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RESEARCH ARTICLE

A study to assess the etiology and clinical profile of patients with hyponatremia at a tertiary care hospital

Nilesh Kumar Rai, Lalit Prashant Meena, Jaya Chakravarty, Madhukar Rai, Shyam Sundar

Department of General Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Correspondence to: Lalit Prashant Meena, E-mail: drlalitmeena@gmail.com

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ABSTRACT

Background: Hyponatremia, defined as a serum sodium concentration <135 mmol/l. It may be asymptomatic or present with symptoms ranging from nausea, lethargy to seizure and coma or even life threatening. Timely diagnosis can result in appropriate interventions to reduce these symptoms and mortalities. **Aims and Objective:** To evaluate the causes and clinical features of hyponatremia in hospitalized patients. **Material and Methods:** Present study was observational study. Patient aged 14 years and above with serum $Na^+ \leq 130$ meq/l were included in study. Based on history and clinical examination patients were classified as hypovolemic hyponatremia, hypervolemichyponatremia and euvolemic hyponatremia**.** Patients with clinical euvolemia, Urine $Na^+ > 20$ mmol/l, Serum uric acid ≤4 mg/dl, normal renal function (serum creatinine and blood urea) and absence of thyroid or pituitary insufficiency were classified as having Syndrome of inappropriate antidiuresis (SIAD). The sodium estimation was done in the randox automated analyser which measures sodium by ion selective electrode technology. **Results:** A total of 100 patients with hyponatremia (serum $Na^+ \leq 130$ mEq/L) were included in the study. The mean age of presentation was around 51.5 ± 17.5 years with male to female (M:F) ratio 1.8:1. Severe hyponatremia was detected in 56 patients and the mean sodium level was 118.2 ± 8.1 mEq/L. 43 patients had altered level of consciousness in form of drowsiness, confusion, irrelevant talking or coma, 6 patients had seizure, 38 patients had vomiting, 7 patients had hiccups and 38 hyponatremic patients were asymptomatic. The commonest type of hyponatremia noted in our study was euvolemic hyponatremia (71%) followed by hypervolemic (27%) and hypovolemic hyponatremia (2%). Most the euvolemic hyponatremiain in our study were due to SIAD (94.4%). **Conclusion**: Commonest age group for hyponatremia was 60–69 years. Majority of the patients fell in euvolemic group followed by hypervolemic. Most common presentation of hyponatremia was altered sensorium, vomiting and few patients had seizure.

KEY WORDS: Hyponatremia; Syndrome of Inappropriate Antidiuresis; Altered Sensorium; Electrolyte

INTRODUCTION

Hyponatremia, defined as a serum sodium concentration <135 mmol/l, is an undertreated condition in clinical practice it can lead to a wide spectrum of clinical symptom. It may be asymptomatic or present with symptoms ranging from nausea, lethargy to seizure and coma or even life threatening.[1,2] Along with these hyponatremia is also associated with multiple other complications in elderly patients including falls, fractures, increased length of hospital stay, and mortality.[3] Prevalence of hyponatremia at the time of admission is vary widely between 2.8 and 26.5%.[4-8] Clinical management of the patients with hyponatremia is based on correcting the serum sodium level and treating the underlying cause.[3] Diagnosis of the electrolyte abnormalitiy is depends crucially on the correct assessment of volume status which is some time difficult to

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determine, especially in the elderly patients.[9,10] Syndrome of inappropriate antidiuresis (SIAD) is widely assumed the commonest cause of euvolumic hyponatremia, but some time it may be over diagnosed particularly in dehydrated elderly patients.[9,11,12] Due to incorrect diagnosis these patients may be mismanaged because the management of the euvolumic hyponatremia (SIAD) is exact opposite to the management of hypovolemic hyponatremia. Though many studies have been done on hyponatremia, data on clinical and etiological profile of hyponatremia are scarce, to say the least, from the Indian subcontinent. Most of the guidelines on hyponatremia use measured osmolality as a tool for approach to a patient with hyponatremia. But many hospitals do not have access to osmometer. This study was done to evaluate the causes of hyponatremia in resource poor setting where osmometer is not available and to develop an algorithm for evaluation of these patients.

