

FREQUENCY OF ACUTE KIDNEY INJURY IN PATIENTS WITH ACUTE HEART FAILURE

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Abstract

Objective: To determine the frequency of acute kidney injury (AKI) in patients of acute heart failure (AHF).

Methods: This comprehensive cross-sectional research examined 146 individuals at Central Park Teaching Hospital in Lahore between January and May 2025. The study focused on patients aged 20 to 60 years experiencing acute heart failure. Frequency of AKI was noted for all patients. Patients having serum creatinine $\geq 50\%$ from baseline assessed after 48 hours of admission were labelled as having AKI.

Results: The average age of the participants was 51.5 years, with a standard deviation of 6.8 years. Among the participants, 99 were female, representing 67.8% of the group, while 47 were male, accounting for 32.2%. On examining the frequency of AKI, it was found that 38 individuals (26.0%) experienced AKI, while 108 individuals (74.0%) did not. Among those who developed AKI, 29 cases (76.3%) were classified as Stage I AKI, 8 cases (21.1%) accounted for Stage II AKI, and only 1 case (2.6%) had Stage III AKI.

Conclusion: Acute kidney injury (AKI) is common among patients admitted with acute heart failure (AHF). In the present study, the frequency of AKI was 26.0%.

INTRODUCTION

Heart failure has been recognized as a significant epidemic for over a quarter of a century and continues to pose substantial challenges in clinical practice.¹ It is defined as a complex syndrome presenting with common symptoms such as shortness of breath, swelling of the ankles, and fatigue, which may be accompanied by physical signs like raised jugular venous pressure, crackling sounds in the lungs, and swelling in the extremities.¹

Globally, heart failure affects approximately 26 million individuals, making it a widespread health concern.² In industrialized nations, the condition's prevalence among adults is estimated to be between 1 and 2 percent.³ Despite this, cardiovascular diseases as a whole account for a notable proportion of hospital admissions—roughly 7 to 10 percent—with heart failure being responsible for 3 to 7 percent of these cases.^{4,5} The primary underlying causes of heart

failure in these regions include hypertensive heart disease, dilated cardiomyopathy, and rheumatic rheumatic valvular disorders. Additionally, the incidence of kidney dysfunction is increasingly reported, largely linked to the aging process.⁶

Acute kidney injury (AKI) is considered a component of the broader spectrum of cardiorenal syndromes, which encompass various causes and are associated with increased risks of hospitalization and higher mortality rates.^{7, 8} Research has shown that patients who recover nearly fully from an episode of AKI remain at an elevated risk of progressing to chronic kidney disease (CKD) over time. Furthermore, the development of AKI in individuals with existing CKD has been associated with a quicker progression towards end-stage renal disease.⁹ The prevalence and impact of acute kidney injury (AKI) in patients suffering from heart failure (HF) have primarily been studied in those hospitalized with acute heart failure (AHF). In this particular group, approximately 20% experience AKI. Research indicates that AKI serves as a strong and independent indicator of both in-hospital mortality and the risk of death within the following year.¹⁰ The aim of this study was to determine the frequency of acute kidney injury (AKI) in patients of AHF.

METHODS:

This comprehensive cross-sectional research examined 146 individuals at Central Park Teaching Hospital in Lahore between January and May 2025. The study focused on patients aged 20 to 60 years experiencing acute heart failure. Participants with chronic kidney conditions, such as chronic kidney disease or renal failure—defined by blood Urea levels exceeding 20 mg/dL or Creatinine levels above 1.3 mg/dL—were excluded from the study. Prior to participation, written informed consent was obtained from each patient.

All patients were subjected to a comprehensive initial assessment that included a physical examination,

laboratory testing—including blood and urine analysis—and renal ultrasound imaging performed on the day they entered the study. Urine output was carefully recorded. Both midstream and catheterized urine samples (about 4 mL each) were collected in sterile containers within 30 minutes of sampling for laboratory analysis. Serum creatinine levels were measured and compared to a reference range of 66 to 106 mmol/L. The patients were monitored continuously for 48 hours, during which time the occurrence of acute kidney injury (AKI) was regularly evaluated.

Data was entered and analyzed using SPSS v25.0. Frequencies and percentages was expressed for qualitative variables like gender, AKI and severity of AKI. Quantitative variables like age and Serum creatinine was expressed by Mean±S.D.

