Journal of Health and Rehabilitation Research JHRR

https://doi.org/10.61919/jhrr.v4i1.1983

Original Article

Frequency of Acute Kidney Injury in Patients with Myocardial Infarction Presenting at Cardiology Bolan Medical College Quetta

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ABSTRACT

Background: Acute kidney injury is a recognized complication of myocardial infarction and is associated with increased morbidity, mortality, and long-term renal and cardiovascular sequelae. However, local evidence from Pakistan, particularly from Balochistan, remains limited. Objective: To determine the frequency of acute kidney injury in patients presenting with myocardial infarction at a tertiary care cardiology department and to examine its distribution across major demographic and clinical variables. Methods: This descriptive cross-sectional study was conducted at the Cardiology Department of Bolan Medical College Hospital, Quetta, from 10 June 2023 to 31 December 2023. A total of 116 patients aged 30-75 years with myocardial infarction were included. Clinical assessment, electrocardiographic confirmation, and serum creatinine testing were performed at admission. Acute kidney injury was operationally defined in the study as serum creatinine greater than 1.1 mg/dL. Data were analyzed using SPSS version 20, and post-stratification chi-square testing was applied. Results: The mean age was 59.0 ± 10.03 years, and 68.1% of participants were male. Overall, acute kidney injury was present in 21 patients, giving a frequency of 18.1%. A previous history of myocardial infarction showed a significant association with AKI (38.1% vs 13.7%, p=0.0085), while age group, sex, obesity, type of myocardial infarction, and dyslipidemia were not significantly associated. Conclusion: Acute kidney injury was a frequent complication among patients with myocardial infarction in this cohort, and previous myocardial infarction emerged as the strongest marker of increased renal risk. Keywords: acute kidney injury; myocardial infarction; STEMI; NSTEMI; serum creatinine; renal dysfunction.

"Cite this Article" | **Received**: 13 January 2024; **Accepted**: 26 February 2024; **Published**: 28 February 2024.

Author Contributions: Concept: HNT; Design: HNT; Data Collection: HNT; Analysis: HNT; Drafting: HNT. **Ethical Approval**: Bolan Medical College, Quetta, Pakistan. **Informed Consent**: Written informed consent was obtained from all participants; **Conflict of Interest**: The authors declare no conflict of interest; **Funding**: No external funding; Data Availability: Available from the corresponding author on reasonable request; **Acknowledgments**: N/A.

INTRODUCTION

Acute myocardial infarction (AMI) remains one of the leading causes of mortality and long-term disability worldwide despite substantial advances in prevention, reperfusion strategies, and secondary cardiovascular care. It results from prolonged myocardial ischemia caused by acute interruption of coronary blood flow, ultimately leading to irreversible myocardial necrosis if not treated promptly (1). Although outcomes have improved in many high-income settings, AMI continues to impose a major clinical and economic burden, particularly in low- and middle-income countries where delayed presentation, limited access to specialized care, and a high prevalence of cardiometabolic risk factors adversely influence prognosis (2,3). In Pakistan, ischemic heart disease remains an important cause of mortality, making the identification of potentially preventable in-hospital complications increasingly relevant to improving outcomes in routine clinical practice (4).

Among the major complications associated with AMI, acute kidney injury (AKI) is especially important because of its strong association with short-term deterioration and poor long-term prognosis. AKI in the setting of AMI is multifactorial and may arise from renal hypoperfusion due to hemodynamic instability, left ventricular dysfunction, neurohormonal activation, systemic inflammation, use of nephrotoxic medications, and exposure to contrast agents during coronary angiography or percutaneous coronary

intervention (PCI) (5,6). In this context, renal impairment is not merely a coincidental laboratory abnormality but a clinically meaningful event associated with prolonged hospitalization, increased treatment complexity, progression to chronic kidney disease, recurrent cardiovascular events, heart failure, and excess mortality (6,7). Previous studies have reported that the incidence of AKI among patients hospitalized with AMI varies considerably, ranging from approximately 7.1% to 29.3%, while substantially higher rates have been observed in those complicated by cardiogenic shock or severe hemodynamic compromise (5,8). Evidence has further shown that patients with AMI who develop AKI experience markedly worse outcomes than those who maintain preserved renal function during admission (6,9).