Objectives

To evaluate the causes and clinical features of hyponatremia in hospitalized patients.

MATERIAL AND METHODS

The present study was observational study. Patient aged 14 years and above with serum $Na^+ \leq 130$ meq/l were included in study. Exclusion criteria: Uncontrolled diabetes, hyperlipidemia (TG>500 mg/dl), multiple myeloma, receiving mannitol, suspected ethylene glycol or methanol poisoning. Informed consent was taken from all patients. Those patients who had altered sensorium consent were taken from the patient's attendant. All selected patient were evaluated by history and clinical examination using a preformed proforma. Special emphasis was made on duration of hyponatremia and symptoms/signs related to hyponatremia. All the patients were subjected to following investigations: Arterial blood gas, complete blood counts, random blood glucose, blood urea and serum creatinine, serum electrolytes (Na^+, K^+, Cl), serum uric acid, urine electrolytes, liver function test, serum T3, T4 and TSH, serum cortisol level (wherever indicated). Chest radiograph and imaging studies-ultrasonography abdomen, two-dimensional (2D) ECHO and colour doppler (wherever indicated). Since the osmometer was not available for measurement of osmolality serum osmolality was calculated in all patients using the formula: Serum osmolality = $(2Na^+ + (BUN/2.8) + (glucose/18)$. Based on serum Na^+level patients were classified into mild (131–135 mg/dl), moderate (121–130 mg/dl) and severe hyponatremia (≤120 mg/dl). Based on history and clinical examination patients were classified as hypovolemic hyponatremia, hypervolemic hyponatremia and euvolemic hyponatremia**.** Patients with clinical euvolemia, Urine Na^+>20 mmol/l, serum uric acid ≤4 mg/dl, normal renal function (serum creatinine and blood urea) and absence of thyroid or pituitary insufficiency were classified as having SIAD. The sodium estimation was done in the randox automated analyser which measures sodium by ion selective electrode technology.

RESULTS

A total of 100 patients with hyponatremia (serum $Na^+ \leq 130$ mEq/L) were included in the study. The mean age of presentation was around 51.5 ± 17.5 years with male to female (M:F) ratio 1.8:1. Severe hyponatremia was detected in 56 patients. The mean sodium level was 118.2 ± 8.1 mEq/L. Out of the total 100 patients 43 patients had altered level of consciousness in form of drowsiness, confusion, irrelevant talking or coma, 6 patients had seizure, 38 patients had vomiting, 7 patients had hiccups and 38 hyponatremic patients were asymptomatic. Mean sodium level of patients with altered sensorium was 114 ± 8.4 mEq/L. Patients with serum $Na^+ \leq 110$ mEq/L were comatose. The commonest type of hyponatremia noted in our study was euvolemic hyponatremia (71%) followed by hypervolemic (27%) and hypovolemic hyponatremia (2%). Most the euvolemic hyponatremiain our study were due to SIAD (94.4%) and rest due to pan-hypopituitarism or glucocorticoid deficiency (5.6%). The most common cause of SIAD was tuberculosis (TB) (pulmonary/central nervous system [CNS]) (43.3%). Other causes included use of thiazide (14.9%), urinary tract infection (13.4%), pneumonia (4.5%), other febrile illness (12%) and unknown (4.5%). Among the hypervolemic hyponatremia renal failure (63%) was the most common cause followed by cirrhosis of liver (22.2%) and congestive heart failure (CHF) (14.8%). Hypovolemic hyponatremia which was least common type in our study was mainly due to gastrointestinal (GI) losses (2%). Overall the most common cause of hyponatremia in our study was SIAD (67%) due to TB and use of thiazides followed by renal failure (17%). Most common cause of hyponatremia in elderly patients was also SIAD.

