e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(4); 241-248

Original Research Article

Clinico-Etiological Profile and Complications of Chronic Liver Disease in Female Patients: A Prospective Observational Study from a Tertiary Care Hospital in Uttar Pradesh

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Received: 01-01-2026 / Revised: 15-02-2026 / Accepted: 21-03-2026

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Conflict of interest: Nil

Abstract

Background: Chronic liver disease in women has a heterogeneous etiological spectrum and often becomes clinically evident after decompensation. Female-only cohorts have shown marked regional variation in etiology and complication burden.

Methods: This prospective observational study included 50 female patients with chronic liver disease attending the outpatient department or admitted under the Department of General Medicine at a tertiary care hospital in Uttar Pradesh between May 2024 and October 2025. Participants were enrolled by consecutive sampling. Demographic characteristics, etiology, diabetes status, alcohol use, clinical presentation, ascites, varices, laboratory profile, and status at last contact were recorded. The primary outcome was the clinico-etiological profile and complication burden.

Results: The mean age was 55.54 ± 8.29 years, and most participants were 51–60 years old (38%) or 61–70 years old (30%). Metabolic-associated steatotic liver disease was the leading etiology (40%), followed by alcohol-related liver disease (22%), autoimmune hepatitis (14%), hepatitis B virus infection (12%), and hepatitis C virus infection (12%). Diabetes mellitus was present in 50% of patients and was more frequent in metabolic-associated steatotic liver disease than in non-MASLD etiologies (80% vs 30%; p=0.0012).

Jaundice was the most common presenting feature (68%). Ascites was present in 56% and esophageal varices in 58%; large varices were present in 18%. Anaemia (72%), hypoalbuminemia (64%), hyperbilirubinemia (64%), thrombocytopenia (62%), and hyponatremia (42%) were common. At last contact, 41 patients (82%) were discharged, 7 (14%) were referred, and 2 (4%) died. Adverse status at last contact was associated with abdominal distension, fever/infection, severe ascites, large varices, hyponatremia, and renal dysfunction.

Conclusion: Women with chronic liver disease in this cohort had a predominant metabolic burden, frequent diabetes, and a substantial prevalence of portal hypertension-related complications. Advanced clinical and biochemical derangement identified patients with poorer status at last contact.

Keywords: Chronic liver disease; female patients; metabolic-associated steatotic liver disease; portal hypertension; ascites; etiological profile.

DOI: 10.25258/ijcpr.18.4.41

Introduction

Chronic liver disease (CLD) comprises a broad group of disorders characterized by persistent hepatic injury, progressive fibrosis, portal hypertension, and eventual hepatic insufficiency. [1-3] The burden of CLD is substantial because decompensated disease drives hospitalization, multisystem complications, and premature mortality. [2,3]

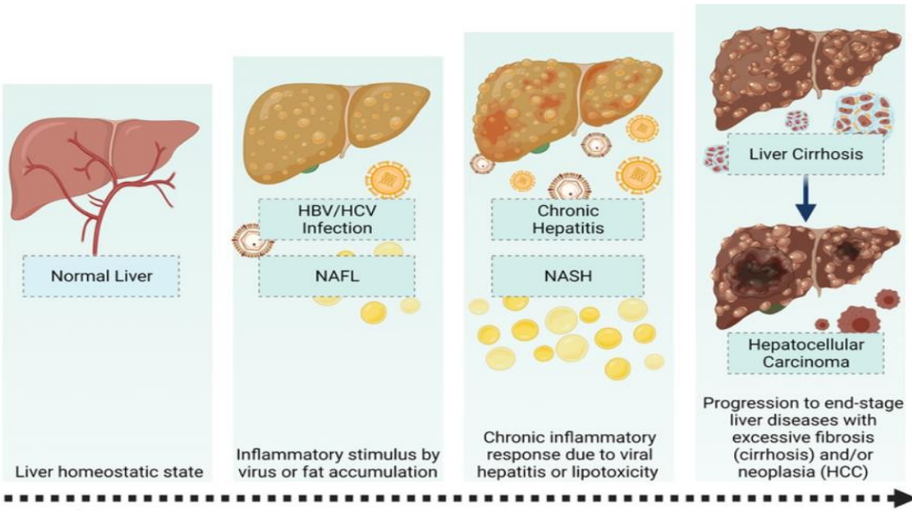

Fig 1: Stages of CLD

The etiological spectrum of CLD has evolved, with metabolic liver disease contributing an increasing share of disease burden, while alcohol-related liver disease, chronic hepatitis B, chronic hepatitis C, and autoimmune liver disease remain clinically important causes. [4-8]

