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ORIGINAL ARTICLE

Frequency of Hypokalemia in Chronic Liver Disease

SABA IZHAR[1], MUHAMMAD SAAD ABDULLAH[2], MUHAMMAD SHAHBAZ AMIN[3], AMINA CHEEMA[4], SHEEZA AFZAL[5], SARA AFZAL[6]
[1]*Senior Registrar, Department of Medicine, CMH Kharian Medical College, Kharian*
[2]*Assistant Professor, Department of Anatomy, CMH Kharian Medical College, Kharian*
[3]*Professor, Department of Pathology, Lahore Medical and Dental College, Lahore*
[4]*Demonstrator, Department of Anatomy, CMH Kharian Medical College, Kharian*
[5]*Demonstrator, Department of Anatomy, CMH Kharian Medical College, Kharian*
[6]*Dental Surgeon, THQ Hospital, Kharian*
Correspondence to Dr. Saba Izhar, Email: sizhar87@gmail.com, Cell: 03324512215.

ABSTRACT

Background: Serum potassium concentration ranges widely in patients with Chronic liver disease (CLD). Both hypokalemia and hyperkalemia may occur, but usually normokalemia is observed. Early studies revealed a 40% prevalence of hypokalemia in cirrhotic patients, irrespective of the disease stage.
Aim: To determine the frequency of hypokalemia in patients with chronic liver disease.
Study design: Descriptive cross-sectional study**.** The study was conducted at Department of Medicine, CMH Kharian Medical College, Kharian over a period of six months.
Methodology: Total 120 consecutive cases of CLD presenting with complications in the medicine ward were enrolled in the study. Ultrasonography, LFTs and other baseline investigations were done to evaluate for hepatic decompensation. Serum electrolytes (for hypokalemia) were done. Serum potassium levels were measured in 1ml of blood sample using electrolyte analyzer system. Data was analyzed using SPSS v23.0. Data was stratified for age, gender, BMI, duration of CLD, Child Pugh class and socio-economic status. Post stratification, Chi-Square test was used taking p-value ≤0.05 as significant.
Results: Total 120 patients were selected for this study. Mean age of the patients was 47.1±13.7 years. Total 82(68.3%) were males and 38(31.7%) were females. 20 patients (16.7%) had hypokalemia. There was a statistical significance between hypokalemia and socio-economic status (p<0.035).
Conclusion: Hypokalemia plays a key role in hepatic encephalopathy which is a common phenomenon in cirrhosis of liver.
Keywords: Chronic Liver Disease, Hypokalemia, Hepatic encephalopathy.

INTRODUCTION

Serum potassium concentration ranges widely in patients with Chronic liver disease (CLD). Both hypokalemia and hyperkalemia may occur, but usually normokalemia is observed. Although there is increased secretion of aldosterone, which leads to sodium and potassium secretion, distal sodium delivery is decreased, thereby counteracting the stimulatory effect of aldosterone on potassium secretion[1].

Early studies revealed a 40% prevalence of hypokalemia in cirrhotic patients, irrespective of the disease stage[2]. Patients may be hypokalemic owing to a variety of reasons including low dietary intake of potassium-rich foods or intracellular shifting of extracellular potassium in the setting of alkalemia. Alternatively, patients may become hypokalemic, commonly in the setting of potassium loss with hyperaldosteronism, diuretic use, vomiting or magnesium depletion, as in the case of chronic alcoholic liver disease[3]. When considering the classic characteristics of cirrhosis such as vomiting, malnourishment, hypomagnesemia, diarrhea, and diuretic use, the perfect scenario is set for the activation of renal and extra renal mechanisms of potassium wasting[4].

Recognizing hypokalemia is important in the setting of liver disease as it is a known precipitating factor for hepatic encephalopathy[5]. Hayat AS reported decrease in total body potassium level in 30% to 40% in patients with liver disease irrespective of the stage of liver disease and pointed out that hypokalemia can exacerbate hepatic encephalopathy by increasing renal ammonia genesis and systemic ammonia levels[6].

Hypokalemia also can result in muscle weakness, myocardial irritability, polyuria, polydipsia and ileus. Exacerbation of hypokalemia was reported in a patient taking terlipressin, a vasopressin analog used in the treatment of bleeding varices. The patient developed urinary potassium wasting and it was postulated that perhaps terlipressin potentiated the effect of aldosterone on potassium secretion[7]. Chronic liver disease patients often have esophageal varices secondary to portal hypertension and are thus liable to this potential exacerbation of hypokalemia if treated with terlipressin[7].

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In Pakistan burden of CLD is very high secondary to high HBV and HCV prevalence. To date, various studies have been carried out covering varying aspects of CLD. In a study by Ahmad, 14% of the cases had hypokalemia[8]. A recent Indian study also reported hypokalemia in 14% of the cases[9].

