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A Study of Serum Sodium Level in Chronic Liver Disease Patients in Tertiary Care Hospital At Guwahati, India

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Abstract:
Background: The normal range for serum sodium is 135-145 mEq/L. Imbalances in serum sodium levels, including hyponatremia and hypernatremia, can have significant clinical implications. Hyponatremia is the most common electrolyte disorder in hospitalized patients, especially those with chronic liver disease (CLD). It is typically characterized by excessive renal retention of water relative to sodium, often due to reduced solute-free water clearance and increased release of arginine vasopressin (AVP). While hypernatremia has a high mortality rate, it is less common than hyponatremia.
Objective: To determine the prevalence of hyponatremia in patients with chronic liver disease (CLD) and to analyze the correlation between serum sodium levels and various complications associated with CLD
Methods: The study was conducted on male and female patients aged 30-70 years, admitted to the ward, ICU, or SICU at Downtown Hospital,Guwahati. A total of 20 patients with CLD were included in the study. Serum sodium levels were measured, and the presence of complications was noted.
Results: Out of the 20 chronic liver disease patients, 55% had hyponatremia, 35% had hypernatremia, and 10% had normal sodium levels (eunatremia). The patients exhibited various complications: 20% had ascites, 15% experienced hematemesis and vomiting, and others had conditions such as swelling, increased intracranial pressure (ICP), seizures, septicemia, and hepatitis.
Conclusion: Hyponatremia is prevalent among hospitalized CLD patients, especially those with ascites and low sodium levels. The study suggests a potential link between serum sodium imbalances and the severity of complications in CLD patients. Further studies with larger sample sizes are necessary to confirm these findings and better understand the correlation between serum sodium levels and clinical outcomes in CLD patients.

Introduction:

The liver is the second largest organ and the largest gland in the human body, performing several critical functions, including detoxification, protein synthesis, and bile production. Chronic liver disease (CLD) is characterized by persistent inflammation, fibrosis, and eventual cirrhosis, leading to impaired liver function. The global burden of liver disease is significant, with approximately 1 million new cases of liver cirrhosis diagnosed annually in India alone (Shivakrishnan, 2019).

Hyponatremia, defined as a serum sodium level < 135 mEq/L, is a common electrolyte disturbance in CLD patients, with studies showing that up to 57% of hospitalized patients with cirrhosis exhibit this condition (Mamun, 2013). Hyponatremia in CLD often results from impaired water clearance due to reduced kidney function and is a key prognostic factor when incorporated into the MELD score (Arroyo, 1994). While less common, hypernatremia (> 145 mEq/L) is also observed in CLD patients, typically in association with complications such as gastrointestinal bleeding or osmotic cathartic use (Sanford, 1980).

Disturbances in water balance and sodium regulation in CLD contribute to significant clinical challenges, including ascites, hepatic encephalopathy, and other systemic complications. Given the high prevalence of hyponatremia and its impact on patient outcomes, this study aims to explore the frequency of hyponatremia versus hypernatremia in CLD patients and its correlation with clinical complications.

Objective: To determine the prevalence of hyponatremia in patients with chronic liver disease (CLD) and to analyze the correlation between serum sodium levels and various complications associated with CLD.

Materials and Methods

Source of Data: This study was conducted using data from 20 patients admitted to Downtown Hospital, Guwahati, Assam. Observational data were collected from laboratory reports and medical records of the patients.

Secondary Sources: Relevant secondary data and literature were sourced from PubMed, Google Scholar, ResearchGate, and other peer-reviewed journals.

Sample Size: The study sample consisted of 20 patients, including both male and female participants.

Study Period: The study was conducted over a period from March 2023 to May 2023.

Inclusion Criteria:

- Patients diagnosed with Chronic Liver Disease (CLD).
- Patients aged between 30 and 65 years.

Exclusion Criteria:

- Patients with recent surgery or trauma.
- Pediatric patients (under the age of 18).
- Pregnant patients.

Methods of Data Collection

- A detailed patient history was obtained using a standardized questionnaire (Natesh, 2016). Serum sodium levels were measured using the Ion Selective Electrode (ISE) method on the VITROS 5600, a fully automated biochemistry analyzer. Based on the serum sodium levels, patients were classified into one of three categories: hyponatremia, hypernatremia, or eunatremia.
- Additionally, any complications present in the patients were thoroughly documented and analyzed as part of the study.

