ORIGINAL RESEARCH

Evaluation of serum sodium levels in liver cirrhosis patients

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ABSTRACT

Background: This study was carried out to assess the serum sodium levels among subjects suffering from liver cirrhosis. **Materials and Methods**: All participants over the age of eighteen who were admitted with a diagnosis of liver cirrhosis were included in the study. Those taking thiazide diuretics, having heart failure, or having chronic kidney disease were among the subjects who were excluded. The demographic information of the patients was recorded into a neatly formatted proforma. The Child Pugh Score Classes A, B, and C were used to categorize the severity of cirrhosis. Ascites, hepatic encephalopathy, spontaneous bacterial peritonitis, hepatorenal syndrome, and variceal hemorrhage were among the side effects associated with cirrhosis. It was determined that flapping tremors, personality changes, odd speech patterns, and intellectual difficulties were indicative of hepatic encephalopathy. A medium, severe, or incomplete grade was assigned to it. **Results**: In this study, one hundred patients were involved in the research. The majority (50%) were in the 41–50 age range, with a mean age of 49 and a range of ages from 30 to 80. Males made up the majority (93%). According to the current study, 45 patients (45%) had hyponatremia (≤130 meq/L). There was no statistically significant difference in the patient demographics between the two groups. Alcoholic liver disease (75, 75%), chronic hepatitis B (15, 15%), and unknown etiology (10 cases, 10%) were among the causative reasons for liver cirrhosis. There was no proof that the patients' salt levels were impacted by the cause of their liver cirrhosis.Eighty-six percent of the patients were classified as Child Pugh C. Hepatorenal syndrome and spontaneous bacterial peritonitis were more common in people with low sodium levels. The results of this investigation show that spontaneous bacterial peritonitis and hepatorenal syndrome are substantially correlated with hyponatremia. **Conclusion**: Reduced sodium levels have a favorable correlation with the severity of the disease, spontaneous bacterial peritonitis, and hepatorenal syndrome in cirrhosis.

Keywords: Child pugh score, Complications, Hepatorenal syndrome, Hyponatremia, Spontaneous bacterial peritonitis

INTRODUCTION

Hyponatremia is the most common electrolyte abnormality observed in hospitalized patients.[1] Hyponatremia in cirrhosis is currently defined as a serum sodium level of less than 130 meq/L.[2] It has been suggested that the prevalence of a serum sodium concentration less than 135, 130 and 120 meq/L in patients with cirrhosis and ascites is 49.4%, 21.6% and 1.2%, respectively.[3] Patients with cirrhosis may develop hyponatremia due to either hypovolemia (example: loss of extracellular fluid due to diuretics) or hypervolemia (expanded extracellular fluid volume due to the inability of the kidneys to excrete solute-free water proportionate to the amount of free water ingested).

Cirrhosis results from fibrosis of the liver. In cases of decompensation, cirrhosis patients develop ascites, spontaneous bacterial peritonitis, hepatic encephalopathy, variceal hemorrhaging, and hepatocellular carcinoma.[4] Cirrhotic ascites is treated with aldosterone antagonists and loop diuretics.[5] In some cases, patients develop refractory ascites. Patients with refractory ascites are treated with several therapies, including concentrated ascites reinfusion therapy, transjugular intrahepatic portosystemic shunt, and peritoneovenous shunt.[6-8] However, the efficacies of these therapies are limited; 15% of patients diagnosed with ascites die within 1 year, and 44% die within 5 years.

Hence, this study was carried out to assess the serum sodium levels among subjects suffering from liver cirrhosis.

MATERIAL AND METHODS

Complete blood counts, liver and kidney function tests, viral indicators for hepatitis B and C, abdominal

ultrasonography, and echocardiography were performed on each individual. At the time of admission, serum sodium levels were tested for every individual. With the widespread recognition of hyponatremia in cirrhosis, a cut-off of 133 meq/L has been proposed. To compare the outcomes, the participants were split into two groups based on the amounts of sodium in their serum: one group had concentrations of sodium in their serum that were less than or equal to 133 meq/L, while the other group had concentrations of sodium in their serum that were greater than or equal to 133 meq/L. The two groups' liver disease severity and consequences were contrasted.

RESULTS

Table 1: age wise distribution of subjects

Age group	Sodium ≤130 meq/L)(n=45)	Sodium ≥130 meq/L (n=55)
30-40	10(22.2%)	15(27.2%)
41-50	23(51.1%)	27(49.09%)
51-60	11(24.4%)	08(14.5%)
Above 60	01(0.02%)	05(9.09%)

In all, one hundred patients were involved in the research. The majority (50%) were in the 41–50 age range, with a mean age of 49 and a range of ages from 30 to 80. Males made up the majority (93%). According to the current study, 45 patients (45%) had hyponatremia (≤130 meq/L). There was no statistically significant difference in the patient demographics between the two groups.

Table 2: gender wise distribution of subjects

Gender	Number of subjects
Males	93 (93%)
Females	07 (07%)
Total	100 (100%)

There were 93 males and 7 females in this study.

