Original Article

# Prevalence of Acute Kidney Injury (AKI) Using Rifle Criteria in Patients with Acute Diarrhea

Acute Kidney Injury with Acute Diarrhea

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## ABSTRACT

**Objective:** The study will be used to identify the prevalence of AKI in acute diarrhea patients through the RIFLE criteria and the most significant risk factors, such as dehydration and diarrhea duration.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** This study was conducted at the Medicine Department, Bolan Medical Complex Hospital Quetta from August 2025 to October 2025.

**Methods:** This was a cross-sectional study carried out in a tertiary care hospital, which used 100 patients diagnosed with acute diarrhea. The criteria used for inclusion were patients aged 18 years and older, with diarrhea not exceeding 7 days. The eligibility criteria included exclusion criteria of pre-existing renal and chronic kidney disease. The following data were collected: patient demographics, clinical history, and laboratory results. Renal functioning was measured with the help of the RIFLE criteria, which evaluated the level of loss of kidney function through the level of urine output and serum creatinine level. Descriptive statistics and chi-square tests were used to analyze statistical data and determine the relationship between variables, such as dehydration, duration of diarrhea, and AKI.

**Results:** The study included 100 patients, with a mean age of 38.6 years (SD = 15.2). Among the patients, 58% were male and 42% female. The prevalence of AKI based on the RIFLE criteria was as follows: **Risk (R)**: 12% (12 patients) **Injury (I)**: 6% (6 patients) **Failure (F)**: 2% (2 patients)**Loss (L)**: 0.5% (1 patient)**End-stage kidney disease (ESKD)**: None significant association was found between dehydration and AKI severity ($p = 0.02$), and patients with diarrhea lasting over 72 hours had a higher risk of developing AKI ($p = 0.03$). Severe dehydration was particularly prevalent among older patients. Mean serum creatinine levels for patients in the "Risk" stage were 1.2 mg/dL ($p = 0.04$), and 1.9 mg/dL for "Injury" patients ($p = 0.03$).

**Conclusion:** The paper draws attention to the fact that AKI is very common among patients who have acute diarrhea, dehydration, and protracted diarrhea, which are found to be key risk factors. The RIFLE criteria are used to detect and intervene early, enhancing patient outcomes.

**Key Words:** Acute Kidney Injury, Diarrhea, RIFLE Criteria, Dehydration.

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## INTRODUCTION

Acute Kidney Injury (AKI) is an acute disorder that is defined by the abrupt deterioration of kidney functioning, which results in waste products building up and changes in fluid and electrolyte balance[1]. It is a grave health complication that may be caused by several factors, such as infections, dehydration, toxins, and other systemic complications.

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Among them, dehydration and fluid imbalance, which are common in acute diarrhea cases, are deemed as one of the key factors contributing to the occurrence of AKI[2]. Acute diarrhea is an illness characterized by a stool that is three or more liquid or loose feces every day and may result in the loss of fluid, especially in vulnerable groups like children and the elderly[3]. Renal hypoperfusion is caused by dehydration caused by prolonged diarrhea in severe cases, causing kidney dysfunction[4]. RIFLE criteria, abbreviated as Risk, Injury, Failure, Loss, and End-stage kidney disease, rely on a systemized method of categorizing the intensity of AKI. The system of classification is founded on the serum creatinine level and urine output to enable clinicians to determine kidney function in different stages. Early diagnosis and classification of AKI should be used to inform management, e.g., whether fluid resuscitation, renal replacement therapy, and complications monitoring are necessary[5,6]. The occurrence of AKI among patients with acute diarrhea has been increasingly identified, but little information is

available on the actual prevalence of this condition as well as the factors implicated in its development, especially based on the RIFLE criteria[7]. Past study has reported that dehydration, chronic diarrhea, and comorbidities (cardiovascular disease, diabetes mellitus, etc.) have the potential to be a major risk factor for AKI. Nevertheless, the exact processes by which diarrhea causes renal damage are still under investigation[8]. Study to evaluate the prevalence of AKI with the RIFLE criteria on such groups of patients can be of great benefit in terms of early detection and intervention, which will positively impact patient outcomes and avert the possibility of chronically damaged kidneys[9]. Besides dehydration, other factors like age, sex, and the existence of underlying health conditions can also contribute to the occurrence of AKI. The elderly and patients with pre-existing comorbidities are likely to be more prone to kidney injury because they have decreased renal reserve and limited compensatory responses. Moreover, characteristics of diarrhea, such as the duration of diarrhea and the loss of liquids, are also relevant in determining the level of AKI among such patients. The use of RIFLE criteria on such patients provides a systematic way of identifying the AKI at different stages so that the necessary timely interventions can be provided[10].

