ORIGINAL RESEARCH

To study serum sodium levels in patients admitted with hepatic encephalopathy and its value as a prognostic marker

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ABSTRACT

Background: A pathological condition known as chronic liver disease (CLD) is characterized by a persistent deterioration of hepatic functioning for at least 6 to 7 months. If unchecked and untreated, CLD usually results in liver Cirrhosis. A series of illnesses known as hepatic encephalopathy (HE) affects people with persistent liver failure and manifests as cognitive function impairment. In hospitalized patients, hyponatremia constitutes one of the most frequent electrolyte malfunction issues. The current research was therefore conducted to evaluate the prognosis of hyponatremia in HE of chronic hepatic disorder in light of the aforementioned results. **Material and methods**: Research comprising of 50 successive subjects aging 18 years and above with clinical and radiological evidence of cirrhosis and hepatic encephalopathy was conducted. Serum sodium levels were measured at the time of admission and repeated weekly in all patients. The clinical status of the patients with hyponatremia was compared to those of patients with normal serum sodium levels. The grading of hepatic encephalopathy was correlated with the severity of hyponatremia. All the results were assessed by SPSS software. **Results:** Mean sodium levels among Hepatic encephalopathy patients was found to be 135.19 mEq/L. Out of 50 patients, hyponatremia was found to be present in 56 percent of the patients (28 patients). Hyponatremia was found to be present in 30 percent of the patients (3 patients) with grade I Hepatic encephalopathy, 27.3 percent of the patients (3 patients) with grade II Hepatic encephalopathy, 69.23 percent of the patients (9 patients) with grade III Hepatic encephalopathy and 81.25 percent of the patients (14 patients) with grade IV Hepatic encephalopathy. Significant results were obtained while assessing the occurrence of hyponatremia in difference grades of hepatic encephalopathy. 25 percent of the patients with Child Pugh Score A, 23.8 percent of the patients with Child Pugh score B and 88 percent of the patients with Child Pugh score C had hyponatremia. While analyzing the correlation between sodium levels and severity of hepatic encephalopathy, significant results were obtained. **Conclusion:** Individuals having, HE frequently exhibits hyponatremia, and as the condition's seriousness worsened, so did the subject's hyponatremia. In attempt to eliminate the sudden emergence of cirrhosis-associated problems, cirrhotic subjects must have their serum sodium levels carefully monitored.

Keywords: hepatic encephalopathy, serum sodium levels.

INTRODUCTION

A pathological condition known as chronic liver disease (CLD) is characterised by a persistent deterioration of hepatic functioning for at least 6 to 7 months. The modified variable comprises dysfunctions in the production of coagulation factors, protein generation, bile elimination, as well as the activity of toxic metabolic products that are detoxified. In CLD, there are chronic inflammatory changes leading to continuous simultaneous process of inflammation, destruction and regeneration of liver parenchymal tissue resulting in cirrhosis. A number of etiologic factors are hypothesized to be responsible for occurrence of CLD. These factors include chronic alcohol drinking, toxins and infectious diseases, autoimmune pathologies, spectrum of hepatic metabolic diseases and genetic predisposition.[1,2] Economically weaker areas across the globe are witnessing epidemiologic evolution in pathologic burden of CLD. For these observed alterations in the recent past, India is among one of the significant epicenters. A series of illnesses known as hepatic encephalopathy (HE) affects people with persistent liver failure and manifests as cognitive function impairment. As per theoretical and clinical concepts, HE is not regarded as a solitary clinical entity. It

might imitate in the form of reversible metabolic encephalopathy/ atrophy of brain/ edema of brain or any mixture of above mentioned disorders. The pathophysiologic process responsible for brain dysfunction in patients with hepatic failure is still not clearly understood. These parameters are unservingly associated to hepatic failure. Till the moment the underlying hepatic pathology is successfully treated, Hepatic encephalopathy is significantly correlated with poor outcome and significantly greater chances of relapse. Quality of life in patients with HE (even milder variant of HE) is significantly reduced.[3]

