International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 556-561 www.ijdmsrjournal.com ISSN: 2582-6018

A Study of Serum Sodium Levels in Decompensated Chronic Liver Disease and its Clinical Significance: A Study in A.J. Institute of Medical Sciences, Mangalore

Dr.Varsha N Shetty[1], Dr. Uday B Nayak[2]
[1]*Junior resident, Department of general medicine, A.J Institute of Medical Sciences, Mangalore*
[2]*Professor and unit Head, Department of General Medicine, A.J. Institute of Medical Sciences Mangalore*

Date of Submission: 28-03-2023 Date of Acceptance: 05-04-2023

ABSTRACT
Decompensated Chronic Liver Disease is associated with disturbances in regulation of water balance leading on to abnormalities in serum sodium. Dilutional Hyponatremia due to impaired free water clearance is the most common dyselectrolytemia while hypernatremia due to cathartic use has also been reported in few studies.
OBJECTIVE: To study serum sodium levels in patients with Decompensated Chronic Liver Disease and establish its significance.
METHOD: Data were collected from 97 patients admitted in medical wards of A.J. Institute of medical Sciences with decompensated chronic liver disease between January 2022 to December 2022.
RESULT: A significant association of Serum sodium ≤130meq/L indicating the existence of Hepatic Encephalopathy, Spontaneous bacterial peritonitis and a higher mortality rate was observed.
CONCLUSION: Hyponatremia is more common in DCLD and low serum sodium levels are associated with increased frequency of complications such as hepatic encephalopathy, hepatorenal syndrome, spontaneous bacterial peritonitis and GI bleeding. Lower serum sodium levels were associated with increased MELD CPS score and mortality indicating the inverse relationship between serum sodium levels and severity of the disease.
KEYWORDS: Hyponatremia, Hypernatremia, Decompensated Chronic Liver Disease

I. INTRODUCTION

The normal range of serum sodium is 135-145 mEq/L. Its homeostasis is vital to the functioning of the cell. An imbalance in the regulation of total body water can lead to abnormal sodium levels. Decompensated chronic liver disease(DCLD) is associated with disturbance in water homeostasis leading to dysnatremias. [1-7] Hyponatremia is defined as concentration of sodium less than 135 mEq/L. It occurs when there is excess of water in relation to sodium. It is the most common electrolyte disorder in hospitalized patients and more so in DCLD patients.[6,7,8-11] A disturbance in total body water regulation leading to decreased clearance of solute free water and the consequent inability to match the urine output to the amount of water ingested leads to dilutional hyponatremia. Hypernatremia is defined as concentration of sodium more than 145 mEq/L. It is associated with high mortality rate. Hypernatremia, though uncommon compared to hyponatremia in DCLD patients, occurs due to use of osmotic cathartics and Upper Gastro Intestinal (UGI) bleeding. If present, it is associated with increased mortality.16 Recent studies have reported that lower serum sodium levels were associated with increased complications and mortality leading to incorporation of sodium in the MELD score.[6,8,11]Hypernatremia when present is also associated with increased mortality. Therefore we undertook this study in our 2 tertiary hospital to study serum sodium levels in patients admitted with DCLD and to establish its significance.

II. MATERIALS AND METHODS

DATA SOURCE
The study was conducted on patients admitted with DCLD in Medical Ward in a tertiary hospital between January 2022 to December 2022.

INCLUSION CRITERIA FOR PATIENTS
All patients with Decompensated Chronic Liver Disease diagnosed by examination, laboratory investigations and radiological imaging.

EXCLUSION CRITERIA FOR PATIENTS
1. Patients with cardiac failure
2. Patients with chronic kidney disease
3. Patients on drugs such as SSRIs, TCA, MAO inhibitors, cytotoxic drugs etc.,

Patients were selected based on history, examination, laboratory investigations and imaging

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 556-561 www.ijdmsrjournal.com ISSN: 2582-6018

suggestive of the diagnosis of Decompensated Chronic Liver Disease. Baseline blood parameters and serum sodium levels assessed The presence of various complications and the outcome of the patients were monitored. The severity of the disease was calculated using MELD score and Child Pugh Score. As cites was classified in to three grades: Grade I- presence on examination not clear, but observed in imaging; Grade II easily made out on examination and palpation; Grade III- severe abdominal distension requiring large volume paracentesis. Hepatic Encephalopathy was graded using West Haven Criteria**.**

III. RESULTS

Data were collected from 97 patients admitted in our hospital. The mean age of the patients was 49.69 years with a range of 28-70 years. Out of the 97 patients, 91(93.81%) were males and 6(6.19%) were females.