The objective of the study was to determine the frequency of hypokalemia in patients with chronic liver disease.

METHODOLOGY

The study was conducted at Department of Medicine, CMH Kharian Medical College, Kharian (CKMC) after the approval of Institutional Review Committee of CKMC. Study spanned over a period of six months between March 2021 and August 2021. It was a descriptive cross-sectional study using non-probability consecutive sampling technique. To determine the sample size, a confidence level of 95% was assumed, with a precision of 9%. Using a mean prevalence 40% hypokalemia[6] in our group of cirrhotic patients on the basis of previous data; the sample size comes out to be 120. Inclusion criteria comprised of patients aged 18 years or above, irrespective of sex having chronic liver disease, Child-Pugh class A, B or C for at least one year. Patients with hepatocellular carcinoma or patients using diuretics within a one-month period before admission, or patients with cholestatic liver diseases, namely primary biliary cirrhosis and primary sclerosing cholangitis were excluded.

After approval of synopsis, 120 consecutive cases of CLD presenting with complications in the medicine ward were offered to enroll in the study. The purpose of the study was explained in detail to all the patients and an informed consent was taken in each case. Ultrasonography, LFTs and other baseline investigations were done to evaluate for hepatic decompensation. Serum electrolytes were done to assess serum potassium levels. Serum potassium levels were measured in 1ml of blood sample, using electrolyte analyzer system. The relevant data was collected in a structured proforma containing background information like age, sex, hypokalemia was recorded as per operational definition i.e., concentration of <3.5mmol/L. All investigations were done in hospital lab and verified by pathologist. Data were analyzed using SPSS v23.0. Mean with standard deviation was calculated for quantitative variables like age, BMI, duration of CLD and serum

potassium levels. In case of qualitative variables like gender, presence of hypokalemia, socio-economic status, Child-Pugh class, frequency and percentages were calculated. Data were stratified for age, gender, BMI, duration of chronic liver disease, Child-Pugh class and socio-economic status. Post stratification, chi-square test was used taking p-value ≤0.05 as significant.

RESULTS

Total 120 patients were selected for this study. Mean age of the patients was 47.1±13.7 years. Total 82 (68.3%) were males and 38 (31.7%) were females. Age distribution of the patients was done and three groups were made, age group 18-40 years, age group 41-55 years and age group 56-70 years. 14(11.7%) patients were in age group 18-40 years. 33(27.5%) and 73(60.8%) were in 41-55 years and 56-70 years age groups respectively. Duration of disease distribution of the patients was done and three groups were made, 6 months-1 year, 1-2 years and >2 years. 42(35%) patients had duration of disease 6 months-1 year. 56 (46.7%) and 22(18.3%) had duration of disease 1-2 years and >2 years respectively. BMI distribution of the patients was done and three groups were made, normal, overweight and obese. 64(53.3%) patients had normal BMI. 43(35.8%) and 13(10.8%) were overweight and obese respectively. According to socio-economic status distribution, 46(38.3%) had low socio-economic status, while 51(42.5%) and 23(19.2%) had middle and high socio-economic status respectively. According to Child-Pugh class distribution, 51(42.5%) had class-A, while 30(25%) and 39(32.5%) had class-B and class-C respectively (Table 1). Among 120 patients, 20(16.7%) had hypokalemia. There was a statistical significance between hypokalemia and socio-economic status (p<0.035).

Table 1: Stratification of hypokalemia with respect to Child-Pugh class

Child-Pugh Class	Hypokalemia		Total	p-value
	Yes	No		
Class-A	8 (15.7%)	43 (84.3%)	51	0.494
Class-B	7 (23.3%)	23 (76.7%)	30	
Class-C	5 (12.8%)	34 (87.2%)	39	
Total	20 (16.7%)	100 (83.3%)	120	

DISCUSSION

This study evaluated the potassium levels in chronic liver disease patients. In the present study after evaluation, hypokalemia was found in 16.7% patients.

Mamun AA found 15% patients with cirrhosis of liver had hypokalemia[10]. Kim JH in their study found that the serum potassium level was strongly associated with the severity of liver function impairment assessed by Child-Pugh and Model for End-Stage Liver Disease (MELD) scores (p<0.0001)[11]. Hypokalemia occurs up to 22% of people with cirrhosis and they were often found to be asymptomatic if serum potassium level is above 3.5mmol/L[11].

Patients with severely impaired hepatic function have a greater degree of potassium depletion and failed to replenished body potassium stores when potassium supplements are given[12].
It has been suggested that patients with severely impaired liver function may be unable to retain the potassium supplements[13,14]. Cirrhosis in itself shows a pattern of physiological disturbance in water and electrolyte metabolism together with the changes in the renal and adrenal cortical functions[15].

Whole body potassium stores in alcoholics are low and not necessarily cirrhotic[16]. The potassium status of cirrhotic patients is affected adversely by many factors including diet, diuretic treatment or gastrointestinal losses[17].

