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Original Research Article

Acute Kidney Injury as an Independent Predictor of In-Hospital Mortality in a General Medical Ward: A Prospective Observational Study from a Tertiary Care Centre in India

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Abstract:

Background: Acute kidney injury (AKI) frequently occurs among hospitalized patients and is strongly linked with adverse clinical outcomes, including increased morbidity and mortality. Despite growing recognition of its impact, prospective evidence from general medical wards in India remains limited.

Objective: To evaluate whether AKI independently predicts in-hospital mortality among patients admitted to a general medical ward.

Methods: A prospective observational study was conducted at PMCH, Patna, between April 2025 and December 2025. Ninety adult patients admitted to the general medical ward were included. AKI was identified and categorized according to KDIGO criteria. Clinical characteristics and outcomes were documented systematically. Logistic regression analysis was performed to determine independent predictors of in-hospital mortality.

Results: AKI occurred in 31 patients (34.4%). Mortality during hospitalization was significantly higher in patients with AKI (38.7%) compared with those without AKI (8.5%) ($p<0.001$). A progressive rise in mortality was observed with increasing AKI stage ($p<0.001$). Multivariate analysis demonstrated that AKI independently predicted in-hospital death (Adjusted OR 4.92; 95% CI 1.62–14.89; $p=0.005$).

Conclusion: AKI independently increases the risk of in-hospital mortality among patients admitted to a general medical ward. Timely detection and appropriate management strategies may help improve clinical outcomes.

Keywords: Acute kidney injury, mortality, KDIGO, medical ward, India

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Introduction

Acute kidney injury (AKI) refers to an abrupt deterioration in renal function, typically identified by a rise in serum creatinine and/or reduced urine output [1]. It constitutes a significant global healthcare challenge, affecting a substantial proportion of hospitalized individuals each year [2,3]. Although AKI has historically been associated with critically ill patients in intensive care units, it is increasingly encountered in non-ICU settings, including general medical wards.

In low- and middle-income countries, the overall burden of kidney disease continues to increase, driven by demographic transitions, longer life expectancy, and the growing prevalence of diabetes and hypertension [4,5]. Even minor elevations in serum creatinine have been linked to increased mortality, prolonged hospitalization, and higher healthcare expenditure [6]. The introduction of standardized criteria by the Kidney Disease: Improving Global Outcomes (KDIGO) group has facilitated uniform diagnosis, staging, and risk stratification of AKI across different clinical settings [7].

Previous investigations have consistently demonstrated that AKI is associated with both short-term and long-term mortality [8,9]. Large multinational studies have shown that this association persists even after adjusting for underlying comorbidities and severity of illness, suggesting that AKI independently contributes to adverse outcomes [10,11]. Furthermore, a graded increase in mortality risk has been observed with worsening stages of AKI [12].

The underlying mechanisms of AKI involve complex interactions among hemodynamic instability, inflammatory responses, and tubular cellular injury [13]. Systemic inflammation and immune dysregulation may further aggravate organ dysfunction and contribute to multi-organ involvement [14].

While substantial global data are available, prospective studies specifically evaluating AKI in Indian general medical wards remain scarce. Therefore, the present study was designed to determine whether AKI independently predicts in-hospital mortality in patients admitted to a tertiary care general medical ward.

Materials and Methods

Study Design and Setting

This was a prospective observational study conducted in the Department of General Medicine at Patna Medical College and Hospital (PMCH), Patna, Bihar, India. The study was conducted over a period of nine months, from April 2025 to December 2025.

Study Population

All consecutive adult patients admitted to the general medical ward during the study period were screened for eligibility.

A total of 102 patients were initially assessed. Twelve patients were excluded (7 had pre-existing end-stage renal disease, 3 were on maintenance dialysis, and 2 were renal transplant recipients). The final study cohort consisted of 90 patients.

Inclusion Criteria

- Age ≥ 18 years
- Admission to general medical ward
- Hospital stay ≥ 48 hours
- Availability of baseline and follow-up serum creatinine measurements

Exclusion Criteria

- Pre-existing end-stage renal disease (ESRD)
- Patients on maintenance dialysis
- History of renal transplantation
- Incomplete clinical or laboratory data

Sample Size Justification

The sample size of 90 patients was determined based on feasibility within the study duration and expected AKI incidence of approximately 30–40% in hospitalized patients, allowing adequate power to detect significant differences in mortality between AKI and non-AKI groups.

