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RESEARCH ARTICLE

THE ASSOCIATION BETWEEN HYPONATREMIA AND SEVERITY OF COMPLICATIONS IN LIVER CIRRHOSIS

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ABSTRACT

Introduction: Sodium disturbances leading to hyponatremia is a common problem in adult patients admitted to hospital and are associated with high mortality rate. Dilutional hyponatremia is considered to be the consequence of higher rate of renal retention of water in relation to sodium, due to decrease in free water clearance. An activation of the renin – angiotensin aldosterone system and sympathetic nervous system and a nonosmotic release of vasopressin frequently develop in patients with cirrhosis.
Aim: To evaluate the association between the serum sodium levels and severity of complications in liver cirrhosis.
Method: Data of inpatients with cirrhotic complications were collected retrospectively. The serum sodium levels and severity of complications in 50 patients were analysed.
Results: The prevelance of dilutional hyponatremia classified as serum sodium concentration of ≤ 130 mmol/L , 131 - 135 mmol /L , > 135 mmol/L. The serum sodium levels was strongly associated with severity of liver function impairement as assessed by Child – Pugh and MELD scores.
Conclusion: The results of this study indicate that low serum sodium levels are a common feature in patients with cirrhosis. The existence of sodium concentration of ≤ 135 mmol/L is associated with poor control of ascites and greater frequency of developing hepatic encephalopathy compared with patients with serum sodium concentration within normal limits.

INTRODUCTION

Hyponatremia common problem in cirrhotic patients admitted to hospital associated with high morbidity and mortality rate[1]. Approximately 57% of hospitalized and in 40% of outpatients with liver disease[1]. In recent years, hyponatremia has attracted interest as possible prognostic factor for liver cirrhosis[1]. Ascites, Portal Hypertension, Spontaneous Bacterial Peritonitis, Esophageal Varices are complications of cirrhosis. In severe cases encephalopathy and death may occur. Activation of the renin angiotensin aldosterone system and sympathetic nervous system and non osmotic release of vasopressin frequently develop in patients with cirrhosis[2]. The main aim of the study is to evaluate the association between the serum sodium levels and severity of complications in liver cirrhosis.

MATERIALS AND METHODS

Study was done on 50 inpatients who were hospitalized with complications due to liver cirrhosis admitted in Victoria and Bowring & Lady Curzon Hospitals attached to BMC & RI, included in the study. The diagnosis of liver cirrhosis was limited to cases based on clinical examinations and Laboratory investigations[3]. Patients with symptoms of vague right upper quadrant pain, distension of abdomen, signs of scleral icterus, pedal edema, spider angioma, hepatosplenomegaly were included. Patients found to have raised serum bilirubin, raised AST and ALT were included. Patients with Hepatocellular carcinoma present at the time of diagnosis and during follow up were excluded. Patients using diuretics within a 1-month period were also excluded from current study. After informed consent, 5 ml of venous blood obtained by venepuncture under aseptic conditions, centrifuged and the separated serum will be used for estimation parameters.

STATISTICAL ANALYSIS

Based on the serum sodium concentrations measured by ISE analyser. Patients were divided into three groups. Serum sodium ≤130mmol/L , serum sodium between 131 and 135mmol/L, serum sodium > 135mmol/L. Complications included were portal HTN, Esophageal varices, Ascites, Gross ascites, SBP, Encephalopathy, Anemia, Infection, Malnutrition.

Study design

An Observational clinical study with 50 patients is undertaken to study the levels of sodium and its correlation with incidence of complications.

Statistical Methods

Descriptive 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. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Statistical software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

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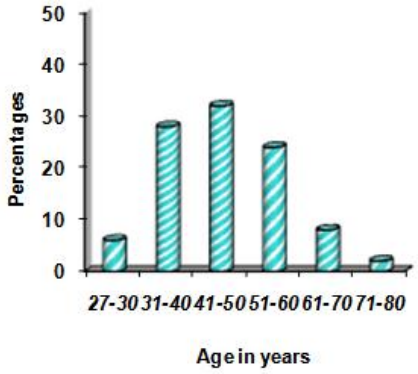
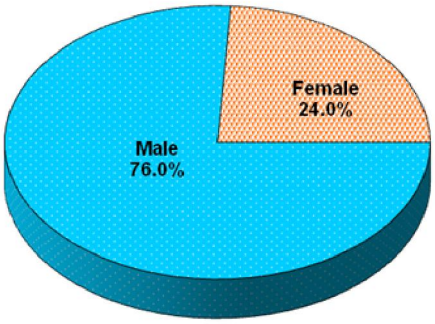


AGE DISTRIBUTION OF PATIENTS STUDIED



GENDER DISTRIBUTION

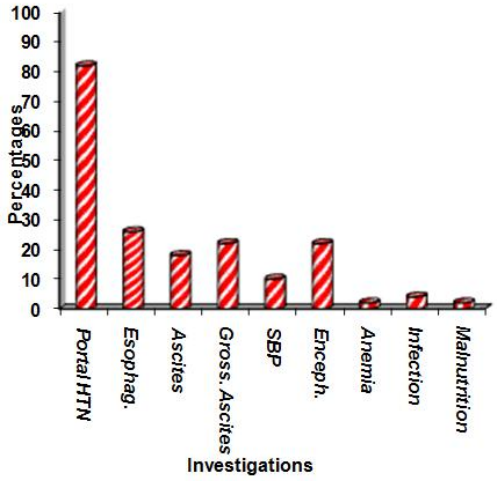
LEVELS OF SERUM SODIUM

Sodium levels	Number of patients (n=50)	%
<130	23	46.0
131-135	21	42.0
>135	5	12.0

