



Original Article

## Risk Factors and Outcomes of Acute Kidney Injury in Critically Ill Children Admitted to the Pediatric Intensive Care Unit

Dr. Gunjeeta Prajapati<sup>1</sup>, Dr RK Soni<sup>2</sup>, Dr Pawan Dara<sup>3</sup>, Dr Mohammed Ammar Abdullah<sup>4</sup> and Dr Akshay Sharma<sup>5</sup>

<sup>1</sup>Department of Pediatrics, Sardar Patel Medical College & Associated Group of Hospitals, Bikaner, Rajasthan, India

<sup>2</sup>Senior professor, Sardar Patel medical college Bikaner

<sup>3</sup>Associate Professor, Sardar Patel medical college Bikaner

<sup>4</sup>Senior Resident, Sardar Patel medical college Bikaner

<sup>5</sup>Senior Resident, Sardar Patel medical college Bikaner

 OPEN ACCESS

### Corresponding Author:

**Dr. Gunjeeta Prajapati**

Department of Pediatrics, Sardar Patel Medical College & Associated Group of Hospitals, Bikaner, Rajasthan, India

Received: 11-01-2026

Accepted: 25-02-2026

Available online: 09-03-2026

Copyright © International Journal of Medical and Pharmaceutical Research

### ABSTRACT

**Background:** Acute Kidney Injury (AKI) is a common and severe complication among children in Pediatric Intensive Care Units (PICUs), associated with high morbidity and mortality. This study evaluates the incidence, risk factors, electrolyte imbalance, and outcomes of AKI using RIFLE and AKIN criteria.

**Methods:** A prospective observational study was conducted at a tertiary care center in Rajasthan, enrolling children aged 1 month to 14 years. Demographic, clinical, and laboratory data were collected, with AKI staged using both RIFLE and AKIN criteria. PRISM III scores were calculated.

**Results:** Of 221 children admitted to the PICU, 57 (25.7%) developed AKI. The 2–5-year age group was most affected. Leading causes included sepsis (21%), dehydration (14%), and hypovolemia (12%). Electrolyte abnormalities, particularly metabolic acidosis and hyperkalemia, were common. Mortality among AKI patients was 28%. Significant predictors included sepsis, cardiac disease, younger age, and higher PRISM scores.

**Conclusion:** AKI significantly increases risk of mortality and hospital stay in critically ill pediatric patients. Early recognition and management of sepsis, cardiac dysfunction, and fluid-electrolyte imbalances are critical.

**Keywords:** Acute Kidney Injury, Pediatric Intensive Care Unit, PRISM Score, Sepsis, Electrolyte Imbalance, Mortality, RIFLE Criteria, AKIN Classification.

### INTRODUCTION

Acute Kidney Injury (AKI) is a reversible decline in renal function that frequently complicates the clinical course of critically ill pediatric patients. Its occurrence is multifactorial—triggered by sepsis, dehydration, nephrotoxic agents, and cardiovascular insufficiency. Standardized classification systems such as RIFLE and AKIN have improved AKI recognition but are underutilized in low-resource settings. Pediatric AKI is often underdiagnosed until severe due to subtle presentation and limited renal reserve in children.

Our study aims to analyze AKI incidence, clinical staging, biochemical derangements, and outcomes in a resource-constrained PICU. Understanding these dimensions is crucial for early identification and targeted intervention.

### METHODS

This prospective observational study was conducted in the Pediatric Intensive Care Unit at Sardar Patel Medical College & PBM Hospital, Bikaner. Children aged 1 month to 14 years admitted between June 2022 and May 2023 were included, excluding those with chronic kidney disease or PICU stay <24 hours.

AKI diagnosis was based on RIFLE and AKIN criteria. Serum creatinine levels and urine outputs were monitored daily. Electrolytes, acid-base status, and other biochemical parameters were recorded. PRISM III scoring was performed to assess

severity.

Statistical analysis was conducted using SPSS v25. Chi-square and t-tests were used for categorical and continuous variables respectively. Multivariate logistic regression was applied to identify independent predictors.  $P < 0.05$  was considered significant.

## RESULTS

Out of 221 PICU admissions, 57 (25.7%) developed AKI. The most commonly affected group was 2–5 years (46%). Females (56%) were slightly more affected. Sepsis (21%) was the leading etiology, followed by gastroenteritis (14%) and hypovolemia (12%). The most frequent symptoms were decreased urine output (94.7%) and fever (77.2%). Metabolic acidosis (37%) and hyperkalemia (36%) were the most common biochemical abnormalities. Stage 3 AKIN and RIFLE-Failure stages were associated with significantly higher mortality ( $p < 0.05$ ).

## DISCUSSION

This study highlights the high burden of AKI among children admitted to the PICU in a tertiary care hospital in Rajasthan, with an incidence of 25.7%. This aligns with studies by Mehta et al. (2007) and Akcan-Arikan et al. (2007), which identified an AKI incidence between 25–35% in critically ill pediatric patients.

In our study, the highest prevalence was in the 2–5-year age group. However, mortality was highest among infants under 12 months. These findings suggest that while older children are more frequently affected, infants suffer worse outcomes—likely due to developmental renal immaturity and late presentation. Rustagi et al. (2017) similarly noted increased AKI severity in younger age groups.

