



A STUDY OF THE RELATIONSHIP BETWEEN SERUM SODIUM AND CHRONIC LIVER DISEASE SEVERITY

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ABSTRACT

INTRODUCTION: The typical sodium range in the blood is 135–145 mEq/L. The cell's homeostasis is critical to its proper functioning. Abnormal sodium levels can be caused by an imbalance in the regulation of total body water. Dysnatremia is a symptom of chronic liver disease (CLD), which is caused by a disruption in water balance.

Aims and objectives: The goal of this study is to determine the prevalence of hyponatremia in CLD patients, as well as to connect blood sodium levels and severity in CLD patients as measured by the Child-Pugh and MELD scores.

Materials and methods: The study is conducted on consecutive patients admitted With CLD in medical wards (male and female) in Government General Hospital between July 2021 and January 2022.

Results: this study, the most common cause of CLD was alcohol, followed by hepatitis B.

Conclusion: CLD is linked to high salt levels in the blood. The most common anomaly in this study is hyponatremia.

KEYWORDS :

INTRODUCTION:

The typical sodium range in the blood is 135–145 mEq/L. The cell's homeostasis is critical to its proper functioning. Abnormal sodium levels can be caused by an imbalance in the regulation of total body water. Dysnatremia a complication of chronic liver disease (CLD), is caused by a disruption in water balance(1-5).

Hyponatremia is defined as a sodium level of less than 135 mEq/L. When there is an overabundance of water in ratio to sodium, this happens. It is the most prevalent electrolyte imbalance in hospitalised patients, especially those with CLD. A disturbance in total body water regulation leading to decreased clearance of solute free water and the consequent inability to match the urine output to the amount of water ingested leads to dilutional hyponatremia.

Hypernatremia is defined as a sodium level greater than 145 mEq/L. It's linked to a high mortality rate. Despite its rarity, hypernatremia is a condition in which the body's sodium levels In CLD patients, it is caused by the use of osmotic cathartics and upper gastro intestinal haemorrhage, as opposed to hyponatremia. If it's present, it's linked to a higher risk of death. Lower serum sodium levels have been linked to greater complications and mortality in recent research, prompting the inclusion of sodium in the MELD Score. As a result, we conducted this study in our tertiary hospital to investigate serum sodium levels in patients with CLD and determine their importance.

AIMS AND OBJECTIVES:

1. Determine the prevalence of hyponatremia in patients with CLD.
2. To examine the relationship between serum sodium levels and severity in CLD patients as measured by the Child-Pugh and MELD scores.

MATERIALS AND METHODS:

The study is conducted on consecutive patients admitted With CLD in medical wards (male and female) in Government General Hospital between July 2021 and January 2022.

This study is a cross-sectional observational study.

The institution's Ethical Committee gave their approval. The patients who were enrolled in the trial gave their informed consent. A Pro forma was used to obtain the patients' information. The pro forma includes the patient's demographic profile and thorough medical history, as well as the clinical examination that will be performed at the time of admission, investigations that were performed to aid in the diagnosis, and the serum sodium level. Patients were chosen based on a history, examination, laboratory tests, and radioimaging that pointed to CLD as a diagnosis. The presence of numerous complications as well as the patients' outcomes were tracked. MELD and Child Pugh scores were used to determine the severity of the condition.

Ascites was classified Into three grades: Grade I – presence on examination not clear, but shown in imaging; Grade II – easily detected on examination and palpation; and Grade III – substantial abdominal distension necessitating large-volume paracentesis. The West Haven Criteria were used to classify hepatic encephalopathy.

Inclusion Criteria:

The study included all patients with CLD who were diagnosed through examination, laboratory testing, and radiographic imaging.

Exclusion Criteria:

The following criteria were used to eliminate participants from the study:

1. Patients suffering from heart failure
2. Chronic kidney disease patients
3. Diuretics, SSRIs, TCA Inhibitors, MAO Inhibitors, and cytotoxic medicines are all used by patients.

