VOLUME - 14, ISSUE - 08, AUGUST - 2025 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Medicine

"STUDY OF RENAL DYSFUNCTION IN PATIENTS WITH CIRRHOSIS OF LIVER"

Dr. Manjiri Naik	Professor & Head Of Department, Dept. Of General Medicine, MGM Medical College & Hospital Aurangabad
Dr. Ajinkya Deshmukh*	Assistant Professor, Department Of General Medicine, MGM Medical College & Hospital Aurangabad *Corresponding Author
Dr Abhay Bhosale	Resident In Department Of General Medicine, MGM Medical College & Hospital, Aurangabad
Dr. Kartik Doshi	Resident In Department Of General Medicine, MGM Medical College & Hospital, Aurangabad
Dr. Atharva Sarode	Resident In Department Of General Medicine, MGM Medical College & Hospital, Aurangabad
Dr. Ketki Naik	Resident Department Of Radiology, MGM Medical College, Aurangabad

ABSTRACT

Background: Cirrhosis of the liver is a major global health issue, often complicated by renal dysfunction in the form of acute kidney injury (AKI), chronic kidney disease (CKD), or hepatorenal syndrome (HRS), all of which increase morbidity and mortality. In India, the incidence of cirrhosis and its renal complications is rising, yet detailed data on their patterns and outcomes remain limited. This study aims to evaluate the clinical profile and implications of renal dysfunction in cirrhotic patients. **Methodology:** A descriptive cross-sectional study was conducted over one year at MGM Medical College and Hospital, Aurangabad, involving 355 patients with liver cirrhosis. Clinical assessments, laboratory investigations, and imaging studies were performed to identify and classify renal dysfunction. Statistical analysis was carried out using SPSS software, with p-values < 0.05 considered significant. **Results:** Renal dysfunction was observed in 78.87% of cases (n=280). AKI was the most common form (40.85%), followed by CKD (35.21%) and acute-on-chronic kidney disease (2.82%). Intrinsic renal disease emerged as the leading cause (43.93%), exceeding HRS type 1 (30.36%) and prerenal causes (25.71%). Important factors that predicted death within 3 months included hepatic encephalopathy, low serum albumin, high bilirubin, low sodium levels, a high MELD score, and low GFR ($p < 0.0001$). **Conclusion:** Renal dysfunction is highly prevalent in cirrhotic patients, with intrinsic renal disease now more common than HRS. Key biochemical markers and clinical features can help predict mortality. Early identification and timely intervention are essential, particularly in resource-limited settings.

KEYWORDS : Cirrhosis, Renal Dysfunction, Acute Kidney Injury, Chronic Kidney Disease, Hepatorenal Syndrome, MELD Score, Hyponatremia, GFR, Mortality Predictors

INTRODUCTION:

Cirrhosis of the liver remains a significant cause of morbidity and mortality worldwide, with renal dysfunction emerging as one of its most severe and life-threatening complications. Globally, liver cirrhosis ranks as the 11th leading cause of death, with an estimated 2 million deaths annually, approximately 1 million due to complications of cirrhosis and another million attributed to viral hepatitis and hepatocellular carcinoma combined. Among these complications, renal impairment, particularly in the form of AKI, CKD, and HRS, poses critical management and prognostic challenges.

In India, CLD is increasingly prevalent, largely driven by alcohol-related liver disease, hepatitis B and C infections, and non-alcoholic steatohepatitis (NASH). Recent epidemiological studies report a CLD prevalence of 5.1% to 10.5% in adult populations, with cirrhosis accounting for a substantial share of hospital admissions in tertiary care centers. Renal dysfunction is commonly encountered in these patients, with incidence rates ranging from 20% to 50%, depending on the severity of cirrhosis and coexisting risk factors.

