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RESEARCH ARTICLE

Short term Outcomes of Patients with Decompensated Cirrhosis on Follow up at Tikur Anbessa Specialized Hospital: a 1-Year Retrospective Cohort Study

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Abstract

Background: Cirrhosis is the leading cause of liver-related mortality worldwide, with the highest age-standardized death rates found in low-income countries, particularly in Sub-Saharan Africa. In Ethiopia, studies evaluating the short-term outcomes of patients with chronic liver diseases, especially decompensated cirrhosis, are limited.

Objectives: This study aimed to assess the short-term outcomes of patients with decompensated cirrhosis at Tikur Anbessa Specialized Hospital and to identify the prevalence and factors associated with poor outcomes among these patients.

Methods: A retrospective cohort study was conducted over one year, including data from medical records of 110 patients with decompensated cirrhosis admitted to the emergency department, intensive care unit, medical wards, or seen as outpatients at the Gastroenterology clinic from March 2020 to March 2021. Participants were selected consecutively using a convenience sampling technique. Chi-square statistics and binary logistic regression were employed to examine associations between categorical variables, while the Cox proportional hazard model assessed the probability of poor outcomes. Statistical significance was set at $P < 0.05$.

Results: Among the 110 participants, 82 (74.5%) were male, with a mean age of 40.35 (± 13.5) years. The median duration of known chronic liver disease was 20.5 months (IQR 33). Chronic hepatitis B infection was the most common etiology of cirrhosis (46.36%), followed by alcohol-related cirrhosis (24.55%) and cryptogenic cirrhosis (20.9%). The prevalence of poor outcomes—defined as readmission, variceal bleeding, hepatic encephalopathy, spontaneous bacterial peritonitis, and/or death—was 16.3%, 14.4%, and 22% at 1, 3, and 6 months, respectively. Sixty-one hospital admissions were documented, with 49 (44.5%) participants admitted at the index visit. Upper GI bleeding, hepatic encephalopathy, and hepatocellular carcinoma were the leading causes of hospitalization. During the study, 16 (14.54%) participants died in the hospital. Chronic HBV infection significantly contributed to poor outcomes [AOR=4.4; 95% CI: 1.15-16.93]. Age over 40 years was associated with upper GI bleeding [AOR=2.8; 95% CI: 0.76-5.44], but not with other complications of portal hypertension.

Conclusion: Chronic HBV infection was the predominant etiology of cirrhosis and a strong predictor of poor outcomes. Age over 40 was significantly linked to upper GI bleeding, while hepatic encephalopathy and upper GI bleeding predicted hospitalization. Enhancing access to HBV vaccines and treatments could improve overall prognosis. A national multicenter study is recommended to further investigate the outcomes of cirrhosis patients, focusing on specific causes and treatments to identify predictors of poor outcomes.

Keywords: Chronic liver disease, Decompensated cirrhosis

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1 Introduction

1.1 Background

Chronic hepatitis encompasses a range of liver disorders with various causes and severities, characterized by ongoing hepatic inflammation and necrosis for at least six months, ultimately leading to fibrosis of the liver parenchyma [1]. Cirrhosis represents the final pathway for all chronic liver diseases (CLD), regardless of etiology, and is a pathological condition marked by late-stage progressive hepatic fibrosis, resulting in the replacement of normal liver architecture with regenerative nodules [1,2]. The most common causes of cirrhosis-related morbidity and mortality worldwide include chronic hepatitis B virus (HBV), hepatitis C virus (HCV), alcohol-related liver disease, and non-alcoholic steatohepatitis (NASH) [3].

The clinical features of cirrhosis arise from pathological changes and reflect the severity of liver disease [1]. In the early stages, patients may maintain synthetic and excretory functions of the liver, often remaining asymptomatic. This stage is termed 'compensated' cirrhosis, during which patients can experience median survival times exceeding 12 years [4,5]. However, as hepatic architecture progressively distorts, patients develop complications related to portal hypertension and/or liver dysfunction, leading to decompensated cirrhosis [1,2,5]. Decompensated cirrhosis is defined by the presence (or history) of ascites, variceal bleeding, encephalopathy, and/or jaundice [4,6,7].

Variable pathophysiological mechanisms, including increased portal venous pressure, bacterial translocation, inflammation, and hyperdynamic circulation, are believed to contribute to decompensation in patients with cirrhosis [8].

The transition from compensated to decompensated cirrhosis is associated with a decline in quality of life and a significant reduction in survival rates, approximately two years [4,5,9]. Common causes of death in patients with cirrhosis include liver failure, bleeding, hepatocellular carcinoma (HCC), infections, hepatorenal syndrome, and acute-on-chronic liver failure (ACLF) [4].

According to the Global Burden of Disease (GBD) Study, in 2017, there were 10.6 million prevalent cases of decompensated cirrhosis and 112 million prevalent cases of compensated cirrhosis globally. That year, cirrhosis caused over 1.32 million deaths, accounting for 2.4% of total deaths worldwide. Sub-Saharan Africa reported the highest age-standardized death rate among GBD super-regions, with 32.2 (25.8–38.6) deaths per 100,000 population in 2017 [3].

While liver biopsy remains the gold standard for diagnosing cirrhosis, various clinical, laboratory, and imaging findings can aid in diagnosing and prognostic stratification across different etiologies [2,5,10]. These include physical examination signs such as jaundice, ascites, splenomegaly, hepatic encephalopathy, dilated abdominal veins, spider angiomata, and gynecomastia; laboratory findings like thrombocytopenia, elevated bilirubin, decreased serum albumin, deranged coagulation parameters, and altered creatinine levels; and imaging evidence of liver fibrosis or complications related to portal hypertension, assessed through ultrasound, transient elastography, or magnetic resonance elastography [1,2,11,12].