The risk of AKI may be further amplified in patients undergoing invasive management, particularly PCI, where contrast exposure adds to an already compromised renal and cardiovascular state. Although contrast-associated nephrotoxicity has traditionally been emphasized, more recent evidence suggests that AKI in AMI is often driven by the combined effects of infarct severity, impaired perfusion, pre-existing comorbidities such as diabetes and hypertension, and acute circulatory instability rather than contrast volume alone (5,6,10). This has important implications for early risk stratification, because renal dysfunction in AMI frequently reflects the overall severity of illness and may help identify patients requiring closer monitoring and more intensive supportive care.

Despite the recognized clinical significance of AKI in AMI, there remains limited region-specific evidence from Pakistan, particularly from Balochistan, where local patient characteristics, healthcare access constraints, and burden of metabolic disease may influence the frequency and profile of this complication. Most available evidence has emerged from international registries or urban tertiary centers outside the local context, and such findings may not be fully generalizable to patients presenting in public-sector hospitals in underserved settings (5,9,10). Generating local data is therefore important not only for understanding disease burden but also for informing pragmatic, low-resource strategies for monitoring renal function and identifying high-risk patients during hospitalization.

The present study was conducted to determine the frequency of acute kidney injury among patients presenting with myocardial infarction to the Cardiology Department of Bolan Medical College Hospital, Quetta. It also sought to describe the distribution of AKI across key demographic and clinical characteristics including age, sex, obesity, diabetes mellitus, smoking status, history of myocardial infarction, type of myocardial infarction, and dyslipidemia. It was hypothesized that AKI would occur in a clinically meaningful proportion of patients with myocardial infarction and would be more frequent among those with adverse baseline clinical characteristics and prior cardiovascular disease (5,6,10).

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in the Cardiology Department of Bolan Medical College Hospital, Quetta, over a six-month period from 10 June 2023 to 31 December 2023. The study was designed to determine the frequency of acute kidney injury among patients presenting with myocardial infarction and to assess its distribution across selected demographic and clinical variables. A hospital-based observational approach was considered appropriate because the objective was to estimate the burden of AKI in consecutively presenting patients under routine clinical conditions rather than to test the effect of an intervention.

Patients were enrolled from the cardiology outpatient and emergency services after clinical evaluation for myocardial infarction. Adult patients of either sex aged 30 to 75 years who fulfilled the operational definition of myocardial infarction and presented during the study period were eligible for inclusion. Diagnosis was established on the basis of clinical assessment and electrocardiographic findings documented by the treating cardiology team. Patients not meeting the age criteria or not fulfilling the study definition of myocardial infarction were not included. To improve internal consistency, the study

followed a predefined eligibility framework and standardized data recording procedures for all enrolled participants.

After obtaining approval from the institutional ethical and research committee, written informed consent was obtained from each participant at the time of admission. A detailed clinical history and physical examination were performed for all patients. Baseline demographic and clinical information was recorded on a structured proforma, including age, sex, weight, height, body mass index, obesity status, diabetes mellitus, smoking status, previous history of myocardial infarction, type of myocardial infarction, and dyslipidemia. Anthropometric and clinical variables were recorded at the time of initial assessment to reduce recall error and ensure uniformity in measurement timing across the sample.

