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Original Research Article

Clinical Profile, Disease Severity, and Predictors of In-Hospital Mortality in Patients with Liver Cirrhosis: A Hospital-Based Observational Study

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Abstract:

Background: Cirrhosis of the liver is a chronic, progressive liver disorder which leads to liver failure, portal hypertension, various complications, and significant mortality risk in hospital. Timely, accurate, and prompt diagnosis of stage and risk factors is crucial for enhancing inpatient treatment and prognosis.

Aim: To assess clinical profile, severity of disease, major complications and predictor of mortality in hospital liver cirrhosis patients in tertiary care hospital.

Methodology: The research took place at the Gastroenterology Department of Patna Medical College and Hospital in Patna, Bihar, India, and used an observational method for a length of one year. The study comprised 150 adult patients who had been diagnosed with liver cirrhosis. We utilised IBM SPSS Statistics 27.0 to analyse demographic, clinical, laboratory, disease severity, complication, therapy, and hospital outcome data that was collected using a standardised proforma. Disease severity was evaluated using the Child-Pugh classification and, when relevant, the MELD-based assessment. The factors related with in-hospital mortality were evaluated using statistical analysis of the in-hospital mortality rate.

Results: Most of the patients were male (74.7%) and age group 51-60 years young (28.0%). The most common aetiology was alcohol-associated liver disease (32.0%) followed by chronic viral hepatitis (24.0%) and metabolic dysfunction-associated liver disease (18.7%). The most common clinical features were ascites (64.0%), jaundice (54.7%) and peripheral oedema (45.3%). The majority of patients were Child–Pugh class B (41.3%) or C (37.3%). Thirty-four percent of patients had hepatic encephalopathy, 30 percent had gastrointestinal bleeding and 24 percent had renal dysfunction. Overall, 24 patients (16.0%) died while in hospital. Patients with Child–Pugh class C disease had higher mortality rates (32.1%), also hepatic encephalopathy (26.9%), gastrointestinal bleeding (26.1%), renal dysfunction (33.3%), infection/sepsis (32.5%) and multiple complications (28.1%).

Conclusion: Liver cirrhosis was associated with a high rate of hospitalisation and morbidity. Advanced Child-Pugh class, hepatic encephalopathy, gastrointestinal haemorrhage, renal failure, infection problems, and numerous complications were associated with a higher risk of in-hospital mortality. Prompt management of decompensating complications, as well as early severity assessment, could aid in the bettering of short-term results.

Keywords: Liver cirrhosis, clinical profile, disease severity, hepatic encephalopathy, complications, in-hospital mortality, Child–Pugh classification, hospital-based study.

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Introduction

Cirrhosis of the liver, the last stage of chronic liver disease brought on by continuous liver injury and fibrosis, is a major contributor to mortality and morbidity [1]. High intrahepatic vascular resistance, reduced liver function, nodular regeneration, and severe architectural deformation of the liver are the hallmarks of this condition. Cirrhosis can develop from a variety of chronic liver diseases, including those caused by alcohol, infections, metabolic dysfunction, autoimmune disorders, cholestatic liver disease, and chronic viral hepatitis. The disease can be clinically compensated for a long time but once it goes into decompensation there is significant morbidity, with frequent hospitalizations, and a high likelihood of mortality [2]. Cirrhosis has therefore become an important public health and clinical problem, as chronic liver disease is increasingly a problem, with increased numbers of patients presenting with advanced disease and multiple complications in tertiary-care hospitals.

The clinical presentation of liver cirrhosis can vary greatly depending on factors such as the origin of the liver disease, the length of time the liver was injured,

the degree to which the liver is dysfunctional, and whether or not portal hypertension and other complications are present [3]. Compensated disease can either be relatively asymptomatic or manifest as general symptoms like that of fatigue, weakness, anorexia and weight loss. As hepatic function worsens, the patient may experience ascites, peripheral oedema, gastrointestinal bleeding, splenomegaly and hepatic encephalopathy. The important manifestations of decompensated cirrhosis are ascites and gastrointestinal bleeding, and hepatic encephalopathy may lead to changes in behaviour, consciousness and dramatic functional changes.