Despite its frequency, the diagnosis of renal dysfunction in cirrhotic patients remains challenging due to overlapping clinical and biochemical features, fluctuating creatinine levels, and confounding effects of fluid retention and low muscle mass. Additionally, the prognostic implications of even mild renal impairment are profound, with studies consistently linking it to increased risk of hepatic encephalopathy, variceal bleeding, infections, and mortality. However, data specific to Indian populations, particularly on the clinical profile, etiology, and outcomes of renal dysfunction in cirrhotic patients, remain limited and fragmented.

Given these gaps, this study was conducted to systematically evaluate the burden and spectrum of renal dysfunction in patients with cirrhosis of the liver. Thereby, we aim to better understand its clinical presentation, correlate renal parameters with the severity of liver disease, and highlight predictive indicators for poor outcomes.

Aim Of The Study

The primary aim of this study was to evaluate the spectrum and clinical characteristics of renal dysfunction in patients with cirrhosis of the liver, and the secondary aim was to assess renal dysfunction in cirrhotic patients according to underlying etiologies, including prerenal causes, hepatorenal syndrome (HRS) type 1, and intrinsic renal disease.

Methodology:

This descriptive cross-sectional study was conducted at MGM Medical College and Hospital, Aurangabad, over a period of one year. The study population comprised patients diagnosed with cirrhosis of the liver who were admitted to the hospital during the study period.

Sample Size Estimation:

The sample size was calculated using the formula

- $N = Z2P[1-P]/d2$
- P = Prevalence = 20%
- Z = 1.96 for 95% confidence interval = 1.96
- d = Allowable Error = 0.07
- N= 355

After obtaining informed written consent in accordance with the Declaration of Helsinki (2008 revision), eligible participants were enrolled. Inclusion criteria included patients aged above 18 years with a confirmed diagnosis of liver cirrhosis. Patients with pregnancy, acute fulminant liver disease, drug-induced liver disease, or Wilson's disease were excluded from the study.

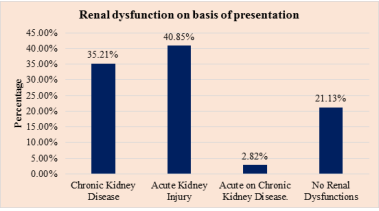
Venous blood samples (~10 ml) were collected using aseptic precautions in plain (red) and EDTA vacutainers for relevant hematological and biochemical investigations. A 5–10 ml midstream urine sample was collected using sterile techniques. A 2 ml early morning fasting blood sample was drawn for lipid profile analysis. Imaging examinations, including ultrasonography of the abdomen and pelvis and FibroScan, were performed to assess hepatic and renal parenchymal status.

Statistical Analysis: The collected data were entered and analyzed using Microsoft Excel and SPSS software. Frequencies of all variables were assessed, and associations between categorical variables were analyzed using the chi-square test. Continuous variables were expressed as mean ± standard deviation (SD). Binary logistic regression was applied for testing associations. A p-value of less than 0.05 was considered statistically significant.

RESULT

Table-1: Distribution According To Renal Dysfunction On Basis Of Presentation

Renal dysfunction on basis of presentation	No of cases	Percentage
Chronic Kidney Disease	125	35.21%
Acute Kidney Injury	145	40.85%
Acute on Chronic Kidney Disease.	10	2.82%
Total	280	78.87%
No Renal Dysfunctions	75	21.13%
Total	355	100.00%



Graph-1: Distribution according to Renal dysfunction on basis of presentation

In our study of 355 patients with cirrhosis of liver, renal dysfunction was observed in 280 cases (78.87%). Among these, 145 patients (40.85%) had acute kidney injury, 125 (35.21%) had chronic kidney disease, and 10 (2.82%) presented with acute on chronic kidney disease. The remaining 75 patients (21.13%) had no evidence of renal dysfunction (Table 1/Graph1).

