

Identification and Prevalence rate of Hyponatremia in Patients with Liver Cirrhosis at PIMS Hospital Islamabad Pakistan

Dr.amanullah¹, Dr Asma Aziz², Dr Imran khan³, Fawad Khalid^{4*}, Dr Azrune Fayaz⁵, Amir Muhammad⁶, Shahab Khan^{7*}.

1. Senior lecturer department of physiology Swat medical College swat Pakistan,
2. Assistant professor at department of physiology saidu medical college swat Pakistan
3. HOD and associate professor at department of physiology saidu college of dentistry swat Pakistan
4. Resident physician medical C , saidu group of teaching hospital swat Pakistan
5. Medical B ward Hayatabad medical complex Peshawar Pakistan
6. Medical officer at Cardiac Surgery ICU, Luqman International Hospital swat Pakistan
7. Resident Physician, Medical C unit Saidu group of Teaching Hospital swat Pakistan

Corresponding author: Fawad Khalid^{4*}

Email Address: fawadkhalid004@gmail.com

CO- Corresponding author: Shahab Khan^{7*}.

Email Address: drshahabkhan@hotmail.com

Abstract

As we know that Chronic liver disease (CLD) is very common ailment in Pakistan and other world as well. Whenever liver got damaged or abnormal than it does not working properly and cause different nutritional and electrolytes imbalance in body of the patients. Therefore we conducted the current research study to find the variation in sodium level in CLD patients and to identify the frequency rate of hyponatremia in patients of chronic liver disease at Department of Medicine, PIMS Hospital Islamabad from 1st January 2021 to 30 June. For the current research study we were selected 175 cases of CLD were selected through OPD. Blood sample was obtained and level of sodium was tested and hyponatremia was noted. SPSS v.20 was used to analyses the data. Frequency and percentage was calculated for hyponatremia. The mean age of the patients was 46.31 ± 15.82 years. There were 54% males and 46% females. Mean duration of CLD was 5.76 ± 2.79 years. Child-Pugh grade A was noticed in 34%, grade B in 30.7% and grade C in 35.3%. The mean sodium level 142.71 ± 15.54 mmol/L. Hyponatremia was present in 33.3% cases. Mild hyponatremia was observed in 35(48%) cases, moderate hyponatremia in 37(50%) and severe hyponatremia in 3(3%)

patients. Hyponatremia was present in 25.5% Child-Pugh class A, 39.1% in Child-Pugh class B and 35.8% in Child-Pugh class C. The difference was insignificant ($P>0.05$). From the Current study we conclude that the Frequency rate of hyponatremia in CLD patients was high.

Keywords: Chronic liver disease, Child-Pugh score, Hyponatremia, Sodium level,

Tob Regul Sci. TM 2023;9(1): 3117-3123

DOI: doi.org/10.18001/TRS.9.1.217

Introduction

Chronic liver disease (CLD) is clinico-pathologically defined disease (1). Symptoms of CLD depend on severity of deterioration inside the liver. In early stages, there are usually no symptoms and can be diagnosed by some particular laboratory tests including liver function tests and abdomen ultrasound. But, CLD, which is already progressed, can be detected by altered state of mind, severe hyperbilirubinemia, coagulopathy and many other conditions (2). CLD is a very common cause of admissions in local hospitals (3). Around 30% CLD patients die because of hepatic encephalopathy (4). The clinical course of CLD patients is more often complicated due to intensification of abnormalities of renal function and electrolytes imbalance (5). Inside patients' body disturbance of water is main indication of advance stage. This disturbance of water is associated with presence of ascites and is described by progression of dilutional hyponatremia, which is a common complication and consequence of CLD (5, 6). It has been indicated that hyponatremia can be a prognostic factor for CLD patients (7). In healthy individuals sodium concentration is sustained properly stable, In spite of significant deviations in daily fluid intake, by homeostatic mechanisms which persuade alterations in renal water management (8, 9). Hyponatremia frequently occur in patients of CLD. It usually occurs at advanced stage of CLD and is concomitant to many other complications including hepatic encephalopathy (10,11). Decreased sodium concentration in blood is a common verdict, being the most common electrolyte imbalance in these cases. Certainly, nearly 20% of patients have sodium $<130\text{mmol/L}$ (12). Decreased renal sodium control, because of renal hypo-perfusion and elevated arginine-vasopressin secretion subordinate to reduced effective volemia owing to peripheral arterial vasodilation represent the main mechanisms leading to dilutional hyponatremia (13). The objective of the study was to assess the frequency of hyponatremia in patients of chronic liver disease.

