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# Clinical Profile and Outcomes of Acute Kidney Injury Among Non-Renal Hospital Admissions

Ferdous Jahan[1*], Salma Jahan[2], Md. Rezaul Alam[1], Md Mizanur Rahman Khan[3], Mahfuja Jahan[4], Md Rafayet Ullah Siddique[5], A.K.M Shahidur Rahman[6]

[1]Associate Professor, Department of Nephrology, Bangladesh Medical University (BMU), Dhaka, Bangladesh
[2]Professor, Department of Pediatric Nephrology, Bangladesh Medical University (BMU), Dhaka, Bangladesh
[3]Associate Professor, Department of Medicine, Bangladesh Medical University (BMU), Dhaka, Bangladesh
[4]Medical Officer, Department of Radiology and Imaging, Bangladesh Medical University (BMU), Dhaka, Bangladesh
[5]Assistant Professor (Former), Department of Anaesthesia Analgesia & Intensive Care Medicine Bangladesh Medical University (BMU), Dhaka, Bangladesh
[6]Medical Officer, Department of Nephrology, Bangladesh Medical University (BMU), Dhaka, Bangladesh

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***Corresponding author:** Dr. Ferdous Jahan
Associate Professor, Department of Nephrology, Bangladesh Medical University (BMU), Dhaka, Bangladesh
E-mail: ferdousjahan1999@gmail.com

**Abstract** **Original Research Article**

***Background:*** Acute kidney injury (AKI) is a common and serious complication in hospitalized patients, even when the primary reason for admission is unrelated to kidney disease. It is often overlooked in non-renal admissions, leading to delayed diagnosis and management. AKI contributes significantly to increased hospital mortality, longer duration of stay, higher healthcare costs, and risk of progression to chronic kidney disease (CKD). Understanding its clinical patterns and outcomes in this context is essential for improving early detection and patient care, particularly in low-resource settings where diagnostic and monitoring capacities may be limited. ***Aim:*** To assess the clinical characteristics, treatment modalities, and renal outcomes of patients who developed AKI during hospitalization for non-renal primary diagnoses. ***Method:*** This cross-sectional observational study was conducted in the Department of Nephrology at Bangladesh Medical University (BMU), Dhaka, Bangladesh from January 2021 to December 2021. A total of 156 hospitalized patients who developed acute kidney injury (AKI) during admission for non-renal conditions were included. Data on demographics, comorbidities, clinical presentations, laboratory parameters, imaging findings, treatment modalities, and renal outcomes were collected and analyzed. Statistical associations were evaluated using odds ratios, confidence intervals, and p-values, with significance set at $p<0.05$. ***Results:*** In this study of 156 hospitalized patients who developed acute kidney injury (AKI) without prior renal disease, the majority were middle-aged (41.52±13.28 years) with a male predominance (58.3%). The most common clinical diagnoses were sepsis (42.9%) and hypovolemia due to fluid loss (37.2%). Conservative fluid management was given to 85.3% of patients, yet 11.5% required hemodialysis, indicating a high burden of severe AKI. While 66.7% recovered fully, 23.1% progressed to chronic kidney disease (CKD), and 10.3% died. Sepsis was slightly more prevalent among those with unfavorable outcomes (46.2%) compared to those who recovered (41.3%). No significant associations were found between unfavorable outcomes with different clinical conditions ($p>0.05$). ***Conclusion:*** Acute kidney injury in non-renal admissions was most commonly precipitated by sepsis and fluid loss. Although most patients recovered, a considerable number progressed to CKD or required dialysis. Early recognition, timely intervention and structured follow-up are critical to improving outcomes and preventing long-term renal impairment.

**Keywords:** Acute kidney injury (AKI), Non-renal Admission, Chronic Kidney Disease (CKD), Sepsis, Hemodialysis, Serum Creatinine, Renal Outcome.



## 1. INTRODUCTION

Acute Kidney Injury (AKI) is a clinical syndrome characterized by a rapid decline in renal function within hours to days and is often reversible, commonly detected through rising serum creatinine levels or reduced urine output [1]. It affects up to 20% of hospitalized patients globally and is associated with high morbidity, mortality, and long-term complications, including progression to chronic kidney disease (CKD) [2, 3]. While AKI is well-documented in critical care and