Table-2: Distribution According To Cause Of Renal Dysfunction

Cause of renal dysfunction	No of cases	Percentage
HRS type 1	85	30.36%
Prerenal	72	25.71%
Intrinsic Renal Disease	123	43.93%
Total	280	100.00%

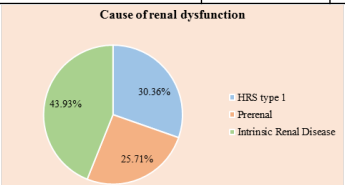


Table-2: Distribution according to cause of Renal Dysfunction

According to **Table 2/Graph 2,** among the 280 patients with renal dysfunction, intrinsic renal disease was the most common cause, seen in 123 cases (43.93%), followed by hepatorenal syndrome (HRS) type 1 in 85 cases (30.36%) and prerenal causes in 72 cases (25.71%).

Table 3: Relationship Of Variables Obtained At Diagnosis Of Renal Failure And 3-month Mortality.

Parameter	Alive (n = 180)	Dead (n = 175)	P value
Hepatic Encephalopathy, n (%)	49 (27.2%)	112 (64.0%)	<0.0001
Serum Albumin (g/L), mean ± SD	30.22 ± 4.93	26.50 ± 5.62	<0.0001
Serum Bilirubin (mg/dL), mean ± SD	6.15 ± 5.31	11.94 ± 10.46	<0.0001
MELD Score, mean ± SD	19.67 ± 5.95	26.35 ± 7.43	<0.0001
Serum Sodium (mEq/L), mean ± SD	132.60 ± 6.52	125.78 ± 7.11	<0.0001
Hyponatremia, n (%)	45 (25.0%)	117 (66.8%)	<0.0001
GFR (mL/min), mean ± SD	34.98 ± 9.80	27.21 ± 10.56	<0.0001

In cirrhotic patients with renal dysfunction, 3-month mortality was significantly associated with hepatic encephalopathy (64% vs. 27.2%), lower serum albumin, higher bilirubin, elevated MELD scores, hyponatremia (66.8% vs. 25%), lower serum sodium, and reduced GFR—all with $p < 0.0001$ indicating these parameters are strong predictors of short-term mortality, as reported in Table 3.

Table 4: Clinical And Biochemical Profile Of Cirrhotic Patients Based On Cause Of Renal Dysfunction.

Parameter	HRS Type 1 (n = 85)	Prerenal (n = 72)	Intrinsic Renal Disease (n = 123)
Age (years), mean ± SD	60.10 ± 10.40	61.80 ± 11.10	60.90 ± 9.80
Male, n (%)	65 (76.47%)	51 (70.83%)	89 (72.36%)
Female, n (%)	20 (23.53%)	21 (29.17%)	34 (27.64%)
Ascites, n (%)	80 (94.12%)	62 (86.11%)	96 (78.05%)
Hepatic Encephalopathy, n (%)	43 (50.59%)	31 (43.06%)	37 (30.08%)
Serum Creatinine (mg/dL), mean ± SD	2.60 ± 0.80	2.30 ± 0.60	2.80 ± 1.10
Serum Sodium (mEq/L), mean ± SD	125.90 ± 6.50	129.20 ± 5.90	128.00 ± 7.10
Hyponatremia, n (%)	61 (71.76%)	32 (44.44%)	75 (60.98%)
GFR (mL/min), mean ± SD	30.23 ± 9.24	34.40 ± 9.65	27.34 ± 10.41
Urine Output (mL/day), mean ± SD	790.04 ± 350.46	970.55 ± 460.50	880.29 ± 420.74

Among 280 cirrhotic patients with renal dysfunction, those with HRS Type 1 (n=85) had higher rates of ascites (94.1%) and hepatic encephalopathy (50.6%) compared to prerenal (86.1% and 43.1%) and intrinsic renal disease groups (78.1% and 30.1%). Some other findings reported in the **Table 5.**

DISCUSSION:

In this study, a total of 355 subjects with liver cirrhosis and renal dysfunction were observed, noted in 78.87% of subjects, which highlights the burden of renal involvement in advanced

liver diseases. Our study findings revealed that AKI was the most common illness reported among 40.85% of subjects, followed by CKD in 35.21%, and acute on chronic kidney disease was observed only in 2.82% of cases. According to Table 1, renal dysfunction in cirrhosis includes a spectrum ranging from reversible functional changes to established structural kidney damage.

