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PREVALENCE OF HYPONATREMIA IN PATIENTS WITH CHRONIC LIVER DISEASE SECONDARY TO ALCOHOL AND ITS RELATION WITH SEVERITY OF DISEASE

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ABSTRACT

Background: Hyponatremia is a frequent complication of advanced cirrhosis related to an impairment in the renal capacity to eliminate solute-free water that causes a retention of water which is disproportionate to the retention of sodium, thus leading to a reduction in serum sodium and hypo-osmolality. Hyponatremia is the most common electrolyte abnormality in patients with advanced cirrhosis and it is associated with a poor prognosis. Hyponatremia in cirrhotic patients is defined as, serum sodium concentration ≤130 mmol/L.It has a prevalence rate of 22%.(1).

Aims And Objective: To study the prevalence of hyponatremia in patients with chronic liver disease secondary to alcohol and its relation with severity of disease.

Results: Out of 41, around 65% of patients had hyponatremia. Hyponatremia was observed with higher Child Pugh Class in this study (p value <0.245). The variations in the serum sodium levels with MELD score was statistically significant and showed an inverse relationship, with high MELD scores associated with lower serum sodium values (p value <0.001; r value -0.553).

Conlusion: Hyponatremia is a common electrolyte imbalance observed in decompensated chronic liver disease.Lower serum sodium levels are associated with increased severity of disease as assessed by MELD and Child Pugh score indicating the inverse relationship between serum sodium levels and severity of the disease.Lower sodium levels is also seen to have higher mortality thus emphasizing on the fact that timely diagnosis and management of the same is beneficial in patients with decompensated chronic liver disease.

KEYWORDS : HYPONATREMIA, CIRRHOSIS, MELD SCORE.

INTRODUCTION:

Hyponatremia is the most common electrolyte abnormality in patients with advanced cirrhosis and it is associated with a poor prognosis. Hyponatremia in cirrhotic patients is defined as, serum sodium concentration ≤130 mmol/L.It has a prevalence rate of 22%.[1] The prevalence of severe hyponatremia,defined as serum sodium ≤125 mmol/L, is 6% and the prevalence rate of serum sodium ≤120 mmol/L is 1.2%.[2-4]

Hyponatremia is divided into three types: hypervolemic, euvolemic, and hypovolemic.In patients with cirrhosis,majority of cases (90%) have hypervolemic/dilutional hyponatremia because of an increase in extracellular fluid volume.In patients with cirrhosis the effective circulating blood volume is reduced because of splanchnic vasodilation due to increased production of nitric oxide, endotoxins, and other vasodilators.[5-7] This causes activation of the renin-angiotensin-aldosterone system (RAAS pathway). The excessive antidiuretic hormone causes impairment of free water excretion secondary resulting in a state of hypervolemia.[6]In 10% of cases, hyponatremia is hypovolemic[3,4] typically due to over zealous diuresis.

METHODS:

The study was conducted by enrolling 41 patients (male and female) admitted in medical wards of Rajarajeswari Medical College and Hospital, Begaluru.

Institutional ethical committee clearance was obtained. An informed consent was taken from all the patients enrolled in the study. Detailed history, clinical examination was done and relavent laboratory investigations were sent as per a predesigned proforma and analysed. Severity of the liver disease was assessed by MELD score and Child Pugh score.

Study Method: Cross sectional observation study

Statistical Method:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients , Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale with in each group.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher Exact test used when cell samples are very small.

Pearson correlation between study variables is performed to find the degree of relationship, Pearson correlation co-efficient ranging between -1 to 1, -1 being the perfect negative correlation, 0 is the no correlation and 1 means perfect Positive correlation

Statistical software:

The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS:

Among 41 patients, mean age was 49.02 years. The study population has 36 males and 5 females.14 (34.1%) had serum sodium levels ≥135 mEq/L, 10 (24.4%) had serum sodium levels between 131 and 135 mEq/L and 17(41.5%) patients had serum sodium level 125-130mEq/L. No patients had serum sodium levels lesser than 125mEq/L.

Among those with serum sodium levels 125-130 mEq/L,7 belonged to class B and 5 belonged to class C and 5 belonged to class A. Among patients with serum sodium levels between 131-135mEq/L, 5 belonged to class A, 5 belonged to class B. Among patients with serum sodium levels >135 mEq/L, 6 belonged to class A, 8 belonged to class B.

Though hyponatremia was observed with higher Child Pugh Class in this study it was not statistically significant (p value <0.245).

Table 1: Serum Sodium Levels With Child Pugh Score

VARIABLES	CHILD PUGH SCORE			Total (n=41)	P value
	A (n=16)	B (n=20)	C (n=5)		
Sodium (mEq/l)					
<125	0(0%)	0(0%)	0(0%)	0(0%)	0.245
125-130	5(31.3%)	7(36.8%)	5(100%)	17(42.5%)	
131-135	5(31.3%)	5(31.3%)	0(0%)	10(24.4%)	

>135	6(37.5%)	8(42.1%)	0(0%)	14(35%)	

Mean serum sodium value for patients with MELD score between 1-9% (n=2) was 133.00±7.07 mEq/L, for patients with MELD score between 10-19% (n=11) was 135.73±4.52 mEq/L, for patients with MELD score between 20-29% (n=21) was 131.81±3.54 mEq/L and for patients with MELD score between 30-39% (n=7) was 127.57±1.51 mEq/L.