Among the various clinical and laboratory parameters influencing prognosis in cirrhosis, the presence of ascites, hepatic encephalopathy, and coagulation abnormalities, along with derangements in serum albumin, bilirubin, creatinine, and sodium levels, significantly increase the risk of mortality [2,4,5,13]. These parameters are incorporated into prognostic scoring models such as the Child-Pugh score, Model for End-Stage Liver Disease (MELD) score, and MELD-Sodium (MELD-Na) score, which are utilized to assess patients' eligibility for liver transplantation [7,11,14,15]. Each scoring system has distinct advantages and limitations for clinical application.

According to the Global Burden of Disease (GBD) Study, in 2017, low-income countries in the Sub-Saharan Africa region exhibited higher age-standardized death rates from cirrhosis compared to other GBD super-regions [3]. This may be attributed to limited access to standard medical care, reduced health-seeking behavior, and

a lack of advanced diagnostic services and therapeutic interventions for decompensated cirrhosis in these regions [16].

Studies assessing the short- and long-term outcomes of patients with chronic liver diseases, particularly decompensated cirrhosis, are limited in Ethiopia. A study conducted 30 years ago by E. Tsega and colleagues among 334 hospitalized patients with chronic liver disease (CLD) found that 208 participants (62%) had cirrhosis. The most common initial clinical presentations included ascites, splenomegaly, hematemesis, or melena from esophageal varices, and mental changes due to hepatic encephalopathy. Hepatitis B virus infection was the most frequently diagnosed cause of chronic liver disease in this study [17]. These findings are comparable to studies evaluating the survival and prognosis of patients with compensated and decompensated cirrhosis conducted in Italy and England [6,18]. However, specific outcomes and causes of decompensation were not reported in this study.

Recent studies among hospitalized CLD patients in Ethiopia indicated inpatient mortality rates ranging from 28.5% to 41%. [19,20] These figures may reflect a sampling bias, as participants were selected from advanced liver disease cases with high predicted mortality rates. Despite the reported high inpatient mortality rates, there is a lack of data on the specific causes of decompensation and predictors of mortality and complications.

This study aimed to assess the short-term outcomes of patients with decompensated cirrhosis at Tikur Anbessa Specialized Hospital (TASH), the largest tertiary hospital in the country, within six months of their index hospital visit or admission. Sociodemographic, clinical, and laboratory parameters of the participants were stratified to identify predictors of mortality, hospital admissions, and complications of portal hypertension. The findings of this study can serve as a baseline for future research aimed at identifying predictors of poor outcomes and developing pathways to improve clinical care for patients with chronic liver disease.

2 Methods

2.1 Study area and period

The study was conducted at Tikur Anbessa (Black Lion) Specialized Hospital, the largest tertiary hospital in Ethiopia, established in 1964 in Addis Ababa. This facility provides specialized clinical services to patients from all regions of the country through various departments and subspecialty units. It also serves as the primary teaching center for the College of Health Sciences at Addis Ababa University, offering both undergraduate and postgraduate clinical training in multiple disciplines.

The Gastroenterology unit within the Department of Internal Medicine offers both inpatient and outpatient services, including diagnostic and therapeutic endoscopic procedures. It features a dedicated 16-bed inpatient ward shared with the hospital's Pulmonary unit and serves approximately 180 outpatients weekly at the follow-up clinic, in addition to managing all emergent gastrointestinal cases in the emergency department. Consultants, fellows, and internal medicine residents actively participate in patient care. The study was conducted from August 2021 to October 2021.

2.2 Study design

A retrospective cohort study design was employed.

2.3 Study population

The study included all patients diagnosed with decompensated cirrhosis based on clinical and laboratory data. Participants were sourced from the emergency department (ED), medical wards, intensive care unit (ICU), and outpatients seen at the Gastroenterology (GI) clinic at Tikur Anbessa Specialized Hospital (TASH) from March 2020 to March 2021.

2.4 Inclusion and exclusion criteria

Inclusion criteria

- Age $>$ 18 years
- Diagnosed with decompensated cirrhosis based on the operational definition of this study

- Admitted at ED, medical wards or ICU at TASH at least 06 months prior to the study period, or
- On follow up at GI clinic at TASH