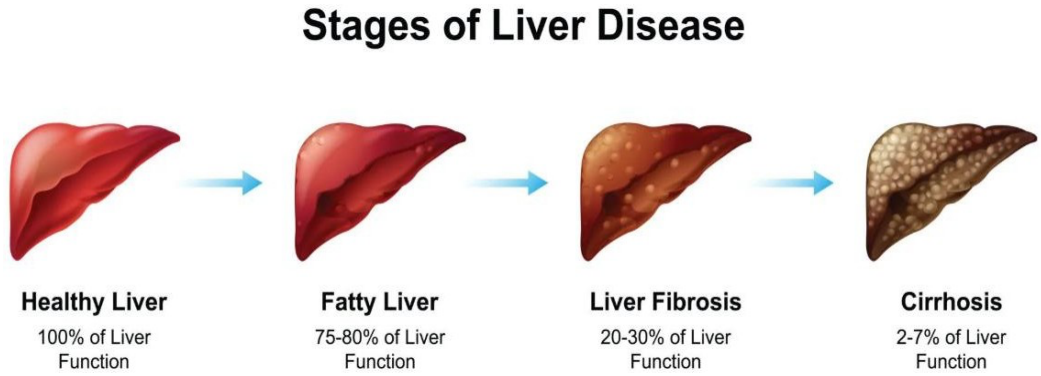

Fig 2: Functional capacity at different stages of liver disease

Female patients merit focused evaluation because Indian female-only cohorts have shown marked heterogeneity in etiology, ranging from alcohol-dominant to metabolic-predominant and viral-heavy distributions, and many women present after portal hypertension and decompensation have already developed. [9-12]

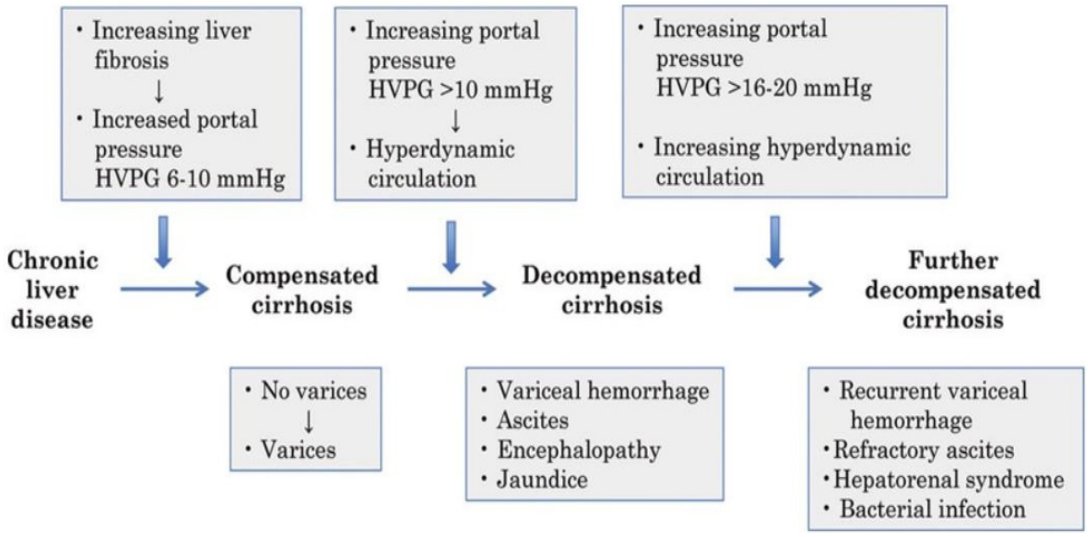

Fig 3: Natural history of cirrhosis: relationship with increasing portal pressure.

Given the heterogeneity reported across female cohorts, a local prospective description of etiology, clinical manifestations, and complications is clinically relevant. This study evaluated the demographic characteristics, etiological distribution, clinical manifestations, complications, laboratory abnormalities, and status at last contact among female patients with CLD.