DISCUSSION

Irrespective of the cause, hyponatremia is associated with substantial morbidity and mortality. Etiological evaluation of the risk factors associated with the development of hyponatremia is important in preventing the recurrent episodes. We conducted this hospital-based, observational descriptive study as an attempt to evaluate etiology and clinical profile of the hyponatremic patients. In our study a total of 100 patients with serum $Na^+ \leq 130$ meq/l were studied to determine the clinical profile and etiology of hyponatremia in medicine ward. Out of 100 patients included in our study, the majority were in the age 60–69 years (34%), the mean age was 51.47 years and 47% patients were ≥60 years. In study conducted by Nandakumar *et al.*, on 120 patients with hyponatremia most patients were in the age group of >55 years and the mean age was 57 years.[13] Paniker and

Joseph study on hyponatremia had age distribution between 11 and 80 years and majority patients in their study were above 41 years with mean age of 55.05 ± 2D. 68% were between ages 41 and 70 years.[14] Thomas *et al.* from Kuwait reported similar finding in their study, where the commonest age group was 45–64 years and the mean age was 57 years.[15] In Rao *et al.* study in elderly patients the mean age of patients with hyponatremia was 72 years with a range of 60–99 years.[16] Thus in our study and most of the other studies hyponatremia was more common among the elderly. The elderly are more likely to have comorbid conditions that predispose to hyponatremia such as diabetes, hypertension and ischemic heart disease. They are also more likely to be on drugs such as diuretics, which produce hyponatremia. Male preponderance for hyponatremia was noticed in our study with male:female ratio of 1.8:1. Studies conducted by Nandakumar *et al.*, Paniker and Joseph, Chatterjee *et al.,* study also showed that males are more commonly affected than females.[13,14,17] However the prevalence of hyponatremia was more in females compared to males in a study conducted by Rao *et al.*[16] Hawkins from Singapore has reported that gender is not an important risk factor for disturbances in serum sodium concentration.[18]

In this study the mean sodium level was 118.2 mEq/l. Severe hyponatremia (serum $Na^+ \leq 120$ mEq/l) was detected in 56 patients. Rao *et al.* and Chatterjee *et al.,* study had the mean sodium level of 113.89, 126.34 mEq/l respectively.[16,17] 43% patients had altered level of consciousness in form of drowsiness, confusion, irrelevant talking or coma, 6% patients had seizure, 38% patients had vomiting, 7% patients had hiccups and 38% hyponatremic patients were asymptomatic. Patients with more severe degree of hyponatremia were more likely to be symptomatic. Similar findings were seen in other studies [Table 1]. Nearly one fifth of patients in Nandakumar *et al*., study were asymptomatic.[13] Drowsiness was present in half of patients. Vomiting, seizures and hiccups were each seen in about 10% of the patients. Confusion was seen in 34%, coma in 12% and seizure in 9% patients in Paniker and Joseph study. 60% patients in their study were asymptomatic.[14] Only 4% of the total patients presented with seizures in Rao *et al.,* study,[16] while in Chatterjee *et al.,* study 11.94% patients were unconscious at admission, 31.8% patients were disoriented while 4.47% patients had seizures.[17]

The commonest type of hyponatremia noted in our study was euvolemic hyponatremia (71%) followed by hypervolemic (27%) and hypovolemic hyponatremia (2%) which was similar as compared to other studies [Table 2]. In Chatterjee *et al.,* study the largest group of hyponatremic patients were euvolemic (50.74%), followed by hypervolemic (26.86%) and hypovolemic (22.4%).[17] Rao *et al.,* study in elderly patients had similar finding as our study. In their study 61% were euvolemic, 23% were hypervolemic and 16% hypovolemic.[16] Coenraad *et al.* has reported, out of 41 hyponatremic patients 12 were due to normovolemic disorders, 10 were due to hypovolemic disorders, 11 were due to hypervolemic disorders in their study.[19] In Nandakumar *et al*., study nearly half of patients (48.3%), had euvolemic hyponatremia. Less than half (39%) of the patients had hypovolemic hyponatremia. Only one eighth (12.5%) of the patients had hypervolemic hyponatremia.[13]