The prevalence of AKI reported in this study was consistent with previous studies performed by **Maiwall R. et al. (2015), Bucsics T. et al. (2015), Belcher J.M. et al. (2013),** and **Wong F. et al. (2013).** Furthermore, a study done by **Fagundes et al.** revealed that AKI is a common complication in hospitalized cirrhotics. [Fagundes C.,] However, our present study findings show a high percentage of CKD, i.e., 35.21%; this advocates a shift towards recognition of long-standing renal impairment. This occurs due to improved survival rates in cirrhotic patients, improved follow-up care, and increased recognition of chronic kidney-related issues in these populations. Similarly, the data presented in this study reported that, in resource-limited settings, delays in diagnosis and management may lead to AKI progressing to CKD or may cause underlying CKD to go unnoticed until decompensation reveals renal dysfunction.

According to our study report, the etiology of renal dysfunction, intrinsic renal disease, emerged as the most frequent cause reported in 43.93% of cases. Other etiological factors, including HRS type 1 and prerenal, were observed in 30.36% and 25.71%, respectively. This differs from conventional understanding, where HRS has traditionally been regarded as the primary renal complication in cirrhotics. The increasing recognition of intrinsic renal disease, including acute tubular necrosis, diabetic nephropathy, or glomerulonephritis, reflects both a better understanding of renal pathology in cirrhosis and changing clinical profiles of patients with more co-existing chronic conditions such as diabetes and hypertension. The diagnostic shift may also be due to improved clinical use of urinary biomarkers, renal imaging, and exclusion criteria that help define structural from functional renal impairment.

Patients with HRS type 1 exhibited more severe clinical features, including ascites and hepatic encephalopathy, along with pronounced biochemical disturbances such as higher serum creatinine, more severe hyponatremia, and reduced GFR. These findings are consistent with the pathophysiology of HRS, which is characterized by intense renal vasoconstriction in the setting of systemic and splanchnic vasodilation. [Erly B,] [Danielle] Furthermore, hyponatremia was present in 71.76% of HRS patients in our study, which revealed the neurohormonal dysregulation and impaired free water clearance typical of HRS. On the other hand, patients with prerenal azotemia showed better biochemical profiles with relatively preserved urine output and GFR, representing probability for reversibility with volume resuscitation and hemodynamic stabilization.

In terms of outcomes, our study found that several parameters were significantly associated with increased 3-month mortality. These included hepatic encephalopathy, low serum albumin, elevated bilirubin levels, higher MELD scores, hyponatremia, low serum sodium, and reduced GFR, all with p-values less than 0.0001. Hepatic encephalopathy was observed in 64% of the patients who died within 3 months, compared to 27.2% among survivors. Similarly, the mean MELD score was markedly higher in non-survivors (26.35 vs. 19.67), and serum sodium levels were significantly lower in those who died (125.78 mEq/L vs. 132.60 mEq/L). These results confirm the prognostic value of the MELD-Na score and hyponatremia, both of which are well-established mortality predictors in cirrhotic patients. Reduced GFR and elevated creatinine, central components of the MELD scoring system, also emerged as life-threatening determinants of short-term prognosis.

This was supported by Nathan L. et al. (2020), who reported that MELD-Na may more accurately capture liver disease severity. Similarly, Syeda Nur-E-Jannat et al., in 2023, reported that MELD-Na was found to be the best predictor with the highest AUC among cirrhotic patients. Krishnan A, et al. are also consistent with the present study findings.

