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# CLINICAL PROFILE OF ACUTE KIDNEY INJURY IN CHRONIC LIVER DISEASE, AND ITS EFFECT ON IN HOSPITAL MORTALITY

General Medicine

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## ABSTRACT

**Introduction -** Chronic liver disease (CLD) is a common clinical condition affecting mankind.Its association with the diseases of other important organs like kidney makes it a more devastating disease. Acute kidney injury (AKI) considerably affects the prognosis and outcome of patients with CLD, hence it is important to prevent the development of AKI and identify the precipitating factors as early as possible, so that early interventions can be done.1 **Material and methods -** A prospective observational study was done on 100 chronic liver disease patients admitted in J. A. group of hospitals Gwalior, over a period of 22 months from Nov. 2019 to June 2021. Detailed history and physical examination, biochemical and radiological investigations were performed and data was collected using a standardised proforma. **Results -** Out of the 100 patients 70 are patients are male and 30 are females. Most of the patients belonged to Child - Pugh class C (60%), followed by class B (39%) and class A (1%).Overall, alcohol was found to be the most common cause of chronic liver disease (59%), followed by hepatitis B virus infection (20%), Hepatitis C virus infection(6%), NASH related CLD(2%), portal vein thrombosis(5%), Wilson's disease (1%), unknown etiology (7%). In males, the most common cause of CLD was found to be chronic alcoholism(84.3%), followed by hepatitis B virus infection(8.6%), portal vein thrombosis and NASH related hepatitis in 2.8% each and Wilson's disease (1.4%). In females most common cause of CLD was found to be hepatitis B virus infection (46.6%),followed by hepatitis c virus infection (20%), portal vein thrombosis(10%), unknown etiology (23.3%). Ascites (78%) was the most common sign of hepatic decompensation, followed by pedal edema (67%), jaundice (52%), altered sensorium(20%), GI bleed ( 22%), dilated abdominal veins(18%), alopecia(10%). palmar erythema ( 8 %) and testicular atrophy(4%). Prevalence of AKI in CLD was found to be 30%, out of which maximum no. of patients were in AKIN stage 3(48%), frequency of stage 1 & 2 AKI was 26.6% each. The most common cause of AKI in CLD was found to be sepsis (40%), followed by GI bleed (26.7%), inappropriate use of diuretics (13. 3%), Paracentesis (6.6%)and diarrhea(10%) severe vomiting ( 3. 3%). The in hospital mortality in the patients who developed AKI was considerably higher (56.6%) than the patients who did not developed AKI (8.5%), significant at $p < 0.05$. **Conclusion -** CLD patients are at increased risk of developing AKI , and mortality rates are significantly higher in patients of CLD complicated by AKI.

## KEYWORDS

Chronic liver disease, acute kidney injury.

## INTRODUCTION

Chronic liver disease (CLD) is a common clinical condition affecting mankind.Its association with the diseases of other important organs like kidney makes it a more devastating disease.

Acute kidney injury (AKI) considerably affects the prognosis and outcome of patients with CLD, hence it is important to prevent the development of AKI and identify the precipitating factors as early as possible, so that early interventions can be done.[1]

Chronic liver disease is frequently complicated by the AKI which makes prognosis even worse.[2] The two most frequent causes of AKI in chronic liver disease patients are - the hepatorenal syndrome type AKI (HRS - AKI), a spectrum of disorders in prerenal chronic liver disease; and acute tubular necrosis (ATN).