Laboratory tests are important in the work-up of patients with cirrhosis and can be used to obtain data on hepatic synthetic function, hepatocellular damage, haematological abnormalities, renal function and metabolic abnormalities [4]. These parameters are typically measured: serum bilirubin, albumin, aminotransferases, alkaline phosphatase, prothrombin INR, platelet counts, serum creatinine and serum sodium. Thrombocytopenia can be a sign of portal hypertension and hypersplenism, while increased bilirubin, decreased albumin and increased INR are signs of liver synthetic and excretory dysfunction. In more advanced cirrhosis, renal dysfunction and hyponatraemia are significant as they can be indicators of more severe circulatory and systemic dysfunction and are linked to poor prognosis. These parameters, along with clinical information, are used together to provide a more complete picture of disease severity than any one of them individually.

There are a number of clinical scoring systems that quantify the severity and prognosis of liver cirrhosis. The Child–Pugh classification system is still the most commonly used to classify hepatic dysfunction according to clinical and biochemical parameters, and the MELD and its later variants, also include laboratory parameters to help to assess the risk of short-term mortality [5]. These systems help to determine the severity of the patient's condition, which can help guide treatment choices and treatment plans, and determine the extent of monitoring and advanced liver care that is necessary. But the degree of hepatic dysfunction is not the only factor that affects prognosis in cirrhosis, other factors include acute complications and extrahepatic involvement of organs. Therefore, the severity of the disease should be assessed taking into account baseline liver function as well as the presence of acute decompensating events during hospitalisation.

The prognosis of decompensated cirrhosis is very poor as the complications can arise at the same time and can be interdependent [6]. Spontaneous bacterial peritonitis can complicate ascites and gastrointestinal bleeding can lead to hepatic encephalopathy, renal dysfunction and haemodynamic instability. Likewise, infection or sepsis may cause a very rapid decline in hepatic and renal function. Impaired renal function in patients with cirrhosis is particularly relevant because of the strong association with hospital mortality and is an important determinant of Hepatorenal dysfunction. The presence of multiple complications is therefore a significant marker of clinical instability, and can help to distinguish patients who may need intensive monitoring and early intervention.

A number of demographic, clinical, biochemical and disease related parameters have been associated with in-hospital mortality in cirrhosis patients [7]. Adverse outcome has been reported for advanced age, severe hepatic dysfunction, hepatic encephalopathy, gastrointestinal bleeding, infection, renal impairment, hyponatraemia and multiple concurrent complications. These factors have clinical significance because they may have very different risks of deterioration in a patient with cirrhosis admitted for similar underlying diagnosis. Early identification of high-risk patients can help to facilitate more vigilant monitoring, prompt management of precipitating factors, supportive management, and appropriate referral for specialised hepatology services if needed.

The management of liver cirrhosis requires a comprehensive approach directed towards the underlying cause, prevention and treatment of complications, maintenance of nutritional and metabolic status, and management of acute decompensation [8]. These may involve diuretics and therapeutic paracenteesis for ascites, antimicrobial therapy for possible or suspected infection, vasoconstrictor agents and endoscopic therapy involving variceal bleeding, lactulose-based therapy for hepatic encephalopathy, and appropriate management of renal dysfunction and electrolyte abnormalities. The results of hospitalization, however, depend significantly on the severity of liver disease at admission, type and number of complications, existence of organ dysfunction and the timeliness of appropriate interventions.

Tertiary care centers often admit patients with complicated and undiagnosed cirrhosis, including those who do not have a diagnosis and have acute complications that necessitate immediate medical care. Assessment of these patients in the hospital setting can yield important information on the demographic, aetiological pattern, clinical manifestations, laboratory abnormalities, severity of disease, complications, and short-term outcomes of cirrhosis [9]. This can help to identify clinical features associated with in-hospital mortality and local burden of severe liver disease. Analysis of these patterns may also enable clinicians to pick up early signs of deterioration in patients at high risk, and better prioritise monitoring and treatment.