Materials and Methods

Study design and setting: This prospective observational study was conducted at Krishna Mohan Medical College and Hospital, Mathura, a tertiary care hospital in Uttar Pradesh, India. Participants were enrolled from women attending the outpatient department or admitted under the Department of General Medicine.

Study Duration: May 2024 to October 2025.

Participants: Eligible participants were female patients aged 18 years or older and younger than 80 years with a diagnosis of CLD established by a certified medical professional and who provided written informed consent.

Inclusion Criteria: Women aged ≥18 years and <80 years with CLD and written informed consent were included.

Exclusion Criteria: Pregnant women, post-liver transplant patients, patients receiving chemotherapy, patients with severe systemic comorbid conditions likely to interfere with assessment or outcomes, patients unable to adhere to follow-up, and patients with comorbidities expected to exacerbate mortality were excluded.

Sample size: Sample size was estimated with Cochran's formula for a single population proportion. [13] Using p=0.50, q=0.50, Z=1.96, and an absolute precision of 0.14, the calculated sample size was 49, which was rounded to 50.

Sampling Method: Consecutive sampling was used until 50 eligible participants were enrolled.

Data collection and variables: Data were recorded in a standardized case record form. Clinical evaluation included history and general and systemic examination. Recorded variables included age, etiology, diabetes status, alcohol exposure, jaundice, abdominal distension, gastrointestinal bleed, altered sensorium, fever/infection, ascites, variceal status, and status at last contact.

Laboratory variables included haemoglobin, total leukocyte count, differential leukocyte count, platelet count, prothrombin time, activated partial thromboplastin time, international normalized ratio, liver function tests, kidney function tests, random blood sugar, serological markers including HIV, HCV, and HBsAg, and blood grouping and typing. Complications, treatment details, duration of admission, and condition at discharge were documented. Follow-up visits were scheduled at 1 week, 1 month, 3 months, 6 months, 9 months, and 12 months.

Outcome Measures: The primary outcome was the clinico-etiological profile and complications of CLD in female patients. Secondary outcomes included clinical course, need for specific treatment, and status at discharge and follow-up as recorded in the case record form.

Statistical Analysis: Categorical variables were summarized as frequency and percentage. Continuous variables were summarized as mean ± standard deviation or median with interquartile range, according to data distribution. Pearson chi-square test or Fisher exact test was used for nominal data. Parametric tests were used for normally distributed variables and non-parametric tests for non-normal variables. A p value <0.05 was considered statistically significant. Statistical analysis was performed with SPSS version 24.0 or higher.

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee before study commencement. Written informed consent was obtained from all participants. Privacy and confidentiality were maintained throughout the study.

Results

Baseline demographic and clinical characteristics: Fifty female patients with CLD were analyzed. Age ranged from 35 to 71 years, with a mean age of 55.54 ± 8.29 years and a median age of 56.5 years (IQR, 49.25–62.0).

The largest age group was 51–60 years (19/50, 38%), followed by 61–70 years (15/50, 30%) and 41–50 years (13/50, 26%); 2/50 (4%) patients were 40 years or younger and 1/50 (2%) was older than 70 years.

Etiological profile and associated metabolic risk: Metabolic-associated steatotic liver disease (MASLD) was the leading etiology, identified in 20/50 (40%) patients, followed by alcohol-related liver disease in 11/50 (22%), autoimmune hepatitis in 7/50 (14%), hepatitis B virus infection in 6/50 (12%), and hepatitis C virus infection in 6/50 (12%). Viral etiologies together accounted for 12/50 (24%) cases.

Diabetes mellitus was present in 25/50 (50%) patients. Diabetes frequency differed across etiological groups (p=0.0065) and was highest in MASLD (16/20, 80%), compared with alcohol-related CLD (4/11, 36.4%), hepatitis B virus infection (3/6, 50%), hepatitis C virus infection (1/6, 16.7%), and autoimmune hepatitis (1/7, 14.3%). When etiologies were grouped as MASLD

and non-MASLD, diabetes remained more frequent in MASLD (80% vs 30%; p=0.0012; odds ratio, 9.33; 95% confidence interval, 2.43–35.84).