RESULTS:

Data was gathered from 100 individuals who were admitted to our facility. The patients' average age was 46.39 years old, with a range of 33–80 years old. There were 85 men and 15 women among the 100 patients. In this study, alcoholic liver

disease was shown to be the most common cause of CLD, accounting for 88 percent of cases, while chronic hepatitis B was discovered to be the reason in 6% of cases, and HBV and alcohol were detected in 5% of cases. The aetiology of CLD in one patient was HCV plus alcohol. All patients had a sodium content of 134.03 meq/L, with a range of 118–144 meq/L.

Serum sodium values showed that 26% of patients had sodium levels below 130 meq/L. Serum sodium levels in the range of 131 to 135 meq/L were found in 31% of patients, whereas serum sodium levels in the range of 136 meq/L were found in 43% of patients. There were no patients who had a sodium level of more than 145 in their blood. The average MELD score was 16.39, with a range of 7–34.

To investigate the relationship between serum sodium levels and patient characteristics, complications, and illness severity as measured by MELD score and CPS, patients were divided into three groups depending on their serum sodium levels. One group had serum sodium levels below 130 meq/L, whereas the other two groups had serum sodium levels between 131 and 135 meq/L and those with 136 meq/L. Patients with blood sodium levels of 131–135 meq/L and 136 meq/L had a mean age of 47.23 10.045 years, whereas those with serum sodium levels of 131–135 meq/L and 136 meq/L had a mean age of 46.16 11.11 years, respectively. There was no statistical difference between the three groups (P = 0.888).

The severity of disease as measured by the Child-Pugh class had a strong relationship with serum sodium levels. Thirteen people in Class B and thirteen people in Class C had serum sodium levels below 130 meq/L. 2 patients in Class A, 23 patients in Class B, and 6 patients in Class C had serum sodium levels between 131 and 135 meq/L. 9 patients in Class A, 30 patients in Class B, and 4 patients in Class C had serum sodium levels 136 meq/L (P = 0.0001). Patients with serum sodium levels of less than 130 meq/L had a mean MELD score of 25.12 5.317, whereas those with levels of 131–135 meq/L and 136 meq/L had mean MELD scores of 16.16 4.390 and 11.28 3.30, respectively. There was a statistically significant difference in MELD scores across the three groups (P = 0.001). In terms of age, gender, and causative factor, there was no statistical difference between the three groups.

At the time of admission, all of the patients had stomach distension and lower limb edoema. Around 19 percent of patients had GI bleeding, and 18 percent had a history of sensorium changes.

Ascites was found in every single one of the 100 patients examined. Hepatic encephalopathy was identified in 18% of the patients, while GI haemorrhage was found in 19%. Coagulopathy and SBP were discovered in 12% of patients, while hepatorenal syndrome was discovered in 11%.

Ascites (P = 0.0001), hepatic encephalopathy (P = 0.001), GI bleeding (P = 0.005), coagulopathy (P = 0.025), hepatorenal syndrome (P = 0.0001), and SBP (P = 0.001) were all more common in the three groups.

There were eight deaths in the group with serum sodium concentrations less than 130 meq/L, one fatality in the group with serum sodium concentrations between 131 and 135 meq/L, and no deaths in the group with serum sodium concentrations greater than 136 meq/L. There is a statistically significant difference in mortality across the three groups (P = 0.0001).

DISCUSSION:

Abnormal blood sodium concentration affects a large percentage of CLD patients. In our investigation, hyponatremia was the most common incidence. There were no

patients with serum sodium levels greater than 145 meq/L. Around 57 percent of patients had serum sodium levels of less than 135 meq/L, while 26% had serum sodium levels greater than 130 meq/L.