Exclusion criteria

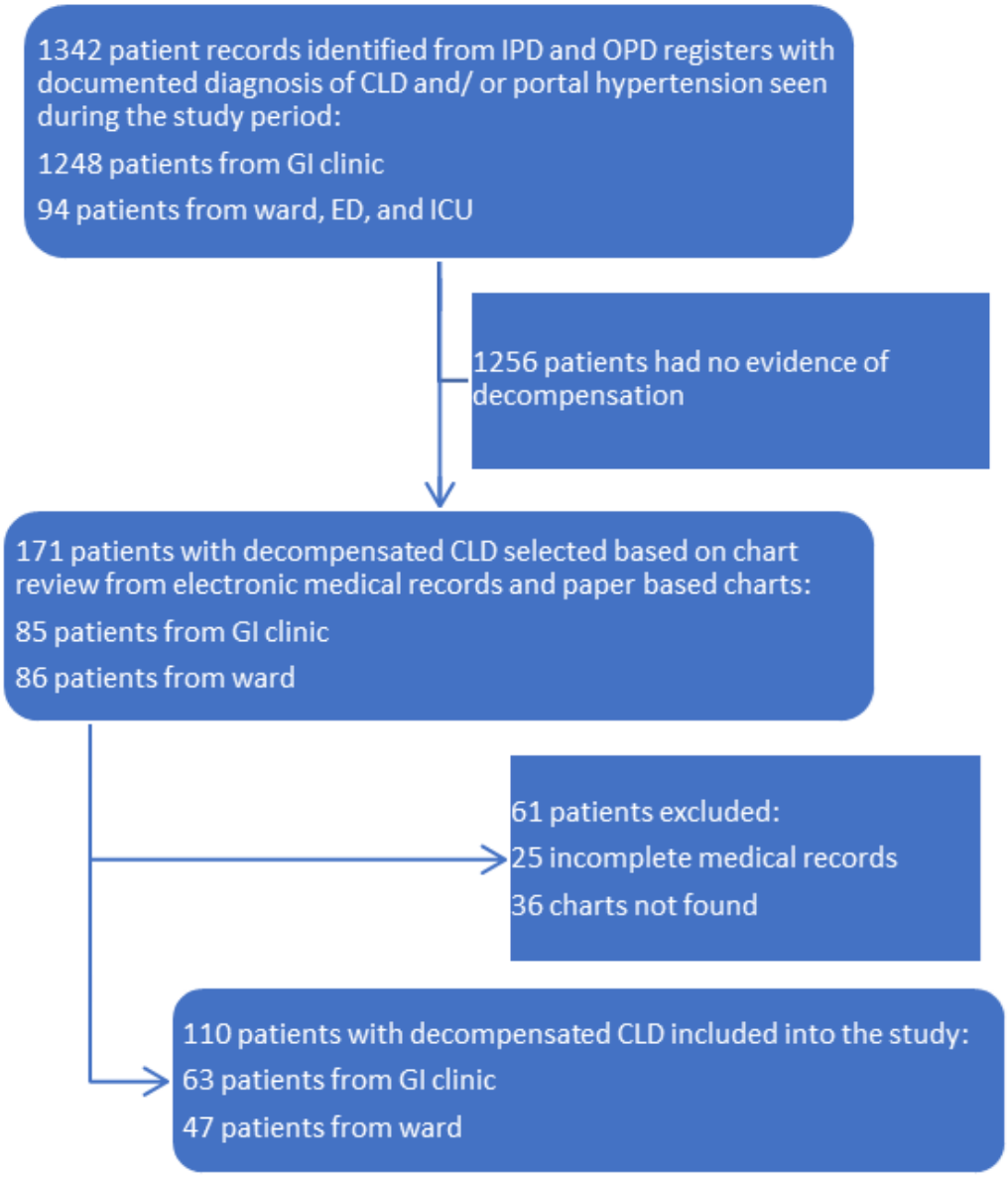
- Patients with decompensated cirrhosis with incomplete medical records or clinical assessment.
- Patients with portal hypertension resulting from disorders other than cirrhosis

Selection of participants

2.5 Sampling procedure

Sample size calculation

The minimum sample size was initially calculated using a single population formula, followed by the finite population correction formula due to the limited number of patients with cirrhosis and complications (140) attending monthly follow-ups at the GI clinic or admitted to medical wards. The revised sample size was calculated to be 103, and with a 10% non-response rate included, the final sample size was set at 113.



Sampling technique

Among adult patients with chronic liver disease (CLD), all individuals meeting the inclusion criteria were consecutively recruited using a convenient sampling technique.

2.6 Study variables

The independent variables in this study were:

- Age
- Sex
- Etiology of cirrhosis
- Child-Pugh score
- Renal function
- Presence of comorbidities

The dependent variables in this study were:

- Mortality at 01, 03, and 06 months of enrollment into the study
- Hospital admission
- Rate of occurrence of complications such as variceal bleeding, spontaneous bacterial peritonitis, hepatic encephalopathy, and hepatorenal syndrome

2.7 Operational definitions

Compensated Cirrhosis: A clinical stage of cirrhosis in which liver fibrosis is present, but complications of portal hypertension that indicate decompensation are absent.

Decompensated Cirrhosis: A clinical stage of cirrhosis characterized by the presence (or past history) of ascites, variceal bleeding, encephalopathy, and/or jaundice [4].

Poor Outcome: Defined as readmission to the hospital, development of variceal bleeding, hepatic encephalopathy, spontaneous bacterial peritonitis, and/or death within 1, 3, and 6 months of enrollment in the study.

2.8 Data collection procedures

Patients admitted to the emergency department (ED), medical wards, or ICU, or seen as outpatients at the GI clinic at TASH with a diagnosis of decompensated cirrhosis from March 2020 to March 2021 were identified from the admission and outpatient Health Management Information Systems (HMIS) registers and enrolled in the study. Medical record numbers (MRN) were used to retrieve patient medical records from both the electronic medical record system and paper charts.

A structured checklist was prepared in the Open Data Kit (ODK) format and pretested before data collection commenced. Data regarding demographic characteristics, clinical information—including etiology of cirrhosis, results of laboratory and imaging tests, management decisions, and outcomes documented in the patients' medical records—were reviewed and entered into the ODK by the primary investigator.

Eligible patients whose medical records were lost or incomplete (i.e., lacking documentation of clinical information, laboratory or radiographic investigations, and therapeutic interventions performed during the study period) were excluded from the final analysis.

2.9 Data Quality Assurance

The primary investigator checked the completeness and consistency of the data. The data were cleaned and edited before exporting the ODK questionnaires for analysis using SPSS version 26 software.

