

FREQUENCY OF ACUTE KIDNEY INJURY IN CASES OF LIVER CIRRHOSIS: A CROSS-SECTIONAL STUDY

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Abstract: Acute kidney injury (AKI) frequently complicates the clinical course of liver cirrhosis, impacting patient outcomes significantly. Understanding the epidemiology of AKI in this population is crucial for timely intervention and management. **Objective:** To assess the frequency and clinical outcomes of acute kidney injury in patients with liver cirrhosis. **Methods:** Following ethical approval, this descriptive cross-sectional study was conducted at the Department of Nephrology from December 2023 to June 2024. A total of 231 patients aged 18 years and older with a confirmed diagnosis of liver cirrhosis were included. The frequency of AKI was determined using standard criteria. Data analysis was performed using SPSS 24, employing Independent samples t-tests to evaluate differences between patients with and without AKI, with a significance level set at $P < 0.05$. **Results:** Among the 231 cirrhotic patients (mean age: 52.5 ± 10.61 years; 83.1% male), AKI was identified in 55 patients (23.8%). Patients with AKI exhibited higher mean serum creatinine (2.99 ± 0.44 mg/dL) and blood urea nitrogen (66.64 ± 9.92 mg/dL), along with lower sodium levels (129.37 ± 4.14 mmol/L) and elevated total bilirubin (5.23 ± 1.37 mg/dL) compared to their non-AKI counterparts. The average length of hospital stay was significantly longer for AKI patients (14.35 ± 3.22 days) compared to non-AKI patients (7.37 ± 1.92 days), and mortality was higher in the AKI group (12.7% vs. 1.7%). **Conclusion:** Our study highlights a significant prevalence of AKI among patients with liver cirrhosis, particularly affecting those with viral hepatitis B and C. The findings emphasize the need for vigilant monitoring and early therapeutic interventions in this vulnerable population to improve outcomes.

Keywords: Acute Kidney Injury, Liver Cirrhosis, Viral Hepatitis, Serum Creatinine, Hyponatremia, Mortality, Renal Dysfunction.

Introduction

Acute kidney injury (AKI) refers to a reduction in a kidney's glomerular renal function (GFR), which commonly happens in patients. AKI causes substantial illness and death in individuals with liver cirrhosis (1). Cirrhotic patients who are admitted to the hospital have a significantly elevated death rate, both during their stay and after they are discharged (1). Cirrhosis is an intricate disease that leads to considerable health problems because of significant changes in fluid volume and increasing widening of blood vessels. Renal disease adds a level of complexity for individuals with cirrhosis and should be taken into account when assessing a candidate for liver transplantation (2-4). Kidney dysfunction is a prevalent and potentially fatal occurrence in individuals with liver cirrhosis. The estimated prevalence of acute kidney damage among hospitalized patients with liver cirrhosis is between 20-50% (5, 6). Renal dysfunction parameters are highly accurate indicators of mortality in individuals with decompensated liver cirrhosis. Patients suffering from liver cirrhosis frequently exhibit kidney dysfunction as a consequence of reduced elimination of excess water, leading to the accumulation of salt and water in the body (7).

Several factors that can cause acute kidney failure in patients with liver cirrhosis have been observed, mainly upper gastrointestinal bleeding resulting in hypovolemic shock, spontaneous bacterial peritonitis, draining of large volumes of fluid, and the use of certain medications such as angiotensin transforming enzyme inhibitors, non-steroidal

anti-inflammatory drugs, quinolones, and aminoglycosides (8). Although upper gastrointestinal bleeding is more common in individuals with liver cirrhosis, various variables associated with upper gastrointestinal bleeding can contribute to the deterioration of renal function. Initially, the diminished amount of blood in the blood vessels due to the loss of blood could contribute to a drop in the blood flow to the kidneys, potentially decreasing the pace at which the kidneys filter blood via the glomeruli (9-12).

Liver cirrhosis, which is marked by the gradual development of fibrous tissue in the liver and impaired liver function, frequently results in changes in blood flow and fluid distribution that make patients more susceptible to kidney problems. The objective of this study is to determine the frequency of acute kidney injury (AKI) in individuals with liver cirrhosis and identify possible factors that could predict its occurrence. This information will help guide medical practices and interventions to prevent kidney damage and improve patient care.