Hence, the present study was undertaken with a view of a systematic assessment of the clinical profile, severity, complications and in-hospital outcomes of liver cirrhotics. The study also aimed to explore

some of the key clinical and disease-related factors that were associated with in-hospital mortality [10]. This study sought to identify all potential factors associated with poor prognosis in the hospital setting among patients with cirrhosis from a variety of perspectives: demographic parameters, clinical presentation, laboratory parameters, severity of cirrhosis as assessed by the Child–Pugh and MELD scores, major complications and hospital outcomes. The results could help identify high-risk patients earlier, guide clinical treatment more effectively and help to optimize clinical management and outcomes in the short-term for patients with severe liver disease.

Methodology

Study Design: The clinical characteristics, disease severity, complications, and risk factors linked to in-hospital mortality of patients with liver cirrhosis were evaluated in an observational study conducted in a hospital setting. The study aimed to systematically evaluate the demographic variables, clinical features, laboratory parameters, severity of cirrhosis, complications and hospital outcomes of the patients admitted with liver cirrhosis during the study period.

Study Area: The study was carried out in Gastroenterology department, Patna Medical College and Hospital, Patna, Bihar, India. The department catered to patients with chronic liver disease, liver cirrhosis, portal hypertension, ascites, gastrointestinal bleeding, hepatic encephalopathy etc. with special diagnostic and therapeutic facilities.

Study Duration: The study was conducted over a period of one year from January 2025 to December 2025.

Study Participants: Adults admitted to the gastrointestinal department during the study period and diagnosed with liver cirrhosis were the subjects of the study. The necessary data were collected from clinical assessment and available medical records: demographic data, type of symptoms, clinical findings, aetiology, laboratory tests performed, complications, severity of the disease, treatment provided, and in-hospital outcome.

Inclusion Criteria

- Patients with liver cirrhosis during study period.
- Patients admitted to the Department of Gastroenterology, in the study centre.
- Patients aged 18 years and above.
- Liver cirrhosis patients who have clinical, biochemical, radiological, endoscopic and/or other relevant evidence.
- Patients with adequate clinical and laboratory information required for assessment of disease severity and hospital outcome.

Exclusion Criteria

- Patients where the diagnosis of liver cirrhosis was not confirmed.
- Patients who have only partial or incomplete clinical and/or laboratory data.
- Patients who were admitted for another acute medical problem whose principal diagnosis was not the cirrhosis and for whom there was insufficient information about the underlying cirrhosis.
- Patients with isolated acute liver injury with no evidence of chronic liver cirrhosis.
- Patients with incomplete medical records in their files regarding relevant clinical parameters, disease severity, and in-hospital outcome.

Sample Size: The study comprised a total of 150 patients who met the predetermined inclusion and exclusion criteria. Participants were eligible if they were admitted to the gastrointestinal department during the study period and diagnosed with liver cirrhosis.

Procedure: Data were collected using a structured data collection proforma. Demographic features, clinical presentation, the underlying aetiology, relevant comorbidities and previous episodes of hepatic decompensation were documented. The clinical findings were ascites, jaundice, gastrointestinal bleeding, hepatic encephalopathy, abdominal distension, peripheral oedema, fever and altered sensorium. The following laboratory parameters were obtained to evaluate the severity of the disease and hepatic and renal function: haemoglobin, platelet count, serum bilirubin, serum albumin, liver enzymes, INR, serum creatinine, serum sodium, and blood urea. Disease severity was determined by Child–Pugh classification and/or MELD-based classification if applicable. Treatment information and hospital course data were collected and in-hospital mortality was regarded as the main outcome. The relationship between clinical characteristics, disease severity, complications and hospital outcome was evaluated, and the data collected were systematically entered for statistical analysis.

Statistical Analysis: Using IBM SPSS Statistics version 27.0, the data was entered, coded, and tabulated for analysis. The means, standard deviations, medians, and interquartile ranges of the continuous variables and the frequencies and percentages of the categorical variables were used for presentation. The data kind and distribution dictated the statistical tests applied. To assess correlations between category variables, we employed either Fisher's exact test or the Chi-square test, as fitted. For proper comparison of continuous variables according to distribution, independent-samples tests were employed. To determine what factors contributed to the in-hospital mortality, suitable regression analysis was carried out. The multivariable analysis included factors that had associations in the original analysis that were either

clinically meaningful or statistically significant, if applicable. The significance level was set at a p-value of less than 0.05.

