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EXAMINATION OF SERUM SODIUM AND POTASSIUM LEVELS IN PATIENTS WITH ALCOHOLIC LIVER DISEASE ADMITTED IN BHARATI VIDYAPEETH MEDICAL COLLEGE AND HOSPITAL - A HOSPITAL BASED STUDY

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ABSTRAC

Hyponatremia is an electrolyte imbalance that commonly occurs in hospitalized patients. Most cases are dilutionalhyponatrema caused by the impairment of solute-free water clearance. Hyponatremia resulting from the impairment of solute-free water excretion is commonly accompanied by portal hypertension. In recent years, hyponatremia has attracted interest as a possible prognostic factor for liver cirrhosis. Chronic alcoholic patients experience low blood concentrations of key electrolytes and severe alterations in the body's acid-base balance. Aim of the study is to evaluate serum sodium and potassium levels in patients with alcoholic liver disease attending Bharati Hospital. The study design is hospital based case control study. For the study 50 no of cases are selected on the basis of clinical history. 50 no of apparently healthy age and sex matched individuals have been taken from normal population as control group. Liver function test, serum sodium and potassium are done on vitros 250 auto analyser based on principle of reflectance spectroscopy. After evaluation, hyponatremia is found among the cases to be statistically significant. The serum potassium level is also mildly decreased, but not significant.

KEYWORDS: Alcoholic liver disease, Hyponatremia.

INTRODUCTION

Liver Cirrhosis is an irreversible result of various disorders that damage liver cells over time. When damage becomes extensive, there is distortion of the normal structure of the liver leading to impairment of the liver function. Progressive fibrosis and cirrhosis, clinically presenting as end-stage liver disease are common outcomes in patients with Alcoholic Liver disease (ALD).

Chronic and excessive alcohol ingestion is one of the major causes of Liver diseases in the western world. Incidence of alcohol consumption is increasing in modern India. Fatty Liver is present in 90% of chronic alcoholics. Alcohol is considered as a direct hepatotoxin.[1]

All over the world ALD is a serious and potentially fatal consequence of alcohol use. The diagnosis of ALD is based on drinking history, physical signs, symptoms, and laboratory tests.[2] One of the most important conditions that can cause hyponatremia and hypokalemia include liver disease viz alcoholic liver disease. Among the electrolyte abnormalities**,** hyponatremia is most commonly reported in alcoholic liver disease. However, the underlying pathogenetic mechanisms are not well delineated.[3] Hyponatraemia is defined as a serum sodium level 136 mEq/L[4] while, in cirrhosis, it has classically been considered relevant only at a serum sodium level <130 mEq/L.[5] In general, hyponatraemia can be divided into three clinical types: hypovolemic, euvolemic and hypervolemic, with some patients presenting a mixed picture. Serum sodium and potassium levels are independent predictors of severity in chronic and cirrhotic liver disease.[4] Sodium has an important role in maintaining the ECF and is also responsible for most of the osmotic activity of plasma.

Normal concentration of sodium is 136 - 146 mMol/L. Sodium level <136 mMol/L is considered as hyponatremia and <120 mMol/L is hyponatremia. Mild hyponatremia is often asymptomatic and sometimes associated with nonspecific features like nausea, lethargy etc. Rapid onset of severe hyponatremia associated with disorientation, unsteadiness, agitation, seizures, coma and death (due to cerebral oedema).

Normal potassium level is 3.5-5 mMol/L and <3.5 mMol/L is considered as hypokalemia. Potassium plays vital role in nerve impulse conduction, muscle contraction, cell membrane function and enzyme activity. Half of the alcoholics admitted in hospitals with alcoholic withdrawal syndrome experience hypokalemia. Alcoholism is often associated with poor nutrition, vomiting, diarrhoeaetc which subsequently leads to hypokalemia.

Chronic alcoholic liver disease is associated with nephromegaly and is directly proportionate to hepatomegaly. It is suggested that both cellular enlargement and proliferation leads to nephromegaly.[6] Effect of alcohol on urine output due to its diuretic effects (acute inhibition of release of ADH) causes disarrangement of the fluid and electrolyte balance. Beer drinkers suffer from hyponatremia due to excess of fluid intake in the form of beer. It was observed that the 5 patients who drink beer 5L /day were found to be hyponatremic in comparison with normal subjects as control group. Beer contains some solutes such as sodium and potassium, so these patients lack sufficient solute to stimulate kidney to eliminate excess fluid.[7]

Depletion in potassium due to increased excretion is encountered in alcoholic patients, although the excretion and retention of the potassium is dependent upon the hydration of the patients. Body's potassium excretion generally causes excess of fluid absorption which results in exacerbation of hyponatremia due to fluid overload. Excess of potassium loss will lead to stimulation of ADH hormone. This in turn leads to hypervolemia and consequently hyponatremia. Moreover, increase potassium excretion increases the thirst and thereby increases the fluid intake. So, for maintenance of body's homeostasis level of both the electrolytes should be proper.[8] The current study has been undertaken to evaluate the serum sodium and potassium levels in a group of alcoholic liver disease patients admitted to Bharati Medical College Hospital and compare the findings with a healthy, age and sex matched control group. The study also examined the causes of hospital admissions of the cases as an ancillary study.

