

**Original article:**

## Study of hyponatremia and its correlation with frequency and severity in hepatic encephalopathy

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### **Abstract:**

**Introduction:** Decompensated chronic liver disease is one of the leading causes of morbidity and mortality worldwide. It is a very common medical problem in underdeveloped countries, resulting in a heavy burden on the healthcare system and health professionals.

**Materials and methods:** The research approach employed a cross-sectional study design to correlate hyponatremia with HE and the severity of the liver disease. Patients with diagnosed chronic liver disease of any etiology who were aged between 20-80 years were included in this study. Patients under treatment for hepatocellular carcinoma, ascites, and hyponatremia were excluded.

**Results :** In our study it has been observed that there was high mortality in patients with both severe hyponatremia and grade III and IV encephalopathy, indicating that as hyponatremia increases severity of hepatic encephalopathy increases along with mortality.

**Conclusion:** Our study concluded that patients with chronic liver disease have a variable presence of low sodium levels. Patients with lower levels of sodium had higher grades/severity of HE. Cirrhotic patients with hyponatremia should be managed very carefully as it can lead to various neurological complications.

**Keywords:** Decompensated chronic liver disease , hepatic encephalopathy.

### **Introduction:**

Decompensated chronic liver disease is one of the leading causes of morbidity and mortality worldwide. It is a very common medical problem in underdeveloped countries, resulting in a heavy burden on the healthcare system and health professionals. Patients with decompensated chronic liver disease frequently develop complications like ascites, variceal bleeding, and hepatic encephalopathy (HE). The annual rate of growth of HE in cirrhotic patients is about 8%. Various underlying pathologies like constipation, esophageal variceal bleed,

and infections like spontaneous bacterial peritonitis can precipitate HE. The clinical manifestations of HE range from the mildly altered level of sensorium to severely altered consciousness levels, difficulty in judgement, the day-night reversal of sleep, flapping tremor of hands, and irrelevant talking or speech. Similarly, the patients with liver cirrhosis experience disturbance in the regulation of body fluid homeostasis. The kidneys start to retain the water excessively, which results in a significant derangement of sodium levels in the serum.

### Materials and methods

The research approach employed a cross-sectional study design to correlate hyponatremia with HE and the severity of the liver disease. Patients with diagnosed chronic liver disease of any etiology who were aged between 20-80 years were included in this study. Patients under treatment for hepatocellular carcinoma, ascites, and hyponatremia were excluded. Patients with underlying renal pathology, those on dialysis, and patients on diuretic therapy were also excluded. A total of 50 patients of both genders with chronic liver disease were approached. Simple random sampling was performed. Consent was taken from all patients relatives and re-consent was taken from patient once patient was improved. All data were analyzed using IBM SPSS Statistics version 25.0

### Results

Table 1) Hyponatremia and its correlation with hepatic encephalopathy

Hyponatremia	Hepatic encephalopathy		Total
	Yes	No	
Yes	36% (18)	20% (10)	28
No	28% (14)	16% (08)	22
Total	32	18	50

In our study it has been observed that 18 patients had hyponatremia associated with hepatic encephalopathy. It has been observed that there was a positive correlation between hyponatremia and hepatic encephalopathy.

**Table 2) Correlation of severity of hyponatremia with grades of hepatic encephalopathy**

Hyponatremia		Hepatic encephalopathy			
		I	II	III	IV
Mild		1	1	1	0
Moderate		1	1	1	2
Severe		2	1	3	4
Outcome of patient	Recovered	4	2	4	3
	Expired	0	1	1	3
Total		4	3	5	6

In our study it has been observed that severe hyponatremia is associated with severe hepatic encephalopathy

**Table 3) Hepatic encephalopathy grades**

Severity of hyponatremia	Grades of hepatic encephalopathy					Total
	I	II	III	IV	None	
Mild	1	1	1	0	04	07
Moderate	1	1	1	2	03	08
Severe	2	1	3	4	03	13
None	06	03	04	01	08	22
Total	10	06	09	07	18	50

In our study it has been observed that there was high mortality in patients with both severe hyponatremia and grade III and IV encephalopathy, indicating that as hyponatremia increases severity of hepatic encephalopathy increases along with mortality.

**Table 4) Outcome of the patient with hepatic encephalopathy associated with no hyponatremia**

Hyponatremia		Hepatic encephalopathy			
		I	II	III	IV
None		06	03	04	01
Outcome of patient	Recovered	06	03	03	00
	Expired	00	00	01	01
Total		06	03	04	01

**Discussion:**

In our study it has been observed that mortality is less in patients with hepatic encephalopathy without hyponatremia is a well-known complication of chronic liver disease. In our study, hyponatremia was present in 36% patients with hepatic encephalopathy. Our results are consistent with those of previous studies. In a study by Khalil et al., it was shown that the prevalence of hyponatremia (serum sodium level of <130 meq/L) was 45.5% among the cohort, with a mean of 123.26±5.57 meq/L. In another study, the prevalence of hyponatremia was found to be 30%. A study done by Jenq et al. revealed that cirrhotic patients with hyponatremia had a higher in-hospital mortality rate.

In our study, HE was present in 64% patients; and 36% patients with hyponatremia had HE. In a study conducted by Udagani et al., it was revealed that cirrhotic patients with hyponatremia had a greater risk of developing neurological disorders as compared to those who had normal sodium levels. Similarly, in the above-mentioned study, the risk of developing HE was found to be more in patients with low sodium levels. Hence, it was observed that hyponatremia may affect brain function and predispose patients to HE.

Our results showed that the correlation of severity of hyponatremia with grades of HE was statistically significant. In a study by Angeli et al., it was reported that 38% of the severe hyponatremic patients had HE as compared to 24% of patients with mild hyponatremia .

The risk of developing ascites, variceal bleeding, HE, and other cirrhosis- related complications is directly proportional to the degree/severity of hyponatremia. Various studies have shown that severe hyponatremia is associated with increased severity of HE. In a study by Cordoba et al., it was concluded that hyponatremia causes mild cerebral edema, which results in increased osmotic pressure on astrocytes. Eventually, it leads to many neurological dysfunctions.

**Conclusion:**

Our study concluded that patients with chronic liver disease have a variable presence of low sodium levels. Patients with lower levels of sodium had higher grades/severity of HE. Cirrhotic patients with hyponatremia should be managed very carefully as it can lead to various neurological complications.

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