Triggering factors responsible for occurrence of HE are kidney failure, GIT bleeding and hemorrhages, constipation, infectious pathologies, non-compliance of drugs, disproportionate (mostly higher) dietary protein consumption, dehydration (through diarrhea or vomiting), discrepancies in physiologic serum electrolyte levels, chronic alcohol drinking habit, certain selective sedatives/ analgesics/ diuretic addiction etc. all in the background of chronic hepatic pathologies. In few instances, HE might occur after the formation of a transjugular intrahepatic portosystemic shunt (TIPS).[4]

Hyponatremia is another typical manifestation in patients with portal hypertension and is brought on by the stimulation of antidiuretic hormone following a decrease in effective arterial volume in connection to splanchnic arterial vasodilation. Nevertheless, persistent hyponatremia causes the organic osmolytes found inside the cells to deplete. Hyponatremia seems to be a critical diagnostic as well as prognostic indication for the emergence of overt hepatic encephalopathy in hepatic cirrhosis subjects, according to evidence gained from prior research. [5]The current research was therefore conducted to evaluate the prognosis of hyponatremia in HE of chronic hepatic disorder in light of the aforementioned results.

MATERIALS AND METHODS

50 subjects having the age of 18 years and above with clinical as well as radiological evidence of cirrhosis and hepatic encephalopathy had been evaluated.Subjects with clinical, biochemical as well as ultrasound diagnosis of CLD, those having clinical diagnosis of hepatic encephalopathy, as well as those belonging to the age of over 18 years had been included in the study.

INCLUSION CRITERIA

- Patients of age more than 18 years.
- Confirmed cases of hepatic encephalopathy of chronic liver disease by clinical and lab investigations.

EXCLUSION CRITERIA

- Age less than 18 yrs
- Patients with encephalopathy because of renal failure, hypertension, Sepsis, CNS infections .

The selected subjects had beenexplained about the nature of the study and written informed consent was obtained from them. Chronic liver disease had been confirmed by clinical, biochemical as well as ultrasonographic findings. Hepatic encephalopathy, was graded according to the West Haven classification. The data collected included age, gender, serum electrolytes, prothrombin time, liver function tests, serum albumin. Patients were categorized into 3 cohorts as per the serum sodium content as : conc. below 130 meq/L (severe hyponatremia), ranging 131-135 meq/L (mild hyponatremia) and > 135 meq/L (normal) . Serum sodium levels were measured at the time of admission and repeated weekly in all patients.

STATISTICAL ANALYSIS

Student t-test was used for testing mean between independent groups whereas Paired Student t – test was used for paired observation. Cross tables were generated and Chi square test was used for testing of association. P value < 0.05 was considered statistically significant. All analysis was done using SPSS software.

RESULTS

The present study was undertaken for assessing the prognostication of hyponatremia in hepatic encephalopathy of chronic liver disease. **50 consecutive patients** with Hepatic Encephalopathy due to Chronic Liver Disease were enrolled and analysed. Mean age of the patients was 58.68 years. 84 percent of the (42 patients) were males while the remaining were females. Out of 50 patients, 8 percent of the patients belonged to Child Pugh score A while 42 percent of the patients (21 patients) and 50 percent of the patients (25 patients) belonged to Child Pugh score B and Child Pugh score C respectively. 20 percent of the patients (10 patients) and 22 percent of the patients (11 patients) had Grade I and Grade II encephalopathy respectively, while 26 percent of the patients (13 patients) and 32 percent of the patients (16 patients) belonged to Grade III and Grade IV of hepatic encephalopathy respectively. 26 percent of the patients (13 patients) and 24 percent of the patients (12 patients) had mean sodium levels within the range of 136 to 145 mEq/L and 131 to 135 mEq/L respectively. Mean sodium levels among Hepatic encephalopathy patients was found to be 135.19 mEq/L. Out of 50 patients, hyponatremia was found to be present in 56 percent of the patients (28 patients). Hyponatremia was found to be present in 30 percent of the patients (3 patients) with grade I Hepatic encephalopathy, 27.3 percent of the patients (3 patients) with grade II Hepatic encephalopathy, 69.23 percent of the patients (9 patients) with grade III Hepatic encephalopathy and 81.25 percent of the patients (14 patients) with grade IV Hepatic encephalopathy. Significant results were obtained while assessing the occurrence of hyponatremia in