renal settings, increasing evidence highlights its occurrence in patients admitted with non-renal primary diagnosis, where it is often under-recognized and poorly managed [4, 5]. It was reported that, 50% of patients who died from AKI received inadequate care and 14% of AKI cases were preventable [6]. The International Society of Nephrology started the 0by25 campaign in 2013 to improve early identification and treatment of acute kidney injury (AKI) with the goal of eradicating avoidable AKI-related fatalities globally by 2025 [7]. In non-renal admissions, AKI commonly arises due to systemic factors such as sepsis, hypovolemia, dehydration, drug toxicity, and hemodynamic instability [8]. These mechanisms can impair renal perfusion or induce direct tubular injury, even in the absence of underlying kidney disease [9]. Studies have shown that sepsis is a leading cause of AKI in general wards, and is associated with higher in-hospital mortality, particularly in resource-limited settings [10, 11]. Dehydration and infections often overlooked in non-critical units also contribute significantly to AKI development and severity [12]. Despite the growing burden of AKI, its incidence and outcomes in non-renal admissions remain underreported, especially in South Asia. Regional studies indicate that delayed recognition, inadequate monitoring, and limited access to renal replacement therapy exacerbate outcomes in low-resource settings [10, 13]. Furthermore, even transient episodes of AKI have been linked to increased long-term risk of CKD, cardiovascular events, and mortality [4, 14]. Bangladesh, like many low- and middle-income countries, lacks focused data on AKI occurring outside specialized nephrology care. Given the potential for early intervention to improve outcomes, there is an urgent need to characterize the clinical features, risk factors, and renal sequelae of AKI in this overlooked patient population. This study aims to evaluate the clinical characteristics, causative conditions, treatment modalities, and renal outcomes of patients who developed AKI during hospitalization for non-renal conditions at a tertiary care setting in Bangladesh.

## 2. METHODOLOGY

This cross-sectional observational study was conducted in the Department of Nephrology at Bangladesh Medical University Hospital, a tertiary care hospital in Dhaka, Bangladesh, over a period of 12 months from January 2021 to December 2021. A total of 156 patients were included using purposive sampling. Eligible participants were adult patients (≥18 years) admitted for non-renal medical or surgical conditions who developed acute kidney injury (AKI) during hospitalization, as defined by the KDIGO 2012 criteria [2]. Patients with pre-existing chronic kidney disease (CKD), those admitted primarily for renal disorders, or those with post-renal obstruction were excluded.

Data were collected using a pre-designed case record form, capturing socio-demographics (age, sex, occupation, socioeconomic status), clinical diagnosis, comorbidities, presenting symptoms, and laboratory investigations including serum creatinine, hemoglobin, and electrolytes. Imaging findings (renal ultrasonography) and treatment modalities (fluid therapy, medications, and dialysis) were also recorded. Outcomes were assessed at discharge and categorized as complete recovery, recovery with chronic kidney disease (CKD), or in-hospital death. Renal recovery was defined as normalization or stabilization of kidney function without ongoing dialysis. CKD was defined as an estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m² persisting at discharge.

Statistical analysis was performed using SPSS version 26. Descriptive statistics were used for demographic and clinical data. Continuous variables were presented as mean ± standard deviation (SD), and categorical variables as frequencies with percentages. Associations between variables and outcomes were tested using chi-square or Fisher's exact tests, and odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value <0.05 was considered statistically significant. Ethical clearance for this study was obtained from the Institutional Review Board (IRB) of Bangladesh Medical University (BMU) prior to data collection. Informed consent was obtained from all participants or their legal guardians.

## 3. RESULTS

Table 1 shows the demographic and clinical profile of 156 patients who developed AKI during hospitalization for non-renal causes. The mean age was 41.52±13.28 years, with the majority aged between 31 and 50 years (51.3%). Males accounted for 58.3% of cases. Most patients belonged to middle socioeconomic status (62.2%), and business (36.5%) and service (30.8%) were the most common occupations. Vomiting (42.3%) and diarrhea (20.5%) were the leading clinical presentations, reflecting fluid loss-related AKI triggers, while oedema, oliguria, and blood loss were less frequent.