Sepsis, dehydration, and hypovolemia were the predominant causes of AKI, consistent with prior literature identifying sepsis as a leading cause of AKI in low- and middle-income countries. Sepsis contributes through multiple pathways, including renal hypoperfusion, cytokine storm, and nephrotoxic treatments.

Electrolyte derangements such as metabolic acidosis and hyperkalemia were frequent. These findings are important as they directly influence the risk of arrhythmia and encephalopathy. Studies by Bellomo et al. (2012) and Hoste et al. (2006) have emphasized these complications as markers of poor prognosis.

Mortality was significantly higher in patients with AKIN stage 3 and RIFLE-Failure/Loss classifications. These classifications were independently associated with outcomes, echoing observations by Goldstein et al. (2007), who proposed RIFLE as a valuable prognostic indicator in PICUs.

PRISM III scores, which assess multi-organ dysfunction, were substantially higher among non-survivors. This correlation underscores the systemic nature of AKI and supports prior studies by Joshi et al. and Uber et al. showing PRISM score's utility in PICU outcome prediction.

Multivariate regression showed that sepsis, cardiac disease, high PRISM III scores, and age  $< 12$  months were independent predictors of poor outcome. This emphasizes the need for comprehensive monitoring protocols and early renal function assessment in high-risk groups.

Although mechanical ventilation was not a statistically significant risk factor in this cohort, its association with severe AKI in other studies warrants its consideration as a confounder or co-morbidity in future analysis.

This study reaffirms the utility of structured AKI classification and PRISM scoring in early diagnosis and outcome prediction. It also emphasizes modifiable risk factors such as fluid management, infection control, and monitoring of nephrotoxic drugs.

## CONCLUSION

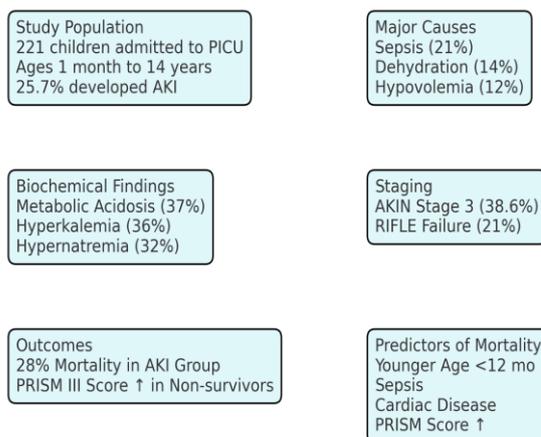
AKI is a common and serious complication in pediatric intensive care, associated with increased morbidity, hospital stay, and mortality. This study reinforces the need for early detection using AKIN/RIFLE classification and clinical predictors such as PRISM scores, electrolyte imbalance, and sepsis. Implementation of strict sepsis protocols, nephrotoxin surveillance, and individualized fluid therapy may reduce AKI incidence and improve outcomes in resource-limited settings.

## Tables and Figures

**Table 1: Etiological Factors Contributing to AKI in PICU Patients**

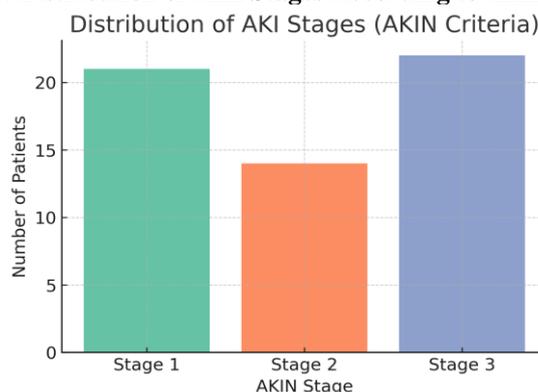
## Graphical Abstract

### Risk Factors and Outcomes of AKI in Critically Ill Children



This table summarizes the primary causes of AKI observed in the study, with sepsis being the most frequent.

**Figure 1: Distribution of AKI Stages According to AKIN Criteria**



Stage 3 AKI was the most common, indicating that a significant number of children presented with advanced renal impairment.

#### REFERENCES

1. Mehta RL, Kellum JA, Shah SV, et al. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. *Crit Care*. 2007;11(2):R31.
2. Akcan-Arikan A, Zappitelli M, Loftis LL, et al. Modified RIFLE criteria in critically ill children with acute kidney injury. *Kidney Int*. 2007;71(10):1028-1035.
3. Rustagi RS, et al. Risk factors and outcome of acute kidney injury in children admitted to PICU. *Indian J Nephrol*. 2017;27(3):207–212.
4. Bellomo R, Kellum JA, Ronco C. Acute kidney injury. *Lancet*. 2012;380(9843):756–66.
5. Hoste EA, et al. RIFLE criteria for acute kidney injury is associated with hospital mortality in critically ill patients. *Crit Care*. 2006;10(3):R73.
6. Joshi R, et al. Role of PRISM III Score in Predicting Mortality in Pediatric Intensive Care Unit. *J Pediatr Intensive Care*. 2024;13(1):42–50.
7. Uber AM, et al. Long-term sequelae of pediatric acute kidney injury. *Pediatr Nephrol*. 2020;35(2):271–284.
8. Goldstein SL, et al. Pediatric patients with AKI are at higher risk for mortality than adults. *Kidney Int*. 2007;72(8):982–986.