PARAMETER		NO. OF PATIENTS	PERCENTAGE	MEAN	STANDARD DEVIATION
AGE		100		46.39	10.227
GENDER	MALE	85	85		
	FEMALE	15	15		
CAUSE OF CLD	ALCOHOL	88	88		
	HBV	6	6		
	HCV	0	0		
	ALC and HBV	5	5		
	ALC and HCV	1	1		
PRESENTATION TIME OF ADMISSION	Abdominal distension	100	100		
	Lower limb swelling	100	100		
	Altered sensorium	18	18		
	GI bleeding	19	19		
MELD SCORE				16.39	6.998
SERUM NA	<=130meq/l	26	26	134.03	5.321
	131-135meq/l	31	31		
	>=136meq/l	43	43		
ASCITES		100	100		
HEPATIC ENCEPHALOPATHY		18	18		
GI BLEEDING		19	19		
COAGULOPATHY		12	12		
HRB		11	11		
SBP		12	12		
FREQUENCY OF COMPLICATIONS BY SERUM SODIUM CONCENTRATION					
		<=130meq/l	131-135meq/l	>=136meq/l	P-VALUE
ASCITES		26	31	43	0.0001
HEPATIC ENCEPHALOPATHY		15	3	0	0.001
GI BLEEDING		10	6	3	0.005
COAGULOPATHY		7	2	3	0.025
HRB		11	0	0	0.0001
SBP		8	4	0	0.001

Angeli et al. gathered information on 997 patients with cirrhosis from 28 hepatology departments in Europe, Asia, North America, and South America. In her study, 50.6 percent of patients had normal serum sodium levels, 27.8% had sodium levels between 131 and 135 mEq/L, and 21.6 percent of patients had sodium levels less than 130 mEq/L.

Kim et al. looked at 188 patients with cirrhosis complications who were hospitalised to Ilsan Paik Hospital in Korea. 52.1 percent of patients had normal serum sodium levels, whereas 20.8 percent had serum sodium levels ranging from 131 to 135. Serum sodium levels of less than 130 were seen in about 27.1 percent of patient.

Raj et al. studied 100 patients with cirrhosis and found that 48% of patients had serum sodium levels more than 136 mEq/L, while 21% of patients had serum sodium levels between 131 and 135 mEq/L. About 31% of patients had serum sodium levels ≤ 130 mEq/L.

Borroni et al. looked examined 156 patients with cirrhosis and discovered that 29.8% of them had serum sodium levels below 130 mEq/L.

The findings of this investigation support the findings of the previous studies showing decompensated liver disease is linked to aberrant serum sodium concentrations. It also demonstrates that hyponatremia is the most common anomaly, with blood sodium levels of less than 135 mEq/L in more than half of the patients. Lower salt levels have been linked to ascites, which is difficult to treat with diuretics and necessitates periodic large-volume paracentesis, according to several studies. Patients with blood sodium less than mEq/L had a poor GFR, which resulted in lower free water clearance, according to Arroyo et al. When compared to individuals with salt levels greater than 130 mEq/L, these patients did not respond well to diuretics.

In comparison to individuals who showed Response to diuretics, Angeli et al. and Bernardi et al. discovered that weaker Response to diuretics was associated with lower serum Sodium concentration.

Patients with lower sodium levels had a higher grade of ascites, according to the current study.

Hepatic encephalopathy was identified in 38 percent of individuals with serum sodium levels less than 130 mEq/L, according to Angeli et al. When serum sodium levels are between 131 and 135 mEq/L, the percentage drops to 24%.

Hepatic encephalopathy was identified in 43.1 percent of individuals with serum sodium levels less than 130 mEq/L, according to Kim et al. When serum sodium levels are between 131 and 135 mEq/L, the percentage drops to 35.8%.

Angeli et al. found that 17% of patients with serum sodium Levels \leq 130 mEq/L had hepatorenal syndrome compared to 10% and 6% in patients with serum sodium levels 131–135 mEq/L and more than 135 mEq/L, respectively.

Hepatorenal syndrome was seen in 3.9 percent of patients with serum sodium levels less than 130 mEq/L, compared to 2.5 percent and 3 percent in patients with serum sodium levels 131–135 mEq/L and more than 135 mEq/L, respectively, according to Kim et al. According to Raja et al., 77.7% of patients with HRS had a serum sodium content of less than 130 meq/L. In this study, patients with serum sodium levels of less than 130 mEq/L had a higher rate of hepatorenal syndrome than the other two groups.

