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Prevalence and Patterns of Hyponatremia in Patients with Chronic Liver Disease

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Abstract

Background: Hyponatremia is the most frequent electrolyte disturbance in chronic liver disease (CLD), especially cirrhosis, and is associated with poor prognosis.[1],[2]

Objectives:

1. To determine the prevalence of hyponatremia among CLD patients.
2. To describe clinical and biochemical patterns of hyponatremia.
3. To correlate severity of hyponatremia with disease stage and complications.

Methods: A cross-sectional study was conducted in the Department of Medicine, from **July 2023 – June 2024**. A total of 120 CLD patients were enrolled. Serum sodium was categorized as mild (130–134 mEq/L), moderate (125–129 mEq/L), and severe (<125 mEq/L).[3] Disease severity was assessed using Child-Pugh and MELD scores.[10–12] Complications including ascites, hepatic encephalopathy, and spontaneous bacterial peritonitis (SBP) were documented.

Results: Hyponatremia prevalence was 45% (54/120). Distribution: mild 22.5%, moderate 13.3%, severe 9.2%. Hyponatremia was significantly associated with **Child-Pugh C (64%)** and higher MELD scores (23.4 vs. 16.7; $p < 0.01$). Ascites (80% vs. 52%), hepatic encephalopathy (42% vs. 21%), and SBP (18% vs. 7%) were more common in hyponatremic patients.

Conclusion: Hyponatremia is highly prevalent in CLD patients at hospital and correlates with advanced disease and complications. Regular sodium monitoring and early correction are essential.

Keywords: Hyponatremia, CLD, Cirrhosis, Child-Pugh, MELD

1. Introduction

Chronic liver disease (CLD) is a major cause of morbidity and mortality worldwide. In India, alcohol, viral hepatitis, and non-alcoholic steatohepatitis are leading etiologies. Hyponatremia is the most common electrolyte disorder in cirrhosis and has important prognostic significance.[1,2]

Pathogenesis involves **non-osmotic vasopressin release**, systemic vasodilation, and impaired renal perfusion, leading to dilutional hyponatremia.[7,10] It predisposes patients to refractory ascites, hepatic encephalopathy, hepatorenal syndrome, and worsens outcomes after liver transplantation.[6,8,9,13,15]

Reported prevalence varies between **30–50%** depending on study setting.[1,3,7] Limited data exist from tertiary centers in North India. This study was therefore conducted at UPUMS, Saifai to determine prevalence and patterns of hyponatremia in CLD patients.

Methods

Study Design

A **cross-sectional observational study** was carried out. This design was chosen as it allows estimation of the prevalence of hyponatremia and description of its patterns at a single point of time among patients with chronic liver disease (CLD).

Study Period

The study was undertaken over a period of **12 months, from July 2023 to June 2024**.

Sample Size and Sampling

A total of **120 consecutive patients** diagnosed with chronic liver disease (CLD) and admitted to the Department of Medicine during the study period were included. A consecutive sampling technique was used to avoid selection bias.

Inclusion Criteria

- Adult patients aged **≥18 years**.
- Patients with **clinically, biochemically, and radiologically confirmed chronic liver disease**, irrespective of etiology.

Exclusion Criteria

- Patients with **chronic kidney disease (CKD)**.
- Patients with **congestive heart failure (CHF)**.
- Patients with **thyroid or parathyroid disorders** that could alter serum sodium.
- Patients on **long-term diuretics for non-hepatic causes**.

Data Collection

Data were collected using a structured proforma. The following parameters were recorded:

- **Demographic details**: age, sex, residence (rural/urban).
- **Etiology of CLD**: alcoholic liver disease, viral hepatitis, non-alcoholic steatohepatitis (NASH), others.
- **Laboratory parameters**: serum sodium levels, liver function tests, renal function tests.
- **Classification of hyponatremia**:
  - Mild: 130–134 mEq/L
  - Moderate: 125–129 mEq/L
  - Severe: <125 mEq/L
- **Disease severity indices**:
  - **Child-Pugh score** (grading into A, B, and C).
  - **Model for End-Stage Liver Disease (MELD) score**.
- **Complications documented**: ascites, hepatic encephalopathy, spontaneous bacterial peritonitis (SBP).