Laboratory evaluation included serum creatinine testing performed in the hospital laboratory by qualified personnel. Renal status was assessed using the serum creatinine value obtained during admission, and acute kidney injury was categorized according to the study operational threshold as a serum creatinine level greater than 1.1 mg/dL. While this threshold reflected the study's predefined local measurement approach, all samples were processed within the same institutional laboratory pathway to maintain analytical consistency. Myocardial infarction subtype was recorded as ST-elevation myocardial infarction or non-ST-elevation myocardial infarction based on the clinical diagnosis documented at presentation. Obesity, diabetes mellitus, smoking status, previous myocardial infarction, and dyslipidemia were recorded as categorical variables according to the clinical history and available medical documentation.

To minimize information bias, all participants underwent the same sequence of assessment, including history taking, examination, electrocardiographic confirmation, and laboratory investigation. Data were recorded prospectively during admission rather than reconstructed retrospectively from incomplete charts. Use of a structured data collection form supported uniform capture of variables across patients and reduced variability in documentation. Restriction through eligibility criteria was used to improve comparability of the enrolled group, and stratified analysis was planned to examine whether the frequency of AKI varied across major clinical subgroups. Because of the descriptive nature of the study, multivariable adjustment was not undertaken; however, clinically relevant covariates were retained in the dataset and examined through post-stratification comparisons.

The sample comprised 116 patients meeting the study criteria during the specified study period. This sample reflected the total number of eligible cases available within the study setting and duration and was considered adequate for estimating the frequency of AKI in the target hospital population. All collected data were entered and analyzed using SPSS version 20. Quantitative variables, including age and serum creatinine, were summarized as mean and standard deviation, while categorical variables were presented as frequencies and percentages. The primary outcome was the frequency of acute kidney injury among patients with myocardial infarction. Post-stratification analysis was performed to assess the distribution of AKI across age group, sex, obesity, diabetes mellitus, smoking status, history of myocardial infarction, type of myocardial infarction, and dyslipidemia. The chi-square test was applied for comparison of categorical variables, and a p-value of 0.05 or less was considered statistically significant.

Data integrity was supported through same-setting recruitment, standardized assessment procedures, uniform laboratory processing, and statistical coding performed after completion of data collection. Records were reviewed for completeness before data entry to reduce transcription errors and missing fields. Patient confidentiality was maintained throughout the study by restricting the use of personally identifiable information in the analytical dataset and limiting data access to the research team. The study was conducted in accordance with institutional ethical requirements and the principles governing research involving human participants.

RESULTS

A total of 116 patients with myocardial infarction were included in the analysis. The mean age of the study population was 59.0 ± 10.03 years. Most patients were male (68.1%), 66.4% had diabetes mellitus, 64.7% were classified as obese according to the study dataset, 37.1% were smokers, and 18.1% had a previous history of myocardial infarction. NSTEMI accounted for 79.3% of cases, while STEMI accounted for 20.7%. Dyslipidemia was present in 25.9% of participants. Overall, acute kidney injury was identified in 21 of 116 patients, giving a frequency of 18.1% (95% CI: 12.2% to 26.0%).

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population

Variable	Category	n	%	95% CI for %
Age group	30-50 years	36	31.0	23.2-40.1
	51-75 years	80	69.0	59.9-76.8
Sex	Male	79	68.1	59.0-76.0
	Female	37	31.9	24.0-41.0
Obesity status	Non-obese	41	35.3	27.2-44.4
	Obese	75	64.7	55.6-72.8
Diabetes mellitus	Yes	77	66.4	57.3-74.4
	No	39	33.6	25.6-42.7
Smoking status	Smoker	43	37.1	28.8-46.2
	Non-smoker	73	62.9	53.8-71.2
History of MI	Positive	21	18.1	12.2-26.0
	Negative	95	81.9	74.0-87.8
Type of MI	STEMI	24	20.7	14.3-29.0
	NSTEMI	92	79.3	71.0-85.7
Dyslipidemia	Yes	30	25.9	18.9-34.5
	No	86	74.1	65.5-81.1

The study population was predominantly older and male, with nearly two-thirds of patients belonging to the 51–75-year age group and a similar proportion recorded as obese or diabetic. Nearly one in five patients had a prior history of myocardial infarction, and approximately four in five presented with NSTEMI rather than STEMI. These findings indicate a clinically high-risk cardiovascular cohort with a substantial burden of metabolic comorbidity.