Most patients had never consumed alcohol (31/50, 62%), whereas 12/50 (24%) reported past alcohol use and 7/50 (14%) current alcohol use. Alcohol exposure category differed significantly by etiology (p<0.001). All patients with alcohol-related CLD had alcohol exposure, with current use in 7/11 (63.6%) and past use in 4/11 (36.4%), whereas 18/20 (90%) patients with MASLD were never-users.

Table 1: Baseline demographic, etiological, and metabolic characteristics of female patients with chronic liver disease

Domain	Parameter	Value
Demographic profile	Age, mean ± SD	55.54 ± 8.29 years
	Age, median (IQR)	56.5 years (49.25–62.0)
	Age range	35–71 years
	≤40 years	2 (4.0%)
	41–50 years	13 (26.0%)
	51–60 years	19 (38.0%)
	61–70 years	15 (30.0%)
	>70 years	1 (2.0%)
Etiology	MASLD	20 (40.0%)
	Alcohol-related liver disease	11 (22.0%)
	Autoimmune hepatitis	7 (14.0%)
	Hepatitis B virus infection	6 (12.0%)
	Hepatitis C virus infection	6 (12.0%)
	Viral etiologies overall	12 (24.0%)
Metabolic and alcohol profile	Diabetes mellitus present	25 (50.0%)
	Diabetes mellitus absent	25 (50.0%)
	Diabetes in MASLD	16/20 (80.0%)
	Diabetes in non-MASLD etiologies	9/30 (30.0%); p=0.0012
	Alcohol use: never	31 (62.0%)
	Alcohol use: past	12 (24.0%)
	Alcohol use: current	7 (14.0%)

MASLD = metabolic-associated steatotic liver disease; IQR = interquartile range.

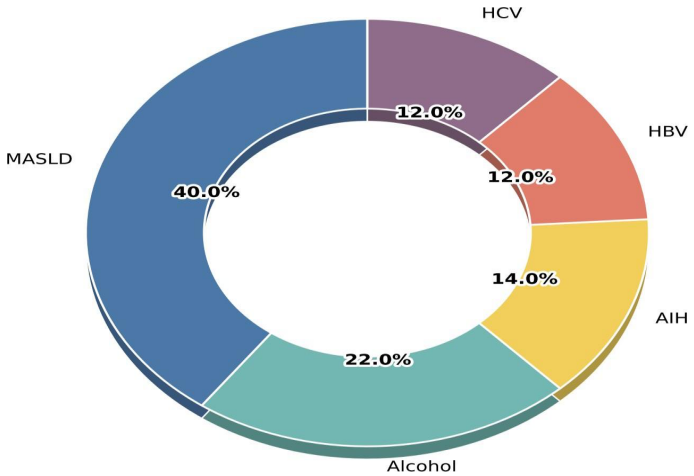

Figure 4: Etiological distribution of chronic liver disease in female patient.

Clinical presentation and portal hypertension-related complications: Jaundice was the most common presenting feature and was present in 34/50 (68%) patients. Fever/infection occurred in 18/50 (36%), abdominal distension in 16/50 (32%), and altered sensorium in 4/50 (8%). Gastrointestinal bleed was not recorded at presentation. Ascites was absent in 22/50 (44%) patients, mild in 15/50 (30%), moderate in 7/50 (14%), and gross in 6/50 (12%). Overall, ascites of any grade was present in 28/50 (56%). Severe ascites, defined as moderate or gross ascites, differed across etiologies (p=0.0014) and was most frequent in alcohol-related CLD (8/11, 72.7%), followed by MASLD (4/20, 20.0%) and hepatitis C virus infection (1/6, 16.7%); severe ascites was not observed in autoimmune hepatitis or hepatitis B virus infection.

Esophageal varices were absent in 21/50 (42%) patients, small in 20/50 (40%), and large in 9/50 (18%); 29/50 (58%) had varices of any size. Variceal status differed across etiologies (p=0.0130), and large varices clustered strongly in alcohol-related CLD (p<0.001). Median platelet count fell progressively with increasing variceal severity, from 170 ×10⁹/L in patients without varices to 129 ×10⁹/L with small varices and 90 ×10⁹/L with large varices.

