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Research Article

An open model cross sectional observational study of hyponatremic patients in a tertiary care hospital

Harsha Gopinath*, T. Duraickannu, Roopak Mohan, G. Rakesh Kumar

Department of General Medicine, Aarupadai Veedu Medical College and Hospital, Kirumampakkam, Bahour Post, Cuddulore Main Road, Puducherry

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***Correspondence:**
Dr. Harsha Gopinath,
E-mail: harsharoopak21@gmail.com

ABSTRACT

Background: Hyponatremia is the most common electrolyte disturbance encountered in clinical practice. Hyponatremia frequently develops in hospitalized patients, especially in metabolic encephalopathy patients, their causes are multiple. Symptomatology depends more on the rate of development of the electrolyte abnormality than on its severity. We undertook this study to determine etiological, clinico-lab profile and differential diagnosis in a group of hyponatremic patients.
Methods: We included retrospectively 50 patients of hyponatremia admitted in medical intensive care unit between June 2013 and May 2014. We excluded all patients who presented with chronic hyponatremia, chronic use of diuretics and recent cases undergoing surgery and chronic cases of malnutrition and those with age below 18 years. Data were analyzed by univariate methods, followed by multivariate analysis.
Results: Among the 50 patients with hyponatremia, 42% of encephalopathy patients had metabolic encephalopathy. Majority who developed hyponatremia had age between 61 to 80 years. Clinical profile of patients with hyponatremia was revealed that most of the patients with hyponatremia were observed having confusion followed by nausea/vomiting, delirium, seizure. The most common etiology of metabolic encephalopathy with hyponatremia is diuretic induced, followed by diabetic ketoacidosis, chronic liver disease, chronic kidney disease, SIADH and hypothyroidism. The common co-morbid conditions for hyponatremia were hypertension 55.93%, diabetes mellitus 43.85%, and chronic renal failure 35.29%. In the patients with hyponatremia high urine sodium level suggests that most of the patients had hyponatremia due to renal loss of sodium other than extra renal cause.
Conclusions: In the present study, hypertension was found a major risk factor for hyponatremia. Common causes of hyponatremia found are intake of diuretics and excessive renal loss. Most of the hypertensive patients in the present study group were on thiazide or potassium sparing diuretics. Diabetes mellitus and dyslipidemia were important co-morbidities of hyponatremia.

Keywords: Hyponatremia, Metabolic encephalopathy, Hypertension, Diabetes mellitus, Dyslipidemia

INTRODUCTION

Electrolyte imbalance is one of the leading causes of metabolic encephalopathy as studied and discussed among various literatures previously. Sodium is generally the most important element causing metabolic encephalopathy in critically ill patients as found out by previous researches done.[1,2]

The normal value of sodium is 135 mmol/l. Both hyponatremia and hypernatremia can cause metabolic encephalopathy. Hyponatremia is defined as serum sodium of less than 135meq/L.[3-7] Hyponatremia is the

most common electrolyte disorder encountered in clinical practice. Hyponatremia is divided into three groups depending on the serum osmolality.

Hyponatremia is divided in three Groups, viz: (i) mild hyponatremia: it is defined as serum sodium level between 130 - 135 mmol/L; (ii) moderate hyponatremia:it is defined as serum sodium level between 125-130 mmol/L and severe hyponatremia: it is defined as serum sodium level less than 125mmol/L.

It is also classified into 3 sub-groups on the basis of patient's volume status which includes (i) Isotonic hyponatremia, a type of hyponatremia occur when patient is having severe hyperlipidemia or hyperparaprotienaemia and after intravenous immunoglobulin therapy. These interfere with measurement of sodium and at the same time, they do not affect the measurement of osmolality of plasma and sodium will be low, this is also called as pseudohyponatremia, (ii) Hypertonic hyponatremia, a type of hyponatremia is mainly caused by hyperglycaemia and mannitol administration, which attract Intracellular fluid (ICF) into extracellular compartment to maintain osmotic equilibrium, with net effect as increased total extracellular fluid (ECF) with relative sodium dilution, leading to hyponatremia in the presence of hyper osmolality and (iii) Hypotonic hyponatremia, one of the most common disorders that we come across in clinical set up. The etiology of hyponatremia can be of varied type starting from decreased intake of food and salt, drug induced, systemic illness, congestive cardiac failure, cirrhosis of liver or SIADH. Many studies have been done to find out the association of all these causes with hyponatremia and the frequency by which they affect the patient and cause hyponatremia. Hypotonic hyponatremia is further classified into three subgroups viz; hypovolemic hypotonic hyponatremia; euvolemic hypotonic hyponatremia; hypervolemic hypotonic hyponatremia.[3,8]

Few studies have shown that hyponatremia is associated with the development of metabolic encephalopathy but there are no published estimates of the prevalence of hyponatremia. So the objectives of the study were to identify the etiological factors for hyponatremia.