Table 2. Frequency of Acute Kidney Injury in the Study Population

Outcome	n	%	95% CI
AKI present	21	18.1	12.2-26.0
AKI absent	95	81.9	74.0-87.8

Acute kidney injury occurred in 21 of 116 patients, corresponding to an overall frequency of 18.1%. This means that nearly one in every six patients admitted with myocardial infarction developed renal dysfunction according to the study's operational definition, confirming that AKI was a clinically meaningful in-hospital complication in this cohort.

Table 3. Association of Acute Kidney Injury with Age, Sex, Obesity, Previous Myocardial Infarction, Type of MI, and Dyslipidaemia

Variable	Comparison	AKI / Total in Exposed Group	AKI %	AKI / Total in Reference Group	AKI %	Odds Ratio (95% CI)	p-value
Age	51-75 vs 30-50 years	13/80	16.3	8/36	22.2	0.68 (0.25-1.82)	0.4396
Sex	Female vs Male	8/37	21.6	13/79	16.5	1.40 (0.52-3.74)	0.5006
Obesity	Obese vs Non-obese	12/75	16.0	9/41	22.0	0.68 (0.26-1.77)	0.4261
History of MI	Positive vs Negative	8/21	38.1	13/95	13.7	3.88 (1.35-11.17)	0.0085
Type of MI	STEMI vs NSTEMI	4/24	16.7	17/92	18.5	0.88 (0.27-2.92)	0.8373
Dyslipidemia	Yes vs No	7/30	23.3	14/86	16.3	1.57 (0.56-4.35)	0.3875

On stratified analysis, only previous history of myocardial infarction showed a statistically significant association with acute kidney injury. AKI occurred in 38.1% of patients with prior MI compared with 13.7% of those without prior MI, corresponding to nearly fourfold higher odds of AKI in the previously infarcted group (OR 3.88, 95% CI 1.35-11.17; p=0.0085). In contrast, no statistically significant

associations were observed for age group, sex, obesity, MI subtype, or dyslipidemia. Although AKI was numerically more frequent in females than males (21.6% vs 16.5%) and in those with dyslipidemia than those without it (23.3% vs 16.3%), the confidence intervals were wide and crossed unity, indicating imprecision and lack of statistical significance. Similarly, AKI prevalence was slightly lower in older patients and in the obese category within this dataset, but these differences were small and not statistically meaningful.

The source manuscript states that stratification was also performed for diabetes mellitus, smoking status, and hypertension; however, the actual cross-tabulated counts and p-values for these variables were not present in the supplied results table. For that reason, no additional inferential statistics have been created for those variables here.