Table 2: Clinical presentation, ascites severity, variceal status, and common laboratory abnormalities

Domain	Parameter	n (%) or statistic
Presenting clinical features	Jaundice	34 (68.0%)
	Fever / infection	18 (36.0%)
	Abdominal distension	16 (32.0%)
	Altered sensorium	4 (8.0%)
	Gastrointestinal bleed	0 (0.0%)
Ascites severity	Absent	22 (44.0%)
	Mild	15 (30.0%)
	Moderate	7 (14.0%)
	Gross	6 (12.0%)
	Any grade of ascites	28 (56.0%)
Variceal status	Absent	21 (42.0%)
	Small varices	20 (40.0%)
	Large varices	9 (18.0%)
	Any varices	29 (58.0%)
Laboratory summary	Total bilirubin, median (IQR)	2.65 mg/dL (1.80–3.88)
	INR, median (IQR)	1.29 (1.16–1.59)
	Serum creatinine, median (IQR)	0.99 mg/dL (0.90–1.10)
	Serum sodium, median (IQR)	136 mmol/L (132–138)
	Serum albumin, median (IQR)	3.30 g/dL (3.00–3.60)
	Platelet count, median (IQR)	135 ×10⁹/L (115–165)
	Haemoglobin, median (IQR)	10.4 g/dL (8.9–12.8)
Laboratory abnormalities	Anaemia	36 (72.0%)
	Hypoalbuminemia	32 (64.0%)
	Hyperbilirubinemia	32 (64.0%)
	Thrombocytopenia	31 (62.0%)
	Hyponatremia	21 (42.0%)
	Coagulopathy	16 (32.0%)
	Renal dysfunction	5 (10.0%)
	Severe hyponatremia	4 (8.0%)

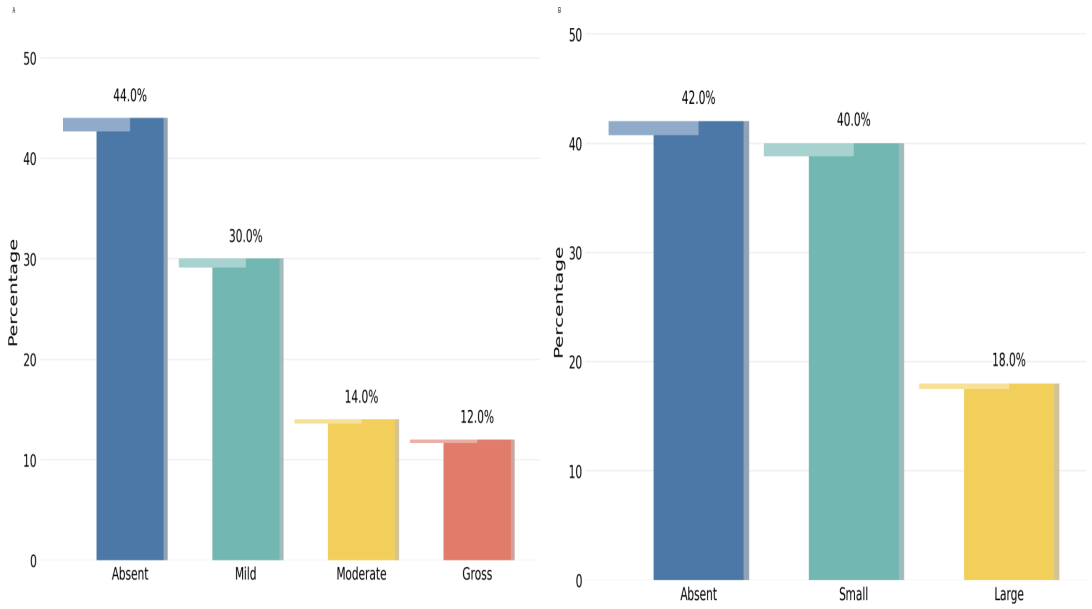

Figure 5: Distribution of ascites severity (A) and esophageal variceal status (B) in female patients with chronic liver disease.