2.10 Data Analysis

Data from a total of 110 patients were used for the final analysis with SPSS version 26.0 statistical software. Descriptive statistics for demographic and clinical data were presented using means with standard deviations (SD) and medians with interquartile ranges (IQR) for continuous data, and frequency and percentage tables for categorical data.

Chi-square statistics and binary logistic regression were employed to examine the presence and strength of associations between categorical variables. The Cox proportional hazards model was used to assess the probability of poor outcomes among the study participants. Statistical significance was set at $p<0.05$.

2.11 Ethical Considerations

To respect patients' rights and comply with the regulations of the hospital where the study was conducted, permission to undertake the study was obtained from the Ethical Review Committee of the Department of Internal Medicine to access patient medical records. All personal data of participants were de-identified.

3 Results

3.1 Demographic characteristics of the study participants

A total of 110 participants were included in the final analysis of this study, resulting in a response rate of 97.3%. Of these, 82 participants (74.5%) were male, with a median age of 40 years (IQR: 18) (Table 1).

Table 1 Demographic characteristics of patients with decompensated cirrhosis at TASH

Variable (n = 110)		Number (percentage)
Sex	Male	82 (74.5%)
	Female	28 (25.5%)
Age category	<35 years	39 (35.5%)
	35 – 44 years	26 (23.6%)
	45 – 54 years	27 (24.5%)
	55 – 65 years	11 (10%)
	>65 years	7 (6.04%)

3.2 Clinical characteristics of the study participants

Clinical profile of study participants

In this study, chronic hepatitis B virus infection was the most common identified etiology of cirrhosis, affecting 51 participants (46.36%). This was followed by alcohol-related cirrhosis in 27 participants (24.55%) and cirrhosis of unknown cause in 23 participants (20.9%). Chronic hepatitis C virus-related cirrhosis and autoimmune hepatitis were documented in 11 participants (10%) and 3 participants (2.73%), respectively.

The median duration of known chronic liver disease in this study was 20.5 months (IQR: 33), with the longest duration being 14 years for a participant with cryptogenic cirrhosis. Twenty-three participants (20.9%) were newly diagnosed with decompensated cirrhosis during the study period.

Additionally, thirty-four participants (30.9%) had a documented chronic medical illness other than chronic liver disease, with HIV being the most common comorbidity, followed by diabetes mellitus, hypertension, and chronic kidney disease. Table 2 summarizes the clinical characteristics of patients with decompensated cirrhosis at TASH.

Table 2 Clinical profile among patients with decompensated cirrhosis at TASH

Variable		Number (percentage)
Etiology of cirrhosis (n=110)	Chronic HBV related cirrhosis	51 (46.36%)
	Chronic HCV related cirrhosis	11 (10%)
	Alcohol related cirrhosis	27 (24.55%)
	Autoimmune hepatitis	3 (2.72%)
	Cirrhosis of unknown cause	23 (20.9%)
Duration of known CLD (n=110)	Newly diagnosed	23 (20.9%)
	<12 months	22 (22%)
	13 – 24 months	25 (22.7%)
	25 – 36 months	16 (14.5%)
	37 – 48 months	12 (10.9%)
	49 – 60 months	4 (3.6%)
	>60 months	8 (7.3%)
Comorbidities (n=34)	HIV	8 (7.27%)
	Diabetes Mellitus	6 (5.45%)
	Hypertension	4 (3.63%)
	Chronic kidney disease	3 (2.72%)
	Structural heart disease	2 (1.81%)
	Others	15 (13.63%)

Among the 31 participants (28.18%) with a documented positive history of alcohol intake, daily alcohol consumption was quantified in terms of standard drinks for only 25 participants. Nine participants consumed 3-4 standard drinks per day, while 8 participants consumed 5-6 standard drinks per day. Twenty-two participants (20%) had no history of alcohol consumption. Only 7 participants (6.36%) had a documented history of cigarette smoking, all of whom had smoked 5 or more pack-years.

Clinical presentation of participants

In this study, the most common presenting complaints among participants at enrollment included abdominal distension in 44 participants (40%), tarry stools in 40 participants (36.4%), and both bloody vomiting and abdominal pain in 35 participants (31.8%) each. Other complaints included fatigue and yellowish discoloration of the eyes/skin. Sleep disturbances and altered mental status were documented in 11 participants (10%) and 4 participants (3.6%), respectively.

Among the 95 study participants for whom physical examination findings were documented at the time of hospitalization or clinic visit, the most common finding was ascites, observed in 61 participants (64.2%). This was followed by splenomegaly, pallor, jaundice, and pleural effusions.

Hepatic encephalopathy was documented in 20 participants (18.18%) at the time of hospital admission or clinic visit, including 9 participants (8.18%) with grade I and 8 participants (7.27%) with grade II hepatic encephalopathy. At 1, 3, and 6 months into the study, hepatic encephalopathy was recorded in 4, 2, and 3 participants, respectively, with the majority exhibiting grade I hepatic encephalopathy.

Among the 61 participants with ascites at enrollment, 35 (31.8%) had moderate ascites and 15 (13.64%) had severe ascites. The relative frequency of subjective complaints and physical examination findings among the study participants was comparable at 1 month, 3 months, and 6 months after enrollment. Details are presented in Table 3.

