

## **Clinical profile of renal dysfunction in cirrhotic liver**

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### **Abstract**

**Objectives:** Renal dysfunction is a serious complication in patients with cirrhosis and associated with significant morbidity and mortality. Renal failure in cirrhosis is one of the most important risk factors when liver transplantation is being considered. The present study was carried out to analyze the profile of renal dysfunction in patients with cirrhosis.

**Methods:** In this retrospective study we have included the medical records of one hundred cirrhotic patients admitted in Rajiv Gandhi Government General Hospital / Madras Medical College, Chennai. The definite etiology for chronic liver disease was noted. Clear definitions were used to define cirrhosis and etiologies of renal dysfunction. Chi-square test and odds ratio were used to measure the strength of association.

**Results:** The mean age of patients was  $48.32 \pm 10.19$  years. The most common type of renal dysfunction was AKI (12%, 12/100) followed by HRS (7%, 7/100) and CKD (3%, 3/100). There is no significant association between the etiologies of cirrhosis and renal disorders ( $P = 0.25$ ). There is a significant increase in the number of renal disorder with increase in the severity of cirrhosis ( $P = 0.03$ ).

**Conclusion:** Renal dysfunction has occurred in 22% of patients with cirrhosis and the most common cause is AKI (54%). Chronic kidney injury appears to be a rare diagnosis as seen in 3% of the cirrhotic patients. This study highlights the fact that we should take utmost care in treating chronic liver disease patients with regard to their renal function. Therefore early diagnosis, prevention and treatment of renal dysfunction can reduce the morbidity and mortality.

**Keywords:** Cirrhosis, hepatorenal syndrome, acute kidney injury, chronic kidney disease.

### **1. Introduction**

Renal dysfunction is a serious complication in patients with cirrhosis and associated with significant morbidity and mortality.[1,2] A systemic review of studies which evaluated the predictors of survival in cirrhosis have reported that parameters of renal dysfunction (creatinine and blood urea nitrogen/azotemia) together with parameters of liver dysfunction (Child-Pugh score and its components) were important predictors of death in decompensated cirrhosis.[3]

The common cause of acute renal failure includes prerenal azotemia, hepatorenal syndrome (HRS) or acute tubular necrosis. Patients with cirrhosis may develop these three types of acute renal failure and may have chronic renal failure.[4] Prerenal azotemia has been documented as the underlying factor of acute renal injury, which is reported to initiate HRS-type 1 and progress to acute tubular necrosis (according to the level of splanchnic vasodilation or renal hypoperfusion and the reduced cardiac output).[2,4] Recent report documented that there is a rise in the number of

patients with chronic liver disease and chronic kidney disease.[5]

HRS type-1 is commonly observed in patients with decompensated cirrhosis, which may exist as a less severe chronic form (HRS-type 2).[6] HRS type-1 continues as a terminal condition in most of the cases with advanced liver disease or cirrhosis and is characterized by functional renal impairment without significant changes in renal histology.[7] The early detection, treatment, monitoring and prevention of HRS is life saving in most instances. There are very few studies documenting various renal disorders in patients with cirrhosis of liver. Hence, the present study was carried out to analyze the profile of renal dysfunction in patients with cirrhosis.

### **2. Materials and methods**

We retrospectively reviewed medical records of one hundred cirrhotic patients admitted in three month period

(March 2015 to May 2015) in Rajiv Gandhi Government General Hospital & Madras Medical College, Chennai. The definite etiology for chronic liver disease was noted (i.e. viral (Hepatitis B, Hepatitis C) or alcoholic chronic liver disease or steatohepatitis or autoimmune (Wilson's disease, cryptogenic)). Institutional ethical clearance was obtained to conduct this study.

Clinical history of patients and details of complete clinical examination, pelvic-abdominal ultrasound, chest x-ray, and results of laboratory investigations like complete blood count, liver function test, blood urea, serum creatinine, urine analysis, ascetic fluid analysis, serum sodium, serum potassium and urinary sodium were collected. Mortality in patients with the effect of other diseases such as heart failure or coronary artery disease, malignancies (primary or metastatic) and patients with incomplete data were not included in this study.

Clear definitions were used to define cirrhosis and etiologies of renal dysfunction. Definitions of acute kidney injury (AKI) and chronic kidney disease (CKD) were made according to the diagnostic criteria of renal dysfunction in cirrhosis.[8] Hepatorenal syndrome was defined as per the International Ascites Club (IAC).[9]

Statistical analysis was performed using GraphPad Prism 6 (GraphPad Software, Inc., La Jolla, California, USA). Continuous variables were summarized by mean and standard deviation. Categorical variables were compared using Chi-square test. Odds ratio (OR) and 95% confidence interval (CI) were used to measure the strength of association. P value <0.05 was considered as significant.

### 3. Results

A total of one hundred cases were included in this study and renal diseases were present in 22% (22/100) of cirrhotic patients. Clinical and demographic characters are shown in Table 1. The mean age of patients was  $48.32 \pm 10.19$  years. Of these, majority were male (95% (95/100)) and females were 5% (5/100).

The most common etiology of cirrhosis was alcohol 85% (85/100), followed by Hepatitis B (11% (11/100)) and C virus (4% (4/100)). Renal dysfunction was observed in 33.3% (5/15) of cirrhotic cases with viral etiology. There is no significant association between the etiologies of cirrhosis and renal disorders (P = 0.25) (Table 2). Co-morbidities and complications of cirrhosis such as diabetes, hypertension, hepatic encephalopathy and gastrointestinal bleeding are shown in table 4. Factors associated with renal dysfunction are shown in table 5.