**Table 1: Demographic and clinical profile of study participants (N= 156)**

| Variables | Number of patients | Percentage |
|---|---|---|
| Age group (years) | | |
| ≤20 | 14 | 9.0 |
| 21-30 | 27 | 17.3 |
| 31-40 | 36 | 23.1 |

| | | |
|---|---|---|
| 41-50 | 44 | 28.2 |
| >50 | 35 | 22.4 |
| Mean±SD | 41.52±13.28 | |
| Range (minimum-maximum) | (18-65) | |
| **Sex** | | |
| Male | 91 | 58.3 |
| Female | 65 | 41.7 |
| Clinical Presentation | | |
| Vomiting | 66 | 42.3 |
| Diarrhea | 32 | 20.5 |
| Oedema | 11 | 7.1 |
| Oliguria | 8 | 5.1 |
| Blood loss | 6 | 3.9 |

Table 2 shows the clinical diagnosis at admission among patients who developed AKI. Sepsis was the most common underlying condition, observed in 42.9% of cases, followed by hypovolemia due to fluid loss (37.2%), both of which are well-established precipitants of AKI. Less frequent but relevant contributors included hemorrhage (8.3%), drug-induced nephropathy (5.1%), and hypertensive complications like pre-eclampsia/eclampsia (4.5%). Acute pancreatitis (1.3%) and insect bite reactions (0.6%) were rare causes, reflecting the diverse etiologies of AKI in hospitalized patients.

**Table- 2: Distribution of study patients according to clinical diagnosis (N= 156)**

| Clinical Diagnosis | Number of Patients (n) | Percentage (%) |
|---|---|---|
| Sepsis | 67 | 42.9 |
| Hypovolemia due to fluid Loss | 58 | 37.2 |
| Hemorrhage | 13 | 8.3 |
| Drug-Induced AKI | 8 | 5.1 |
| Pre-eclampsia/Eclampsia | 7 | 4.5 |
| Acute Pancreatitis | 2 | 1.3 |
| Insect Bite Reaction | 1 | 0.6 |
| Total | 156 | 100.0 |

Table 3 outlines the treatment modalities provided to patients with AKI. The majority (85.3%) received conservative fluid management, while 41.7% were treated with pharmacologic agents. Notably, renal replacement therapy (hemodialysis) was required in 11.5% cases (Table- 3)

**Table- 3: Distribution of the study patients according to treatment modalities (N= 156)**

| Treatment modalities | Number of patients (n) | Percentage (%) |
|---|---|---|
| Conservative management | | |
| Fluid | | |
| Yes | 133 | 85.3 |
| No | 23 | 14.7 |
| Drug | | |
| Yes | 65 | 41.7 |
| No | 91 | 58.3 |
| Renal replacement therapy | | |
| Hemodialysis | 18 | 11.5% |

Among 156 patients, 66.6% recovered with preserved renal function, while 23.1% progressed to chronic kidney disease (CKD). Mortality was observed in 10.3% of cases (Figure- 1).

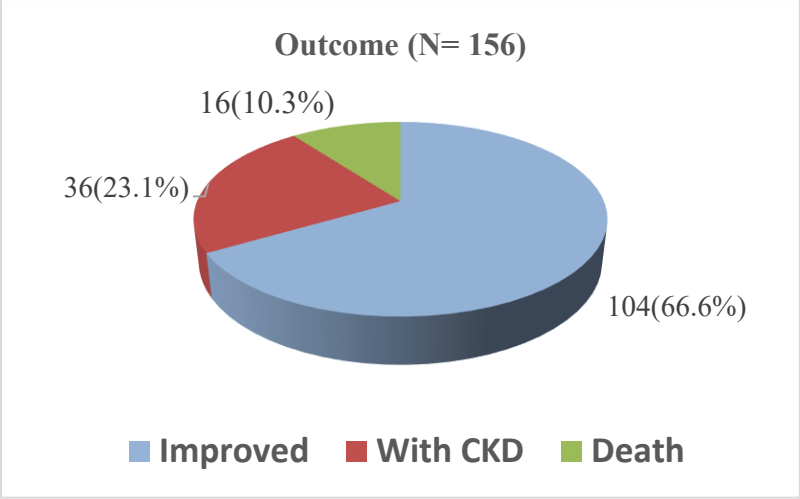


**Figure 1: Distribution of patient outcomes following AKI (N = 156)**

Table 4 compares clinical diagnosis between patients with favorable and unfavorable outcomes following AKI. Sepsis (42.9%) and hypovolemia due to fluid loss (37.2%) were the most common underlying conditions. Although sepsis was slightly more prevalent among those with unfavorable outcomes (46.2%) compared to those who recovered (41.3%), the difference was not statistically significant (p = 0.558). Similarly, no significant associations were found for other diagnoses, including drug-induced AKI (p = 0.076), hemorrhage (p = 0.412), or pregnancy-related complications (p = 1.000).