Statistical Analysis

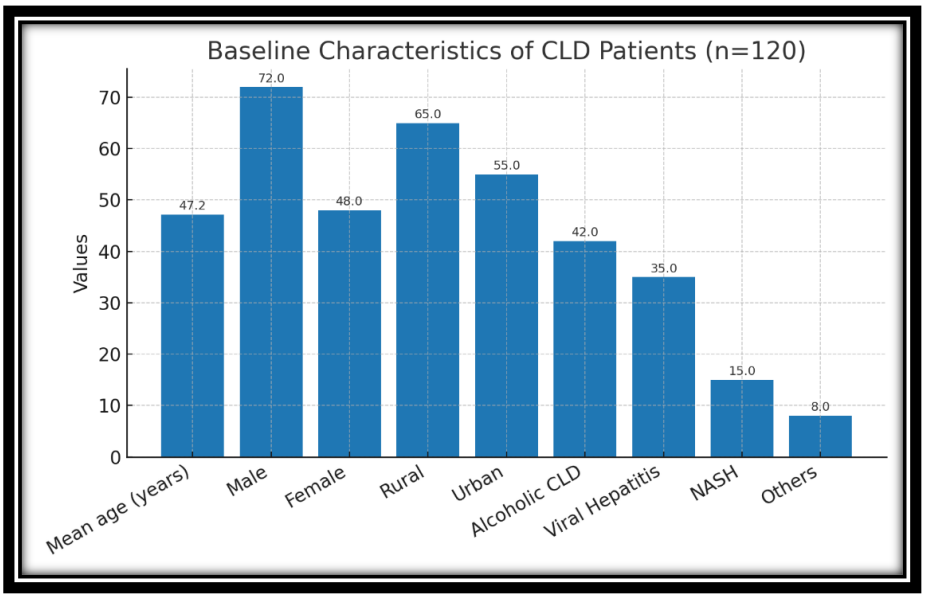
Data were entered into **Microsoft Excel** and analyzed using **Statistical Package for Social Sciences (SPSS), version 25.0 (IBM, USA)**.

- Continuous variables were expressed as **mean ± standard deviation (SD)** and compared using **Student's t-test**.
- Categorical variables were expressed as **frequency and percentage** and compared using the **Chi-square test (χ^2)**.
- A **p-value <0.05** was considered statistically significant.

Results

Table 1. Baseline Characteristics (n = 120)

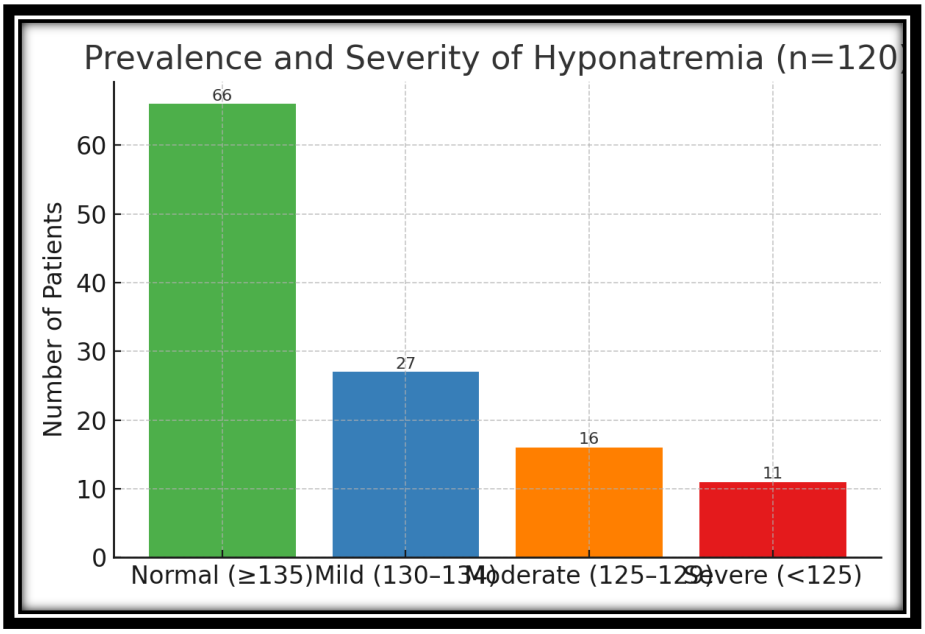
Characteristic	Value
Mean age (years) ± SD	47.2 ± 11.8
Male : Female ratio	72 (60%) : 48 (40%)
Residence (Rural/Urban)	65 (54%) / 55 (46%)
Etiology of CLD	Alcoholic – 42%; Viral Hepatitis – 35%; NASH – 15%; Others – 8%



