

Original Research Article

## Study of Serum Sodium and Potassium Level in Patients with Alcoholic Liver Disease Attending Jorhat Medical College Hospital - A Hospital Based Study

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### ABSTRACT

Hyponatremia is a common finding in approximately 57% of hospitalized patients with chronic liver disease and in 40% of outpatients with liver disease. 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 JMCH. The study design is hospital based case control study. For the study 40 no of cases are selected on the basis of clinical history. Forty 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:** Hyponatremia, Alcoholic liver disease.

### INTRODUCTION

The case of alcoholic liver disease has been increasing at an alarming rate. All over the world Alcoholic liver disease (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. <sup>[1]</sup> 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. <sup>[2]</sup> Serum sodium and potassium levels are independent predictors of severity in chronic and cirrhotic liver disease. <sup>[3]</sup>

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 m Mol /L. Sodium level <136 m Mol /L is considered as hyponatremia and <120 m Mol /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 m Mol/L and <3.5 m Mol/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 diarrhoea etc. which subsequently lead 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. [4] 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. [5]

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. [6] 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,

## RESULTS

increase potassium excretion increases the thirst and thereby increases the fluid intake. [7] So, for maintenance of body's homeostasis level of both the electrolytes should be proper. The current study has been undertaken to evaluate the serum sodium and potassium levels in a group of alcoholic liver disease patients admitted to Jorhat 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 Jorhat Medical College Hospital during six month of study period (1<sup>st</sup> January 2015 to 30<sup>th</sup> June, 2015) were the cases. Age and sex matched apparently healthy individuals from the population were taken as controls.
- 3. Sample size:** No. of cases=40(forty), No. of controls=40(forty)
- 4. Duration of study:** Six months (1<sup>st</sup> January 2015 to 30<sup>th</sup> June, 2015.)

### Statistical analysis

The hospital based case control study was done using Chi square test .Data analysis was done by using MS Excel.

Table 1: Serum sodium levels in cases and control

| Serum sodium (m mol/L) | CASES        |                                      |     | CONTROLS     |                                      |     | P value |
|------------------------|--------------|--------------------------------------|-----|--------------|--------------------------------------|-----|---------|
|                        | No. of cases | Average Serum sodium Level (m mol/L) | SD  | No. of cases | Average Serum sodium level (m mol/L) | SD  |         |
| <136                   | 23           | 128                                  | 3.8 | 2            | 124                                  | 8.4 | 0.0001  |
| 136-146                | 11           | 138                                  | 0.7 | 35           | 141                                  | 3.5 |         |
| >146                   | 6            | 148                                  | 0.5 | 3            | 147                                  | 0.7 |         |

Table 2: Serum potassium levels among cases and controls

| Serum Potassium (m mol/l) | CASES       |   |     | CONTROLS    |   |      | P value       |
|---------------------------|-------------|---|-----|-------------|---|------|---------------|
|                           | No of Cases | Average Serum potassium level (m mol/L) | SD  | No of Cases | Average Serum potassium level (m mol/L) | SD   |               |
| <3.5                      | 6           | 2.9                                     | 0.7 | 1           | 3.3                                     | -    | 0.079 (>0.05) |
| 3.5-5                     | 33          | 4.1                                     | 0.4 | 39          | 4                                       | 0.21 |               |
| >5                        | 1           | 5.2                                     | -   | 0           | 0                                       | 0    |               |

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

| Causes of hospital admission                    | Number (n =40) | Percentage |
|---|----------------|------------|
| 1) Alcohol withdrawal syndrome                  | 17             | 42.5       |
| 2) Increased serum enzyme levels / Hepatomegaly | 15             | 37.5       |
| 3) Chronic alcoholic pancreatitis               | 5              | 12.5       |
| 4) Anaemia                                      | 2              | 5          |
| 5) G.I Symptoms                                 | 1              | 2.5        |

## DISCUSSION

This study evaluated the serum sodium and potassium levels in alcoholic liver disease patients attending Jorhat Medical College and also their causes of hospital admission during a period of six months i.e. 1<sup>st</sup> January 2015 to 30<sup>th</sup> June, 2015. 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.

Mamun A A et al found 35% patients with cirrhosis of liver had hyponatremia with serum sodium level  $\geq$  130meq/L. [8] 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 ( $p < 0.0001$ ). [9]

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. [10] 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. [9]

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. [9] The study carried out by Liamis G et al in a group of alcoholic patients (n=127), hyponatremia (serum sodium  $< 134$  m mol/L) was found in 22 patients (17.3%). [2]

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. [9] This particular adaptive mechanism explains why patients with chronic hyponatremia and serum sodium concentrations above 120 meq / L are asymptomatic. [10]

Patients with severely impaired hepatic function have a greater degree of potassium depletion and failed to replenish body potassium stores when potassium supplements are given. [11] It has been suggested that patients with severely impaired liver function may be unable to retain the potassium supplements. [12,13] 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. [14] Whole body potassium stores in alcoholics are low and not necessarily cirrhotic. [15] The potassium status of cirrhotic patients is affected adversely by many factors including diet, diuretic treatment or gastrointestinal losses. [16] In the present study, though statistically not significant ( $p = 0.079$ ), hypokalemia was found in 6 patients (15%) compared to 1 with 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 (42.5%) of hospital admission among alcoholics. The least common cause of hospital admission was gastro intestinal symptom (2.5%).

## CONCLUSION

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. Moreover further study can be taken up to establish a relationship between specific electrolyte deficiency or any other abnormalities associated with and alcohol withdrawal.

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