Differentiating these two conditions is important because of the difference in treatment strategy. Prerenal AKI, is a more benign disorder, in which there is a good response to plasma volume expansion, whereas ATN requires more specific management and is associated with significant mortality.[3]

Although prerenal azotemia caused by severe hypoalbuminemia seems to be the first phase of AKI, differentiating it from hepatorenal syndrome (HRS) and acute tubular necrosis (ATN) is difficult. Therefore, occurrence of renal dysfunction in chronic liver disease patients require not only earlier recognition but also precise diagnosis with optimal management.[3]

Physiological changes which occur in patients of CLD places these patients at high risk of developing AKI. It is usually as a result of systemic and splanchnic vasodilatation and consecutive reduction in effective circulating volume. Renal perfusion may be critically impaired in cirrhotic patients and patients with portal hypertension.[1]

## MATERIALAND METHODS

The present study is a hospital-based prospective observational study conducted over a period of 22 months from Nov 2019 to Jun 2021 on 100 adult patients of CLD, admitted at J. A. group of hospitals Gwalior(mp).

**Inclusion criteria -**

1. Age more than 18 years.
2. Diagnosed case of chronic liver disease.
3. Patient of acute kidney injury in chronic liver disease.

**Exclusion criteria -**

1. Known case of CKD.
2. Patients of chronic diseases such as active tuberculosis, malignancy, coronary artery disease (CAD) , multiple organ dysfunction syndrome (Mods) , Acute dengue fever, valvular heart disease.

**Collection of data-**

Patients admitted with clinical features of chronic liver disease or cirrhosis were evaluated with S.bilirubin ,AST, ALT, Total protein, Albumin, ALP, Platelet count, S.creatinine, S.Urea, ascitic fluid examination, hepatitis B and C status, prothrombin time and INR value.

Detailed history and physical examination will be performed and data was collected using a standardised proforma. USG abdomen was done to evaluate liver morphology and kidney size. Investigations were collected and documented to make a definite diagnosis of acute kidney

injury and chronic liver disease.

## RESULTS:

**Table 1- sex wise distribution of cases**

| SEX | NUMBER | FREQUENCY |
|---|---|---|
| Males | 70 | 70% |
| females | 30 | 30% |

Above table shows out of 100 patients ,70 cases are male and 30 are female.

**Table 2- Age wise distribution of cases**

| Age group | Number of cases | Frequency |
|---|---|---|
| <30 years | 8 | 8% |
| 30-45 years | 22 | 22% |
| 46-60 years | 63 | 63% |
| >60 years | 7 | 7% |

Above table shows that the majority of patient belong to the age group 46-60 years (63%) and 30-45 years (22%),8% cases belong to <30 years age group; and 7% belong to >60 years age group.

**Table 3- Distribution of cases according to Child Pugh Classes**

| Child-Pugh Class | Number of cases | Percentage (%) |
|---|---|---|
| A | 01 | 01 |
| B | 39 | 39 |
| C | 60 | 60 |

Above table shows that 60% cases belong to Child Pugh Class C; while 39 % cases belong to class B. Only 1% case belong to Child Pugh Class A.

**Table 4- Causes of CLD**

| S. No. | Cause of CLD | No. of cases | Percentage of cases |
|---|---|---|---|
| 1 | Alcohol | 59 | 59 |
| 2 | HBV | 20 | 20 |
| 3 | HCV | 06 | 06 |
| 4 | NASH related | 02 | 02 |
| 5 | Portal vein thrombosis | 05 | 05 |
| 6 | Unknown cause | 07 | 07 |
| 7 | Wilsons disease | 01 | 01 |

Above table shows that overall alcohol is the most common cause of CLD (59%), followed by hepatitis B virus infection (20%), Hepatitis C virus infection (6%), Nash related CLD(2%), portal vein thrombosis(5%), Wilson's disease (1% ) and unknown etiology (7%).