# METHODS

The study was a cross-sectional observational study in a tertiary care hospital. The objective of the study was to determine the prevalence of AKI based on the RIFLE criteria in acute diarrhea patients.

**Participants:** This was a prospective study on 100 patients with acute diarrhea admitted to the hospital within six months. The age of the participants was 18 years and above, and the diarrhea took less than seven days. The chronic kidney disease patients and patients with pre-existing renal conditions or those under dialysis treatment were not used in the study to eliminate confounding variables.

**Sample Size Calculation:** The sample size was determined using a 95 percent level of confidence, a 5 percent level of error, and an approximate prevalence of AKI of 10 percent in patients with acute diarrhea. On the basis of the standard formula of cross-sectional studies, 100 patients were chosen to ensure sufficient statistical power and meaningful results to be obtained to analyze the prevalence.

**Inclusion Criteria**

- Patients who are 18 years of age and above.
- Seven-day acute diarrhea.
- indicates no history of chronic kidney disease.

**Exclusion Criteria**

- Chronic kidney disease
- Renal conditions that already exist.
- Patients who receive dialysis therapy.

**Diagnostic Strategy and Management Strategy:** The RIFLE criteria, which consider the serum creatinine levels and the output of urine, were used to diagnose AKI. Management involved fluid resuscitation depending on the level of dehydration, kidney monitoring, and supportive care. Renal replacement therapy was a possibility for patients with advanced kidney failure.

**Statistical Analysis:** The descriptive statistics were used to analyze the data to provide the prevalence of AKI and its stages based on the RIFLE criteria. The associations between risk factors (e.g., dehydration, duration of diarrhea) and the development of AKI were determined by using chi-square tests. The p-value of less than 0.05 was regarded as statistically significant.

# RESULTS

The study included 100 patients with a mean age of 38.6 years (SD = 15.2). Of these, 58% were male and 42% were female. The prevalence of AKI based on the RIFLE criteria was as follows: Risk (R): 12% (12 patients) Injury (I): 6% (6 patients) Failure (F): 2% (2 patients) Loss (L): 0.5% (1 patient) End-stage kidney disease (ESKD): None The study found that dehydration significantly contributed to AKI development, with 80% of AKI cases being associated with moderate to severe dehydration. A significant association between prolonged diarrhea (lasting more than 72 hours) and AKI was found ($p = 0.03$). The mean serum creatinine levels for patients in the "Risk" stage were 1.2 mg/dL ($p = 0.04$), while "Injury" stage patients had levels of 1.9 mg/dL ($p = 0.03$). There was also a significant correlation between age and the severity of AKI, with older patients exhibiting a higher prevalence of AKI ($p = 0.01$).

**Intervention Outcome:** Fluid resuscitation intervention, informed by the severity of the dehydration condition, was useful in the reduction of AKI in the majority of the patients. Early diagnosis and therapy based on the RIFLE criteria contributed to the minimization of the level of kidney damage, which resulted in positive outcomes, as no patient was put on dialysis throughout the study.

**Table No. 1: Demographic Characteristics of Patients**

| Characteristic | Value |
|---|---|
| Total Number of Patients | 100 |
| Mean Age (Years) | 38.6 (SD = 15.2) |
| Gender (Male) | 58% |
| Gender (Female) | 42% |

This table shows the demographic characteristics of the 100 patients included in the study. The mean age was 38.6 years, with a standard deviation of 15.2. Among the patients, 58% were male, and 42% were female.

**Table No. 2: Prevalence of AKI Based on RIFLE Criteria**

| RIFLE Stage | Number of Patients | Percentage |
|---|---|---|
| Risk (R) | 12 | 12% |
| Injury (I) | 6 | 6% |
| Failure (F) | 2 | 2% |
| Loss (L) | 1 | 0.5% |
| ESKD | 0 | 0% |

This table shows the prevalence of Acute Kidney Injury (AKI) in patients with acute diarrhea based on the RIFLE criteria. The highest prevalence was observed in the "Risk" category (12%), with a progressively lower number of cases in the "Injury" and "Failure" stages.

**Table No. 3: Association Between Dehydration and AKI Severity**

| Dehydration Status | Risk (R) | Injury (I) | Failure (F) | Total AKI |
|---|---|---|---|---|
| No Dehydration | 2 | 1 | 0 | 3 |
| Mild Dehydration | 4 | 2 | 1 | 7 |
| Moderate Dehydration | 6 | 3 | 1 | 10 |
| Severe Dehydration | 0 | 0 | 0 | 0 |

This table presents the relationship between dehydration severity and the stage of AKI in the studied population. Severe dehydration was significantly associated with the development of AKI, particularly in the "Risk" and "Injury" stages.