This table shows the demographic and clinical profile of the 120 CLD patients included. The mean age was 47.2 years, with a male predominance (60%). Slightly more patients belonged to rural areas (54%). Alcoholic liver disease (42%) and viral hepatitis (35%) were the leading etiologies.

Table 2. Prevalence and Severity of Hyponatremia

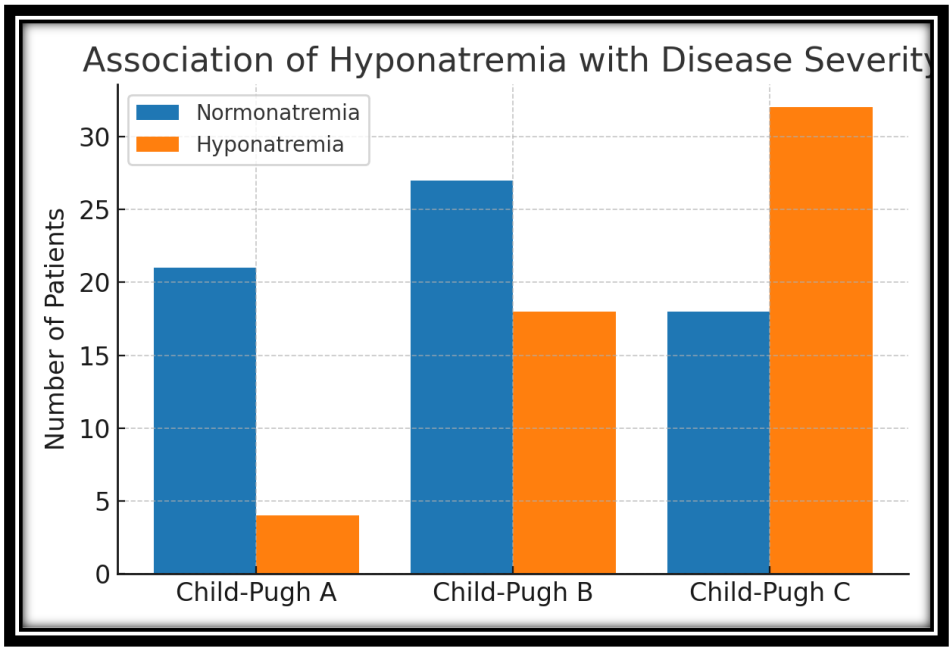
Serum Sodium (mEq/L)	Patients (%)
Normal (≥135)	66 (55%)
Mild (130–134)	27 (22.5%)
Moderate (125–129)	16 (13.3%)
Severe (<125)	11 (9.2%)
Total Hyponatremia	**54 (45%)**



Out of 120 CLD patients, 54 (45%) had hyponatremia. Most cases were of mild type (22.5%), followed by moderate (13.3%) and severe (9.2%). More than half of the patients (55%) maintained normal sodium levels. This highlights that nearly one in two patients with CLD develops hyponatremia.