Of the one hundred patients, sixteen patients (16%, 16/100) corresponded to Child-Pugh C class, 80% (80/100) to B class, and only 4% (4/100) were class A (Table 6). The types of renal dysfunction are shown in Table 3. The most common type of renal dysfunction in liver cirrhotic cases was AKI, present in 12% (12/100) of patients followed by HRS

(7%, 7/100) and CKD (3%, 3/100). There is an increase in the number of renal disorder with increase in the severity of cirrhosis. In the cirrhotic patients with higher severity of cirrhosis (Child Pugh class B and C), renal dysfunction was developed much more (OR=3.37; CI=1.08-10.5; P = 0.03) (Table 6).

**Table 1: Baseline Characteristics**

Variables	n (%)
Male	95 (95%)
Female	5 (5%)
Age (years) <sup>a</sup>	48.32±10.19
Creatinine <sup>a</sup>	1.169±0.81
MELD score <sup>a</sup>	17.59±6.66
<b>Etiology of cirrhosis</b>	
Hepatitis B virus	11 (11%)
Hepatitis C virus	4 (4%)
Alcohol	85 (85%)

<sup>a</sup>Mean±SD

**Table 2: Etiology of cirrhosis and distribution of renal dysfunction**

Cirrhosis etiology	Normal renal function n (%)	Renal dysfunction n (%)	*OR (95% CI)	P value
Viral (HBV & HCV)	10 (66.7)	5 (33.3)	0.5 (0.2-1.6)	0.25
Alcohol	68 (80)	17 (20)		

\*OR - Odds ratio; CI - Confidence Interval

**Table 3: Types of renal dysfunction**

	Total (n=100)
<b>Normal</b>	78 (78%)
<b>AKI</b>	12 (12%)
<b>CKD</b>	3 (3%)
<b>HRS</b>	7 (7%)

**Table 4: Distribution of cirrhosis complications and comorbidities in renal dysfunction**

Co-morbidities	Normal renal function n (%)	Renal dysfunction n (%)
<b>Diabetes</b>		
Present (n = 17)	14 (82.4)	3 (17.6)
Absent (n = 83)	64 (77.1)	19 (22.9)
<b>Systemic hypertension</b>		
Present (n = 2)	1 (50)	1 (50)
Absent (n = 98)	77 (78.6)	21 (21.4)
<b>Hepatic encephalopathy</b>		
Present (n = 17)	7 (41.2)	10 (58.8)
Absent (n = 83)	71 (85.5)	12 (14.5)
<b>Gastrointestinal Bleed</b>		
Present (n = 33)	25 (75.8)	8 (24.2)
Absent (n = 67)	53 (79.1)	14 (20.9)

**Table 5: Renal dysfunction and associated factors**

Associated Factors	Normal n (%)	Renal dysfunction n (%)	Total No.
<b>Vomiting/ diarrhoea</b>			
Yes	17 (77.3)	5 (22.7)	22
No	61 (78.2)	17 (21.8)	78
<b>Urinary tract infection</b>			
Yes	3 (60)	2 (40)	5
No	75 (79)	20 (21)	95
<b>Sepsis</b>			
Yes	2 (100)	0 (0)	2
No	76 (77.6)	22 (22.4)	98
<b>Diuretic drugs</b>			
Yes	35 (72.9)	13 (27.1)	48
No	43 (82.7)	9 (17.3)	52

**Table 6: Rate of renal failure classified according to Child-Pugh classification**

Classification	Normal renal function n(%)	Renal dysfunction n(%)	*OR (95% CI)	P value
<b>Child-Pugh A (n = 4)</b>	4 (100)	0 (0)	-	-
<b>Child-Pugh B (n = 80)</b>	65 (81.2)	15 (18.2)	3.37 (1.08-10.5)	0.03
<b>Child-Pugh C (n = 16)</b>	9 (56.2)	7 (43.8)		

\*OR - Odds ratio; CI – Confidence Interval

#### 4. Discussion

Liver cirrhosis is a major health problem. Renal failure in cirrhosis is one of the most important risk factors when liver transplantation is being considered. Cirrhotic patients with renal failure are at high risk for mortality while waiting transplantation and have an increased incidence of complications and reported to have reduced survival after transplantation.[10-14]

In our study renal dysfunction has occurred in 22% of hospitalized patients with cirrhosis and the most common cause is AKI, accounting for 54.5% (12/22) of the cases which is in agreement with a study report from North India.[15] AKI has been documented to occur mostly secondary to hypovolemia (gastrointestinal haemorrhage, aggressive diuresis, or diarrhoea), infection and drugs.[16,17] We have observed that HRS constitutes 31.8% of the cases with renal dysfunction and, it accounts for 7% of cases of hospitalized cirrhotic patients. In this study chronic kidney injury appears to be a rare diagnosis as seen in 3% of the cirrhotic patients which is comparatively lower than the study reports from India and Texas which reported 15.6% and 13% respectively.[15,18] Among the renal dysfunction cases studied 45.5% (10/22) had hepatic encephalopathy and 59.1% (13/22) were under diuretic therapy. It has been documented

that diuretics were associated with the risk of renal injury and factor such as hepatic encephalopathy has been associated with the progression of AKI.[2,19]

In the present study there was no statistically significant difference in renal parameters in different etiologies of liver cirrhosis, which is in contrast with other study reports.[20-22] We have also observed that increased incidence of renal dysfunction with increase in the severity of liver cirrhosis which is well correlated with other study report.[1]

#### 5. Conclusion

This study highlights the fact that we should take utmost care in treating chronic liver disease patients with regard to their renal function. Therefore early diagnosis, prevention and treatment of renal dysfunction can reduce the morbidity and mortality.

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