Low sodium levels were linked to an increased frequency of spontaneous bacterial peritonitis, according to Angeli et al.

According to Kim et al., 33.3 percent of patients with serum sodium levels less than 130 mEq/L developed SBP, compared to 30.7 percent and 16.3 percent, respectively, in patients with serum sodium levels 131–135 mEq/L and 136 mEq/L.

The findings of this study back up the previous assertions. SBP was seen in 30.77 percent of patients with serum sodium levels of less than 130 mEq/L, compared to 13 percent of patients with serum sodium levels of 131 to 135 mEq/L.

There was no link between GI bleeding and salt levels, according to Angeli et al., Kim et al., and Shaikh et al. In this study, patients with low salt levels had a higher prevalence of GI bleeding.

In their study, Warren et al. found that 15 out of 25 patients with decompensated liver disease had hypernatremia. There were no participants in this study who had serum sodium levels greater than 145 mEq/L.

Lower sodium levels were linked to higher MELD and Child Pugh scores, according to Kim et al. This means that lower salt levels in the blood were linked to more severe illness.

In comparison to the other two groups, patients with sodium levels less than 130 mEq/L had a higher MELD score and Child Pugh score.

Comparison of various studies showing distribution of patients according to serum sodium concentration			
Present study	26	31	43
Angeli et al. (2006)	21.6	27.8	50.6
Kim et al. (2009)	27.1	20.8	52.1
Raja et al. (2016)	31	21	48
Comparison of studies showing association between serum sodium concentration and hepatic encephalopathy			
Present study	57.7	10.7	0
Angeli et al.	38	24	15
Kim et al.	43.1	35.8	24.4
Raja et al.	60.6	30.3	9
Comparison of studies showing association between serum sodium concentration and hepatorenal syndrome			
Present study	42.3	0	0
Angeli et al.	17	10	6
Kim et al.	3.9	2.5	3
Raja et al.	77.7	22.2	0
Comparison of studies showing association between serum sodium concentration and SBP			
Present study	30.77	13	0
Kim et al.	33.3	30.7	16.3

Summary:

The research involved 100 patients with CLD who were hospitalised to medical wards at GOVERNMENT GENERAL HOSPITAL, VIJAYAWADA, ANDHRA PRADESH. In this study, the most common cause of CLD was alcohol, followed by hepatitis B. The most frequent sodium anomaly is hyponatremia (57 percent). Hypermnatremia was not seen in any of the patients. Patients were separated into three groups based on serum sodium levels: those with 136 mEq/L, 131–135 mEq/L, and 130 mEq/L were in one group, while those with 131–135 mEq/L and 130 mEq/L were in the other two. Serum sodium levels were not linked to age, gender, or the cause of CLD.

Ascites (P = 0.0001), hepatic encephalopathy (P = 0.001), hepatorenal syndrome (P = 0.0001), and spontaneous bacterial peritonitis (P = 0.001) were all seen when serum sodium was less than 130 meq/L. Patients with a blood sodium level of 130 mEq/L had a higher risk of problems than those with a level of 136 mEq/L. Between the three groups, there was a substantial variation in severity measures such as MELD and CPS. Patients with sodium levels less than 130 meq/L exhibited a higher mortality rate (30.7 percent; P = 0.0001).

CONCLUSION:

CLD is linked to a high sodium concentration in the blood. The most common anomaly in this study is hyponatremia. Serum sodium levels were unaffected by age, gender, or the cause of CLD. When compared to individuals with serum sodium levels of 136 mEq/L, patients with serum sodium levels of 135 mEq/L had a higher risk of problems like ascites, hepatic encephalopathy, hepatorenal syndrome, spontaneous bacterial peritonitis, and GI bleeding. Patients with a sodium content of less than 130 mEq/L are the most vulnerable. Lower serum sodium levels are linked to a higher MELD score, a higher CPS score, and a higher death rate, implying an inverse association between serum sodium levels and illness severity.

Because of the higher frequency of complications and fatality, patients with low serum sodium levels should be considered a high-risk category.

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