Table 3 Comparison of clinical presentation among patients with decompensated CLD over 06 months at TASH

	At index hospital visit Number (%)	At 01month Number (%)	At 03months Number (%)	At 06months Number (%)
History	(n=110)	(n=92)	(n=83)	(n=77)
Abdominal distension	44 (40%)	12 (11.8%)	11 (13.25%)	11 (14.29%)
Bloody vomiting	35 (31.8%)	4 (4.3%)	4 (4.8%)	8 (10.4%)
Tarry stools	40 (36.4%)	2 (2.1%)	4 (4.8%)	8 (10.4%)
Yellowish discoloration of eyes	29 (26.4%)	4 (4.3%)	3 (3.6%)	2 (2.6%)
Abdominal pain				
Fatigue	35 (31/8%)	7 (7.6%)	2 (2.4%)	1 (1.3%)
Sleep pattern disturbance	32 (29.1%)	9 (9.7%)	4 (4.8%)	2 (2.6%)
Altered mental status	11 (10%)	4 (4.3%)	2 (2.4%)	2 (2.6%)
Other	4 (3.6%)	1 (1.0%)	1 (1.2%)	1 (1.3%)
	34 (24.5%)	40 (43.4%)	55 (66.2%)	43 (55.8%)
Physical examination				
Ascites	61 (64.2%)	18 (19.5%)	18 (21.7%)	15 (19.5%)
Splenomegaly	41 (37.3%)	25 (27.1%)	25 (30.1%)	30 (38.9%)
Pallor	36 (32.9%)	11 (11.9%)	7 (8.4%)	8 (10.4%)
Jaundice	33 (30%)	11 (11.9%)	6 (7.2%)	4 (5.2%)
Peripheral edema	33 (30%)	8(8.7%)	6(6.5%)	5(5.4%)
Pleural effusion	24 (25.3%)	5 (5.4%)	1 (1.2%)	1 (1.3%)
Abdominal tenderness	13 (13.7%)	3 (3.2%)	1 (1.2%)	3 (3.9%)

3.3 Laboratory and imaging findings of participants

Moderate anemia and thrombocytopenia were the most common findings in complete blood count assessments at all time points of the study, with mild leukopenia documented in a few participants. The results of renal function tests and serum electrolytes were within the normal range for the majority of participants at the time of hospitalization or clinic visit.

The performance and documentation of liver function tests and enzyme levels varied during the study period. Moderate hypoalbuminemia, hyperbilirubinemia, and modest elevations in transaminases (1.5-2.5 times the upper limit of normal) were observed in the majority of participants (Table 4).

Table 4 Laboratory profiles of patients with decompensated cirrhosis at TASH

	At index hospital visit Median (IQR)	At 01 month Median (IQR)	At 03 months Median (IQR)	At 06 months Median (IQR)
WBC (103/μL)	6.0 (5.58)	4.27 (3.55)	4.0 (2.55)	3.3 (2.6)
Hemoglobin (g/dL)	11.65 (4.12)	11.98 (3.55)	13.3 (3.68)	13 (4.3)
Platelet (103/μL)	109 (95.5)	90 (88)	79 (54)	71 (49)
Serum creatinine (mg/dL)	0.82 (0.71)	0.7 (0.39)	0.7 (0.12)	0.6 (0.3)
Total bilirubin (mg/dL)	2.7 (3.16)	1.7 (1.65)	1.24 (1.25)	1.15 (0.98)
Albumin (g/dL)	2.45 (0.98)	3.1 (1.13)	3.6 (1.46)	3.5 (1.1)
PT (sec)	21.55 (6.68)	25.6 (19.9)	16.2	20.8 (3.1)
INR	1.9 (0.74)	1.89 (0.49)	1.39 (1.24)	1.85 (0.43)
Serum sodium (mmol/L)	130.8 (10.4)	132.5 (6)	136.7 (6.9)	136.8 (4)
Serum potassium (mmol/L)	3.99 (1.02)	4.5 (1.02)	4.68 (0.84)	4.25 (0.56)

Child-Pugh scores were calculated for 47 participants (42.7%) at enrollment, with a median score of 11. Twenty-eight participants (25.4%) had Child scores greater than 10 (Child class C), while 12 participants (10.9%) had scores between 7 and 9 (Child class B). At 1, 3, and 6 months into the study, Child scores were documented for 6, 2, and 6 participants, respectively.

Among the 27 participants (24.5%) who underwent ascitic fluid analysis at the time of hospitalization, the median total white cell count was 700 cells/μL (IQR: 1471.8). However, a differential count was performed for only 19 participants (17.27%), with 8 samples showing absolute neutrophil counts greater than 250 cells/μL. Among the 16 peritoneal fluid samples for which ascitic fluid albumin levels were documented, 15 had a serum-ascites albumin gradient (SAAG) greater than 1.1 g/dL. In 11 participants, Gram stains of the peritoneal fluid showed no organisms, and no growth was documented for 2 participants for whom cultures were performed.

Ascitic fluid analysis was conducted for only 2 and 1 participants at 1 and 3 months of the study, respectively. For both samples, only total white cell count and glucose levels were documented, with no objective evidence of spontaneous bacterial peritonitis.

Among the 51 participants with chronic HBV infection, quantitative HBV DNA levels were determined for 17 participants, revealing a median viral load of 6,670 IU/ml. Six participants had documented HCV RNA results, among whom 3 achieved viral clearance after therapy with direct-acting antivirals (DAAs).

Features of cirrhotic liver, ascites, and splenomegaly were the most common findings on various modalities of abdominal imaging performed for the study participants. Portal vein thrombosis was documented in 13 participants, the majority of which were identified as tumor thrombi. Variable-sized liver masses were reported on triphasic abdominal CT in 18 participants (16.3%).

Transient elastography was performed for 4 participants, with documented liver stiffness measurements in kPa ranging from 12 to 14.9. However, fat attenuation measurements were recorded for only one participant (270 UAP).