**Table- 4: Evaluation of acute kidney injury in non-renal admissions: clinical characteristics and renal outcomes**

| Clinical Diagnosis | Favorable Outcome (n = 104) | Unfavorable Outcome (n = 52) | Total (N= 156) | p-value |
|---|---|---|---|---|
| Sepsis | 43 (41.3%) | 24 (46.2%) | 67 (42.9%) | 0.558 |
| Hypovolemia due to fluid loss | 41 (39.4%) | 17 (32.7%) | 58 (37.2%) | 0.422 |
| Hemorrhage | 10 (9.6%) | 3 (5.8%) | 13 (8.3%) | 0.412 |
| Drug-Induced AKI | 3 (2.9%) | 5 (9.6%) | 8 (5.1%) | 0.076 |
| Pre-eclampsia/Eclampsia | 5 (4.8%) | 2 (3.8%) | 7 (4.5%) | 1.000 |
| Acute Pancreatitis | 1 (1.0%) | 1 (1.9%) | 2 (1.3%) | 1.000 |
| Insect Bite Reaction | 1 (1.0%) | 0 (0.0%) | 1 (0.6%) | 1.000 |

p-value obtained by Chi-square test, $p<0.05$ was considered as a level of significant

## DISCUSSION

Acute kidney injury (AKI) is a major complication among critically ill patients, contributing significantly to global mortality and morbidity [15]. AKI may be present at the time of admission or can develop during the course of hospitalization. According to the Kidney Disease, Improving Global Outcomes (KDIGO) report, between 17 and 31% of hospitalized patients have AKI, or develop it while they are in the hospital [16]. Inpatient care for AKI is also linked to higher medical expenses because of longer hospital stays, additional investigations, and the emergence of AKI- related complications. Considering the wide variation in culture, ethnicity, climate, and socioeconomic conditions across Asia, it is not surprising that the etiology, incidence, and risk factors for acute kidney injury (AKI) differ significantly among different regions of ASIA. In Asia, the incidence of AKI among hospitalized patients range from 9.0% in Central Asia to 31.0% in Southeastern Asia [16]. It has been demonstrated that AKI can lead to chronic kidney disease (CKD) and end-stage renal disease (ESRD). Therefore, current study aimed to evaluate the clinical features, management strategies, and renal outcomes in patients who developed acute kidney injury (AKI) during hospitalization for primary non-renal conditions.

In this cohort, acute kidney injury (AKI) most frequently affected middle-aged adults, particularly those aged 31–50 years (51.3%), with a clear male predominance (58.3%). This pattern is consistent with other studies from similar settings and suggests that this demographic may carry a higher risk due to cumulative exposure to comorbidities or delayed care [11, 12]. Clinically, vomiting (42.3%) and diarrhea (20.5%) were the most frequent symptoms, indicating fluid loss as a major and potentially preventable cause of AKI. Oliguria and oedema, though less common, signaled more advanced disease at presentation. These findings emphasize the importance of early recognition of fluid depletion, targeted prevention strategies, and context-

specific risk profiling to reduce the burden of AKI in general hospital settings.

Among patients who developed AKI during non-renal admissions, sepsis (42.9%) and hypovolemia from fluid loss (37.2%) were the most frequent clinical diagnoses. This reflects a well-established link between systemic infections and impaired renal perfusion in the pathogenesis of AKI [2, 10]. Sepsis-associated AKI is often multifactorial, involving hemodynamic instability, inflammation, and nephrotoxic medications. Hypovolemia, commonly caused by vomiting, diarrhea, or inadequate fluid intake, was also a major contributor, particularly in tropical and resource-limited settings where gastrointestinal infections are prevalent [12]. Less common causes included hemorrhage (8.3%), drug-induced nephrotoxicity (5.1%), and pregnancy-related hypertensive disorders such as pre-eclampsia/eclampsia (4.5%). Drug-induced AKI remains a preventable cause, often linked to NSAIDs, antibiotics, or contrast agents, especially when used without renal monitoring. The presence of pre-eclampsia/eclampsia also highlights the overlap between obstetric complications and renal dysfunction in reproductive-age women, a pattern similarly reported by Bamoulid *et al.,* [13]. Though relatively rare, conditions such as acute pancreatitis (1.3%) and insect bite reactions (0.6%) illustrate the diverse etiologies of AKI in hospital settings. These findings support the need for high clinical suspicion and individualized risk assessment in non-nephrology departments to identify and address AKI early, regardless of admission cause.

Most patients (85.3%) in this study received conservative fluid management, emphasizing the central role of volume resuscitation in early AKI care. Pharmacologic therapy was administered to 41.7% of patients, likely for managing sepsis, electrolyte imbalances, or underlying conditions. Notably, a considerable proportion (11.5%) required hemodialysis, suggesting that many patients presented with advanced or unresponsive AKI. This is substantially lower than the dialysis rates reported in similar studies for example, Esposito *et al.,* [17] documented a 64% dialysis rate, and Georges *et al.,* [18] reported even lower utilization, highlighting a potential delay in AKI recognition or referral in the current setting.