Laboratory profile: Median total bilirubin was 2.65 mg/dL (IQR, 1.80–3.88; range, 1.00–9.80), median INR was 1.29 (IQR, 1.16–1.59; range, 1.02–2.30), median serum creatinine was 0.99 mg/dL (IQR, 0.90–1.10; range, 0.70–1.80), median serum sodium was 136 mmol/L (IQR, 132–138; range, 128–139), median serum albumin was 3.30 g/dL (IQR, 3.00–3.60; range, 2.50–4.10). Median platelet count was 135 ×10⁹/L (IQR, 115–165; range, 70–205), and median haemoglobin was 10.4 g/dL (IQR, 8.9–12.8; range, 7.8–14.1). Anaemia was present in 36/50 (72%) patients, hypoalbuminemia in 32/50 (64%), hyperbilirubinemia in 32/50 (64%), thrombocytopenia in 31/50 (62%), hyponatremia in 21/50 (42%), coagulopathy in 16/50 (32%), renal dysfunction in 5/50 (10%), and severe hyponatremia in 4/50 (8%). Total bilirubin, INR, creatinine, sodium, albumin, and platelet count differed significantly across etiologies (all $p<0.001$), whereas haemoglobin did not ($p=0.809$). The alcohol-related CLD subgroup had the most deranged biochemical profile.

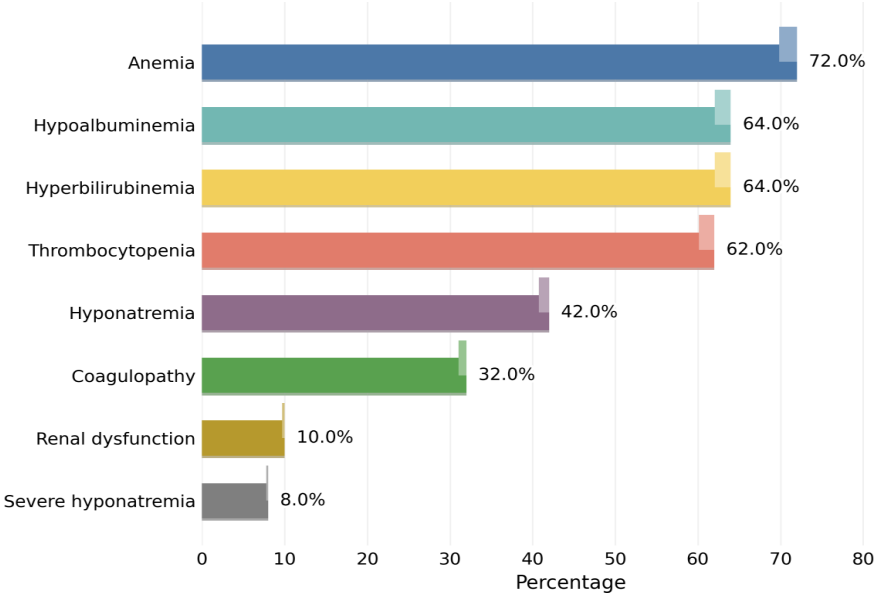

Figure 6. Distribution of common laboratory abnormalities in female patients with chronic liver disease.

Status at last contact and factors associated with adverse status: At last contact, 41/50 (82%) patients had been discharged, 7/50 (14%) had been referred, and 2/50 (4%) had died. Adverse status at last contact, defined as referral or death, occurred in 9/50 (18%) patients. Adverse status was most frequent in alcohol-related CLD (4/11, 36.4%), followed by MASLD (3/20, 15.0%), hepatitis B virus infection (1/6, 16.7%), and hepatitis C virus infection (1/6, 16.7%); no adverse status occurred in autoimmune hepatitis. The distribution of adverse status across etiologies was not statistically significant ($p=0.381$). Patients with adverse status had significantly higher bilirubin ($p=0.042$) and creatinine ($p=0.015$) and lower sodium ($p=0.033$) and albumin ($p=0.039$) than those discharged. INR and platelet count showed borderline differences ($p=0.056$ and $p=0.052$, respectively).

Adverse status at last contact was associated with abdominal distension (8/16 [50.0%] vs 1/34 [2.9%]; $p=0.00018$), fever/infection (8/18 [44.4%] vs 1/32 [3.1%]; $p=0.00058$), severe ascites (5/13 [38.5%] vs 4/37 [10.8%]; $p=0.0397$), large varices (4/9 [44.4%] vs 5/41 [12.2%]; $p=0.0432$), hyponatremia (7/21 [33.3%] vs 2/29 [6.9%]; $p=0.0253$), and renal dysfunction (3/5 [60.0%] vs 6/45 [13.3%]; $p=0.0350$). Jaundice and altered sensorium were not significantly associated with adverse status.