Liver biopsy was performed for only one participant; with the reported finding of cirrhosis (details of other pathological findings were not documented).

Results of upper GI endoscopy were documented for 68 participants (61.8%), with the most common findings being variable degrees of portal hypertensive gastropathy. This was followed by grade 3 and grade 2 esophageal varices observed in 37 participants (33.6%), 34 participants (30.9%), and 19 participants (17.3%), respectively. Three additional participants under-

went screening endoscopy, but specific findings were not documented in their medical records.

Duodenitis was diagnosed in 9 participants, and duodenal ulcers were reported in 4 participants. Stigmata of recent bleeding were documented in 22 participants (20%) with varices, and endoscopic variceal ligation was performed for 17 participants (15.45%).

3.4 Outcome of the participants over 06 months of index hospital admission/ OPD visit

Forty-nine participants (44.5%) were admitted to the hospital at enrollment, with a mean duration of hospital stay of 9.5 days (±7). During follow-up, 5, 3, and 4 participants were admitted to the hospital at 1, 3, and 6 months into the study period, respectively.

The most common reasons for admission among the study participants at all time points were upper GI bleeding, hepatic encephalopathy, hepatocellular carcinoma, and spontaneous bacterial peritonitis. See Figure 1 for details.

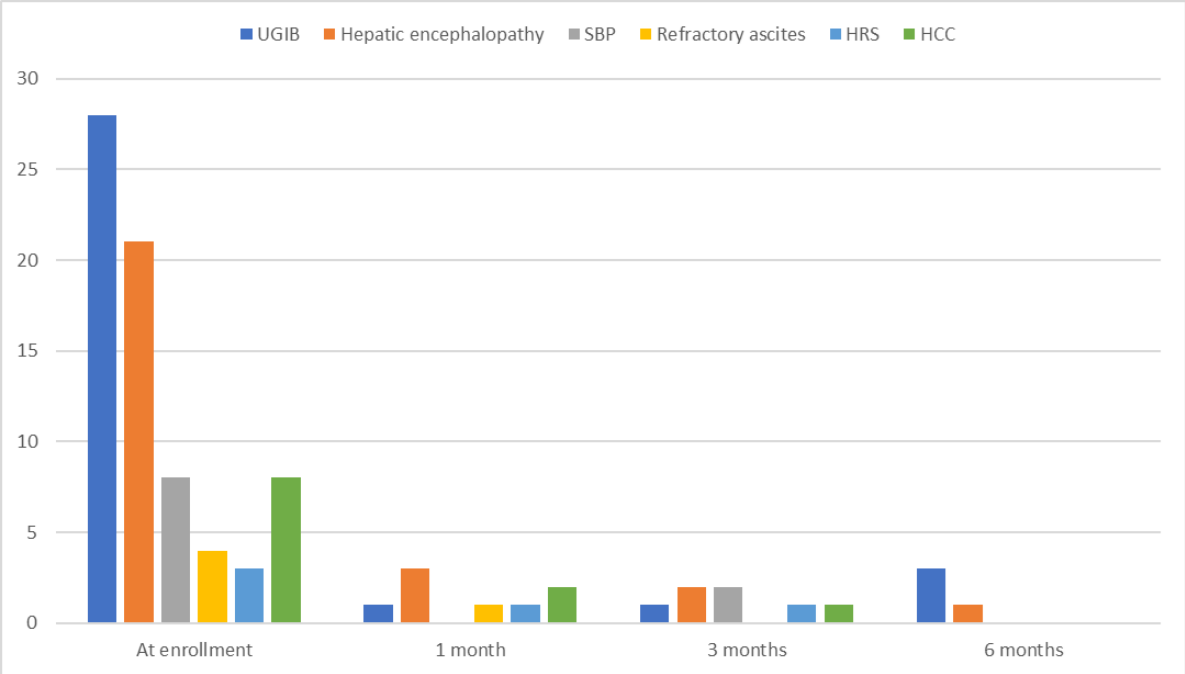


Figure 1 Reasons of hospital admission among patients with decompensated cirrhosis at TASH

The majority of participants received treatment with non-selective β-blockers, primarily Propranolol, at a maximum dose of 60 mg orally three times a day (PO TID). Diuretics were administered as indicated, with a maximum dose of Spironolactone at 200 mg PO daily and Furosemide at 80 mg PO/IV twice daily (BID). Additionally, proton pump inhibitors and antibiotics, mainly third-generation cephalosporins, were prescribed, with treatment escalation based on clinical indications.

During the index admission, 12 participants experienced in-hospital death, while 6 participants left against medical advice. The median duration from hospital admission to death was 9 days (interquartile range (IQR: 8). An additional 4 deaths occurred during the remainder of the study period, and another 4 participants left against medical advice (see Table 5).

Table 5 Outcomes of patients with decompensated cirrhosis over 06 months of follow up at TASH

	At Index hospital visit	1 month	3 months	6 months
	Number (%)	Number (%)	Number (%)	Number (%)
Documented hospitalization during the study period	49(44.54%)	5(5.4%)	3(3.6%)	4(5.1%)
Documented complications of portal hypertension during the study period:				
Upper gastrointestinal bleeding				
Hepatic encephalopathy	40(36.36%)	4(4.3%)	4(4.8%)	8(10.4%)
Spontaneous bacterial peritonitis (SBP)	22(20%)	5(5.4%)	2(2.4%)	3(3.9%)
Hepatorenal syndrome (HRS)	8(7.2%)	-	2(2.4%)	-
	3(2.72%)	1(1.0%)	1(1.2%)	-
Documented outcomes during the study period:				
Death				
Left against medical advice	12(10.9%)	1(1.0%)	1(1.2%)	2(2.6%)
Lost to follow up	6(5.4%)	3(3.2%)	-	1(1.3%)
Transferred to another health facility	-	4(4.3%)	5(6.0%)	10(12.9%)
Discharged alive and/or on follow up at TASH	-	1(1.0%)	-	5(6.5%)
	92(83.6%)	83(90.2%)	77(92.7%)	59(76.6%)

Among the 16 participants (14.54%) who died in the hospital during the study period, the most common immediate causes of death were sepsis or septic shock in 6 participants (5.45%) and multiorgan failure related to advanced liver failure in 5 participants (4.54%).