difference grades of hepatic encephalopathy. 25 percent of the patients with Child Pugh Score A, 23.8 percent of the patients with Child Pugh score B and 88 percent of the patients with Child Pugh score C had hyponatremia. While analyzing the correlation between sodium levels and severity of hepatic encephalopathy, significant results were obtained.

Table 1: Distribution of patients according to child Pugh score

Child Pugh score	Number of patients	Percentage
A	04	08
B	21	42
C	25	50
Total	50	100

Table 2: Distribution of patients according to the grade of hepatic encephalopathy

Hepatic encephalopathy	Number of patients	Percentage
Grade I	10	20
Grade II	11	22
Grade III	13	26
Grade IV	16	32
Total	50	100

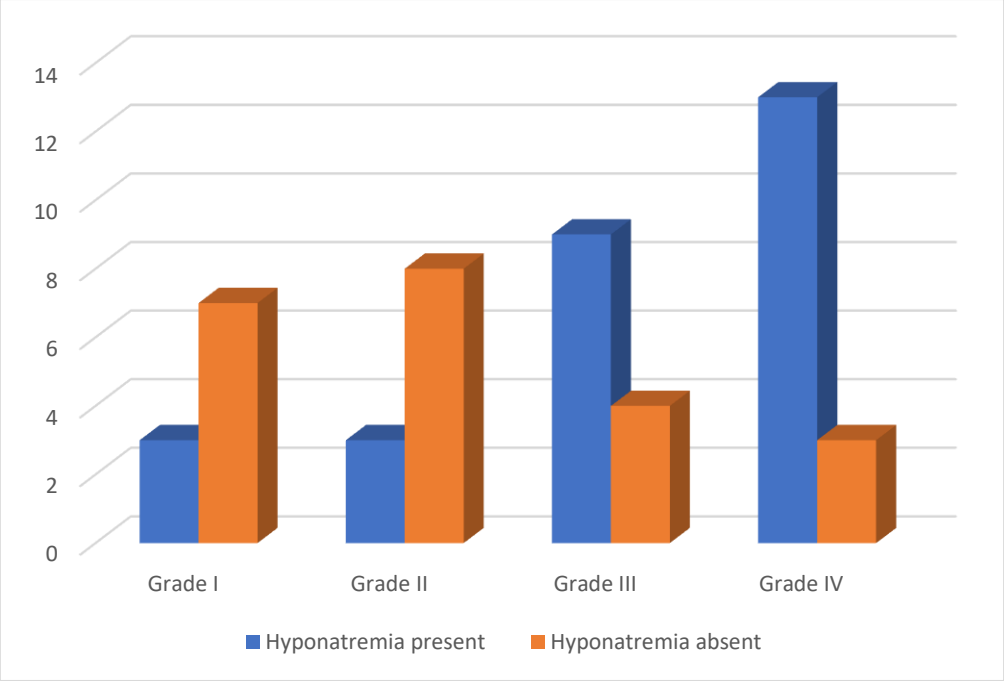
Table 3: Distribution of patients according to serum sodium levels

Serum sodium levels (mEq/L)	Number of patients	Percentage
≤125	06	12
126 to 130	11	22
131 to 135	11	22
136 to 145	13	26
≥146	09	18
Total	50	100