Hayat AS[6] reported decrease in total body potassium level in 30% to 40% in patients with liver disease irrespective of the stage of liver disease and pointed out that hypokalemia can exacerbate hepatic encephalopathy by increasing renal ammonia genesis and systemic ammonia levels. Hypokalemia also can result in muscle weakness, myocardial irritability, polyuria, polydipsia and ileus. Exacerbation of hypokalemia was reported in a patient given terlipressin, a vasopressin analog used in the treatment of bleeding varices. The patient developed urinary potassium wasting and it was postulated that perhaps terlipressin potentiated the effect of aldosterone on potassium secretion[7].

In Pakistan burden of CLD is very high secondary to high Hepatitis B virus and Hepatitis C Virus prevalence. To date, various studies have been carried out covering varying aspects of CLD. In a study by Ahmad hypokalemia found in exactly 14% of the cases[8]. A recent Indian study also reported hypokalemia in exactly 14% of the cases[9].

CONCLUSION

Hypokalemia plays a key role in hepatic encephalopathy which is a common phenomenon in patients with cirrhosis of liver.

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Author's Contribution: Izhar S & Abdullah MS: Conceptualized the study, analyzed the data, and formulated the initial draft. **Amin MS:** Contributed to the verification of laboratory investigations, **Abdullah MS:** Contributed to the analysis of data and proofread the draft, **Cheema A & Afzal S:** Contributed to data collection, **Abdullah MS** & **Afzal S:** Contributed to the proofreading the manuscript for intellectual content.
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REFERENCES

1. Jiménez JV, Carrillo-Pérez DL, Rosado-Canto R, García-Juárez I, Torre A, Kershenobich D, et al. Electrolyte and acid–base disturbances in end-stage liver disease: a physiopathological approach. Digestive diseases and sciences. 2017;62(8):1855-71.
2. Casey TH, Summerskill WH, Bickford RG. Body and Serum Potassium in Liver Disease. Ii. Relationships to Arterial Ammonia, Blood Ph, and Hepatic Coma. Gastroenterology. 1965;48(2):208-15.
3. Adewale A, Ifudu O. Kidney injury, fluid, electrolyte and acid-base abnormalities in alcoholics. Nigerian medical journal : journal of the Nigeria Medical Association. 2014;55(2):93-8.
4. Unwin RJ, Luft FC, Shirley DG. Pathophysiology and management of hypokalemia: a clinical perspective. Nature reviews Nephrology. 2011;7(2):75-84.
5. Helmy A, Hussein M, Saleh SA, Mostafa ASER, Abdella HM, Elaidy D. Serum Electrolytes: a simple predictive test for grading severity o f overt hepatic encephalopathy. Int J Adv Res. 2015;3(7):1342-51.
6. Hayat AS, Shaikh N, Memon F. Identification of precipitating factors in hepatic encephalopathy patients at Liaquat University Hospital Jamshoro. World Applied Sciences Journal. 2010;8(6):661-6.
7. Stéphan F, Paillard F. Terlipressin-exacerbated hypokalaemia. The Lancet. 1998;351(9111):1249-50.
8. Mamun A, Mridha M, Alam K, Asraf M. Correlation between the serum sodium and the severity of liver disease in cirrhotic patients. Bangladesh Medical Journal. 2013;42(3):73-7.
9. Huang J, Cai M, He X. Serum potassium levels and prognosis in HBV-associated decompensated cirrhosis. Journal of Clinical Laboratory Analysis. 2021;35(6):e23775.
10. Casey TH, Summerskill WH, Orvis AL. Body and Serum Potassium in Liver Disease. I. Relationship to Hepatic Function and Associated Factors. Gastroenterology. 1965;48(2):198-207.
11. Heinemann HO, Emirgil C. Hypokalemia in liver disease. Metabolism. 1960;9:869-79.
12. Aikawa JK, Felts JH, Jr. Alterations in the body potassium content in cirrhosis of the liver. Gastroenterology. 1953;24(3):437-43.
13. Laragh JH, Ames RP. Physiology of body water and electrolytes in hepatic disease. Medical Clinics of North America. 1963;47(3):587
14. Ellis KJ, Shukla KK, Cohn SH, Pierson RN. A predictor for total body potassium in man based on height, weight, sex and age: applications in metabolic disorders. J Lab Clin Med. 1974;83(5):716-27.
15. Soler NG, Jain S, James H, Paton A. Potassium status of patients with cirrhosis. Gut. 1976;17(2):152-7.
16. Ahmad I, Amin ZA Determination of factors precipitating encephalo-pathy in patients with liver cirrhosis. PAFMJ. 2006;56(3): 284-88.
17. Nayak M, Anubhaw N, Nayak R. Incidence of hepatic encephalopathy in cirrhosis of liver. IJCMR. 2016;3(12):3528-32.