Alcoholic liver disease was the commonest cause of DCLD in this study accounting for 91.75% while chronic hepatitis B and hepatitis C was found to be the causative factor in 7.22% and 1.03% respectively. The mean concentration of sodium of all patients was 134.18 with a range of 120-144.

TABLE 1 : DEMOGRAPHIC DETAILS

SL.NO	PARAMETER	No. Of Patients	% Of Patients	Mean	SD
1	Age	97		49.69	10.26
2	Gender				
	Male	91	93.81%		
	Female	6	6.19%		
3	Cause of cirrhosis				
	Alcohol	89	91.75%		
	HBV	7	7.22%		
	HCV	1	1.03%		
	Other	0	0.00%		
4	MELD Score			13.54%	5.50
5	Serum sodium			134.18	5.02
	1) ≤130 meq/L	23	23.17%		
	2) 131-135 meq/L	32	32.99%		
	3) ≥136 meq/L	42	43.30%		
	4)>145	0	0%		

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 556-561 www.ijdmsrjournal.com ISSN: 2582-6018

TABLE 2:CHARACTERISTICS OF PATIENTS ACCORDING TO SERUM SODIUM CONCENTRATION

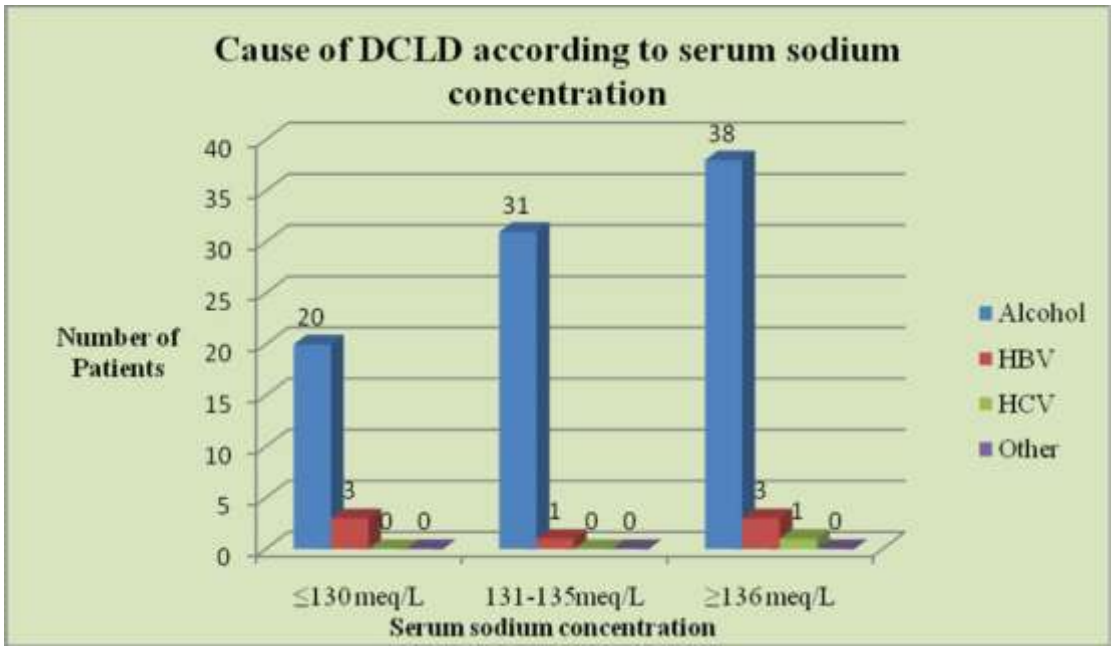
*-calculated using one way annova; $- calculated using chi

SlNo	PARAMETERS	≤130 meq/L	131-135 meq/L	≥136 meq/L	P value
		N=23	N=32	N=42	
1	Age(years)(Mean +SD)	50.50±11.08	49.11 ±11.49	50.82±10. 67	0.877*
2	SEX: Male Female	22 1	31 1	38 4	0.479$
3	CAUSEOFDCLD: Alcohol HBV HCV Others	20 3 0 0	31 1 0 0	38 3 1 0	0.376$
4	MELDscore(Mean ±SD)	18.89±6.70	13.17±4.40	10.90±2.9 5	<0.000 1*
5	Child-PughScore	10.00 ±1.86	8.53±1.27	7.48 ±1.33	<0.000 1*
6	ChildPughClass Class A Class B Class C	0 11 12	1 24 7	9 29 4	<0.000 1$