Material And Methods

The current research study to find the variation in sodium level in CLD patients and to identify the frequency rate of hyponatremia in patients of chronic liver disease at Department of Medicine, PIMS Hospital Islamabad from 1st January 2021 to 30 June. For the current research study we were selected 175 cases of CLD were selected through OPD. Blood sample was

obtained and level of sodium was tested and hyponatremia was noted. SPSS v.20 was used to analyses the data. Frequency and percentage was calculated for hyponatremia. Sampling Technique: Simple random sampling technique was used. Patients aged 16–70 years of either gender with CLD were included. Patients with valvular heart disease, patients restricted to salt were not included. 175 patients fulfilling the inclusion criteria were selected through OPD. Informed consent was obtained. Demographics were also recorded. Then blood sample will be obtained by using 5cc BD syringe. All samples were stored in sterile containers and sent to the laboratory of the hospital for assessment of sodium level. Reports were obtained and sodium level was noted. If sodium level was $<135\text{mmol/L}$, then hyponatremia was labeled. Patients with hyponatremia were managed as per hospital protocol. The collected information was analyzed through SPSS 21. For age, duration of CLD and sodium level, $\text{mean} \pm \text{SD}$ were calculated. Frequency and percentage was calculated for sex, Child-Pugh class and hyponatremia. Hyponatremia was compared with Child-Pugh class and chi square test was applied. $P\text{value} < 0.05$ was considered as significant.

Results

The mean age of the patients was 46.31 ± 15.82 years. There were 54% males and 46% females. Mean duration of CLD was 5.76 ± 2.79 years. Child Pugh grade A was noticed in 34%, grade B in 30.7% and grade C in 35.3% (Table 1). The mean sodium level $142.71 \pm 15.54\text{mmol/L}$. Hyponatremia was present in 33.3% cases. Mild hyponatremia was observed in 24(48%) cases, moderate hyponatremia in 25(50%) and severe hyponatremia in 1(2%) patients (Table 2).

Table 1: characteristics of patients

n	175
Age (Years)	46.31 ± 15.82
Gender (m/f)	81(54%) / 69(46%)
Duration of CLD	5.76 ± 2.79
Child-Pugh class	51 (34%)
A	46 (30.7%)
B	53 (35.3%)
C	

Table 2: Laboratory investigations

Sodium level	142.71 ± 15.54
Hyponatremia	50(33.3%)
Yes	100(66.7%)

No		
Mild (124-134)	24(48%)	
Moderate (116-124)	25(50%)	
Severe (<116)	1(2%)	

In patients of Child-Pugh class A, hyponatremia was present in 25.5% patients. In patients of Child-Pugh class B, hyponatremia was present in 39.1% patients. In patients of Child-Pugh class C, hyponatremia was present in 35.8% patients. The difference was insignificant ($P>0.05$) (Table 3)

Table 3: Comparison of hyponatremia in Child-Pugh class

Child-Pugh class	Hyponatremia		Total
	Yes	No	
Class A	13(25.5%)	38(74.5%)	51(34%)
Class B	18(39.1%)	28(60.9%)	46(30.7%)
Class C	19(35.8%)	34(64.2%)	53(35.3%)
Total	50(33.3%)	100(66.7%)	150(100%)

Discussion

Hyponatremia is a common complication of advanced cirrhosis associated with impaired renal capacity to eradicate solute-free water, which causes retention of water which is unequal to retention of sodium, consequently decrease the sodium levels and hypo-osmolality. Hyponatremia is the prognostic factor for high morbidity & mortality rates in CLD patients (14). The previous studies are also evident that hyponatremia can affect brain functioning and develops hepatic encephalopathy. Hyponatremia can also acts as a risk factor for liver transplantation as it is concomitant to the high number of complications and decreased short-term survival after liver transplant. The existing standard of care, based on fluid restriction is insufficient (15). The mean age of the patients was 46.31 ± 15.82 years. There were 54% males and 46% females. Mean duration of CLD was 5.76 ± 2.79 years. ChildPugh grade A was noticed in 34%, grade B in 30.7% and grade C in 35.3%. The mean sodium level 142.71 ± 15.54 mmol/L. Hyponatremia was present in 33.3% cases. Mild hyponatremia was observed in 24(48%) cases, moderate hyponatremia in 25(50%) and severe hyponatremia in

1(2%) patients. Hyponatremia was present in 25.5% Child-Pugh class A, 39.1% in Child-Pugh class B and 35.8% in Child-Pugh class C. The difference was insignificant ($P>0.05$). One study conducted in Jamshoro / Hyderabad, the frequency of hyponatremia was 51.6% in patients of liver cirrhosis. Mild, moderate and severe hyponatremia in 48.4%, 24.9% and 26.7% liver cirrhosis patients (16). In one more study conducted in Karachi, the frequency of hyponatremia was 46% (18). In a study, conducted in Hyderabad and Mirpur Khas, the frequency of hyponatremia was 60%, which was almost doubled as found in our study. In the same study, 25% had mild, 20% had moderate while 15% patients had severe hyponatremia (17). One more study in Hyderabad showed the frequency of hyponatremia as 70% in patients of liver cirrhosis (18). In another study conducted in Multan, mean sodium level was 133.93 ± 3.8 mmol/L and hyponatremia was present in 48.4% patients of liver cirrhosis (19). The frequency of hyponatremia was quite high in CLD patients in Sindh ethnicity as compared to Punjab ethnicity. But one study conducted in Rawalpindi, the frequency was also high i.e., 59.46%. high i.e., 59.46 % (20). In an international study, the prevalence of hyponatremia in patients with cirrhosis was about 30 % (21). In a study conducted in Bangladesh, 30% of cirrhotic patient had hyponatremia and there was no association of hyponatremia with Child Pugh score ($p>0.05$) (22).