Data Collection

Data were collected prospectively using a structured case record form. The following variables were recorded:

Demographic Variables

- Age (years)
- Sex (male/female)

Clinical Variables

- Primary diagnosis at admission
- Comorbidities (diabetes mellitus, hypertension)
- Vital parameters at admission
- Length of hospital stay (days)

Laboratory Variables

- Baseline serum creatinine (within 24 hours of admission)
- Serial serum creatinine measurements during hospitalization
- Complete blood count
- Serum electrolytes
- Blood glucose levels

Baseline creatinine was defined as the first recorded serum creatinine value within 24 hours of admission.

Definition and Staging of AKI

Acute Kidney Injury was defined and staged according to the Kidney Disease: Improving Global Outcomes (KDIGO) 2012 criteria.

AKI was diagnosed if any of the following were present:

- Increase in serum creatinine by ≥ 0.3 mg/dL within 48 hours
- Increase in serum creatinine to ≥ 1.5 times baseline within 7 days
- Urine output < 0.5 mL/kg/hour for 6 hours

AKI staging was classified as:

- Stage 1
- Stage 2
- Stage 3

Based on peak creatinine levels during hospitalization.

In this study, 31 patients (34.4%) developed AKI:

- Stage 1: 15 patients (48.4%)
- Stage 2: 9 patients (29.0%)
- Stage 3: 7 patients (22.6%)

Outcome Measures

Primary Outcome

- In-hospital mortality (death during the same admission)

Secondary Outcomes

- Association between AKI severity and mortality
- Independent predictors of mortality

Patients were followed daily until discharge or death.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

Descriptive Statistics

- Continuous variables were expressed as mean ± standard deviation (SD).
- Categorical variables were expressed as frequency and percentage.

Comparative Analysis

- Student's independent t-test was used to compare continuous variables between AKI and non-AKI groups.
- Chi-square test was used for categorical variables.
- Chi-square test for trend was used to assess association between AKI stage and mortality.

Logistic Regression Analysis

To determine independent predictors of in-hospital mortality:

1. Univariate logistic regression analysis was performed for:
   - AKI
   - Age >60 years
   - Diabetes mellitus
2. Variables with $p < 0.10$ in univariate analysis were entered into multivariate logistic regression.

Odds ratios (OR) with 95% confidence intervals (CI) were calculated.

A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of PMCH, Patna. Written informed consent was obtained from all participants or their legally authorized representatives. Patient confidentiality was strictly maintained throughout the study.

Results

1. **Study Population and Baseline Characteristics**

A total of 90 patients admitted to the general medical ward were included in the study. Among them, 31 patients (34.4%) developed Acute Kidney Injury (AKI), while 59 patients (65.6%) did not develop AKI.

The mean age of the overall study population was 54.7 ± 13.6 years. Patients who developed AKI were significantly older compared to those without AKI (58.2 ± 12.4 years vs 52.6 ± 14.1 years; p = 0.04). There was no statistically significant difference in gender distribution between the two groups (p = 0.73).

The prevalence of comorbid conditions such as diabetes mellitus and hypertension did not differ significantly between groups (p > 0.05).

Baseline demographic and clinical characteristics are summarized in **Table 1**.

Table 1: Baseline Characteristics of the Study Population

Variable	AKI (n=31)	Non-AKI (n=59)	p-value
Age (years)	58.2 ± 12.4	52.6 ± 14.1	0.04*
Male, n (%)	19 (61.3%)	34 (57.6%)	0.73
Diabetes mellitus, n (%)	13 (41.9%)	18 (30.5%)	0.28
Hypertension, n (%)	15 (48.3%)	22 (37.2%)	0.31
Baseline creatinine (mg/dL)	1.02 ± 0.24	0.98 ± 0.21	0.39

*Statistically significant

2. **Incidence and Severity of AKI**

The overall incidence of AKI in this cohort was 34.4% (31/90). According to KDIGO staging criteria, Stage 1 AKI was the most common, followed by Stage 2 and Stage 3.

The distribution of AKI severity is presented in **Table 2**.

Table 2: Distribution of AKI According to KDIGO Staging (n=31)

KDIGO Stage	Number (%)
Stage 1	15 (48.4%)
Stage 2	9 (29.0%)
Stage 3	7 (22.6%)

3. **In-Hospital Mortality**

The overall in-hospital mortality rate was 18.9% (17/90).