Table 2: Serum sodium levels had a strong association with severity of disease as calculated by Child Pugh Class. Among those with serum sodium levels ≤130,11 belonged to class B and 12 belonged to class C. Patients with serum sodium levels ≤130 had a mean MELD score of18.89±6.70,whilethosewithlevels between 131-135 and ≥136 had mean scores of 13.17±4.40 and 10.90±2.95 respectively. The difference in MELD scores among the three groups was statistically significant.(pvalue<0.0001)

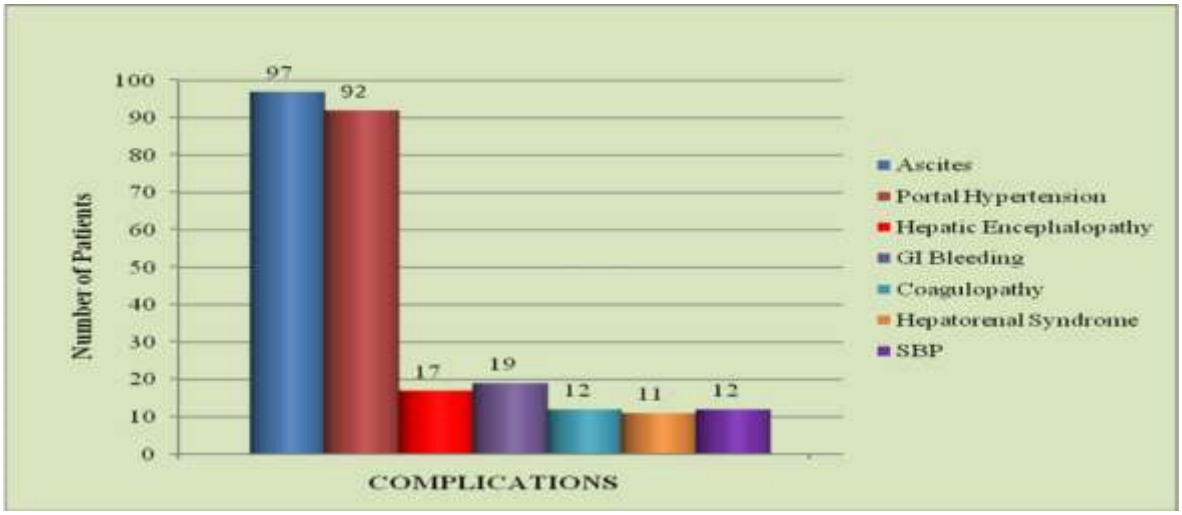
International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 556-561 www.ijdmsrjournal.com ISSN: 2582-6018

FIGURE 1: CAUSES OF DCLD ACCORDING TO SERUM SODIUM CONCENTRATION



Alcohol remains the most common cause of DCLD in the study

FIGURE 2: REPRESENTATION OF COMPLICATIONS IN DCLD STUDY GROUP



As citis remained the most common complication in the study.

International Journal Dental and Medical Sciences Research
Volume 5, Issue 2, Mar - Apr 2023 pp 556-561 www.ijdmsrjournal.com ISSN: 2582-6018

TABLE 3 : ASSOCIATION OF COMPLICATIONS WITH SERUM SODIUM LEVEL

Sl No.	COMPLICATIONS	≤130meq/L Number (%)	131-135meq/L Number (%)	≥136 meq/L Number (%)	pvalue*
1	Ascites	23(100%)	32(100%)	42(100%)	0.51
2	Portal Hypertension	23(100%)	32(100%)	37(88.10%)	0.031
3	Hepatic Encephalopathy	13(56.52%)	4(12.50%)	0(0%)	<0.0001
4	GI Bleeding	9(39.13%)	7(21.88%)	3(7.14%)	0.0074
5	Coagulopathy	7(30.43%)	2(6.25%)	3(7.14%)	0.0106
6	Hepatorenal Syndrome	11(47.83%)	0(0%)	0(0%)	<0.0001
7	SBP	8(34.78%)	4(12.50%)	0(0%)	0.0002

*Calculated by Chi square test

*Calculated by Chi square test

Table 3: There was significant difference in the occurrence of complications of DCLD such as Portal Hypertension (pvalue-0.031), Hepatic Encephalopathy (pvalue<0.0001), GI Bleeding (pvaluve-0.0074), coagulopathy (p value- 0.0106), Hepatorenal syndrome (pvalue<0.0001), SBP (pvalue- 0.0002) among the three groups.
There was no significant difference in the presence of as cites among the three groups (pvalue-0.51).