Table 2: Serum Sodium And Correlation With Meld Score

Variables	MELD				P value	r value
	1-9% (n=2)	10-19% (n=11)	20-29% (n=21)	30-39% (n=7)		
Sodium (meq/l)	133.00± 7.07	135.73± 4.52	131.81± 3.54	127.57± 1.51	0.001**	-0.553
Potassium (meq/l)	4.60± 0.00	4.27± 0.45	4.05± 0.52	3.81± 0.54	0.142	-0.347

The variations in the serum sodium levels with MELD score was statistically significant and showed an inverse relationship. It was observed that with high MELD scores were associated with lower serum sodium values (p value <0.001; r value -0.553).

Table 3: Comparison Of Severity Of CLD With Serum Sodium Levels And Mortality

Child Pugh Class	Mean MELD score	Mean Sodium (mEq/L)	Mortality (%)
A(n=16)	19.18+7.04	133.18+4.80	11.5%
B(n=20)	24.1+4.32	132.65+4.05	22.4%
C(n=5)	32.2+5.06	127.2+1.30	45.76%

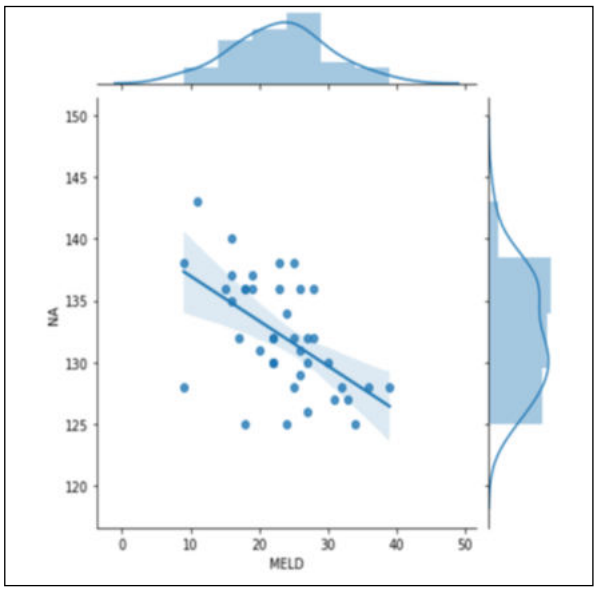

Figure 1: Inverse Relationship Between Meld Score And Serum Sodium

Serum sodium level is represnted along X-axis and the MED score along Y-axis.Majority of the patients have MELd score between 20-29% as demostrated by the histogram plotted along the X-axis.Most of the Patients had serum sodium levels between125-130 mEq/L as demostrated by the histogram along the Y-axis.It is clearly seen that as the MELD score increases the Serum soodium level decreases by an increament of 0.553.

Lower serum sodium, scores are seen with increasing MELD and Child Pugh Class.This is also seen to be associated with increased mortality.Its is observed that the lowest serum sodium levels 127.2+1.30 mEq/L were observed in Child Pugh class C with a mean MELD score of 32.2+5.06 and this class had the maximum mortality (24.76%).

DISCUSSION:

A significant proportion of patients with DCLD have abnormal serum sodium concentration. Among 41 patients in our study, 27 patients (65.8%) had hyponatremia (serum sodium less than135mEq/L) with 10(24.4%) having serum sodium levels between 131 and 135 mEq/L and 17(41.5%) patients having serum sodium level 125-130mEq/L. No patients had serum sodium levels lesser than 125mEq/L.

In a multicenter study conducted by Angeli *et al*.[2] data of 997 cirrhosis patients collected from 28 hepatology departments across Europe, Asia, North America, and South America, 27.8% of patients had sodium levels between 131 and 135 mEq/L, and 21.6% of patients had serum sodium levels ≤130 mEq/L.

Kim *et al* [8] analyzing the data of 188 patients admitted in Ilsan Paik Hospital, Korea, with complications of cirrhosis, found 52.1% of patients with normal serum sodium levels, while 20.8% of patients had serum sodium levels between 131 and 135. About 27.1% of patients had serum sodium levels ≤130.

In our study though hyponatremia was seen with increasing Child Pugh score a significant statistical correlation was not observed (p value <0.245). However the serum sodium levels showed statistically significant inverse correlation with MELD score (p value <0.001; r value -0.553).Higher MELD scores were observed to have low serum sodium levels.

Kim et al[8] in his study of cirrhosis with comlications found a strong association between serum sodium level with the severity of liver function impairment as assessed by Child-Pugh and MELD scores (p<0.0001).

An Indian study by Kumar VS and Ashok RA[9] found that patients with sodium levels ≤130 mEq/L had higher MELD score and Child Pugh score.

Study by Ibrahim M. Boghdady et al[10] a strong inverse correlation between serum sodium levels and MELD score was observed in decompensated cirrhosis ($r = -0.496$ and $P < 0.001$).

Similarly studies, Khalil *et al.*[11] and Wang *et al.* [12] also demonstrated a significant correlation between serum sodium and MELD score in decompensated cirrhotic patients.

CONCLUSION:

Hyponatremia is a common electrolyte imbalance observed in decompensated chronic liver disease.Lower serum sodium levels are associated with increased severity of disease as assessed by MELD and Child Pugh score indicating the inverse relationship between serum sodium levels and severity of the disease.Lower sodium levels is also seen to have higher mortality thus emphasizing on the fact that timely diagnosis and management of the same is beneficial in patients with decompensated chronic liver disease.The inverse relationship between serum sodium and disease severity is best demonstrated with MELD score.Combining the two as in Na-MELD score would act as a better prognostic marker of chronic liver disease.

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