Methodology

This study was a descriptive cross-sectional analysis conducted at the Department of Nephrology Rehman Medical Institute Peshawar from December 2023 to June 2024 after obtaining ethical approval from our hospital. We included 231 patients aged 18 years and above of either gender with a confirmed diagnosis of liver cirrhosis who

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were admitted to the hospital. Patients were excluded if they had a history of chronic kidney disease, recent kidney or liver transplantation, or other conditions like heart failure or malignancies that could influence renal outcomes.

Cirrhosis was diagnosed on clinical evaluation and biochemical markers. Acute Kidney Injury was defined and categorized into three stages according to the International Club of Ascites (ICA) criteria as an increase in serum creatinine by at least 0.3 mg/dL within forty-eight hours or a rise in serum creatinine to 1.5 times baseline within the last seven days.

We recorded age, sex, etiology of cirrhosis viral HBC or HCV and non-alcoholic fatty liver disease [NAFLD]), serum creatinine, urea, sodium, potassium, bilirubin, and albumin levels.

SPSS 24 was utilized for the analysis of data. Independent samples test was used for assessing the difference between variables, keeping the value of P significant at < 0.05.

Results

In this study, 231 patients with liver cirrhosis were included. The mean age was 52.5±10.61 years. The cohort had a male predominance of 192 (83.1%), while females were 39 (16.9%) (Figure 1). The primary causes of liver cirrhosis were viral hepatitis B 113 (48.9%) and viral hepatitis C 94 (40.7%), followed by non-alcoholic fatty liver disease (NAFLD) in 24 (10.4%) (Table 1). Fifty-five patients who developed AKI (23.8%) (Table 2). About 28 (50.9%) had stage 1, 16 (29.1%) had stage 2, and 11 (20.0%) had stage 3 AKI. The mean serum creatinine level among AKI patients was 2.99±0.44 mg/dL, compared to 1.09± 0.29 mg/dL in non-AKI patients. Blood urea nitrogen (BUN) was higher in AKI patients, with a mean of 66.64± 9.92 mg/dL versus 41.78± 7.7) mg/dL in non-AKI patients. Sodium levels were lower in AKI patients 129.37± 4.14 mmol/L, compared to non-AKI patients 134.76± 3.08 mmol/L. Total bilirubin was also elevated in AKI patients at 5.23± 1.37 mg/dL compared to non-AKI patients at 3.92± 1.02 mg/dL. The mean length of hospital stay was longer for AKI patients at 14.35± 3.22) days, compared to 7.37± 1.92 days for non-AKI patients (Table 3). Mortality was higher in AKI patients 7 (12.7%) compared to patients with no AKI 3 (1.7%).

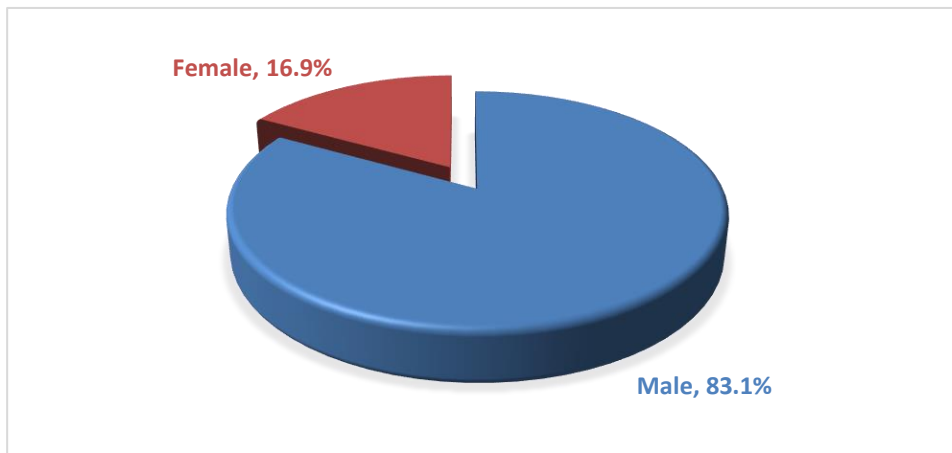


Figure 1 Gender distribution

Table 1 Etiology of cirrhosis

Etiology of cirrhosis	Frequency	Percent
NAFLD	24	10.4
Viral HCV	94	40.7
Viral HBV	113	48.9
Total	231	100.0

