical course in acute STEMI, and that early risk stratification, prompt reperfusion, and infarct-location-specific clinical monitoring may help reduce complications and improve in-hospital outcomes, particularly in resource-limited tertiary care settings.

Limitations

This study has several limitations. It was conducted at a single tertiary care center, which may limit generalizability of the findings to other settings. Multivariate analysis to adjust for confounding factors and post-discharge follow-up data were not available. The findings can be used to develop a national strategy, which can be achieved through additional multi-center, prospective research in the future.

Recommendations

Future research should include multicenter, prospective studies with larger sample sizes to improve generalizability and statistical power for subgroup analyses. Extended post-discharge follow-up is recommended to evaluate longer-term predictors of morbidity and mortality. Multivariate regression modeling should be incorporated to control for confounding and identify independent predictors of adverse outcome by infarct location.

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