Mortality was significantly higher among patients with AKI compared to those without AKI:

- AKI group: 12 out of 31 patients (38.7%)
- Non-AKI group: 5 out of 59 patients (8.5%)

The difference was highly statistically significant (Chi-square = 14.82; p < 0.001).

The comparison of mortality between groups is shown in **Table 3**.

Table 3: Comparison of In-Hospital Mortality Between AKI and Non-AKI Groups

Outcome	AKI (n=31)	Non-AKI (n=59)	p-value
Death, n (%)	12 (38.7%)	5 (8.5%)	<0.001*
Survival, n (%)	19 (61.3%)	54 (91.5%)	

*Statistically significant

The difference in mortality between AKI and non-AKI groups is illustrated in **Figure 1.**

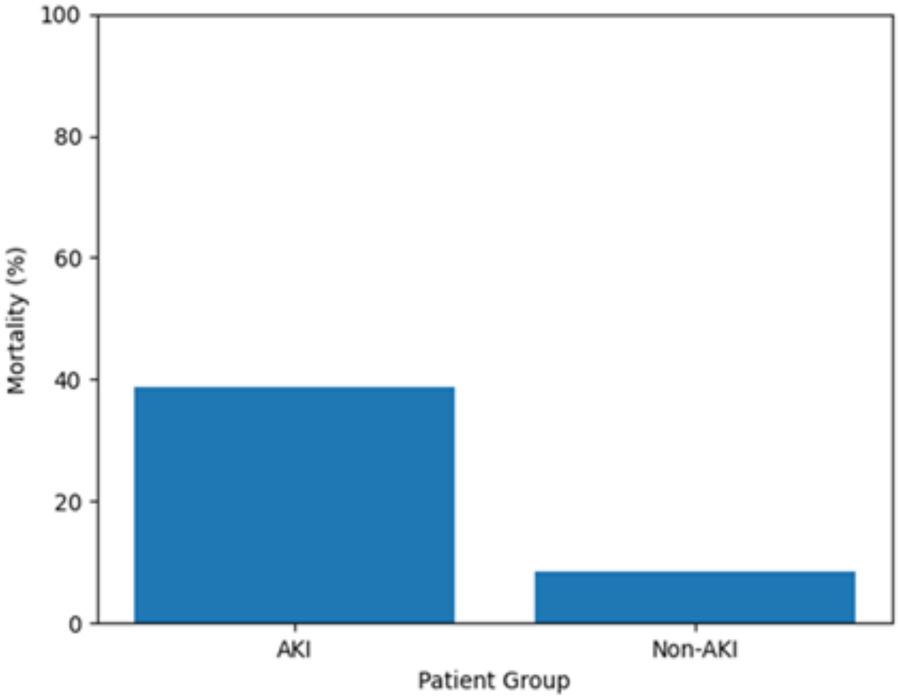

Figure 1: In-Hospital Mortality in AKI versus Non-AKI Patients

4. **Mortality According to AKI Severity**

A stepwise increase in mortality was observed with increasing severity of AKI:

- Stage 1: 2 deaths (13.3%)
- Stage 2: 4 deaths (44.4%)
- Stage 3: 6 deaths (85.7%)

Chi-square test for trend demonstrated a significant association between AKI stage and mortality ($p < 0.001$), indicating that higher AKI stages were associated with increased risk of death.

Mortality according to AKI severity is summarized in **Table 4** and illustrated in **Figure 2**.

Table 4: Mortality According to AKI Stage

KDIGO Stage	Deaths (n)	Mortality (%)
Stage 1 (n=15)	2	13.3%
Stage 2 (n=9)	4	44.4%
Stage 3 (n=7)	6	85.7%

