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CLINICO-EPIDEMIOLOGICAL SPECTRUM OF ACUTE KIDNEY INJURY (AKI) IN PATIENTS WITH CIRRHOSIS: INSIGHTS FROM A SINGLE CENTER IN NORTHEAST INDIA

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ABSTRACT Acute Kidney Injury (AKI) is a significant and often severe complication in patients with cirrhosis, leading to increased morbidity and mortality. In this retrospective study conducted at a tertiary care center in Northeast India, 143 cirrhotic patients were analyzed to assess the incidence, risk factors, and outcomes associated with AKI. The study found that 26.57% of patients developed AKI, with alcoholic liver disease (ALD) identified as the predominant underlying cause of cirrhosis in 89.47% of cases. Infections (39.47%) and Hepatorenal Syndrome (HRS)-AKI (31.58%) were the leading precipitating factors for AKI. Advanced age and a MELD score greater than 20 were significantly associated with the development of AKI. Patients who developed AKI had notably longer hospital stays, higher in-hospital mortality, and increased 28-day mortality compared to those without AKI. These findings underscore the critical need for early identification and targeted management of AKI in cirrhotic patients to improve clinical outcomes and reduce mortality.

KEYWORDS :

INTRODUCTION

Acute kidney injury (AKI) in the context of chronic liver disease and cirrhosis is a common and complex issue, presenting with diverse manifestations. Prerenal renal dysfunction, often triggered by severe hypoalbuminemia, is the most frequent clinical syndrome in advanced liver disease. Distinguishing prerenal azotemia, the initial phase of AKI, from conditions like hepatorenal syndrome (HRS) and acute tubular necrosis (ATN) can be challenging. The onset of AKI in chronic liver disease significantly increases morbidity and mortality rates due to associated complications. Recognizing and managing renal dysfunctions, such as prerenal HRS-ATN, in both cirrhotic and non-cirrhotic patients, is essential for early diagnosis and effective treatment. Recent advancements in classification and understanding of the pathophysiology have enhanced the recognition of the relationship between chronic liver disease and acute renal dysfunction. AKI in cirrhotic patients often leads to poor outcomes, with a higher mortality rate compared to non-cirrhotic individuals. The occurrence of AKI in cirrhosis indicates advanced disease progression and a poor prognosis. Identifying and managing the underlying factors precipitating AKI is crucial, with prompt interventions like addressing infections, stabilizing hemodynamics, and, in severe cases, implementing renal replacement therapy, being essential for improving patient outcomes.[1-4]

Our study was undertaken with the aim to explore the occurrence, predisposing factors, etiology, clinical implications, and predictive markers of Acute Kidney Injury (AKI) in patients diagnosed with cirrhosis and to evaluate the impact of AKI on the overall prognosis and long-term survival of individuals afflicted with cirrhosis.

MATERIALS AND METHODS

This retrospective cohort study was conducted at a tertiary care center in Northeast India, where clinical records were meticulously gathered from hospital archives over a six-month period. The study included patients aged 18 years or older who were diagnosed with Chronic Liver Disease and Acute Kidney Injury (AKI) as per the KDIGO 2012 Guidelines, either at admission or during their hospital stay. Patients with pre-existing Chronic Kidney Disease (CKD), recent exposure to nephrotoxic drugs or toxins, acute or chronic liver failure (ALF/ACLF), or known cardiac issues or systemic inflammatory conditions were excluded from the study. The collected data, encompassing patient demographics, laboratory findings, imaging reports, and other pertinent medical documentation, were subjected to comprehensive analysis. For level of significance, $p<0.05$ was considered significant and it was calculated using Chi-square for categorical data and t-test for continuous factors.

RESULTS AND OBSERVATIONS

In our study, data of 143 cirrhotic patients fulfilling the inclusion and exclusion criteria were collected and subjected to analysis. These patients were admitted to various wards of the hospital.

The study population exhibited a notable male preponderance, with 69% (n=98) of the participants being male and 31% (n=45) female. The age distribution further revealed that a majority of the patients, 60.1%, were in the 30-49 years age group, indicating a significant representation of middle-aged adults. A smaller proportion, 33.6%, were over 50 years old, while only 6.3% were between 18-29 years of age.

In this study, Acute Kidney Injury (AKI) was observed in 38 patients (26.6%), with 14 patients (37%) classified as Stage 1, 19 patients (50%) as Stage 2, and 5 patients (13%) as Stage 3. The predominant etiology for cirrhosis among the study population was Alcoholic Liver Disease (ALD), which accounted for 128 patients (89.5%), while the remaining 15 patients (10.5%) had cirrhosis due to non-alcoholic causes such as Non-Alcoholic Steatohepatitis (NASH) and Hepatitis B. Infections were the primary precipitating factor for AKI, contributing to 15 cases (39.5%), with specific types including Spontaneous Bacterial Peritonitis (6 cases), Urinary Tract Infections (7 cases), and other infections (2 cases). Hepatorenal Syndrome-AKI (HRS-AKI) was observed in 12 patients (31.6%) as another significant precipitating factor. Additionally, drug-related causes, particularly the use of diuretics (7 cases) and NSAIDs (3 cases), were implicated in 10 patients (26.3%). Gastrointestinal bleeding was the least common precipitating factor, observed in 1 patient (2.6%).