3.5 Predictors of poor outcome among patients with decompensated cirrhosis

Poor outcome in this study was defined by the presence of any readmission to the hospital, development of variceal bleeding, hepatic encephalopathy, spontaneous bacterial peritonitis, and/or death within 1, 3, and 6 months of enrollment.

Binary logistic regression analysis revealed a statistically significant association between the presence of comorbidities and upper GI bleeding documented throughout the study period [COR=2.51; 95% CI: 0.97-6.50] (p=0.057). However, this association was not observed for individual comorbidities. Additionally, age above 40 years was found to have a statistically significant association with upper GI bleeding when adjusted for comorbidity [AOR=2.8; 95% CI: 0.76-5.44] (p=0.017).

A statistically significant association was found between chronic HBV infection and overall mortality during the study period [COR=4.52; 95% CI: 1.2-16.9] (p=0.025), which persisted even when adjusted for upper GI bleeding [AOR=4.4; 95% CI: 1.1-16.9] (p=0.030).

Cryptogenic cirrhosis was associated with a statistically significant negative correlation with overall poor outcomes during the study period [COR=0.26; 95% CI: 0.08-0.82] (p=0.022).

Upper GI bleeding and hepatic encephalopathy were found to have a statistically significant association with hospital readmission at 1, 3, and 6 months into the study, with adjusted odds ratios (OR) of 10.59 (95% CI: 3.76-29.3) [p<0.0001] and 93.35 (95% CI: 11.13-782.8) [p<0.0001], respectively. Conversely, documented upper GI bleeding during the study period showed a negative but weak association with overall mortality [AOR=0.11; 95% CI: 0.014-0.88] (p=0.038).

The association between age, sex, other etiologies of cirrhosis, Child-Pugh score at enrollment, and renal function with poor outcome measures during the study period was not found to be statistically significant (Table 6).

Table 6 Results of Pearson's Chi-square test of factors associated with poor outcome in patients with decompensated cirrhosis at TASH

Poor outcome at any time during the study period			
	Value	df	Asymptotic significance (2-sided)
Sex	1.87	1	0.171
Age	4.49	1	0.343
Presence of comorbidities	0.09	1	0.764
Etiology of cirrhosis	7.54	4	0.110
Renal function test	21.76	27	0.749
Child Pugh score	4.85	2	0.088

In this study, multivariate analysis was performed using the Cox proportional hazards model to estimate the probability of inpatient mortality, hospital admission, and the development of new decompensating events (hepatic encephalopathy, upper GI bleeding, spontaneous bacterial peritonitis, and hepatorenal syndrome) among patients with decompensated cirrhosis. Age was found to have a statistically significant association with a higher probability of developing upper GI bleeding, with a hazard ratio (HR) of 0.97 (95% CI: 0.94-0.99), but not with other poor outcome measures. There was no statistically significant difference in the risk of developing poor outcomes based on sex, comorbidity, or etiology of cirrhosis in patients with decompensated cirrhosis at TASH (Table 7).

Table 7 Probability of in patient mortality, hospitalization, hepatic encephalopathy, and upper GI bleeding at 1, 3, and 6 months in patients with decompensated cirrhosis at TASH

Variables	In patient Mortality	Hospitalization	Upper GI Bleeding	Hepatic Encephalopathy
Age	HR 1.00 (95% CI 0.96-1.05), p=0.847	HR 0.99 (95% CI 0.97-1.01), p=0.539	HR 0.97 (95% CI 0.94-0.99), p=0.03	HR 1.02 (95% CI 0.99-1.06), p=0.07
Sex	HR 0.61 (95% CI 0.19-1.93), p=0.847	HR 1.50 (95% CI 0.76-2.98), p=0.240	HR 1.62 (95% CI 0.66-3.98), p=0.288	HR 1.37 (95% CI 0.50-3.73), p=0.541
Comorbidity	HR 0.74 (95% CI 0.22-2.45), p=0.404	HR 0.78 (95% CI 0.42-1.45), p=0.435	HR 1.42 (95% CI 0.59-3.41), p=0.429	HR 1.26 (95% CI 0.48-3.35), p=0.637
Etiology of cirrhosis	HR 1.12 (95% CI 0.81-1.55), p=0.470	HR 1.09 (95% CI 0.92-1.29), p=0.303	HR 1.03 (95% CI 0.84-1.26), p=0.77	HR 1.09 (95% CI 0.83-1.43), p=0.511

4 Discussion

A total of 110 patients with decompensated cirrhosis admitted to medical wards, the emergency

department (ED), and the ICU, or seen as outpatients at the GI clinic at TASH from March 2020 to March 2021 were included in this study. The majority of participants (82 or 74.5%) were male, with a median age of 40 years (IQR: 18). This is comparable to a study by Terefe Tesfaye *et al.*, which included 109 admitted patients with chronic liver disease (CLD) across three selected teaching hospitals, where 85 participants (78%) were male, and the median age was 38 years (IQR: 30–48) [19].