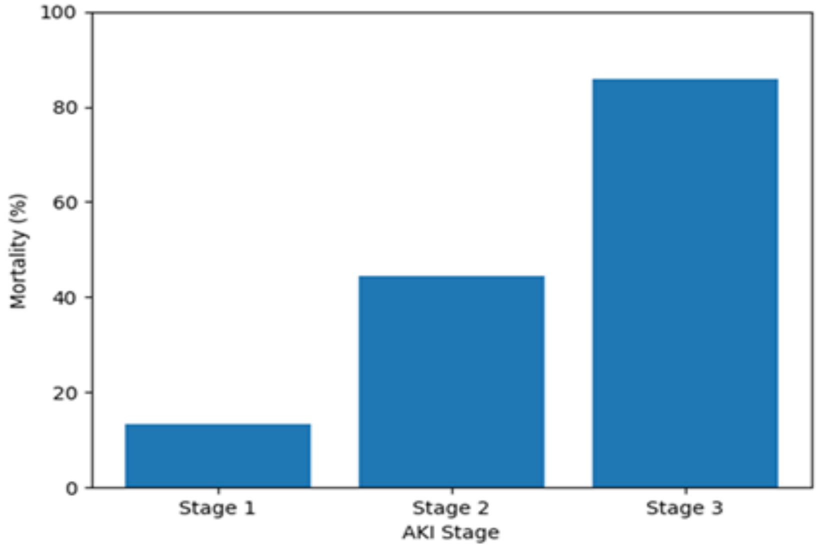

Figure 2: Mortality According to AKI Severity

5. **Logistic Regression Analysis**

Univariate Analysis

On univariate logistic regression analysis:

- AKI was significantly associated with mortality
  OR = 6.76
  95% CI: 2.15–21.21
  p < 0.001
- Age >60 years was also associated with increased mortality
  OR = 2.89
  95% CI: 1.01–8.29
  p = 0.04
- Diabetes mellitus was not significantly associated with mortality
  OR = 1.64
  95% CI: 0.59–4.54
  p = 0.34

Multivariate Analysis

After adjusting for age and diabetes mellitus, AKI remained an independent predictor of in-hospital mortality:

- Adjusted OR = 4.92
- 95% CI: 1.62–14.89
- p = 0.005

The multivariate logistic regression model is presented in **Table 5**.

Table 5: Multivariate Logistic Regression for Predictors of In-Hospital Mortality

Variable	Adjusted OR	95% CI	p-value
AKI	4.92	1.62–14.89	0.005*
Age >60 years	2.11	0.89–5.01	0.09
Diabetes mellitus	1.43	0.54–3.79	0.47

*Statistically significant

Summary of Results

In this prospective study, the incidence of acute kidney injury (AKI) among patients admitted to the general medical ward was 34.4%. The overall in-hospital mortality rate was 18.9%. Mortality was significantly higher among patients who developed AKI compared to those without AKI (p < 0.001). Furthermore, a progressive increase in mortality was observed with increasing severity of AKI, demonstrating a statistically significant trend (p < 0.001). On multivariate logistic regression analysis, AKI remained an independent predictor of in-hospital mortality, with an adjusted odds ratio of 4.92 (p = 0.005).

Discussion

The present prospective study demonstrates that AKI is strongly associated with increased in-hospital mortality among patients admitted to a general medical ward and remains an independent predictor after adjusting for confounding variables. The observed AKI incidence of 34.4% is comparable to rates reported in broader epidemiological studies [15].

A clear stepwise rise in mortality was noted with increasing AKI severity. This graded association is consistent with previously published data showing that more advanced stages of AKI are linked to progressively worse outcomes [16]. Additionally, long-term observational studies have established that even transient or partially reversible AKI episodes are associated with sustained increases in mortality risk [17].

The relationship between AKI staging and mortality observed in our cohort aligns with earlier consensus-based definitions and outcome studies [18]. Reports from Indian centers have similarly highlighted the substantial mortality burden associated with AKI in hospitalized populations [19,20]. These findings reinforce the relevance of early identification and risk stratification in routine clinical practice.

Several risk factors and outcome determinants for AKI have been described across adult and pediatric populations [21]. On a global scale, AKI represents a major contributor to preventable morbidity and mortality, particularly in resource-limited settings [22,23]. Given the growing healthcare burden, emphasis has increasingly shifted toward preventive strategies, early recognition, and timely intervention [24]. Emerging evidence also suggests that biomarker-guided approaches may allow earlier detection and improved prognostication [25].

Importantly, our findings suggest that AKI should not be viewed merely as a consequence of severe illness but rather as an independent contributor to mortality risk. Early recognition, vigilant monitoring, and prompt management may therefore play a critical role in improving patient survival in general medical wards.

Conclusion

AKI is common among patients admitted to a general medical ward and independently predicts in-hospital mortality. Early identification and aggressive management strategies are crucial to improve patient outcomes.

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