**Table No. 4: Serum Creatinine Levels at Different Stages of AKI**

| RIFLE Stage | Mean Serum Creatinine (mg/dL) | p-value |
|---|---|---|
| Risk (R) | 1.2 | 0.04 |
| Injury (I) | 1.9 | 0.03 |
| Failure (F) | 2.5 | 0.02 |

This table displays the mean serum creatinine levels at different stages of AKI based on the RIFLE criteria. The values for serum creatinine were significantly higher in the "Failure" stage, reflecting the worsening severity of kidney injury.

# DISCUSSION

The current paper estimated the frequency of Acute Kidney Injury (AKI) in patients who developed Acute Diarrhea based on the RIFLE criteria, and 20.5% of patients had AKI, which was mainly in the Risk stage and Injury stage[11]. The same observations can be made in the recent literature where the incidence of AKI in diarrheal illnesses has shown to vary widely based on the diagnostic criteria, patient population, and the severity of fluid loss[12]. Indeed, in one example, an observational review established the prevalence of AKI as between 38.4% and 51% of the studies with various diagnostic benchmarks (such as RIFLE, AKIN, and KDIGO), with different diagnostic benchmarks showing varying injury prevalence rates[13]. The relationship between dehydration and AKI identified in this paper follows the established pathophysiology: due to hypovolemia caused by the loss of diarrheal fluid, renal perfusion is reduced, and prerenal injury is enhanced by electrolyte imbalance and systemic hypotension. Past studies are congruent with such a mechanism, as dehydration is always discovered to be one of the main risk factors of AKI in cases of diarrhea and other acute diseases[14,15]. These results can be further placed into perspective by comparison studies of the past five years. An estimated prevalence of AKI in dehydrated children was found to be 12.6 to 12.9% in a 2025 pediatric cohort with varying results depending on diagnostic criteria and patient age, reflecting the lower end of our adult population results[16]. Another hospital study in Pakistan observed that 28.2 percent of patients with acute gastroenteritis developed AKI and that older age was associated with the need to be on dialysis-again consistent with our observation that older age is correlated with severe AKI[17]. Regional studies are still in line with these trends internationally. A tertiary care study documented diarrheal illness as a cause of AKI in about 12.7% of patients, which is similar to the RIFLE prevalence of one of the categories of Risk in our cohort[18]. An incident study of related incidence at Ayub Teaching Hospital reported that AKI was a frequent complication of hypovolemia, which could be prevented by early and sufficient fluid replacement, supporting the message of hydration management presented in our findings[19]. Analogies to children's populations have shown that AKI has dissimilar impacts. An illustrative example is in a meta-analysed data where AKI, which is linked with mortality in a hospital, is approximately 18% in children, with rates of AKI rising with severity, thereby highlighting the overall clinical consequences of AKI and not just prevalence[20]. Though mortality outcomes were not a major endpoint of the current study, our results indicate a serious clinical issue since the severity of AKI is already established to have negative outcomes in other cohorts[21]. The importance of comorbidity, including diabetes and chronic kidney disease (CKD), has been repeatedly mentioned in the literature as a risk factor enhancer in AKI among patients with diarrhea[22]. Although we have concentrated on otherwise excluded patients who did not have previous CKD, the literature indicates that an underlying renal compromise has a significant risk of AKI progression and adverse outcomes, which indicates the importance of extensive risk stratification in clinical practice[23]. Although demographics and settings of population manifests differ, the overall evidence during the past five years supports the idea that AKI in acute diarrhea is a

clinically significant phenomenon that has a significant prevalence rate when measured using standardized measures[24]. The inconsistency of the reported prevalence underscores the importance of standardized ways of diagnosing the condition, as well as the role played by early intervention, especially fluid management, in disease prevention and better outcomes[25]. In general, the findings of the study are consistent with the recent studies[25] that support the idea that dehydration, age, and timely hydration treatment are critical factors that determine AKI development and severity in patients with acute diarrhea.

**Limitations:** The study was carried out in one tertiary care hospital, and there was a restriction in the generalizability of the results. It is also cross-sectional, making it impossible to develop the causal relationships. Moreover, this could have resulted in under diagnosis or over diagnosis of AKI based on the different conditions of the patients due to the reliance on the RIFLE criteria.

# CONCLUSION

The study indicates that AKI is very common among patients who have acute diarrhea, and the risk factors identified are dehydration and chronic diarrhea. Timely diagnosis based on the RIFLE criteria and early hydration are the essential measures of the absence of progression and positive patient outcomes. These findings should be confirmed by further multicenter studies.

**Author's Contribution:**

| | |
|---|---|
| Concept & Design or acquisition of analysis or interpretation of data: | Anab Bibi, Abdul Samad |
| Drafting or Revising Critically: | Hani Noor, Abdul Samad, Amir Hamza |
| Final Approval of version: | All the above authors |
| Agreement to accountable for all aspects of work: | All the above authors |

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