**Table 5- Causes of CLD in Males**

| Cause | No. of cases | Percentage |
|---|---|---|
| Alcohol | 59 | 84.3 |
| HBV related | 06 | 8.6 |
| Portal vein thrombosis | 02 | 2.8 |
| NASH related | 02 | 2.8 |
| Wilsons disease | 01 | 1.4 |

Above table shows that In males, the most common cause of CLD was found to be chronic alcoholism(84.3%), followed by hepatitis B virus infection(8.6%).Portal vein thrombosis and NASH related hepatitis in 2.8% each and Wilson's disease (1.4%)

**Table 6- Cause of CLD in Females**

| Cause | No. of cases | Percentage (%) |
|---|---|---|
| HBV related | 14 | 46.6 |
| HCV related | 06 | 20 |
| Portal vein thrombosis | 03 | 10 |
| Unknown cause | 07 | 23.3 |

Above table shows that In females most common cause of CLD was found to be hepatitis B virus infection (46.6%),followed by hepatitis c virus infection (20%), portal vein thrombosis(10%), unknown etiology (23.3%).

**Table 7- Common signs of hepatic decompensation**

| sign | No. of cases | Percentage (%) |
|---|---|---|
| ascites | 78 | 78 |
| Pedal edema | 67 | 67 |
| jaundice | 52 | 52 |
| Altered sensorium | 20 | 20 |
| GI bleed | 22 | 22 |
| Dilated abdominal veins | 18 | 18 |
| alopecia | 10 | 10 |
| Palmar erythema | 8 | 8 |
| Testicular atrophy | 4 | 4 |

Above table shows that ascites (78%) is the most common sign of hepatic decompensation, followed by pedal edema (67%), jaundice (52%), Altered sensorium(20%), GI bleed ( 22%), dilated abdominal veins(18%), alopecia(10%). Palmar erythema ( 8 %) and testicular atrophy(4%).

**Table 8- Prevalence of AKI in CLD**

| | |
|---|---|
| Cases of CLD with renal dysfunction | 30 |
| Cases of CLD without renal dysfunction | 70 |
| Prevalence | 30% |

Above table shows that out of 100 patients of CLD, 30 % developed AKI.

**Table 9- Causes of renal dysfunction in CLD**

| S. No. | Cause of AKI | No. of cases | Percentage (%) |
|---|---|---|---|
| 1 | Sepsis | 12 | 40 |
| 2 | GI bleed | 8 | 26.7 |
| 3 | Diuretics | 4 | 13.3 |
| 4 | Paracentesis | 2 | 6.6 |
| 5 | Diarrhea | 3 | 10 |
| 6 | Vomiting | 1 | 3.3 |

Above table shows that the most common cause of AKI in CLD is sepsis (40%), followed by GI bleed (26.7%), inappropriate use of diuretics (13. 3%), Paracentesis (6.6%)and diarrhea(10%) severe vomiting ( 3. 3%)

**Table 10- Stage of AKI**

| Stage of AKI | No. of cases | Percentage (%) |
|---|---|---|
| Stage-1 | 8 | 26.6 |
| Stage-2 | 8 | 26.6 |
| Stage-3 | 14 | 46.6 |

Above table shows that maximum no. of patients were in AKIN stage 3(48%), frequency of stage 1 & 2 AKI was 26.6% each.

**Table 11- In hospital mortality in CLD with AKI Vs CLD without AKI**

| Category | No. of cases | Percentage |
|---|---|---|
| Mortality in CLD with AKI | 17/30 | 56.6% |
| Mortality in CLD without AKI | 6/70 | 8.5% |
| Fisher exact test statistical value is <0.00001, with significant at p <0.05 | | |

Above table shows that the in hospital mortality in the patients who developed AKI is considerably higher (56.6%) than the patients who did not developed AKI (8.5%), significant at p <0.05.

## DISCUSSION

The present study is conducted in Department of General Medicine, Gajra Raja Medical College & J.A. group of hospitals, Gwalior (M.P) with an aim to study the clinical profile of acute kidney injury in chronic liver disease patients. In our study 100 patients with CLD are included as per inclusion and exclusion criteria, and observations are compared with similar studies.

In present study, Total no: of patient is 100, out of which 70 are males and 30 are females. Age of the patients are between 18 to 85. Male to female ratio is 7:3 and mean age is 48.1 years.