RESULTS:

The baseline study characteristics included a total of 146 participants. The average age of the participants was 51.5 years, with a standard deviation of 6.8 years. Their body mass index (BMI) averaged at 27.4 kg/m², with a standard deviation of 4.5. Among the participants, 99 were female, representing 67.8% of the group, while 47 were male, accounting for 32.2%. The residence of the participants showed a predominance of rural inhabitants, with 93 individuals (63.7%) living in rural areas and 53 individuals (36.3%) residing in urban settings. Additionally, the average serum creatinine level was reported at 98 ± 23 mmol/L (Table 1).

On examining the frequency of AKI, it was found that 38 individuals (26.0%) experienced AKI, while 108 individuals (74.0%) did not. Among those who developed AKI, 29 cases (76.3%) were classified as Stage I AKI, 8 cases (21.1%) accounted for Stage II AKI, and only 1 case (2.6%) had Stage III AKI (Table 2).

Table 1. Baseline Study Characteristics. (N=146)

Age (Years)	51.5±6.8
BMI (Kg/m ²)	27.4±4.5
Gender (%)	
Female	99 (67.8%)

Male	47 (32.2%)
Residence (%)	
Rural	93 (63.7%)
Urban	53 (36.3%)
Serum Creatinine	98±23

Table 2. Frequency of AKI and Its Severity.

AKI (%)	
Yes	38 (26.0%)
No	108 (74.0%)
Severity of AKI (%)	
Stage I	29 (76.3%)
Stage II	8 (21.1%)
Stage III	1 (2.6%)

DISCUSSION:

Acute kidney injury (AKI) frequently occurs as part of the disease progression in patients suffering from heart failure (HF). The exact underlying mechanisms are not fully understood, but several hypotheses exist. One notable factor is acute heart failure (AHF), which involves diminished left ventricular systolic function and reduced cardiac output. This situation activates various compensatory responses, including the renin-angiotensin-aldosterone system (RAAS), the sympathetic nervous system, and localized mediators. These systems work together to regulate fluid balance, aiming to maintain stable blood volume. However, when this balance is disrupted, it can result in insufficient cardiac output and excessive workload on the heart. Additionally, reduced blood flow to the kidneys, alongside the use of nephrotoxic medications and aggressive diuresis, can precipitate AKI in affected individuals.^{11, 12} The prevalence of kidney disease remains high among hospitalized adults with heart failure, regardless of the mechanism, and its presence is linked to poorer outcomes.

In present study, among the 146 patients of AHF, AKI occurred in 38 (26.0%) patients. This result aligns closely with the prevalence rates identified in a comprehensive meta-analysis of 28 studies, which reported a prevalence of 23%.¹³ It also mirrors findings from research conducted across eight European nations, which reported a cumulative prevalence of 25%.¹⁴

In a study evaluating the frequency of AKI in patients with heart failure showed that 2.68% of patients with acute heart failure developed acute kidney injury.¹⁵

Another study showed that AKI occurred in 34% of patients with heart failure.¹⁶

Another study showed that AKI occurred in 24.7% of patients with heart failure.¹⁷

In earlier groups of hospitalized heart failure patients within the United States, the occurrence of kidney impairment—defined by an estimated glomerular filtration rate (eGFR) below 60 mL/min/1.73 m²—was consistently observed in approximately 64% to 68% of cases. Furthermore, in these older populations, renal dysfunction was linked to an increased risk of adverse outcomes during hospital stays.^{18, 19}

Given the widespread occurrence of acute kidney injury (AKI) among individuals suffering from acute heart failure (AHF), it is essential to implement strategies that prevent the onset of further cardiac deterioration. These strategies should include identifying and managing triggering factors, promoting strict adherence to prescribed medications, and addressing the root causes of heart disease. Additionally, healthcare policymakers need to prioritize the allocation of resources to improve the diagnosis and management of AKI. This includes ensuring that hospitals equipped to care for AHF patients have access to renal support therapies, such as hemodialysis, which are critical for patient outcomes.

CONCLUSION:

Acute kidney injury (AKI) is common among patients admitted with acute heart failure (AHF). In the present study, the frequency of AKI was 26.0%.

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