Results

Table 1 displays the demographic distribution of the individuals who participated in the study. The study included 150 individuals who had liver cirrhosis in total. The age group with the highest representation was 51-60 years old (42 patients, 28.0%) followed by 41-50 years old (38 patients, 25.3%). Patients aged 61–70 years accounted for 32 patients (21.3%), while 22 patients (14.7%) were aged >70 years and 16 patients (10.7%) were aged <40 years. The study group consisted mainly of male patients (112, 74.7%), and female patients (38, 25.3%). The overall population in the study was middle aged and older adults and the population was highly skewed towards males.

Table 1: Participants in the study were distributed based on their demographics (n=150)

Variable	Category	(n)	(%)
Age (years)	<40	16	10.7
	41–50	38	25.3
	51–60	42	28.0
	61–70	32	21.3
	>70	22	14.7
Sex	M	112	74.7
	F	38	25.3
Total		**150**	**100**

The distribution of patients based on their clinical presentation and major complications is shown in Table 2. The common clinical findings were ascites (96 patients, 64.0%), jaundice (82 patients, 54.7%) and peripheral oedema (68 patients, 45.3%). Fifty-two patients (34.7%) had hepatic encephalopathy and 46 patients (30.7%) had gastrointestinal bleeding. In 40 patients (26.7%) fever or clinical evidence of infection was observed and in 38 patients (25.3%) abdominal pain was reported. Twenty-eight patients (18.7%) had spontaneous bacterial peritonitis and 36 patients (24.0%) had renal dysfunction. In general, ascites, jaundice and peripheral oedema were the most frequent symptoms, reflecting a high prevalence of decompensated liver disease in the population studied.

Table 2: Distribution of patients according to clinical presentation and major complications (n=150)

Clinical characteristic	Frequency (n)	Percentage (%)
Ascites	96	64.0
Jaundice	82	54.7
Peripheral oedema	68	45.3
Hepatic encephalopathy	52	34.7
Gastrointestinal bleeding	46	30.7
Fever/infection	40	26.7
Abdominal pain	38	25.3
Renal dysfunction	36	24.0
Spontaneous bacterial peritonitis	28	18.7
Abdominal distension	76	50.7
Altered sensorium	44	29.3

The data in Table 3 show the distribution of patients by aetiology of liver cirrhosis. Alcohol-associated liver disease was the most common aetiology identified (48 patients, 32.0%) followed by chronic viral hepatitis (36 patients, 24.0%). MALD was seen with 28 patients (18.7%), autoimmune liver disease in 10 patients (6.7%), and cholestatic liver disease in 8 patients (5.3%). For 13.3% (20) of patients no definite cause was able to be determined and was grouped under cryptogenic/undetermined. In summary, the largest proportion of cirrhosis cases in the study group were due to alcohol-associated liver disease and chronic viral hepatitis.

Table 3: Patient distribution based on liver cirrhosis aetiology (n=150)		
Aetiology	**Frequency (n)**	**Percentage (%)**
Alcohol-associated liver disease	48	32.0
Chronic viral hepatitis	36	24.0
Metabolic dysfunction-associated liver disease	28	18.7
Autoimmune liver disease	10	6.7
Cholestatic liver disease	8	5.3
Cryptogenic/undetermined	20	13.3
Total	**150**	**100**

According to the Child-Pugh illness severity categorisation, Table 4 shows the distribution of patients. Classification by Child-Pugh was as follows: 32 patients (21.3%) were placed in class A, 62 in class B, and 56 in class C. Therefore, a large number of patients had moderate to advanced hepatic impairment, since most of them were in Child-Pugh classifications B or C. Evidence of advanced cirrhosis in a large proportion of patients necessitated meticulous clinical evaluation and treatment.

Table 4: Distribution of patients according to Child–Pugh disease severity (n=150)			
Child–Pugh class	**Disease severity**	**Frequency (n)**	**Percentage (%)**
Class A	Less severe/compensated	32	21.3
Class B	Moderate severity	62	41.3
Class C	Advanced/severe disease	56	37.3
Total		**150**	**100**

The distribution of selected laboratory abnormalities and disease severity parameters in the study population is given in Table 5. Hypoalbuminaemia was seen in 88 patients (58.7%) and elevated serum bilirubin was seen in 92 patients (61.3%). Long-term INR had been noted in 78 patients (52.0%) while 84 patients (56.0%) had thrombocytopenia recorded. Of the 36 patients (24.0%) with renal dysfunction, based on clinically significant elevation of serum creatinine, 42 (28.0%) suffered from hyponatraemia.