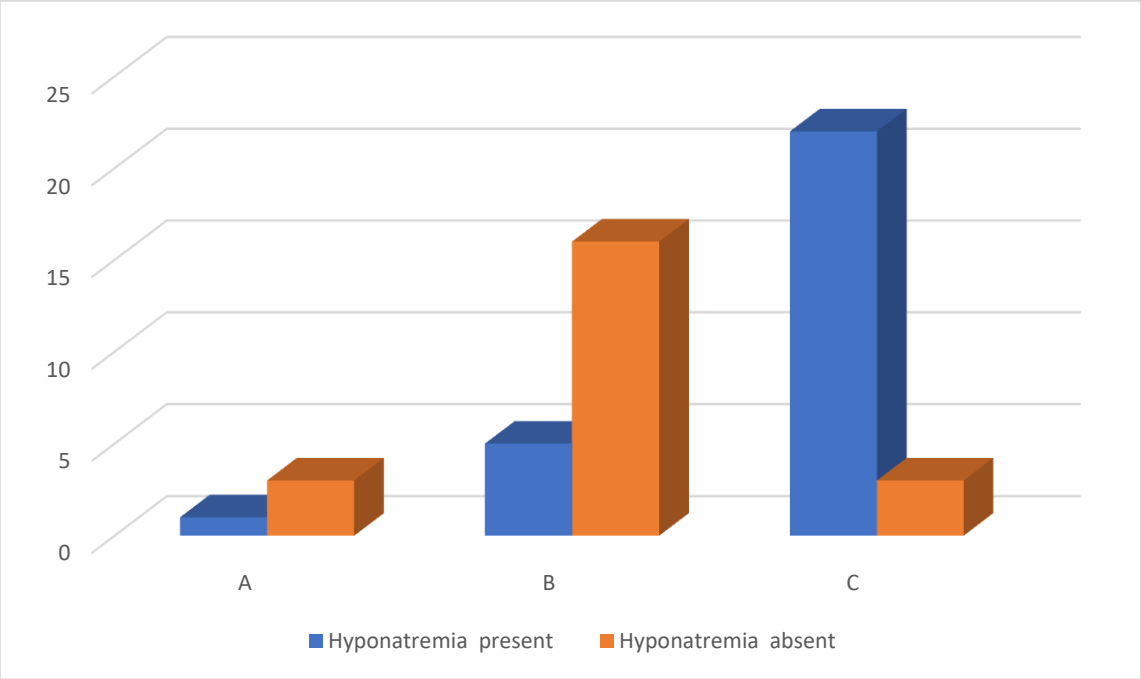
Table 4: Incidence of hyponatremia (Na levels < 135 mEq/L) in Hepatic encephalopathy patients

Parameter	Hyponatremia
Number of patients	28
Percentage of patients	56

Graph 1: Incidence of hyponatremia in different grades of Hepatic encephalopathy patients



Graph 2: Incidence of hyponatremia among patients according to severity of cirrhosis of liver



DISCUSSION

The liver is among the major body organs. It is a complicated organ that also serves as the site as well as framework for a variety of the body's productive functions. Chronic parenchymal liver disease is frequently seen in the medical profession. The majority of adverse events which trigger the transition from compensated to decompensated cirrhosis are caused by portal hypertension. Clinical signs of progressive cirrhosis include extreme hyponatremia as well as reduced arterial pressure.[6]

The goal of the current research was to evaluate the prognosis of hyponatremia in CLD-related HE. 100 successive participants having CLD-related HE were recruited as well as their data was reviewed.

20 percent of the patients (10 patients) and 22 percent of the patients (11 patients) had Grade I and Grade II encephalopathy respectively, while 26 percent of the patients (13 patients) and 32 percent of the patients (16 patients) belonged to Grade III and Grade IV of hepatic encephalopathy respectively. In a research carried out by Bashir et al, seventeen subjects reported with grade I HE, thirty six subjects came with grade II HE, twenty four subjects showed grade III HE whereas thirty eight participants reported with grade IV HE.[7]

26 percent of the patients (13 patients) and 24 percent of the patients (12 patients) had mean sodium levels within the range of 136 to 145 mEq/L and 131 to 135 mEq/L respectively. Mean sodium levels among Hepatic encephalopathy patients was found to be 135.19 mEq/L. In a research carried out by Bashir et al, average sodium content in subjects having hepatic encephalopathy was 132.42 mEq/L.[7]