Table 2 Frequency of acute kidney injury

Acute kidney injury	Frequency	Percent
Yes	55	23.8
No	176	76.2
Total	231	100.0

Table 3 Comparison of biochemical markers between AKI and non-AKI patients

Biochemical markers	AKI	N	Mean	Std. Deviation	P value
Serum Creatinine (mg/dL)	Yes	55	2.998727	.4407530	0.0001
	No	176	1.093182	.2940536	
Blood Urea Nitrogen (BUN) (mg/dL)	Yes	55	66.645455	9.9238549	0.0001
	No	176	41.787500	7.7004313	

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Sodium (mmol/L)	Yes	55	129.378182	4.1427174	0.0001
	No	176	134.760227	3.0895784	
Total Bilirubin (mg/dL)	Yes	55	5.234545	1.3768211	0.0001
	No	176	3.926136	1.0210353	
Length of Hospital Stay (days)	Yes	55	14.350909	3.2200111	0.0001
	No	176	7.373864	1.9212790	

Discussion

The definition of acute kidney injury (AKI) has evolved significantly over the past twenty years, with the understanding that even a minor elevation in serum creatinine of greater than 0.3 mg/dL from baseline can harm survival. (12)

The frequency of acute kidney injury (AKI) in our patients was 23.8%, which is consistent with other research showing an AKI frequency of 20-50% in cirrhotic patients. The mean age of our participants was 52.5±10.61 years, which matches the typical demographic for complications related to cirrhosis, compared to the study by Mohan et al. (13), where the average age was reported as 51.5 years. Additionally, Thapa et al. (14) found a comparable AKI prevalence of 18.5%, reinforcing the reliability of our findings.

In our cohort, viral hepatitis B and C were the leading causes of liver cirrhosis, accounting for more than 90% of cases. This pattern is in line with other regions where viral hepatitis is a significant health concern, and alcohol consumption is relatively low, as highlighted by Mohan et al. (13), who stressed the heavy burden of viral hepatitis among cirrhotic patients.

Biochemical analysis of our AKI patients revealed significantly elevated serum creatinine levels, with an average of 2.99 mg/dL. This finding echoes Thapa et al. (14), who observed similar creatinine levels in their AKI population, underlining the importance of serum creatinine as an indicator of renal dysfunction in cirrhosis. Moreover, the occurrence of hyponatremia (average sodium level of 129.37 mmol/L) in our AKI patients is consistent with the results from Mohan et al. 13, who found that lower sodium levels were strongly connected to the development of hepatorenal syndrome (HRS) in cirrhotic patients.

Higher total bilirubin levels (average 5.23 mg/dL) among AKI patients suggest more severe liver impairment, closely associated with the worsening of renal function in cirrhosis. Thapa et al. (14) also noted that elevated bilirubin levels are indicative of advanced liver disease and poorer renal outcomes. The mortality rate among our AKI patients 7 (12.7%) was significantly higher compared to those without AKI 3 (1.7%), a trend that mirrors the findings of Mohan et al. (13), where AKI was a significant factor of mortality in cirrhotic patients.

Overall, these results highlight the critical need for early detection and proactive management of AKI in cirrhotic patients, particularly those with viral hepatitis B and C. Effective strategies for monitoring renal function and managing electrolyte disturbances, as discussed in existing literature, are essential for improving outcomes in this vulnerable population.

Conclusion

In conclusion, our study highlights the notable prevalence of AKI among cirrhotic patients, which was 55 (23.8%), particularly those patients having viral hepatitis B and C, stressing the dire need for early detection and management to improve patient outcomes.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRBEC/RMCH-02484/22)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Concept & Design of Study

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