Study of electrolyte disturbance in chronic liver disease patients attending a hospital in Kumaon region

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ABSTRACT

Introduction: Pathophysiological changes secondary to cirrhosis predispose patients of chronic liver disease to develop various electrolyte disturbances which have a significant impact on morbidity, mortality, and prognosis of these patients. This study aims to estimate the level of electrolyte disturbance and its association with the severity, complication, and outcome in chronic liver disease patients attending a hospital in the Kumaon region of Uttarakhand. Methods: Our study was a hospital-based cross-sectional study conducted on 100 chronic liver disease patients at the OPD/IPD Department of Medicine, Dr. Sushila Tiwari Hospital, Haldwani, Uttarakhand, from January 2020 to September 2021. Results: Hyponatremia was observed in 49% of the patients, hypokalemia in 30%, and hypocalcemia in 16% of the patients. The electrolyte levels were similar irrespective of the disease severity and presence of complications. The sodium and potassium levels had a significant association with the outcomes. Conclusion: Hyponatremia was the commonest electrolyte disturbance seen in the study patients. No significant association was observed between the electrolyte and severity of the disease and complications.

Keywords: Chronic liver disease, electrolyte, hypocalcemia, hypokalemia, hyponatremia, Kumaon

Introduction

Cirrhosis is defined as the histological development of regenerative nodules surrounded by fibrous bands in response to chronic liver injury that leads to portal hypertension and end-stage liver disease.¹ Alcoholic liver disease and hepatitis C are the most common causes in the western world, while hepatitis B prevails in most parts of Asia and sub-Saharan Africa.¹ Hyponatremia is the most common electrolyte abnormality observed in hospitalized patients and is a common finding in patients with advanced cirrhosis. Hyponatremia in cirrhosis is currently defined as a serum sodium level of less than 130 meq/L,² being the most common electrolyte disorder in this setting. Indeed, about 20% of the patients have values lower than 130 mmol/L, which is the current definition of hyponatremia in cirrhosis.³ The prevalence of hyponatremia is around 57 and 40% in hospitalized and ambulatory patients of cirrhosis with ascites, and 25% in stable patients with cirrhosis, respectively.⁴ Even though severe hypernatremia (>150 mmol/L) shows low prevalence in cirrhosis (0.4%), moderate hypernatremia (>145 mmol/L) has been reported in up to 4% of these patients.⁴ The serum potassium concentration can vary widely in unstable cirrhotic patients, with a higher prevalence of hypokalemia (20%) than hyperkalemia (12%) in this group.⁸ Hypokalemia can be caused either by a decreased intake of potassium or by excessive losses of potassium in the urine or through the gastrointestinal (GI) tract.⁸ Gastrointestinal losses of potassium usually are due to prolonged diarrhea or vomiting, chronic laxative abuse, intestinal obstruction, or infections. The intracellular shifting of potassium can also result in severe hypokalemia. The

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sympathetic nervous system stimulation, insulin administration, familial periodic paralysis, and thyrotoxicosis are a few of the reasons for hypokalemia. Chronic liver disease complicated by hepatocellular carcinoma or cholangiocarcinoma is a known cause of hypercalcemia. Chronic liver disease, per se, as the cause of hypercalcemia in this subset of patients is not clearly established.[1] Two cases developed hypercalcemia during the advanced chronic liver disease. This type of hypercalcemia is relatively easy to treat and requires minimal intervention.[3] The study will be an add-on evidence about the various aspects of electrolyte disturbance in the chronic liver disease patients enabling the treating physician to take appropriate steps in its management. So, the study was done to estimate the level of electrolyte disturbance and its association with severity, complication, and outcome in chronic liver disease patients attending a hospital in the Kumaon region of Uttarakhand.

Materials and Methods
This study was a hospital-based observational cross-sectional study carried out on 100 chronic liver patients at the OPD/IPD Department of Medicine, Dr. Susheela Tiwari Hospital, Haldwani (Uttarakhand), from January 2020 to September 2021. The study included patients of chronic liver disease, 18 years and above, except those patients with cardiac failure, chronic kidney disease, patients on drugs like selective serotonin reuptake inhibitors (SSRI), tricyclic antidepressants (TCA), and monoamine oxidase (MAO) inhibitors, angiotensin-converting enzyme (ACE)/angiotensin receptor blockers (ARB), and sodium/potassium/calcium supplements. The study patients were subjected to a detailed history, clinical examination, investigations, viz. complete hemogram, liver function test, serum electrolytes (sodium, potassium, calcium), ascitic fluid examination, ultrasound, upper gastrointestinal endoscopy, severity assessment using the Child-Pugh Score. The study was approved by the Institutional Ethics Committee, GMC, Haldwani. Informed written consent was obtained from each patient. The nature and consequence of the study were explained to them. Strict confidentiality was assured. Data were entered and analyzed using SPSS ver. 16. The frequency, percentages, and mean (SD) were estimated. Unpaired t-test, one-way analysis of variance (ANOVA), and Chi-square test were applied. A P value <0.05 was considered significant.