Out of 50 patients, hyponatremia was found to be present in 56 percent of the patients (28 patients). Hyponatremia was found to be present in 30 percent of the patients (3 patients) with grade I Hepatic encephalopathy, 27.3 percent of the patients (3 patients) with grade II Hepatic encephalopathy, 69.23 percent of the patients (9 patients) with grade III Hepatic encephalopathy and 81.25 percent of the patients (14 patients) with grade IV Hepatic encephalopathy. Significant results were obtained while assessing the occurrence of hyponatremia in difference grades of hepatic encephalopathy. 25 percent of the patients with Child Pugh Score A, 23.8 percent of the patients with Child Pugh score B and 88 percent of the patients with Child Pugh score C had hyponatremia. While analyzing the correlation between sodium levels and severity of hepatic encephalopathy, significant results were obtained. **JavedM et al**[8] statedhyponatremia in 57.6% of subjects having hepatic encephalopathy, while **Sulehria SB et al**[9] stated that 51.6 % of subjects showed hyponatremia because of CLD. However; comparatively lower prevlance of hyponatremia have been reported in the studies conducted by **Shaikh S et al**[10] and **Qureshi et al**[11] who have reported presence of hyponatremia in 18.75 percent and 30.7 percent of the patients with HE.In the research carried out by **Qureshi et al.,** the majority of the participants having significant hyponatremia corresponded to Child Pugh class C.[11]

G S et al assessed the correlation of hyponatremia with the severity of the chronic liver disease. The study was conducted among 100 chronic liver disease patients admitted in a tertiary care hospital. The mean age of the study subjects was 45.19±10.01 years and 92.0% were males. The prevalence of hyponatremia was 75.0% at the cut off of ≤135 mEq/L and it was 52.0% at the cut off of ≤130 mEq/L. Higher

proportions of those with moderately impaired hepatic function and advanced hepatic dysfunction (class B/ Class C) had hyponatremia compared to those without hyponatremia (76.6% vs 50.0%) but it was not statistically significant (P>0.05).[12]Mei X et al prospectively collected the data of 3970 patients with AoCLD from the CATCH-LIFE cohort in China. The prevalence of different Na levels (≤ 120; 120–135; 135–145; >145) and their relationship with 90-day prognosis were analyzed. For hyponatremic patients, we measured Na levels on days 4 and 7 and compared their characteristics, based on whether hyponatremia was corrected. A total of 3880 patients were involved; 712 of those developed adverse outcomes within 90 days. There were 80 (2.06%) hypernatremic, 28 (0.72%) severe hyponatremic, and 813 (20.95%) mild hyponatremic patients at admission.[13]Thuluvath PJ et al evaluated the differences in clinical characteristics, resource utilization, and disposition of hospitalized cirrhotic patients with ascites with and without hyponatremia. The National Inpatient Sample (NIS) database was used to identify all adult hospitalized patients with a diagnosis of cirrhosis and ascites with or without hyponatremia from 2016 to 2017 using ICD-10 codes. 10,187 (7.6%) hospitalized patients with cirrhosis had ascites and hyponatremia and 34,555 (24.3%) had ascites but no hyponatremia. Elixhauser comorbidity score, excluding liver disease, was higher in hyponatremic patients. Acute kidney injury and sepsis were more common in hyponatremic patients compared to those without hyponatremia. Similarly, acute respiratory failure, coagulopathy, hepatorenal syndrome, spontaneous bacterial peritonitis, acute (on chronic) liver failure, and liver cancer were more common in hyponatremic patients.[14]

CONCLUSION

Hepatic encephalopathy is a neuropsychiatric syndrome with unclear etiology. There are several precipitating factors that have been explained, among which electrolyte imbalance is one of the factor which is responsible for aggravating hepatic encephalopathy

The study concluded that individuals having Hepatic encephalopathy frequently exhibit hyponatremia, and as the condition's seriousness worsened, so did the subject's hyponatremia.In attempt to eliminate the sudden emergence of cirrhosis-associated problems, cirrhotic subjects must have their serum sodium levels carefully monitored.

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