In a similar study done by Purohit A. et[2] al at Shri Aurobindo institute of medical sciences Indore, out of 100 patients 87 were males and 13 were females, with male to female ratio 6.6 : 1. In a similar study done by Das N. et al[4] at Calcutta National Medical College & Hospital, Kolkata, it was found that most of the patients were in their forties and the mean age was 43.58 years and majority of patients were males. In various other studies, males were predominantly involved than females, like Andrew S et al[5], in which median (quartile 1, quartile 3) age of entire cohort was 58(50, 65) years. The majority of participants were males (71%), white race (93%) and non-Hispanic ethnicity (87%).

Majority of the patients presented late in the hospital. In our study out of 100 cases, 60% cases belonged to Child Pugh Class C; while 39 %

cases belonged to class B. Only 1% case belong to Child Pugh Class A. This result is similar to that of Purohit A et al[2] in which majority of the cases were presented with Child Class C. (Child Class C 56%, Child class B 34% and Child class A 10%).

In our study, out of 30 cases of CLD, who developed AKI; the most common cause of AKI was found to be sepsis (40%), which was followed by GI bleed (26.7%) and inappropriate use of diuretics (13. 3%). Paracentesis and diarrhea was responsible for 6.6% and 10% of cases respectively; while severe vomiting was the cause of AKI in 3. 3% of cases.

In the present study, the most common cause of CLD in males was found to be chronic alcoholism (84.3%), which was followed by hepatitis B virus infection (8.6%). Portal vein thrombosis and NASH related hepatitis were the cause of CLD in 2. 8% of patients each, while Wilson's disease was the cause of CLD in 1.4% of patient. The most common cause of CLD in females was found to be hepatitis B virus infection (46.6%), which was followed by hepatitis c virus infection (20%). Portal vein thrombosis was responsible for 10% of CLD cases, while in 23.3% of cases the etiology of CLD could not be identified.

The results were similar to that of Purohit A et al[2], in which alcoholic cirrhosis was the most common etiology of cirrhosis that is 77% followed by hepatitis B (10%) then hepatitis C (3%) then NASH (2%) and then Wilson s disease (1%). Similarly, Jaiprakash et al[6] found the Most common etiology of cirrhosis was chronic alcoholism (29.8%) followed by cryptogenic (25.3%) and chronic hepatitis B (24.1%). Other less common causes included chronic hepatitis C (7.3%), primary biliary cirrhosis, non-alcoholic fatty liver disease, and autoimmune hepatitis, combined effects of alcoholism and hepatitis B, and Wilson s disease, in decreasing order of frequency. Jaiganesh et al[7] found that, the most common etiology of cirrhosis was alcohol 85% (85/100), followed by Hepatitis B (11% (11/100)) and C virus 4% (4/100)).

Other studies done on cirrhosis patients also found that alcohol was the most common cause of cirrhosis. In Brij Sharma et al[8], alcohol was the cause of CLD in 62.9%cases, followed by HBV infection (10.1%) and NASH found in <10% cases. In a study done by Apurva Shah et al[9], found alcohol in 48%, NASH in 26% HBV in 10% HCV in 6% and 7% have others causes of CLD.

In the present study ascites was the most common sign of hepatic decompensation (78%), which was followed by pedal edema (67%). Jaundice was present in 52% of patients. Altered sensorium and GI bleed were present in 20% and 22 % of patients respectively. 18% patients presented with dilated abdominal veins, while 10 % of patients presented with alopecia. Palmar erythema was present in only 8 % of patients while 4 % of patients presented with testicular atrophy.

In the study done by Purohit A. et al[2], it was found that the most common sign of hepatic decompensation was jaundice 78% followed by ascites 70%, hepatic encephalopathy 37% and upper GI bleed 30%. In a similar study done by Banait S. et al[10], it was found that the most common sign of decompensation was pedal edema (93.5%), followed by GI bleed (63.5%). Other signs were icterus (62%), parotid swelling (43.5%), dilated veins (37%), alopecia (29.5%), flapping tremor (28.5%), altered sensorium (26%), palmar erythema (17.5%), spider nevi (13.5%) and testicular atrophy (13%).