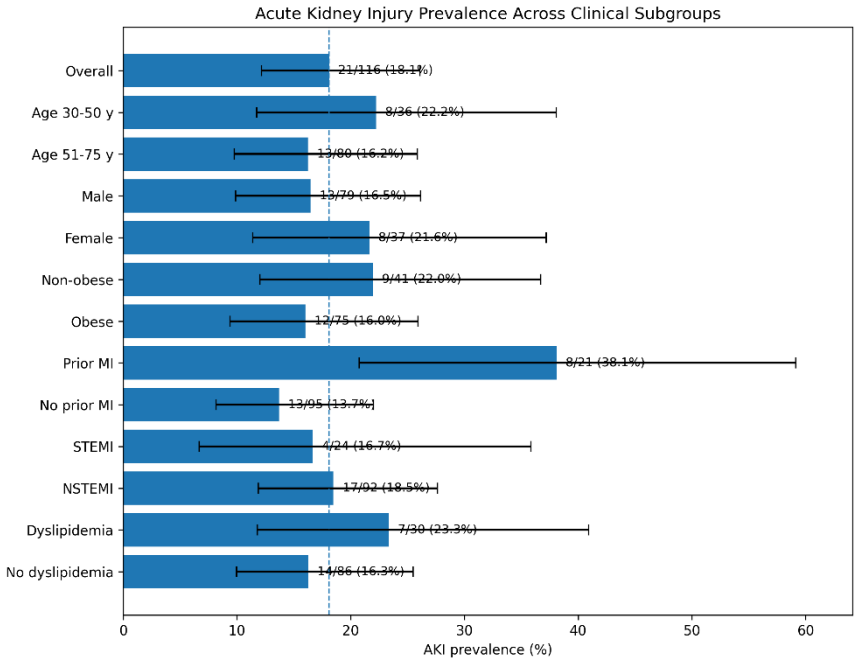

Figure 1 Acute Kidney Injury Prevalence Across Clinical Subgroups

The subgroup pattern showed clear heterogeneity in AKI burden, with the highest observed prevalence in patients with a previous history of myocardial infarction at 38.1% (8/21), followed by patients with dyslipidemia at 23.3% (7/30), females at 21.6% (8/37), and the 30-50 year age group at 22.2% (8/36). By contrast, AKI prevalence was lower among patients without prior MI at 13.7% (13/95), among obese participants at 16.0% (12/75), and among STEMI cases at 16.7% (4/24). The overall cohort prevalence was 18.1% (21/116), and the only subgroup pattern supported by both magnitude and statistical testing was the excess AKI burden in patients with previous MI, reinforcing prior cardiovascular injury as the most clinically relevant marker of renal vulnerability in this dataset.

DISCUSSION

Acute kidney injury is a clinically important complication in patients presenting with myocardial infarction because it reflects the interaction between cardiovascular instability, renal hypoperfusion, metabolic comorbidity, and the burden of acute ischemic injury. In the present study, AKI was identified in 21 of 116 patients, yielding a frequency of 18.1%, which indicates that nearly one in six patients with myocardial infarction developed renal dysfunction during admission according to the study definition. This finding supports the clinical relevance of routine renal surveillance in patients admitted with acute coronary syndromes, particularly in resource-constrained public-sector settings where delayed presentation, pre-existing comorbidities, and limited early risk stratification may contribute to worse in-hospital outcomes. The observed frequency is consistent with previously reported international

estimates showing that AKI in patients with acute myocardial infarction occurs in a substantial minority of cases and is associated with major adverse consequences during hospitalization and follow-up (11,12).

The overall AKI frequency in this cohort is lower than the 26.0% reported by Cong et al. but comparable to the 18.0% reported in the Bremen STEMI registry, suggesting that the burden observed in this study is clinically credible despite differences in population characteristics, disease severity, and AKI definitions across studies (11,13). Variability between studies is expected because the occurrence of AKI in myocardial infarction is influenced by differences in baseline renal reserve, prevalence of diabetes and hypertension, infarct extent, hemodynamic compromise, use of nephrotoxic medications, exposure to contrast media, and the criteria used to define renal injury. In the present dataset, the relatively high burden of diabetes mellitus, obesity, smoking, dyslipidemia, and previous myocardial infarction indicates that this was a metabolically vulnerable population in whom renal dysfunction could reasonably emerge even in the absence of detailed hemodynamic profiling. The predominance of NSTEMI in this cohort also distinguishes it from many STEMI-focused registries and may partly explain why the overall AKI frequency was moderate rather than extremely high (13,14).

The most important analytical finding in this study was the significant association between AKI and previous history of myocardial infarction. Patients with prior MI had an AKI frequency of 38.1%, compared with 13.7% among those without previous MI, corresponding to nearly fourfold higher odds of AKI. This pattern is clinically plausible because a history of prior infarction may reflect pre-existing ventricular dysfunction, greater cumulative atherosclerotic burden, repeated exposure to cardiometabolic stressors, polypharmacy, and possibly reduced renal perfusion reserve. Such patients are also more likely to have longstanding vascular disease and occult chronic kidney impairment, both of which increase susceptibility to renal injury during acute ischemic cardiac events. Although the present study did not include multivariable modeling, the strength of this unadjusted association suggests that prior MI may serve as a practical bedside marker for identifying patients who warrant closer renal monitoring at admission and during early hospitalization (11,13).