MATERIALS AND METHODS

1. Study design: Hospital based case control study.

2. Study population: Known patients with alcoholic liver disease attending Bharatividyapeeth Medical College Hospital during one year of study period (1st April 2018 to 1st April 2019) were the cases. Age and sex matched apparently healthy individuals from the population were taken as controls.

3. Sample size: No. of cases = 50 (fifty),

No. of controls= 50 (fifty)

4. Duration of study: one year (1st April 2018 to 1st April 2019.)

5. Statistical analysis: Type of study: Case Control (Hospital Based) Data analysis was done by suitable statistical software available in the institute i.e. SPSS.

RESULTS

Table 1: Serum sodium levels in cases and control.

	CASES			CONTROLS			P value
Serum sodium (m mol/L)	No. of cases	Average Serum sodium Level (m mol/L)	SD	No. of cases	Average Serum sodium level (m mol/L	SD	0.0001
<136	26	130.9	4.8	4	123.7	1.7	
136-146	22	139.0	2.8	43	141.0	3.0	
>146	02	148.0	1.4	03	147.0	1.1	

Table 2: Serum Potassium levels in cases and control.

	CASES			CONTROLS			P value
Serum Potassium (m mol/L)	No. of cases	Average Serum Potassium Level (m mol/L)	SD	No. of cases	Average Serum Potassium level (m mol/L	SD	0.082 (> 0.05)
< 3.5	11	3.0	0.2	2	3.3	-	
3.5-5	38	3.9	0.4	48	4	0.43	
> 5	1	5.5	-	0	0	0	

Table 3: Causes of hospital admission of alcoholic liver disease patients.

Causes of hospital admission	Number (n =50)	Percentage
1) Alcohol withdrawal syndrome	21	42
2) Increased serum enzyme levels	17	34
3) Chronic alcoholic pancreatitis	6	12
4) Anaemia	4	8
5) Gastro intestinal Symptoms	2	4

DISCUSSION

This study evaluated the serum sodium and potassium levels in alcoholic liver disease patients admitted in Bharati Medical College and also their causes of hospital admission during a period of one year i.e. 1st April 2018 to 30th April, 2019 In the present study after evaluation hyponatremia (57.5%) was found among the cases to be statistically highly significant (p value = 0.0001). Many studies carried out elsewhere also found similar results.

Chronic hyponatremia (defined as serum sodium concentration below 130 meq/L), occurs up to 22% of people with cirrhosis, and they were often found to be asymptomatic if serum sodium level is above 120 meq/L. **(**9**)** Kim J H et al studied the prevalence of dilutional hyponatremia and found serum sodium concentrations of <135 m mol/L, 130 m mol /L, and <125 m mol/L were 20.8%, 14.9% and 12.2%, respectively.[10]

Mamun A A et al found 35% patients with cirrhosis of liver had hyponatremia with serum sodium level ≥ 130meq/L.[11] Kim J H et al in their study found that the serum sodium level was strongly associated with the severity of liver function impairment assessed by Child-Pugh and MELD scores($p<0.0001$).[10]

The most common reason for chronic hyponatremia in cirrhosis impairment in renal solute free water secretion. This is due to the increased anti diuretic hormone (ADH) secretion and decreased effective arterial volume. The study carried out by Liamis G et al in a group of alcoholic patients (n=127), incidence of hyponatremia (serum sodium <134m mol/L) was found to be 22 patients (17.3%).[3]

The brain is able to compensate for the increased osmolar pressure (which leads to cerebral edema) in case of chronic hyponatremia by extruding intracellular osmolytes, such as potassium, glutamine and myo-inositol. This can take 48 hours for complete effect.[10] This particular adaptive mechanism explains why patients with chronic hyponatremia and serum sodium concentrations above 120 meq / L are asymptomatic.[9]

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. It has been suggested that patients with severely impaired liver function may be unable to retain the potassium supplements.[12] 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. Whole body potassium stores in alcoholics are low and not necessarily cirrhotic.[13]

The potassium status of cirrhotic patients is affected adversely by many factors including diet, diuretic treatment or gastrointestinal losses.[14] In the present study, though statistically not significant ($p=0.080$), hypokalemia was found in 11 patients (33%) compared to 2 in the control group. This may be due to less number of the cases in the study for which it was not statistically significant. Another additional ancillary finding that came into light during the study is that alcohol withdrawal syndrome was the commonest cause of hospital admission. It accounts for 42% of hospital admission among alcoholics. The least common cause of hospital admission was gastro intestinal symptom (4%).

CONCLUSION

In conclusion, Hyponatraemia is a commonly encountered problem in patients with end-stage liver disease. Hyponatremia was found among the cases to be statistically highly significant. So in alcoholic liver disease estimation of electrolytes is advocated strongly to be included as routine investigation of ALD. Low serum sodium is a poor prognostic indicator in both the pre- and posttransplant patient population and has been shown to increase the risk of early mortality and complications including infection, renal failure, and encephalopathy. To enlight on prognosis of end stage liver diseases, further more studies are warranted on electrolyte imbalance.

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