Table 5: Patient distribution based on specific laboratory abnormalities (n=150)			
Laboratory parameter	**Category**	**Frequency (n)**	**Percentage (%)**
Serum bilirubin	Elevated	92	61.3
Serum albumin	Reduced	88	58.7
INR	Prolonged	78	52.0
Platelet count	Reduced	84	56.0
Serum creatinine	Elevated/renal dysfunction	36	24.0
Serum sodium	Hyponatraemia	42	28.0
Total leukocyte count	Elevated	44	29.3

Table 6 presents the comparison of selected clinical characteristics and disease severity according to in-hospital outcome. Of the 150 patients, 126 (84.0%) survived to be discharged from hospital and 24 (16.0%) died in hospital. Mortality was higher in patients with severe Child–Pugh disease, hepatic encephalopathy, gastrointestinal bleeding, renal dysfunction, infection and presence of multiple complications. Among patients with Child–Pugh class C disease, 18 of 56 patients (32.1%) died compared with 5 of 62 patients (8.1%) in class B and 1 of 32 patients (3.1%) in class A. Similarly, mortality was observed in 14 of 52 patients (26.9%) with hepatic encephalopathy compared with 10 of 98 patients (10.2%) without encephalopathy. There was also a high mortality rate among patients with renal dysfunction, with 12 of 36 (33.3%) of these patients dying while in hospital. The results of this study show that in-hospital outcomes are worse in the presence of advanced hepatic dysfunction and large decompensating complications.

Table 6: Comparing clinical traits based on in-hospital results (n=150)			
Variable	**Category**	**Discharged alive n (%)**	**Died n (%)**
Child–Pugh class	A	31 (96.9)	1 (3.1)
	B	57 (91.9)	5 (8.1)
	C	38 (67.9)	18 (32.1)
Hepatic encephalopathy	Present	38 (73.1)	14 (26.9)
	Absent	88 (89.8)	10 (10.2)
Gastrointestinal bleeding	Present	34 (73.9)	12 (26.1)
	Absent	92 (88.5)	12 (11.5)
Renal dysfunction	Present	24 (66.7)	12 (33.3)
	Absent	102 (89.5)	12 (10.5)
Infection/sepsis	Present	27 (67.5)	13 (32.5)
	Absent	99 (90.0)	11 (10.0)
Overall outcome	Discharged alive	**126 (84.0)**	—
	Death	—	**24 (16.0)**

Table 7 shows the distribution of potential predictors of in-hospital mortality. Advanced Child-Pugh class, hepatic encephalopathy, gastrointestinal bleeding, renal dysfunction, infection, and other comorbidities were significant clinical variables linked to mortality. Those with signs of extrahepatic organ dysfunction and more advanced disease had a greater in-hospital death rate. These results revealed that the short-term prognosis was influenced by the degree of hepatic dysfunction and the existence of significant decompensating comorbidities.

Table 7: Distribution of major factors associated with in-hospital mortality (n=150)			
Potential predictor	**Category**	**Frequency (n)**	**Mortality n (%)**
Child–Pugh class	A	32	1 (3.1)
	B	62	5 (8.1)
	C	56	18 (32.1)
Hepatic encephalopathy	Present	52	14 (26.9)
	Absent	98	10 (10.2)
Gastrointestinal bleeding	Present	46	12 (26.1)
	Absent	104	12 (11.5)
Renal dysfunction	Present	36	12 (33.3)
	Absent	114	12 (10.5)
Infection/sepsis	Present	40	13 (32.5)
	Absent	110	11 (10.0)
Multiple complications	≥2 complications	64	18 (28.1)
	<2 complications	86	6 (7.0)

Discussion

The present study aimed at assessing clinical profile, severity of liver cirrhosis, major complications and factors associated with in-hospital mortality in 150 hospitalised patients [11] (Sethi et al., 2022). This study population was mainly comprised of male patients and the majority were aged between 40 to 60 years. This tendency could be explained by the significant proportion of chronic liver disease related to alcohol abuse and other chronic liver diseases among adult men. The high proportion of male patients also emphasizes the need to know the demographic and aetiological pattern for the planning of preventive and clinical strategies for cirrhosis [12] (De Matteis et al., 2022).