In the present study, out of 100 patients of CLD, 30 % developed AKI.

In a similar study done by Gines P. et al[11], in the Centre for Hepatology, Royal Free and University College Medical School, London, found that the incidence of AKI in hospitalized patients with chronic liver disease is around 20%. In a similar study done by Guadalupe Garcia-Tsao et al[12], in Yale University School of Medicine, New Haven, CT, USA found that AKI occurs in approximately 20% of hospitalized patients with cirrhosis. In the study done by Prakash J. et al[13], it was found that the incidence of AKI in chronic liver disease is 24.5%.

In the present study, out of 30 cases of CLD, who developed AKI; the most common cause of AKI was found to be sepsis (40%), which was followed by GI bleed (26.7%) and inappropriate use of diuretics (13. 3%). Paracentesis and diarrhea were responsible for 6.6% and 10% of cases respectively; while severe vomiting was the cause of AKI in 3. 3% of cases.

These results are almost similar to that of Purohit A. et al[2], in which the most common precipitating factor was sepsis (33%), followed by spontaneous bacterial peritonitis (18%), UGI bleed 10%, diuretics 9%, UTI 8%, paracentesis, diarrhea, vomiting, bacteremia, pneumonia 4% each, and aminoglycosides 1%. There are many studies in which sepsis is one of the commonest cause of AKI in cirrhosis patients while rest of the other cause are in different orders.

Similar finding were also observed by Prakash J. et al[13]; in his study sepsis was the most common cause of AKI. Similar observations were made by Watt K. et al[14], who reported bacterial infection as the most common precipitating factor (48%) for development of AKI in cirrhosis followed by gas-trointestinal bleeding (33%).

In the present study, out of 30 cases of CLD who developed AKI; 46.6%of patients presented with stage 3 AKI, while 26.6% of patients presented with stage 1 and stage 2 AKI each.

This is in agreement with the findings of the study of Purohit A. et al[2], in which the maximum no. of patients was found in AKI stage III 40% followed by stage I 36% then stage II 24%. In a similar study done by Belcher JM et al[15], 49% of patients of cirrhosis had AKIN stage 3 AKI, frequencies of stage 1 and stage 2 AKI were 26 %and 24% respectively.

In our study, the in hospital mortality in the patients who developed AKI was considerably higher (56.6%) than the patients who did not developed AKI (8.5%), significant at $p < 0.05$.

This was in agreement with the findings of Jenq CC et al[16] study, in which out of 134 patients with cirrhosis admitted to the ICU, they found a mortality of 32.1% in those without AKI, 68.8% for RIFLE-R, 71.4% for RIFLE-I, and 94.8% for RIFLE-F. In a similar study, Cholongitas et al[17] followed a large cohort of 412 cirrhosis patients admitted to the ICU, evaluating the impact of AKI on mortality during ICU stay or within 6 weeks of unit discharge. The authors noted a similar stage-dependent association between AKI and mortality, with rates increasing from 42.5% in those without AKI to 71% for RIFLE-R and 88% for RIFLE-I/F. In a similar study done by Belcher JM et al[15], they found that the overall mortality in cirrhosis complicated with AKI was 26%, however a pronounced stage-dependent response was seen, with mortality for peak AKIN stages 1, 2, and 3 of 2%, 15%, and 44%, respectively.

## CONCLUSION -

Chronic liver disease patients are at increased risk of developing renal dysfunction and it adversely affects their outcome.

Chronic alcoholism and chronic hepatitis B and c virus infections are among the most common causes of chronic liver disease. Ascites, pedal edema and icterus are the most common signs of hepatic decompensation in chronic liver disease patients. Sepsis is the most common precipitating factor for developing AKI in chronic liver disease patients.

Mortality rates are significantly higher in patients of chronic liver disease complicated by renal dysfunction.

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