Table 3: Factors associated with adverse status at last contact

Factor	With factor	Without factor	p-value
Abdominal distension	8/16 (50.0%)	1/34 (2.9%)	0.00018
Fever/infection	8/18 (44.4%)	1/32 (3.1%)	0.00058
Hyponatremia (Na <135 mmol/L)	7/21 (33.3%)	2/29 (6.9%)	0.0253
Renal dysfunction (creatinine ≥1.5 mg/dL)	3/5 (60.0%)	6/45 (13.3%)	0.0350
Severe ascites (moderate/gross)	5/13 (38.5%)	4/37 (10.8%)	0.0397
Large varices	4/9 (44.4%)	5/41 (12.2%)	0.0432
Jaundice	7/34 (20.6%)	2/16 (12.5%)	0.699
Altered sensorium	1/4 (25.0%)	8/46 (17.4%)	0.560

Discussion

Principal findings: This prospective observational study identified a predominantly middle-aged to elderly female CLD cohort with a clear metabolic contribution to disease burden. MASLD was the leading etiology, half of the patients had diabetes, and portal hypertension-related complications were frequent. More advanced decompensation, infection, hyponatremia, and renal dysfunction were associated with poorer status at last contact.

Comparison with previous studies: The age distribution in this cohort was older than that reported in the large multicentric Indian CLD series by Mukherjee et al. [14] and was compatible with the later-adult pattern described in female cohorts from Assam, Raichur, Kerala, and other tertiary care settings. [9-12]

The etiological pattern also emphasizes the heterogeneity of CLD in women. The predominance of MASLD aligns with the metabolic shift reported in central Kerala and with pooled Indian prevalence estimates for fatty liver disease,[4,11] whereas alcohol-dominant female cohorts have been reported from Assam and Raichur, and a more viral-heavy distribution was described by Rita et al. [9,10,11]

The high burden of ascites and esophageal varices is consistent with the natural history of decompensated cirrhosis and with prior female and mixed-sex hospital-based cohorts in which portal hypertension-related complications dominate presentation. [9-12,15-17] Frequent anaemia, thrombocytopenia, hypoalbuminemia, and coagulopathy in this cohort are also in keeping with observations from other female CLD series. [18]

Clinical Interpretation: The strong association between diabetes and MASLD underscores the importance of metabolic evaluation in women with CLD. Alcohol-related CLD showed the greatest concentration of severe ascites, large varices, and biochemical derangement, suggesting a heavier decompensation burden in this subgroup. The association of abdominal distension, fever/infection, hyponatremia, renal dysfunction, severe ascites, and large varices with adverse status at last contact is congruent with established markers of poor prognosis in decompensated cirrhosis. [3,15,19] These findings support systematic etiological work-up, metabolic risk assessment, careful alcohol history, early endoscopic evaluation, and prompt recognition of infection and renal dysfunction in female patients with CLD.

Strengths and Limitations: Strengths of this study include prospective enrolment, a female-specific cohort, and structured documentation of etiological, clinical, laboratory, and complication profiles. Limitations include the single-center hospital-based design, the modest sample size, likely enrichment for symptomatic or advanced disease because participants were seen at a tertiary care hospital, and outcome assessment that relied on status at last contact rather than long-term survival or disease progression.

Conclusion

Among female patients with CLD in this tertiary care cohort, MASLD was the leading etiology and was strongly associated with diabetes mellitus. Portal hypertension-related complications, including ascites and esophageal varices, were common, and alcohol-related CLD showed a greater burden of severe decompensation. Adverse status at last contact was associated with abdominal distension, fever/infection, severe ascites, large varices, hyponatremia, and renal dysfunction.

Declarations: Ethics approval and consent to participate: The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants.

Consent for publication: Written informed consent was obtained from all participants. No identifying personal information has been included in this manuscript.

Availability of data and materials: The data supporting the findings of this study are available from the corresponding author on reasonable request.

Author Contributions:

Dr. Abhishek Bhardwaj contributed to study conception and design, data collection, clinical assessment, data interpretation, and manuscript drafting.

Dr. Ravi Bhardwaj contributed to study design, data interpretation, corresponding author responsibilities/critical revision of the manuscript.

Acknowledgments: The authors thank all study participants for their cooperation and the Department of General Medicine, Krishna Mohan Medical College and Hospital, Mathura, Uttar Pradesh, for support during the conduct of the study.

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