Chronic viral hepatitis, alcohol-related liver disease, and liver disease linked to metabolic dysfunction were the most often found causes [13] (De Matteis et al., 2022). This distribution implies that new causes of cirrhosis burden may play a part in addition to established ones. The fact that a sizable portion of patients also have liver disease linked to metabolic dysfunction further illustrates how chronic liver disease is changing. The significance of thoroughly investigating the cause of liver disease in individuals with advanced liver disease is further highlighted by patients with cryptogenic or unclear aetiology [14] (Baruah et al., 2022).

The most common clinical findings were ascites, jaundice, peripheral oedema, and abdominal distention [15] (Wani et al., 2020). The results suggest a significant number of patients admitted with cirrhosis had decompensated cirrhosis at the time of admission. The disease burden of serious complications was also evident, as some patients developed hepatic encephalopathy and gastrointestinal bleeding. These complications can present as a combination which can quickly lead to significant clinical

deterioration and often may require multi-disciplinary management and careful inpatient observation.

The degree of the disease was assessed by disease severity and most of the patients were C and B child–Pugh disease group, with a lesser number of patients in A disease group. Overall, the majority of patients presented with moderate and severe cirrhosis likely advanced through the disease to tertiary care [16] (Bhattacharya et al., 2020). The laboratory values of bilirubin, albumin, INR, platelet count, and other values corroborated with the presence of significant hepatic and systemic dysfunction. Less common, but clinically important, were renal dysfunction and hyponatraemia, which frequently are present with advanced cirrhosis and may be a poor prognostic sign [17] (De Matteis et al., 2022).

Potential predictors evaluated and those which had the most important associations with mortality were renal dysfunction, infection, advanced Child–Pugh class, hepatic encephalopathy, and multiple complications [18] (Mishra et al., 2022). Patients with renal dysfunction had a proportion of 33.3% with mortality, and 32.5% with infection/sepsis. Patients with 2 or more major complications also showed significantly higher mortality rates than patients with less complication. These observations underscore the need to recognise and promptly treat factors that can be reversed during the hospitalisation [19] (Tripathi et al., 2020).

Overall, the results indicate that patients with liver cirrhosis admitted to a tertiary care gastroenterology service often have advanced disease and clinically significant complications. Some important markers for worse short-term prognosis were child–Pugh class, hepatic encephalopathy, gastrointestinal bleeding, renal dysfunction, infection and multiple complications [20] (Pratap et al., 2021). Therefore, early severity assessment, early recognition of decompensation, prevention and treatment of infection and bleeding, careful monitoring of renal function and timely escalation of care may help improve the outcome. The value of recognising high risk patients at admission in order to begin monitoring and therapeutic interventions promptly is also demonstrated in the study.

Conclusion

This observational study in the hospital setting at Patna Medical College and Hospital showed that liver cirrhosis was the most common and was predominantly seen in middle age and elderly population and also was more common in males. The most common causes found were chronic viral hepatitis, alcohol-related liver disease, and liver disease linked to metabolic dysfunction. Ascites, jaundice, and peripheral oedema were the most prevalent clinical characteristics; hepatic encephalopathy, gastrointestinal bleeding, infection, and renal failure were all present in a considerable proportion of patients. Child-Pugh classifications B and C, which indicate a significant degree of moderate to severe liver dysfunction, accounted for the majority of patients. Patients with Child-Pugh class C disease, hepatic encephalopathy, gastrointestinal haemorrhage, renal failure, infection, and many complications had higher in-hospital mortality rates (16.0%). The results emphasize the need for early assessment of the severity of the disease, early recognition of decompensating complications, careful monitoring of renal function and infection and timely management of high-risk patients for better short term outcomes of hospitalised patients with liver cirrhosis.

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