Upon analysis, factors significantly impacting the development of AKI were advanced age ($p<0.001$) and MELD Score >20 ($p=0.004$). The source of infection ($p=0.03$) and the presence of gross ascites or fluid overload ($p=1$) did not have any statistically significant impact. Patients with AKI, however, had a much longer hospital stay ($p < 0.001$), higher in-hospital mortality ($p =0.002$), and increased 28-day mortality compared to those without AKI ($p=0.009$). (Table 1)

Table 1: Factors Impacting the Development of AKI	
FACTOR	STATISTICAL SIGNIFICANCE
Advanced Age	$p < 0.001$
MELD Score > 20	$p = 0.004$
Source of Infection	$p = 0.03$
Presence of gross ascites or fluid overload	$p = 1$
Outcomes for patient with AKI	
OUTCOME	STATISTICAL SIGNIFICANCE
Longer Hospital Stay	$p < 0.001$
Higher in-hospital Mortality	$p = 0.002$
Increased 28 day Mortality	$p = 0.009$

DISCUSSION

The occurrence of acute kidney injury (AKI) in cirrhotic patients is a significant concern due to its association with increased morbidity and mortality. Our study findings align with and expand upon the existing literature in several important ways.

In our cohort, infections were the most frequent precipitating factor for AKI, identified in 39.5% of cases. This finding is consistent with previous studies, such as those by Fernández et al. (2012), which identified bacterial infections, particularly spontaneous bacterial peritonitis (SBP) and urinary tract infections (UTIs), as major triggers for AKI in cirrhotic patients. The pathophysiological mechanism behind this association involves a systemic inflammatory response leading to hemodynamic instability, which reduces renal perfusion. Similar observations were noted in the work of Wong et al. (2019), who emphasized that managing infections aggressively is critical in preventing the onset of AKI in cirrhosis.[5,6]

Hepatorenal Syndrome (HRS)-AKI was observed in 31.6% of our study population, a figure that aligns with the findings of Ginès and Schrier (2009), who reported a similar prevalence in their cohort. The pathophysiology of HRS-AKI involves significant systemic vasodilation, which leads to renal vasoconstriction—a phenomenon well-documented in literature. Our results underscore the importance of early detection and intervention, as HRS-AKI is frequently reversible with appropriate therapies such as terlipressin and albumin.[7]

In our study, 89.5% of patients with cirrhosis and AKI had underlying alcoholic liver disease (ALD). This is consistent with previous research, which identifies ALD as a leading cause of liver cirrhosis worldwide. Rehm et al. (2013) and Arroyo et al. (2020) highlighted that ALD contributes to a range of complications, including cirrhosis and subsequent renal dysfunction, due to factors such as severe portal hypertension, an increased risk of infections, and frequent use of nephrotoxic drugs. Our findings support the assertion that patients with ALD are particularly vulnerable to developing AKI, further complicating their prognosis.[8,9]

Our study observed that AKI in cirrhotic patients was associated with significantly longer hospital stays, higher in-hospital mortality ($p=0.002$), and increased 28-day mortality ($p=0.009$). These outcomes are consistent with those reported by Garcia-Tsao et al. (2008), who documented a similar correlation between AKI and poor clinical outcomes in cirrhotic patients. Additionally, our finding that the MELD score was significantly higher in patients who developed AKI ($p=0.004$) aligns with the study by Biggins et al. (2006), which established the MELD score as a robust predictor of mortality in cirrhotic patients.[10]

While the overall findings regarding the impact of AKI on prognosis are well-supported by the literature, our study adds to the existing knowledge by emphasizing the need for routine monitoring and early intervention in high-risk patients. This is particularly relevant in resource-limited settings where advanced interventions may not be readily available.

The high morbidity and mortality associated with AKI in cirrhosis, as demonstrated in our study, highlight the urgent need for effective prevention and early intervention strategies. Existing literature, such as the consensus recommendations by Angeli et al. (2015), suggests several key strategies, including avoiding nephrotoxic agents, aggressively managing infections, and utilizing albumin in patients with SBP.[11]

This study has some limitations that should be considered. The retrospective design, may introduce data inconsistencies or missing information that could affect the reliability of the results. Additionally, as a single-center study conducted at a tertiary care facility in Northeast India, the findings may not be generalizable to broader populations. The study was of relative short duration of data collection. These factors suggest that while the findings provide valuable insights, they should be interpreted with caution and further validated through larger, multi-center, prospective studies.

CONCLUSION

This study underscores the significant burden of acute kidney injury (AKI) in cirrhotic patients, highlighting its strong association with poor clinical outcomes, including increased mortality and prolonged hospital stays. Our findings align with existing literature, identifying infections and Hepatorenal Syndrome (HRS)-AKI as key precipitating factors. The high prevalence of alcoholic liver disease (ALD) as an underlying cause further emphasizes the need for targeted interventions to manage and mitigate AKI risk in cirrhosis. Early identification and aggressive management, including avoiding nephrotoxic agents, promptly treating infections, and using vasoconstrictors and albumin, are crucial. This study contributes valuable regional data that can inform clinical practice and healthcare policies, with future research needed to develop predictive models and explore novel therapeutic approaches for better management of AKI in this population.

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