Conclusion

Results of our study concluded that the frequency of hyponatremia in CLD patients was high. Now, on the basis of these results, we recommend the regular screening of CLD patients for sodium levels in blood to prevent hyponatremia which may cause altered state of mind of patients and develop hazardous consequences.

References

- [1] Khan A, Ayub M, Khan WM. Hyperammonemia Is Associated with Increasing Severity of Both Liver Cirrhosis and Hepatic Encephalopathy. *International journal of hepatology* 2016;2016.
- [2] Garcia-Tsao G, Lim J. Management and treatment of patients with cirrhosis and portal hypertension: recommendations from the Department of Veterans Affairs Hepatitis C Resource Center Program and the National Hepatitis C Program. *The American journal of gastroenterology* 2009;104(7):1802-29.
- [3] Memon MA, Memom N, Qadir A, Dal AS. Association of Hyponatremia and Encephalopathy in Patients with Chronic Liver Disease. *Annals of King Edward Medical University* 2017;23(1).
- [4] 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.

- [5] Qureshi MO, Khokhar N, Saleem A, Niazi TK. Correlation of hyponatremia with hepaticencephalopathy and severity of liver disease. J Coll Physicians Surg Pak 2014;24(2):135-7.
- [6] Gaglio P, Marfo K, Chiodo J. Hyponatremia in cirrhosis and end-stage liver disease: treatment with the vasopressin V2-receptor antagonist tolvaptan. Digestive diseases and sciences 2012;57(11):2774-85.
- [7] Shaikh S, Mal G, Khalid S, Baloch GH, Akbar Y. Frequency of hyponatraemia and its influence on liver cirrhosis-related complications. JPMA The Journal of the Pakistan Medical Association 2010;60(2):116-20.
- [8] Nielsen S, Frøkiær J, Marples D, Kwon T-H, Agre P, Knepper MA. Aquaporins in the kidney from molecules to medicine. Physiological reviews 2002;82(1):205-44
- [9] Berridge MJ. Module 7: Cellular Processes. Cell Signalling Biology 2014;6:csb0001007.
- [10] Hori T, Ogura Y, Onishi Y, Kamei H, Kurata N, Kainuma M, et al. Systemic hemodynamics in advanced cirrhosis: Concerns during perioperative period of liver transplantation. World journal of hepatology 2016;8(25):1047.
- [11] Chen C, Tian X, Jiao J, editors. Influence Factors of Serum Sodium and Prediction of Hyponatremia Using Back Propagation Artificial Neural Network Model (BP-ANN) Model in Cirrhosis Patients. Information Technology in Medicine and Education (ITME), 2016 8th International Conference on; 2016: IEEE.
- [12] Bernardi M, Ricci CS, Santi L. Hyponatremia in Patients with Cirrhosis of the Liver. Journal of clinical medicine 2015;4(1):85-101.
- [13] 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 2017:1-17.
- [14] Ginès P, Guevara M. Hyponatremia in cirrhosis: pathogenesis, clinical significance, and management. Hepatology 2008;48(3):1002-10.
- [15] Cárdenas A, Ginès P, Marotta P, Czerwiec F, Oyuang J, Guevara M, et al. Tolvaptan, an oral vasopressin antagonist, in the treatment of hyponatremia in cirrhosis. Journal of hepatology 2012;56(3):571-8.

- [16] Suk KT, Baik SK, Yoon JH, Cheong JY, Paik YH, Lee CH, et al. Revision and update on clinical practice guideline for liver cirrhosis. The Korean journal of hepatology 2012;18(1):1.
- [17] John S, Thuluvath PJ. Hyponatremia in cirrhosis: pathophysiology and management. World Journal of Gastroenterology: WJG 2015;21(11):3197.
- [18] Achakzai MS, ullah Shaikh H, Mobin A, Majid S, Javed A, Khalid AB, et al. Factors leading to hepatic encephalopathy in patients with liver cirrhosis at a tertiary care hospital in Karachi, Pakistan. Gomal Journal of Medical Sciences 2016;14(2).
- [19] Khan AH, Hayat AS, Humaira M, Pathan GN, Akbar A. Hyponatremia; frequency and outcome in patients with liver cirrhosis. Professional Med J 2016; 23(6): 669-72.
- [20] Qureshi MAM, Zubair N, Rafiq M. Frequency of Hyponatremia in Patients with Liver Cirrhosis. PJMHS 2017;11(2):562-5.
- [21] Barakat AAE-K, Metwaly AA, Nasr FM, El-Ghannam M, El-Talkawy MD. Impact of hyponatremia on frequency of complications in patients with decompensated liver cirrhosis. Electronic physician 2015;7(6):1349.
- [22] Cárdenas A, Ginès P. Predicting mortality in cirrhosis—serum sodium helps. Mass Medical Soc; 2008.
- [23] Mamun A, Mridha M, Alam K, Asraf M, Ferdoushi S, Majid F. Correlation between the serum sodium and the severity of liver disease in cirrhotic patients. Bangladesh Medical Journal 2014;42(3):73-7