RESULT AND DISCUSSION:

According to my period of study, 20 patients were diagnosed with CLD. Of 20 total patients, 12 patients

was male (60%) and rest of the 8 patients were Female (40%).
In my study, I found about overall (with my sample size) 55 % of the patient have an abnormality of Hyponatremia and 35% patient have Hypernatremia & 10% have eunatremia in CLD patient.

Sex	Frequency	Percentage(%)
Male	12	60
Female	8	40
Total	**20**	**100**

Table: Gender Distribution, As shown that majority patient of the sample size is male (60%)patient & fewer was female (40%) patient.

My study showed that In 12 male patient, 5 patient was affected by Hyponatremia & 5 patient was affected by Hypernatremia ,2 tularemia and In 8 female patient 6 patient have Hyponatremia & 2 patient had Hypernatremia.

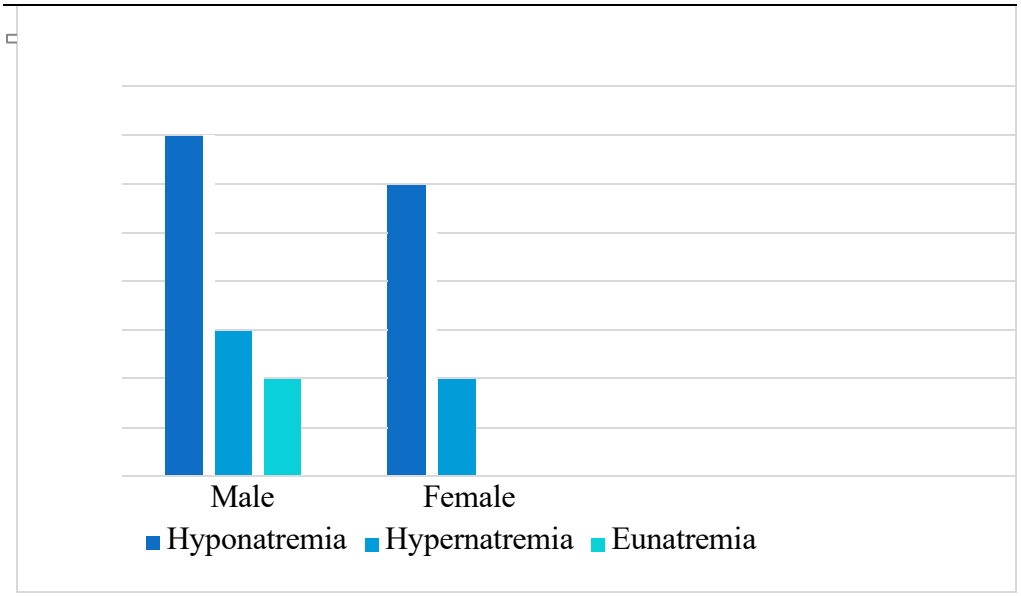
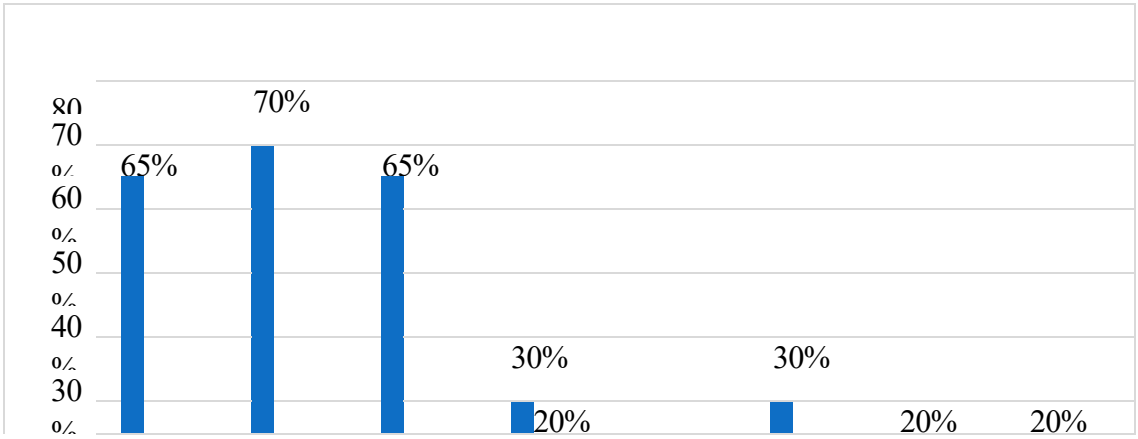


Figure : Graphical representation of Differential Signs & symptoms collected by questionnaire showing ,100% of patients have edema & 70% of patients are effected by HTN, Diabetes65% ,CKD65% & rest are Blackstool,breathing difficulty,oedema,and hepatitis.