Mean ± SD: 130.76±4.51

COMPLICATIONS

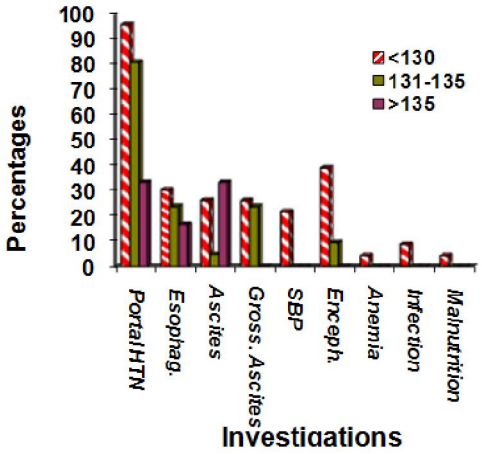
Complications	Number of patients (n=50)	%
Portal HTN	41	82.0
Esophagealvarices	13	26.0
Ascites	9	18.0
Gross ascites	11	22.0
SBP	5	10.0
Encephalopathy	11	22.0
Anemia	1	2.0
Infection	2	4.0
Malnutrition	1	2.0

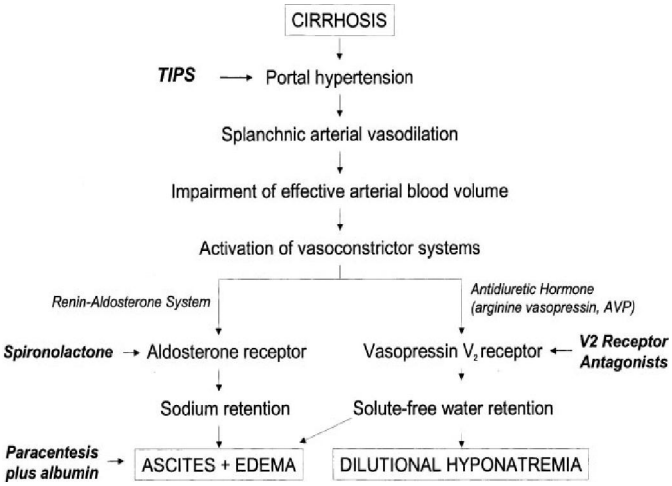


CORRELATION OF INCIDENCE OF COMPLICATIONS ACCORDING TO SODIUM LEVELS

Complications	Sodium levels			P value
	<130 (n=23)	131-135 (n=21)	>135 (n=6)	
Portal HTN	22(95.7%)	17(81%)	2(33.3%)	0.004**
Esophagealvarices	7(30.4%)	5(23.8%)	1(16.7%)	0.821
Ascites	6(26.1%)	1(4.8%)	2(33.3%)	0.090+
Gross ascites	6(26.1%)	5(23.8%)	0(0%)	0.563
SBP	5(21%)	0(0%)	0(0%)	0.05+
Encephalopathy	9(39.1%)	2(9.5%)	0(0%)	0.034*
Anemia	1(4.3%)	0(0%)	0(0%)	1.000
Infection	2(8.7%)	0(0%)	0(0%)	0.606
Malnutrition	1(4.3%)	0(0%)	0(0%)	1.000

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P ≤ 0.05)
** Strongly significant (P value: P≤0.01)





DISCUSSION

The pathogenesis of hyponatremia in patients with cirrhosis directly related to hemodynamic changes (systemic vasodilation and decreased mean arterial pressure) and secondary to neurohumoral adaptations (rennin – angiotensin – aldosterone activation, increase ADH secreation) that occur, resulting in an impaired ability to excrete ingested water. Similar study by John Hoon Kim, sodium levels less than 130 mmol/L indicated the existence of massive ascites (*p=0.007), hepatic encephalopathy (p=0.011), spontaneous bacterial peritonitis*[1]. Study by Angeli P, existence of serum sodium <135 mmol/L was associated with severe ascites, as indicated by high prevalence of refractory ascites, large fluid accumulation rate compared with normal serum sodium levels[4].Study by Aaron

Lindsay,existence of serum sodium <135 mmol/L was associated with severe ascites, as indicated by high prevalence of refractory ascites, large fluid accumulation rate[5].Low serum sodium levels were more frequent in patients with severe liver failure (59.9%) irrespective of age and sex of the patients[6].Serum sodium < 126 mEq/L at for transplantation is a strong independent predictor of mortality. Addition of serum sodium to MELD increases the ability to predict 3- and 6-month mortality in patients with cirrhosis[9]. Serum sodium levels and severity of hepatic encephalopathy (65.8%) is closely linked to low serum sodium in patients[10]. Comparing with patients with serum sodium >135 mmol/L, patients with serum sodium ≤135 mmol/L had a greater frequency of ascites, illness severity scores, hepatic encephalopathy, sepsis, renal failure, and in-hospital mortality (55.9% vs. 73.1%, P=0.043)[11].

Conclusion

In this current study, hyponatremia strongly associated with Portal hypertension (p=0.004), moderately with encephalopathy (p=0.034) and there is some suggestive correlation with ascites (p=0.090) & SBP (p=0.057).

LIMITATION

One limitation of the current study was that it did not assess the effect of serum sodium concentration on the risks for developing complications but simply examined the concurrent presence of complications and sodium levels in a retrospective analysis. Further prospective studies are needed to determine the clinical significance of hyponatremia and to identify its correlation with the incidence of possible complications.

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