Table 3: etiological profile

Etiology of cirrhosis	Number of subjects
Alcoholic liver disease	75 (75%)
Chronic hepatitis B	15 (15%)
Unknown causes	10 (10%)
Total	100 (100%)

Alcoholic liver disease (75, 75%), chronic hepatitis B (15, 15%), and unknown etiology (10 cases, 10%) were among the causative reasons for liver cirrhosis. There was no proof that the patients' salt levels were impacted by the cause of their liver cirrhosis.

Eighty-six percent of the patients were classified as Child Pugh C. Hepatorenal syndrome and spontaneous bacterial peritonitis were more common in people with low sodium levels. The results of this investigation show that spontaneous bacterial peritonitis and hepatorenal syndrome are substantially correlated with hyponatremia.

DISCUSSION

The signs and symptoms of hyponatremia are primarily related to central nervous system dysfunction due to movement of water from intravascular spaces into brain cells, with resultant cerebral edema.[9] Initially, adaptive mechanisms promote the efflux of electrolytes (sodium, potassium, chloride) from brain cells, allowing for rapid adaptation. Subsequently, the extrusion of organic osmolytes (primarily glutamate) promotes adaptation at a slower pace. Both mechanisms serve to return water to intravascular compartments and limit the swelling of brain tissue. The rapid adaptations are typically completed in approximately 48 h. Hyponatremia is classified as acute if it develops within 48 h or as chronic if it develops over a period exceeding 48 h.[10,11]

Hyponatremia has been showed to cause increase the risk of mortality among individuals with cirrhosis,[12] and in those patients who are on liver transplantation waiting lists.[13,14] Its association with greater frequency and severity of complications of cirrhosis has been demonstrated in multiple studies.[15]

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proof that the patients' salt levels were impacted by the cause of their liver cirrhosis.Eighty-six percent of the patients were classified as Child Pugh C. Hepatorenal syndrome and spontaneous bacterial peritonitis were more common in people with low sodium levels. The results of this investigation show that spontaneous bacterial peritonitis and hepatorenal syndrome are substantially correlated with hyponatremia.

Kim JH et al (2009)[16]evaluated the association between the serum sodium level and the severity of complications in liver cirrhosis. Data of inpatients with cirrhotic complications were collected retrospectively. The serum sodium levels and severity of complications of 188 inpatients were analyzed. The prevalence of dilutional hyponatremia, classified as serum sodium concentrations of <or=135 mmol/L, <or=130 mmol/L, and <or=125 mmol/L, were 20.8%, 14.9%, and 12.2%, respectively. The serum sodium level was strongly associated with the severity of liver function impairment as assessed by Child-Pugh and MELD scores (p<0.0001). Even a mild hyponatremia with a serum sodium concentration of 131-135 mmol/L was associated with severe complications. Sodium levels less than 130 mmol/L indicated the existence of massive ascites (OR, 2.685; CI, 1.316-5.477; p=0.007), grade III or higher hepatic encephalopathy (OR, 5.891; CI, 1.490-23.300; p=0.011), spontaneous bacterial peritonitis (OR, 2.562; CI, 1.162-5.653; p=0.020), and hepatic hydrothorax (OR, 5.723; CI, 1.889-17.336; p=0.002).

Hayashi M et al (2018)[17] in their study, evaluated the factors related to the tolvaptan response and the prognosis in cirrhosis patients with ascites and hyponatremia. They retrospectively reviewed the clinical records of cirrhosis patients hospitalized for treatment with tolvaptan. The associations of patient baseline characteristics with the tolvaptan response after one week and of the characteristics after one-month tolvaptan treatment with the prognosis were analyzed. Theyanalyzed 83 cirrhosis patients with ascites, including 34 patients with hyponatremia. The response rates to tolvaptan in patients with serum sodium <130 mEq/L, 130-135 mEq/L, and >135 mEq/L were 20%, 66%, and 58%, respectively (p=0.22). The serum sodium level was associated with the response to tolvaptan [odds ratio=1.18; 95% confidence interval (CI)=1.02-1.37; p=0.029]. In patients with hyponatremia, the serum sodium level after 1-month tolvaptan treatment was increased compared to baseline (132 mEq/L vs. 136 mEq/L, p=0.006), and an increasing serum sodium level was associated with a lower risk of mortality (hazard ratio=0.85; 95% CI=0.75-0.97; p=0.016). The survival rate was higher in patients with an increase in the serum sodium level after 1 month than in patients with a decreased serum sodium level (p=0.023).Tolvaptan treatment was effective in cirrhosis patients with ascites and hyponatremia, but a low serum sodium level was associated with non-responsiveness to tolvaptan. An increased serum sodium level after one-month tolvaptan treatment may positively influence the mortality risk in cirrhosis patients with hyponatremia.

CONCLUSION

Reduced sodium levels have a favorable correlation with the severity of the disease, spontaneous bacterial peritonitis, and hepatorenal syndrome in cirrhosis.

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