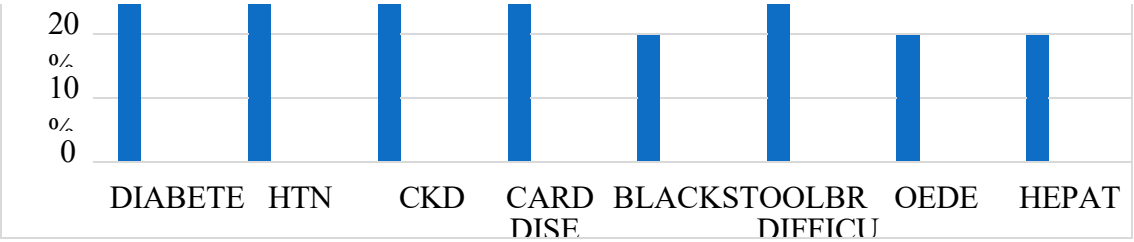


Table 6 : Comparison of Serum Sodium (Na+) in Male & Female patients with Complication, In the present study showed that 55%ofpatientshave hyponatremia, which coincides with the study of Sindhura.,2022 found that 76.6% areeffected by hyponatremia. Hyponatremia is the most commonest major finding in CLD

Results and Discussion

This study aimed to investigate the prevalence of sodium abnormalities in patients diagnosed with Chronic Liver Disease (CLD). The sample consisted of 20 patients, with 12 males (60%) and 8 females (40%).

Sodium Abnormalities

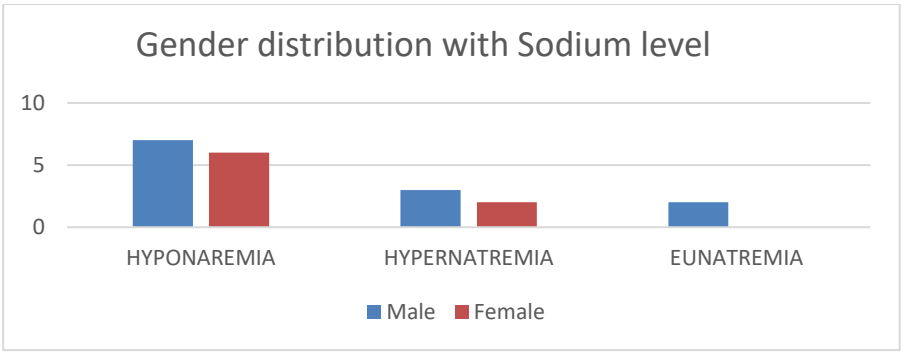
The study found that 55% of CLD patients had hyponatremia, 35% had hypernatremia, and 10% had eunatremia. Hyponatremia was the most common sodium imbalance in these patients, which aligns with the findings of Kim et al. (2009), who attributed this to impaired renal solute-free water secretion due to increased antidiuretic hormone and reduced effective arterial volume.

Fluid accumulation, particularly ascites, was the most common complication observed in this cohort. Serum sodium testing showed a higher prevalence of hyponatremia, especially in the age group of 30-40 years, while hypernatremia was more frequent in patients aged 61-65 years.

Gender Distribution and Sodium Imbalances

Among the 12 male patients, 7 had hyponatremia, 3 had hypernatremia, and 2 had eunatremia. Of the 8 female patients, 6 had hyponatremia, and 2 had hypernatremia.