No statistically significant associations were observed between AKI and age group, sex, obesity, type of myocardial infarction, or dyslipidemia, although some numerical differences were noted. AKI appeared somewhat more frequent among females and in patients with dyslipidemia, but these differences were not statistically robust and were accompanied by wide confidence intervals. Similarly, the absence of a significant difference between STEMI and NSTEMI should be interpreted cautiously, as the STEMI subgroup was relatively small and the study may not have had sufficient power to detect modest subgroup effects. These non-significant findings should therefore not be interpreted as evidence of no relationship; rather, they indicate that the present sample was better suited to descriptive estimation than to fine-grained causal inference. Larger multicenter studies with standardized AKI definitions and adjusted analyses would be needed to clarify the independent contribution of these clinical variables (13–15).

The present findings are also relevant from a clinical management perspective. AKI in myocardial infarction is not simply a coincidental biochemical abnormality but an indicator of heightened physiological stress and poorer prognosis. Previous studies have shown that renal injury in the setting of AMI is associated with increased short-term mortality, greater risk of heart failure progression, longer hospital stay, chronic kidney disease progression, and recurrent cardiovascular events (11,13,15). Even though mortality outcomes were not systematically analyzed in the current study, the documented burden of AKI supports the importance of early serum creatinine assessment, serial renal monitoring in higher-risk patients, careful optimization of hydration and hemodynamics, and judicious use of potentially nephrotoxic exposures. In hospitals serving populations with high cardiometabolic risk, these measures may be especially valuable because they are feasible, relatively low cost, and potentially capable of improving risk stratification without requiring advanced technology.

This study has several limitations that should be considered when interpreting the results. First, it was a single-center descriptive study with a modest sample size, which limits generalizability beyond the local hospital population. Second, AKI was defined using a single serum creatinine threshold rather than internationally standardized dynamic criteria, which may have led to misclassification and reduces comparability with studies using KDIGO-based definitions. Third, the analysis was primarily descriptive, and the absence of multivariable adjustment means that residual confounding cannot be excluded. Fourth, some subgroup data referenced in the source manuscript, including detailed cross-tabulations for diabetes, smoking, and hypertension, were not fully available in the supplied dataset and therefore could not be robustly reanalyzed here. Despite these limitations, the study provides useful local evidence on the burden of renal dysfunction in patients with myocardial infarction and highlights a clinically meaningful signal linking previous infarction with increased AKI risk.

Taken together, the study suggests that acute kidney injury is a frequent complication among patients admitted with myocardial infarction in this setting and that patients with a previous history of MI may represent a particularly vulnerable subgroup. Future studies should adopt standardized AKI definitions, include serial renal measurements, evaluate in-hospital and post-discharge outcomes, and use larger multicenter samples to improve precision and external validity. Such work would strengthen the evidence base needed to develop pragmatic renal risk stratification pathways for patients presenting with acute coronary syndromes in Pakistan and similar healthcare environments.

CONCLUSION

Acute kidney injury was identified in 18.1% of patients presenting with myocardial infarction in this tertiary care cohort, indicating that renal dysfunction is a common and clinically relevant complication in this population. Among the examined variables, a previous history of myocardial infarction showed the strongest association with AKI, suggesting that patients with prior cardiovascular injury may require closer renal surveillance during admission. These findings support the routine assessment and monitoring of renal function in patients with myocardial infarction, particularly in high-risk and resource-limited settings, to facilitate earlier detection, improve risk stratification, and strengthen supportive management strategies.

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