Chronic hepatitis B virus infection was the most commonly identified etiology of cirrhosis, affecting 51 participants (46.36%), followed by alcohol-related cirrhosis in 27 participants (24.55%). Other hospital-based studies in Ethiopia also report a similar prevalence of HBV infection as a cause of CLD [17,19,20,21]. In a study conducted among 117 admitted patients at St. Paul's Hospital Millennium Medical College, hepatitis B virus was diagnosed in 44.4% of cases, while 18% were attributed to hepatitis C virus [20].

The most common presenting complaints among participants at the time of hospital admission were abdominal distension in 44 participants (40%), tarry stools in 40 participants (36.4%), and bloody vomiting in 35 participants (31.8%), with yellowish discoloration of the eyes or skin present in 29 participants (26.4%). These findings are comparable to other studies assessing the clinical profiles and outcomes of admitted CLD patients in Ethiopia [17,20].

Thirty-four participants (30.9%) in this study had documented comorbidities, primarily HIV and diabetes mellitus. Although the presence of these comorbidities has been associated with reduced survival and poor prognosis in patients with decompensated cirrhosis in studies from France and Spain, no statistically significant association was found between comorbidities and the overall prevalence of poor outcomes in this study [COR=0.88; 95% CI: 0.38-2.01] (p=0.7640) [22,23,24].

In this study, chronic HBV infection was found to have a moderate association with overall mortality during the study period [AOR=4.4; 95% CI: 1.1-16.9]. Conversely, cryptogenic cirrhosis showed a statistically significant but negative association with overall poor outcomes [COR=0.26; 95% CI: 0.08-0.82].

The association between age, sex, etiologies of cirrhosis (other than HBV and cryptogenic cirrhosis), and renal function with poor outcome measures during the study period was not statistically significant. This contrasts with findings from a retrospective cohort study conducted by Kim *et al.*, which determined mean survival periods and cumulative survival rates by classifying patients into high-risk and low-risk groups based on MELD-Na. In that study, age and sex were found to be significant variables in the high-mortality group [15].

Complications of cirrhosis were found to have a significant association with poor outcomes in this study. Documented upper GI bleeding during the study period showed a moderate association with overall mortality and hospital readmission at 1, 3, and 6 months [AOR=0.11; 95% CI: 0.014-0.88] and [AOR=10.59; 95% CI: 3.76-29.3], respectively. Hepatic encephalopathy exhibited a relatively strong association with hospital readmission during the study period [AOR=93.35; 95% CI: 11.13-782.8].

In comparison, a study from India that explored predictors of hospital readmission in patients with decompensated cirrhosis found that MELD score at discharge and serum sodium independently predicted 1-month readmissions, while MELD score, serum sodium, and male gender independently predicted 3-month readmissions. However, neither etiology nor complications of cirrhosis emerged as risk factors [25].

The presence of renal failure in patients with decompensated cirrhosis is an important predictor of mortality, with common causes being hypovolemia, bacterial infections, and hepatorenal syndrome [13,26,27]. In contrast to findings from previous studies, renal function was not found to significantly increase the risk of death in this study, with a hazard ratio (HR) of 1.26 (95% CI: 0.98-1.61).

Although the accuracy of various prognostic models in predicting in-hospital mortality has been found to be high in other studies, [10] the association between baseline Child-Pugh scores and overall poor outcomes was statistically insignificant in this study.

Strengths and limitations of the study

This study aimed to assess the prevalence of poor outcomes in patients with decompensated cirrhosis and to identify predictors of these outcomes over a follow-up period longer than that of previous studies conducted in the country.

However, due to the retrospective design of the study, various confounders that could contribute to the development of poor outcomes could not be adequately explored. The utilization and documentation of laboratory and imaging investigations were inconsistent, as observed during data collection. This may limit the incorporation of these parameters into risk prediction models for this specific patient population.

Finally, since the study period coincided with the peak of the COVID-19 pandemic in our country, the use of virtual clinic services—where physical examinations and laboratory parameters were often not documented in the electronic medical record system—along with longer appointment times, may have affected the estimation of overall survival and the rates of loss to follow-up.

5 Conclusion

Chronic hepatitis B infection was identified as the most common etiological cause of cirrhosis among participants and a strong predictor of death during the study period. Age over 40 years significantly contributed to the development of upper GI bleeding. Hepatic encephalopathy and upper GI bleeding were identified as predictors of hospitalization among the study participants.

Recommendations

A prospective multicenter study is needed to assess the short- and long-term outcomes of patients with cirrhosis, focusing on specific etiologies and available therapeutic options in the country. This study would help fully explore the predictors of poor outcomes in this patient population.

Given that chronic HBV infection was identified as the most common etiology and a strong predictor of poor outcomes among patients with decompensated cirrhosis, enhancing the availability of vaccines and treatments for HBV could improve the overall outcomes for these groups.

The documentation of clinical data in both electronic and paper-based medical records should be standardized to include disease-specific parameters, ensuring that future data collection and analysis are thorough.

Ensuring the availability of routine laboratory and imaging tests without frequent interruptions, along with their appropriate utilization at recommended intervals, is essential for the follow-up and risk stratification of patients with decompensated cirrhosis.

Health professionals should actively engage in community awareness efforts regarding vaccines, moderation of alcohol intake, available treatment options for chronic liver diseases, and the importance of early health-seeking behavior in the event of decompensation.

The Ministry of Health and relevant stakeholders should strengthen efforts to expand access to treatment for patients with chronic liver diseases, particularly viral hepatitis.

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