Table 3. Association with Disease Severity

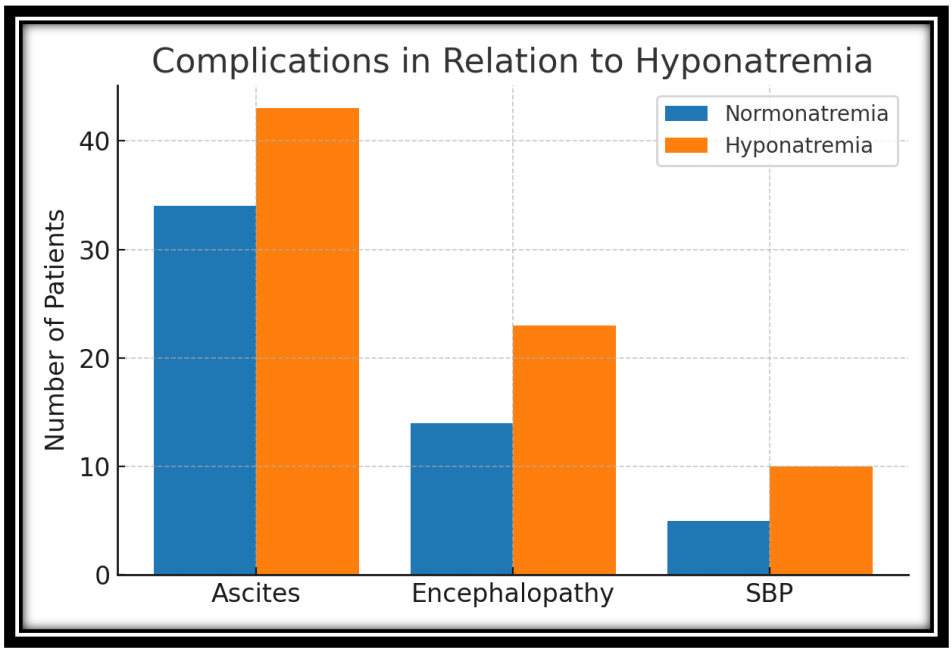
Disease Severity	Normonatremia (%)	Hyponatremia (%)
Child-Pugh A (n=25)	21 (84%)	4 (16%)
Child-Pugh B (n=45)	27 (60%)	18 (40%)
Child-Pugh C (n=50)	18 (36%)	32 (64%)
Mean MELD Score	16.7 ± 4.5	23.4 ± 5.2



The prevalence of hyponatremia rose markedly with worsening Child-Pugh class. Only 16% of Child-Pugh A patients had hyponatremia, compared to 64% in Child-Pugh C. The mean MELD score was also significantly higher in the hyponatremic group (23.4 vs. 16.7), establishing hyponatremia as a marker of advanced disease.

Table 4. Complications in Relation to Hyponatremia

Complication	Normonatremia (n=66)	Hyponatremia (n=54)
Ascites	34 (52%)	43 (80%)
Hepatic Encephalopathy	14 (21%)	23 (42%)
SBP	5 (7%)	10 (18%)



Complications were significantly more frequent among hyponatremic patients. Ascites was present in 80% of the hyponatremia group compared to 52% in normonatremics. Similarly, hepatic encephalopathy (42% vs. 21%) and SBP (18% vs. 7%) showed higher prevalence. This indicates that hyponatremia correlates with increased risk of decompensating events.

Discussion

This study found a **45% prevalence** of hyponatremia in CLD patients at UPUMS, similar to prior Indian and international data.[1],[3],[7] Severe hyponatremia was strongly associated with **Child-Pugh C** and higher **MELD scores**, confirming its role as a poor prognostic marker.[5],[6],[10–12]

Complications such as ascites, encephalopathy, and SBP were significantly more common in hyponatremic patients, consistent with Sindhura et al.[1] and Thuluvath et al.[7] Hyponatremia results from vasopressin-mediated water retention and impaired solute clearance,[7],[10] which worsens cerebral edema[9] and aggravates portal hypertension.[8],[13]

Clinically, hyponatremia is an independent risk factor for mortality and is incorporated in transplant prognostic models.[14],[15] Early detection and timely management (fluid restriction, vaptans, careful correction) are vital.

Limitations: Single-center, cross-sectional design, limited sample size. Multicenter prospective studies are needed.

Conclusion

Hyponatremia is common (45%) in CLD patients. It correlates with advanced disease (Child-Pugh C, high MELD) and with complications such as ascites and encephalopathy. Routine sodium monitoring and appropriate management are essential for better outcomes.

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