The overall reliance on renal replacement therapy underscores the severity of AKI in non-nephrology admissions and the critical need for early detection strategies, especially in settings with limited nephrology coverage. These findings support KDIGO guidelines, which recommend early risk identification, avoidance of nephrotoxins, and timely referral to reduce the need for dialysis and improve renal recovery [2].

In the present study, outcomes among patients with acute kidney injury (AKI) revealed that 66.6% recovered with preserved renal function, while 23.1% progressed to chronic kidney disease (CKD), and 10.3% died during hospital course. These findings reflect the serious long-term implications of AKI, even when it develops in patients admitted for non-renal causes. The proportion progressing to CKD is comparable to that reported by Georges *et al.,* who found that approximately 25% of AKI survivors developed CKD [18]. The observed mortality, although lower than in ICU-based cohorts, remains significant and highlights the need for earlier detection and intervention in general ward settings. Overall, this outcome distribution highlights the growing recognition that AKI is not just a transient event but a key risk factor for both kidney failure and mortality, as supported by previous studies [2, 4].

In the present study, clinical diagnosis such as sepsis (42.9%) and hypovolemia from fluid loss (37.2%) were the leading causes of AKI in non-renal admissions. Although sepsis appeared slightly more common among those with unfavorable outcomes (46.2%), the difference was not statistically significant ($p= 0.558$). Drug-induced AKI and hemorrhage also showed no significant outcome association, despite trends toward higher risk. These findings mirror those reported by Kafle *et al.,* where sepsis and fluid loss were primary causes of AKI, but outcomes varied based on clinical response and supportive care rather than etiology alone [10].

The lack of a strong statistical link between diagnosis and prognosis suggests that factors such as timing of intervention, baseline renal reserve, and severity of systemic illness may play a more decisive role. Similarly Lopes *et al.,* [19] and Hoste *et al.,* [5] observed that while AKI triggers were diverse, the outcomes correlated more with illness acuity and organ dysfunction than the initiating event itself. This supports KDIGO guidance that emphasizes early recognition and standardized management across AKI causes [2]. As well, Bamoulid *et al.,* highlighted that in low-resource settings, diagnostic delays and limited access to nephrology consultation often influence outcomes more than the underlying diagnosis [13]. Therefore, clinical vigilance in high-risk presentations such as sepsis or volume depletion remains critical, regardless of statistical associations in outcome data.

These findings highlight the clinical significance of AKI developing in non-renal hospital admissions. While sepsis and hypovolemia were predominant triggers, the absence of strong statistical associations between diagnosis and outcome highlights the complexity of AKI pathophysiology. A relatively high rates of CKD progression and a considerable portion of dialysis use suggest delays in recognition or intervention, strengthening the importance of early AKI screening, fluid management, and nephrology consultation even outside traditional nephrology settings. Structured post-discharge follow-up and education are essential to prevent long-term renal decline

and reduce readmissions, particularly in resource-limited health systems.

## CONCLUSION

This study demonstrates that acute kidney injury (AKI) developing during non-renal hospital admissions carries a significant risk of progression to chronic kidney disease (CKD) and mortality. Despite conservative management in most cases, a considerable portion of dialysis use and post-discharge renal dysfunction (CKD) highlights the need for earlier identification and multidisciplinary management. Sepsis and hypovolemia remain key contributors, but the severity of renal injury and timing of care appear more predictive of outcomes than etiology alone. These findings support integrating AKI screening protocols into general wards, increasing awareness among non-nephrology clinicians, and ensuring post-discharge nephrology referral to reduce long-term complications.

### Limitations of the study

The study was conducted in one tertiary care hospital, which may limit the generalizability. The results primarily demonstrate associations rather than causation. Lack of long-term follow-up limiting the understanding of the extended impact of AKI. Moreover, lack of standardized management protocol may influence clinical outcomes.

### Recommendations of the Study

Multi-center studies with larger samples will enhance generalizability. Early screening and timely diagnosis of AKI can reduce the unfavorable outcomes. Routine monitoring of renal function especially among high-risk patients such as those with infections/sepsis, diabetes, or hemodynamic instability should be strengthened to allow prompt detection of AKI.

### Conflicts of Interest

The authors declare no conflict of interest related to the research, authorship or publication of this study.

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