Sex	Frequency	Percentage(%)
Male	12	60
Female	8	40
Total	20	100



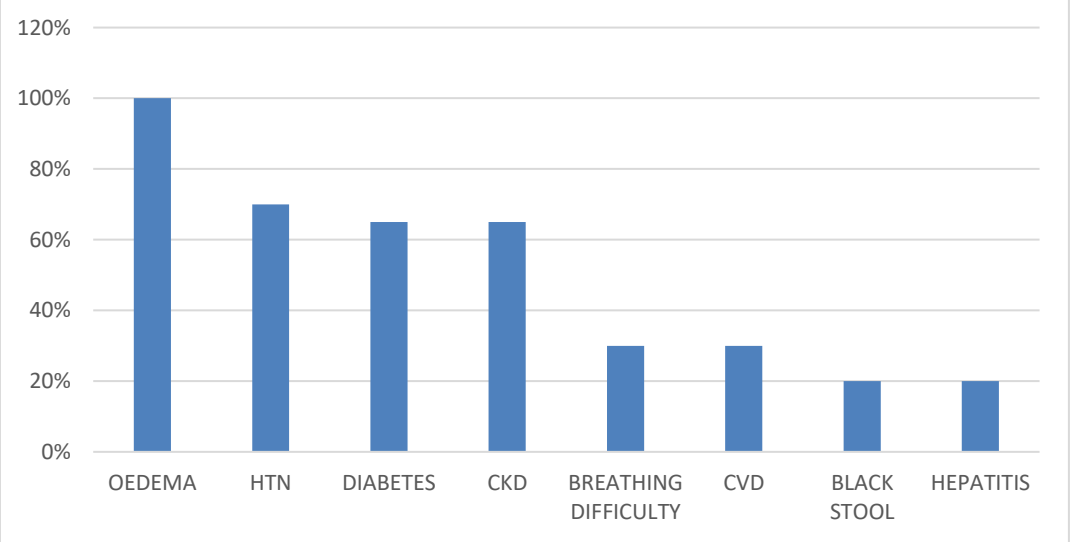
Associated Complications

Hyponatremia was found to be strongly associated with complications such as ascites (20%), hematemesis (15%), vomiting (15%), and other symptoms including swelling, increased intracranial pressure, seizures, and mental status changes. These findings are consistent with the study by Sindhura et al. (2022), which also reported a high prevalence of hyponatremia in CLD patients.

Complications	Frequency	Percentage (%)
Hematemesis	3	15
Vomiting	3	15
Swelling	1	5
↑ICP	1	5
Ascites	**4**	**20**
Seizure	1	5
Lower limb oedema	1	5
Septicaemia	1	5
Confusion	1	5
Facialoedema	1	5
Mentalstatus changes	1	5
Hyperuricemia	1	5
Hepatitis	1	5

Signs and Symptoms

The questionnaire-based survey revealed that 100% of patients presented with edema. Other significant symptoms included hypertension (70%), diabetes (65%), chronic kidney disease (65%), and gastrointestinal issues such as black stool, breathing difficulty, and hepatitis.



Sodium Levels and Gender Distribution

Regarding sodium levels, in the 116-125 mEq/L range, there was 1 male and 1 female patient; in the 126-135 mEq/L range, there were 6 male and 5 female patients. Sodium levels of 136-145 mEq/L were observed in 2 male patients, while 146-155 mEq/L was noted in 3 male and 2 female patients.

SERUM Na+ LEVEL RANGE(mEq/L)	MALE	FEMALE
116-125	1	1
126-135	6	5
136-145	2	0
146-155	3	2

CONCLUSION

Comparative analysis of CLD patient, we found in this study hyponatremia & ascites is more common than any other episodes. CLD is associated with abnormal serum sodium concentration. Hyponatremia is the most common abnormality in this study. Age, gender, and cause of CLD did not have any association with serum sodium level.

Patients with<130 mEq/L serum sodium concentration are most affected. This patient with decreased serum sodium(Na+) level should be considered a high-risk population because of the increased frequency of complications and mortality.

The goal of this paper is to give a general idea about Hyponatremia in CLD patients.

Limitations

- The study population was selected from one selected hospital lin Guwahati, so the result of the study may not reflect the exact picture of the country.
- The present study was conducted in a very short period.
- The small sample size is also a limitation of the present study.therefore, in the future, further study may be undertaken with large sample size.
- Funding: No funding sources.
- Conflict of Interest: None declared.
- Ethical Approval: The study was approved by the Institutional Ethics Committee.

SUMMARY:

This study was conducted on 20 patients diagnosed with CLD in Downtown Hospital, Guwahati, Assam from March 2023- May 2023. All cases were evaluated with detailed history and relevant investigations. Out of 20selected patient, 12patient was male and 8 patient was female. The prevalence of hyponatremia was found55%, If the cut-off value is,135 mEq /L. Severe Hyponatremia was associated with increased mortality

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