Results
The mean sodium level was 131.17 ± 9.19, the mean potassium level was 4.09 ± 1.24, and the mean calcium level was 7.80 ± 1.11. The sodium levels were found to be in the range of ≤130 in 47, 131–135 in 8, 136–145 in 45, and >145 in 0 study participants. The potassium levels were found in the range of ≤3.5 in 30, 3.6–5.4 in 57, and >5.4 in 13 study participants. The calcium levels were found in the range of <9 in 16, 9–11 in 76, and >11 in 8 study participants [Table 1].

A majority of the patients (49.0%) were in Class B as per the Child-Pugh Score for the severity of the disease, 45.0% were in Class C, and 6.0% were in Class A, respectively.

The mean sodium and mean calcium levels were the highest in the patients categorized as Class B whereas the mean potassium level was the highest in the Class A patients although the difference was not significant [Table 2].

The mean sodium, potassium, and calcium levels were similar among the patients with or without different complications. No significant association was found between the electrolyte level and different complications [Table 3].

About 19.2% of mortality was seen among the patients with sodium levels ≤130 meq/L, 12.5% mortality in the patients with sodium levels 131–135 meq/L, however, no mortality was seen in the patients with sodium levels 136–145 meq/L. A significant association was observed between the sodium level and outcome. About 53.8% of mortality was seen among the patients with potassium levels >5.4 meq/L, 5.3% of mortality in the patients with potassium levels 3.5–5.4 meq/L, however, no mortality was seen in the patients with potassium levels <3.5 meq/L. A significant association was observed between the potassium level and outcome. About 18.8% of mortality was seen among the patients with calcium levels <9 meq/L, 7.9% of mortality in the patients with calcium levels 9–11 meq/L, and 12.5% of mortality in the patients with calcium levels >11 meq/L. No significant association was observed between the calcium level and outcome [Table 4].
Discussion

Hyponatremia in the present study was seen in 47%, hypokalemia in 30%, and hypocalcemia in 16% of the patients. The prevalence of hyponatremia was 21.6, 14.9, and 29.8% in the study done by Angeli et al.,[8] Kim et al.,[9] and Borroni et al.[10] In another study by Shaikh et al.[11] the incidence of hyponatremia was 26.7%. The prevalence of hypokalemia was found in 33, 15, and 6.4% of the patients in the study done by Devrajani et al.,[12] Kashyap et al.,[13] and Mumtaz et al.,[14] respectively.

In our study, 49.0% of the patients were in Class B, 45.0% were in Class C, and 6.0% were in Class A categories, respectively.

The study done by Almani et al.[15] showed that 37% of the patients were in Class A, 37% were in Class B, and 26% were in Class C categories. Yan et al. (2006)[16] reported that 22% of the patients were in Class A, 41% in Class B, and 36% in Class C categories.

In our study, anemia was the most common complication (55.0%), followed by the upper GI bleed (50.0%), encephalopathy (49.0%), etc. In a study by Almani et al.[15] ascites were reported as the commonest complication (59%).

In our study, 19.1% of mortality was seen among the patients with sodium levels ≤130 meq/L, 12.5% in patients with sodium levels 131–135 meq/L, however, no mortality was seen in the patients with sodium levels 136–145 meq/L. The study done by Sersté T et al.[17] reported 55% of mortality in patients with hyponatremia. The study done by Younas et al.[18] reported that sodium levels of <130 meq/L were associated with higher morbidity and mortality rates.

Conclusion

Approximately half of the patients had hyponatremia and half of them belonged to the Class B category. The electrolyte level was not significantly associated with disease severity and complications. The disease outcome was significantly associated with the sodium and potassium levels. Electrolyte assessment should be considered in all the patients with cirrhosis admitted to the hospital so that the patients can be helped from developing electrolyte disturbance and related complications.
Summary

The present study highlights the estimate level of electrolyte disturbance and its association with the severity, complication, and outcome in chronic liver disease patients that will help in managing patients considering the evidence to treating physicians.

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Conflicts of interest

There are no conflicts of interest.

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