



THE ASSOCIATION BETWEEN SERUM SODIUM LEVELS AND THE SEVERITY OF CIRRHOSIS OF LIVER AND ITS COMPLICATIONS

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ABSTRACT

Background/Aims: According to several recent studies conducted in patients with cirrhosis of liver, dilutional hyponatremia occurring as a result of reduced solute-free water clearance was a key prognostic factor. However little is known regarding the relationship between the degree of dilutional hyponatremia and development of cirrhotic complications. Therefore this study is done to assess the incidence of hyponatremia in cirrhosis of liver and to evaluate the association between the serum sodium levels and the severity of cirrhosis of liver and its complications.

Methods: 100 consecutive cases of cirrhosis of liver were taken. The serum sodium levels, severity of the disease (Child-turcotte-pugh CTP score and MELD score) and occurrence and severity of complications (ascites, hepatic encephalopathy, spontaneous bacterial peritonitis, hepatorenal syndrome) were assessed in all the cases.

Results: The prevalence of dilutional hyponatremia classified as Group A (serum sodium levels ≤ 130 mmol/L), Group B (serum sodium levels 131-135 mmol/L) and Group C (serum sodium levels ≥ 136 mmol/L) were 55%, 26% and 19% respectively. The serum sodium levels were significantly associated with severity of disease as assessed by CTP score ($p=0.011$) and MELD score ($p=0.012$). Low serum sodium levels were significantly associated with occurrence and severity of complications (ascites $p=0.001$, hepatic encephalopathy $p=0.007$, hepatorenal syndrome $p=0.022$, spontaneous bacterial peritonitis $p=0.049$).

CONCLUSION: Hyponatremia (serum sodium levels less than 130 mmol/L) is a common finding in cirrhosis of liver. Lower serum sodium levels are associated with more severe disease and greater frequency and severity of complications.

KEYWORDS : Cirrhosis of liver, serum sodium levels, hyponatremia

INTRODUCTION

Hyponatremia is a common finding in cirrhosis of liver due to abnormal body fluid regulation. Hyponatremia in cirrhosis is currently defined as reduction in serum sodium levels below 130 mmol/L.^[1] Portal hypertension plays a pivotal role in the development of hyponatremia in patients with cirrhosis of liver.^[2-6]

Till date no studies have been conducted in India to evaluate the prevalence of hyponatremia and the association between serum sodium levels and the occurrence and severity of complications in cirrhosis of liver. Thus we conducted this study to evaluate the same.

METHODS AND MATERIALS

Subjects: All the patients of cirrhosis of liver greater than 18 years of age, of either sex, diagnosed clinically^[7] and ultrasonographically^[8] attending medicine department of Safdarjung hospital over a period of 1 year were included in the study. Whereas, we excluded patients with H/O diabetes mellitus, hypertension, chronic kidney disease, coronary artery disease, any recent surgery, intake of diuretics within 1 month of admission and those not giving consent.

Study design: Based on the serum sodium concentration at the time of admission, patients were assigned to three groups: Group A (Serum sodium ≤ 130 mmol/L), Group B (Serum sodium between 131 and 135 mmol/L) and Group C (Serum sodium ≥ 136 mmol/L). CTP score and MELD score was then calculated in all the three study groups. Complications such as ascites, hepatic encephalopathy, hepatorenal syndrome, spontaneous bacterial peritonitis and bleeding manifestations were looked for in all the three study groups. Ascites and hepatic encephalopathy were further classified based on severity.^[9,10] Also short term in-hospital mortality was determined in the cases.

Statistical analysis: Statistical analysis was performed using SPSS software. Statistical methods used were Pearson chi square test and ANOVA to determine the p value for statistical significance of serum sodium levels with age, sex, etiology of study patients and also with Child pugh score, MELD score, complications of cirrhosis of liver and mortality. A p value < 0.05 was considered statistically significant.

RESULTS

Patient characteristics

We assessed 100 consecutive patients with cirrhosis of liver for its severity and complications. Max no. of cases in our study fall in age

group 28-47 years (57% patients). They consisted of 80% males and 20% females. Causative factors for liver cirrhosis included: alcoholic liver disease in 72% cases, Hepatitis B in 18% cases, Hepatitis C in 6% cases and other causes in 4% cases. There were no significant differences in gender, age and causative factors among the three study groups. (Age $p=0.642$, Sex $p=0.536$, Alcohol intake $p=0.276$, Hepatitis B $p=0.230$, Hepatitis C $p=0.372$)

Occurrence of hyponatremia

In our study, a total of 46% patients had hyponatremia (< 130 mmol/L). Out of the total 100 subjects, 55%, 26% and 19% patients had serum sodium levels in study Groups A, B and C respectively.