TABLE 4 : Comparision of Mortality with serum sodium

	≤130 meq/L(N=23)	**131-135 meq/L(N=32)**	**≥136 meq/L(N=42)**	**P value**
Mortality	7(30.4%)	2(6.25%)	0(0%)	0.0002

Table 4: Among 23 patients with serum sodium levels ≤130, 7 patients (30.4%)died. Among 32 patients with serum sodium levels between 131 and 135, 2 patients (6.25%) died. There were no deaths among patients with sodium levels ≥136.The difference in mortality among these three groups was statistically significant. (pvalue-0.0002).

IV. DISCUSSION

A significant proportion of patients with DCLD have abnormal serum sodium concentration. Hyponatremia is the most common occurrence in our study. No patients presented with serum sodium levels greater than145.

56.7% of patients had serum sodium levels less than 135, while 23.71%patients had serum sodium levels than 130. Serum sodium levels less than 120wereuncommon.

Angeli P et al collected data of 997 cirrhosis patients from 28 hepatology departments across Europe, Asia, North America and South America. Her study revealed that 50.6% patients had normal serum sodium levels, 27.8% patients had sodium levels between 131-135 mEq/L and

21.6% patients had serum sodium levels less than or equal to130 mEq/L.

V. CONCLUSION

Decompensated Chronic Liver Disease is associated with abnormal serum sodium concentration. Hyponatremia is the most common abnormality in this study. Age, gender and cause of DCLD did not have any association with serum sodium levels. Serum sodium levels less than135mEq/ Lis associated with increased frequency of complications such as Hepatic Encephalopathy, Hepatorenal Syndrome, Spontaneous Bacterial Peritonitis and GI Bleeding when compared to patients with serum sodium levels ≥ 136mEq/L. Patients with serum sodium concentration less than 130 mEq/L are the most affected. Lower serum sodium levels are associated with increased MELD score, increased CPS score and increased mortality indicating the inverse relationship between serum sodium levels and the severity of disease. Thus patients with decreased serum sodium levels should be considered a high risk population because of the increased frequency of complications and mortality.

REFERENCES

[1]. Epstein M. Derangements of renal water handling in liver disease. Gastroenterology. 1985; 89:1415-1425.
[2]. Arroyo V, Claria J, Salo J, Jime´nez W. Antidiuretic hormone and the pathogenesis of water retention in cirrhosis with ascites. Semin Liver Dis.1994; 14:44-58.
[3]. Gine`s P, Abraham W, Schrier RW. Vasopressin in pathophysiological states. SeminNephrol.1994; 14:384-397
[4]. Hecker R, SherlockS. Electrolyte and circulatory changes interminal liver failure. Lancet 1956; 271:1121-1125.
[5]. ShearL, Hall P W 3rd, Gabuzda G J. Renal failure in patients with cirrhosis of the liver. II. Factors influencing maximal urinary flow rate. Am J Med. 1965; 39:199-209.
[6]. Arroyo V, Rodes J, Gutierrez-Lizarraga MA. Prognostic value of spontaneous hyponatremia in cirrhosis with ascites. Dig Dis Sci. 1976; 21:249-256.
[7]. Gine`s P, Berl T, Bernardi M, Bichet DG, Hamon G, Jimenez W, et al. Hyponatremia in cirrhosis: from pathogenesis to treatment. HEPATOLOGY.1998; 8:851-864.
[8]. AngeliP,WongF, WatsonH, GinesP. Hyponatremiaincirrhosis: results of a patient population survey. Hepatology.2006;44:1535-1542.
[9]. Heuman DM,Abou-Assi SG, HabibA, WilliamsLM, Strawitz RT, Sanyal AJetal. Persistentascites and low serum sodium identify patients with cirrhosis and low MELD scores who are at high risk forearlydeath.Hepatology.2004; 40:802-810.
[10]. Mónica Guevara, María E. Baccaro, Jose Ríos, Marta Martín-LlahI, Juan Uriz, Luis Ruizdel Arboletal.Risk factors for hepatic encephalopathy in patients with cirrhosis and refractory as cites:relevance of serum sodium concentration. Liver International.2010;30:1137-42
[11]. Fernandez-Esparrach G, Sanchez-Fueyo A, Gines P, Uriz J, Quinto L,Ventura PJ et al. A prognostic model for predicting survival in cirrhosiswithascites.JHepatol.2001;34:46-52