The low incidence of hypovolemic hyponatremia in our study may reflect increased awareness of volume resuscitation in our setting consequently severe hypovolemia leading to hyponatremia do not occur. High incidence on other hand suggests probably that this entity is not recognized and management is delayed. Most the euvolemic hyponatremia in our study were due to SIAD (94.4%) and rest due to pan hypopituitarism or glucocorticoid deficiency (5.6%). The most common cause of SIAD in our study was TB (pulmonary/CNS) (43.3%) and thiazide (14.9%). This was similar to Nandakumar *et al.*, study which also had most common cause of euvolemic hyponatremia as SIAD. In their study among patients with SIAD about half of the

Table 1: Comparison of symptoms in various studies

Symptoms	Our study (%)	Nandakumar *et al.*[13]	Paniker and Joseph[14]	Chatterjee *et al.*[17]	Rao *et al.*[16]
Asymptomatic	38	20	60	48.2	NA
Altered sensorium	43	50	46	43.7	NA
Seizure	6	10	9	4.5	4
Vomiting	38	10	NA	NA	NA
Hiccups	7	10	NA	NA	NA

Table 2: Types of hyponatremia in different studies

STUDY	Euvolemic hyponatremia (%)	Hypervolemic hyponatremia (%)	Hypovolemic hyponatremia (%)
Our study	71	27	2
Nandakumar *et al*.[13]	48.5	12.5	39
Chatterjee *et al*.[17]	50.74	26.86	22.4
Rao *et al*.[16]	61	23	16
Coenraad *et al*.[19]	29	27	24

patients had drug induced hyponatremia, about one third of patients had infections as the underlying cause of SIAD, the other aetiologies were cerebrovascular accident (CVA), malignancy and TB meningitis.[13]

Among the hypervolemic hyponatremia renal failure (63%) was the most common cause followed by Cirrhosis of liver (22.2%) and CHF (14.8%) in the present study. While in Nandakumar *et al.*, study among patients with dilutional hyponatremia just over two thirds of patients had CHF. The reminder had cirrhosis of liver.[13]

Hypovolemic hyponatremia which was least common type in our study was mainly due to GI losses (2%). This is in contrast to Nandakumar *et al.*, study which had two thirds cases of hypovolemic hyponatremia due to salt wasting nephropathy and rest due to GI loss.[13]

Over all the most common cause of hyponatremia in our study was SIAD (67%) followed by renal failure (17%). These two accounted for 84% of the cases. In Nandakumar *et al.*, study also overall SIAD was the commonest cause of hyponatremia (38.3%), but Salt losing nephropathy was the second most common cause (26.7%). The reminder was due to dilutional hyponatremia, GI loss and endocrine deficiency.[13] Paniker and Joseph study also had predominant cause for hyponatremia as SIAD and the commonest cause for SIAD in their study was respiratory infections (pneumonia, pulmonary tuberculosis) and stroke.[14] SIAD was most common cause of hyponatremia in Rao *et al.*, study also.[16] However in Chatterjee *et al.,* study the most common underlying predisposing factor for hyponatremia was GI fluid loss followed by CVA and pulmonary sepsis.[17]

CONCLUSION

To conclude in our study most common age group for hyponatremia was 60–69 years. Elderly comprised nearly half of the total cases. 56% patients presented with severe hyponatremia (serum Na≤120 meq/l). Mean sodium level of the patients was 118.2 mEq/l. Most common presentation of hyponatremia was altered sensorium and vomiting. Only few patients had seizure. Majority of the patients fell in euvolemic group followed by hypervolemic. SIAD was the most common cause of hyponatremia followed by renal failure. SIAD due to pulmonary or CNS TB and thiazide accounted for 39% of the total cases.

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