Although the association of mortality with hepatic encephalopathy, hyponatremia, and high MELD scores is consistent, our study is the first to highlightthe predominance of intrinsic renal disease in cirrhotic patients with renal dysfunction. This may reflect evolving epidemiological trends and differing patient profiles in the Indian subcontinent, where high rates of chronic comorbidities, delayed healthcare access, and limited specialized renal care may predispose cirrhotics to more structural renal damage. Additionally, the higher prevalence of CKD may suggest that some patients presented late in the course of their disease, when renal insult was already irreversible.

CONCLUSION:

In conclusion, our study emphasizes the high prevalence and heterogeneity of renal dysfunction in cirrhotic patients, with intrinsic renal disease now appearing as the leading etiology in this cohort. Patients with HRS showed more severe clinical and biochemical abnormalities, yet intrinsic renal disease was associated with the worst GFR values, indicating a potentially poorer long-term prognosis. The presence of hepatic encephalopathy, low serum sodium, high MELD scores, and poor renal parameters were all strongly linked to short-term mortality, emphasizing the urgent need for timely recognition and tailored intervention. These findings have important implications for the early stratification, prognostication, and management of renal dysfunction in cirrhosis, especially in settings with limited resources.

REFERENCES:

1. Maiwall R, Chandel SS, Wani Z, Kumar S, Sarin SK. SIRS at Admission Is a Predictor of AKI Development and Mortality in Hospitalized Patients with Severe Alcoholic Hepatitis. Dig Dis Sci 2015.
2. Bucsics T., Mandorfer M., Schwabl P., Bota S., Sieghart W., Ferlitsch A., Trauner M., et al. Impact of acute kidney injury on prognosis of patients with liver cirrhosis and ascites: A retrospective cohort study.J Gastroenterol Hepatol, 30 (2015), pp. 1657-1665
3. Belcher J.M., Garcia-Tsao G., Sanyal A.J., Bhogal H., Lim J.K., Ansari N., Coca S.G., Parikh C.R., et al. Association of AKI with mortality and complications in hospitalized patients with cirrhosis.Hepatology, 57 (2013), pp. 753-762
4. Wong F., O'Leary J.G., Reddy K.R., Patton H., Kamath P.S., Fallon M.B., Garcia-Tsao G., et al. New consensus definition of acute kidney injury accurately predicts 30-day mortality in patients with cirrhosis and infection. Gastroenterology, 145 (2013), pp. 1280-1281
5. Fagundes C., Barreto R., Guevara M., Garcia E., Sola E., Rodriguez E., Graupera I., et al. A modified acute kidney injury classification for diagnosis and risk stratification of impairment of kidney function in cirrhosis. J Hepatol, 59 (2013), pp. 474-481
6. Erly B, Carey WD, Kapoor B, McKinney JM, Tam M, Wang W. Hepatorenal Syndrome: A Review of Pathophysiology and Current Treatment Options. Semin Intervent Radiol. 2015 Dec;32(4):445-54.
7. Danielle et al. Pathophysiology of Hepatorenal Syndrome – Acute Kidney Injury Adebayo, Clinical Gastroenterology and Hepatology, 2023; Volume 21, Issue 10, S1 - S10
8. Nathan L. Maassel, Matthew M. Fleming, Jiajun Luo, Yawei Zhang, Kevin Y. Pei. Model for End-Stage Liver Disease Sodium as a Predictor of Surgical Risk in Cirrhotic Patients With Ascites. Journal of Surgical Research. Volume 250;2020:Pages 45-52,
9. Syeda Nur-E-Jannat, Dewan Saifuddin Ahmed. Validation of CTP, MELD & MELD Na Scoring Systems for Predicting Treatment Outcome of Cirrhotic patients in Bangladesh- An observational study. Fortune Journal of Health Sciences. 6 (2023): 182-190.
10. Krishnan A, Woreta TA, Vaidya D, Liu Y, Hamilton JP, Hong K, et al. MELD or MELD-Na as a Predictive Model for Mortality Following Transjugular Intrahepatic Portosystemic Shunt Placement. J Clin Transl Hepatol 2023;11(1):38–44.