Assessment of severity of disease based on serum sodium levels

Based on CTP scoring, out of 100, 1%, 36% and 63% patients fell in CTP Class A, CTP Class B and CTP Class C respectively. 1 patient of CTP Class A belonged to study group C. 36 patients in CTP Class B belonged to study groups A (13 patients, 36.11%), B (13 patients, 36.11%), C (10 patients, 27.7%). 63 patients in CTP Class C belonged to study groups A (42 patients, 66.6%), B (13 patients, 20.6%), C (8 patients, 12.6%). Thus, CTP score is significantly associated with serum sodium levels ($p=0.011$).

Based on MELD scoring (score range 6-56), patients were classified into MELD score ranges 6-16 (40%), 17-26 (35%), 27-36 (22%), 37-46 (1%) and 47-56 (2%). All the patients in higher score ranges (37-56) belong to study group A. MELD score is significantly associated with serum sodium levels ($p=0.012$).

Risk for developing complications based on serum sodium levels

The frequency and severity of complications, ascites (Out of 93 patients, 54, 24 and 15 patients fell in study group A, B and C respectively, $p=0.001$), hepatic encephalopathy (Out of 40 patients, 31, 6 and 3 patients fell in study group A, B and C respectively, $p=0.007$), hepatorenal syndrome (Out of 15 patients, 13, 2 and 0 patients fell in study groups A, B and C respectively, $p=0.022$) and spontaneous bacterial peritonitis (Out of 25 patients, 19, 3 and 3 patients fell in study groups A, B and C respectively, $p=0.049$) differed significantly among the 3 study groups whereas the difference in frequency of bleeding manifestations (Out of 48 patients, 25, 12 and 11 patients fell in study groups A, B and C respectively, $p=0.845$) was not significant.

Mortality based on serum sodium levels

Short term in-hospital mortality was overall 12% with 83.33%

belonging to study Group A, 8.33% to study Group B and 8.33% to study group C. Thus the association was not significant ($p=0.174$).

DISCUSSION

Hyponatremia is an electrolyte disturbance that commonly occurs in hospitalized patients. Most of the cases in cirrhosis of liver are dilutional hyponatremia caused by the impaired solute-free water clearance.^[11] The main pathogenic factor responsible for hyponatremia is a nonosmotic hypersecretion of arginine vasopressin (or antidiuretic hormone) from the neurohypophysis related to circulatory dysfunction.^[12]

In recent years hyponatremia has attracted interest as a possible prognostic factor for cirrhosis of liver. Till date very few such studies have been conducted in India.

Studying the demographic profile of patients, there were no significant differences in gender, age and causative factors for cirrhosis of liver among the three study groups.^[13,14]

Our study showed that lower serum sodium levels are significantly associated ($p=0.011$) with higher Child Pugh Class. Also maximum number of patients included in our study belonged to Child Pugh Class C (63% patients), our hospital being a tertiary care centre.^[13-15]

Also, studying the pattern of occurrence and severity of complications, it was found that all the complications (ascites, hepatic encephalopathy, hepatorenal syndrome and spontaneous bacterial peritonitis) occurred in greater no. and severity with decreasing levels

of serum sodium^[13-23] except the bleeding manifestations, the frequency of which did not differ significantly among the three study groups based on serum sodium levels.^[13,14]

On short term follow up, the overall in hospital mortality was 12%, highest being in study group A with lowest serum sodium levels (<130 mmol/L).^[14,24-30]

CONCLUSION

Thus, we conclude that monitoring of serum sodium levels in cirrhotic patients at the time of admission and during hospital stay, can serve as an effective tool in determining the prognostic outcomes related to severity of disease, occurrence and severity of complications and short term in-hospital mortality of the patients. Serum sodium levels monitoring, hence must be widely included in the regular protocol while assessing the patients of cirrhosis of liver.

Conflict of Interest : None to report

Table 1. Basal characteristics of the patients (n=100)

Characteristic		Value
Gender	Males	80
	Females	20
Age (range in years)		18-97
Etiology	Alcohol	72
	Hepatitis B	18
	Hepatitis C	6
	Others	4

Table 2. Severity of disease and frequency of complications by serum sodium levels

Parameter assessed	Grading	Total	Group A	Group B	Group C	p value
Hyponatremia			55	26	19	
CTP scoring	A	1	0	0	1	0.011
	B	36	13	13	10	
	C	63	42	13	8	
MELD score	6-16	40	17	11	12	0.012
	17-26	35	19	10	6	
	27-36	22	16	5	1	
	37-46	1	1	0	0	
	47-56	2	2	0	0	
Ascites		93	54	24	15	0.001
	Grade1	21	4	7	10	
	Grade2	33	16	14	3	
	Grade3	39	34	3	2	
Hepatic encephalopathy		40	31	6	3	0.007
	Grade1	7	3	3	1	
	Grade2	13	9	2	2	
	Grade3	16	15	1	0	
	Grade4	4	4	0	0	
HRS		15	13	2	0	0.022
SBP		25	19	3	3	0.049
Bleeding manifestations		48	25	12	11	0.846
Short term in-hospital mortality		12	10	1	1	0.174

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