METHODS

The study was conducted in the medical intensive care unit (MICU) of Aarupadai Veedu Medical college hospital and diagnosed as metabolic encephalopathy from June 2013 to May 2014 were included in the present study.

Study population

This was a cross sectional study including 50 patients with hyponatremia satisfying inclusion criteria.

Inclusion criteria

Patients above 18 years of age, who presented in ER with profound illness and on investigation was found to be hyponatremic during the study period.

Exclusion criteria

- Age below 18 years.
- Chronic hyponatremic cases
- Chronic use of diuretics and other ACE/ARB inhibitors.
- K/C/O malnutrition cases
- Recent history of major surgery or head trauma cases.

Method of data collection

Method of data collection was by patient's evaluation through

- Previous case records
- Physical examination
- Detailed clinical history
- Systemic examination

After detailed clinical examination, biochemical and hematological examinations were done. This included random blood sugar, renal function tests, liver function tests, serum electrolytes, urine spot sodium along with complete haemogram.

RESULTS

Among 50 hyponatremic patients satisfying inclusion criteria, 42% of patients had metabolic encephalopathy.

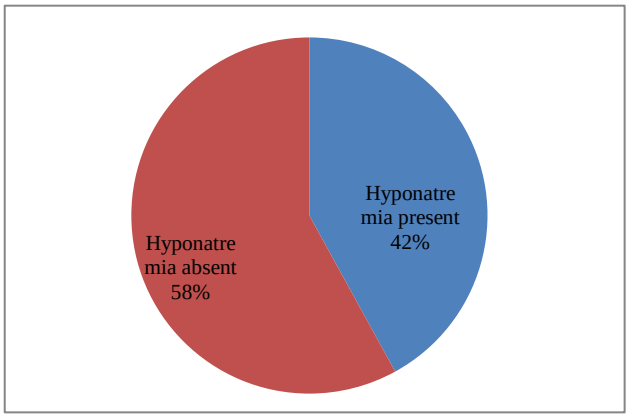

Figure 1: Frequency of hyponatremia found in patients with metabolic encephalopathy.

Sex wise distribution of hyponatremia cases study revealed that 76% male patients had developed hyponatremia while 24%were female patients. Similarly, the age group of the patients with hyponatremia was studied. Majority who developed hyponatremia had age

between 61 to 80 years. Clinical profile of metabolic encephalopathy patients with hyponatremia was studied, which revealed that in most of the patients, confusion (62%), followed by nausea/vomiting (57%), delirium (14%), seizure (9%) was observed. From the study of etiology of metabolic encephalopathy patients with hyponatremia, it was found that the most common etiology is diuretic induced (33%), followed by diabetic ketoacidosis (19%), chronic liver disease (19%), chronic kidney disease (14%), SIADH (4%), and hypothyroidism (4%) (Table 1).

Table 1: Etiology and clinical profile of hyponatremic patients.

Variables	No of patients (n=21)	Percentage %
M/F	16/5	76/24
Age group		
Less 40	1	9
41 to 60	7	28
61 to 80	12	92
81 above	1	100
Nausea/Vomiting	12	57
Confusion	13	62
Delirium	3	14
Seizure	2	9
SIADH	1	4
Diabetic ketoacidosis	4	19
Chronic liver disease	4	19
Chronic kidney disease	3	14
Diuretic induced	7	33
Hypothyroidism	1	4
Alcoholic liver disease	1	4

From the study the most common precipitating factors for hyponatremia found are diuretics (47.6%), followed by GI loss (23.8%), hyperglycemia (19%), and mannitol (9.5%) (Table 2).

Table 2: Precipitating factors for Hyponatremia.

Variables	No of patients (n=21)	%
Diuretics	10	47.6
GI loss	5	23.8
Hyperglycemia	4	19
Mannitol	2	9.5

Patients with different disorders were studied for hyponatremia and it was found that there is association hypernatremia and various disorders as mentioned in Table 3.

Table 3: Hyponatremia present in patients with different disorders.

Name of disorder	Patients with hyponatermia (%)
Diabetes mellitus	43.85
Hypertension	55.93
Chronic liver disease	31.57
Chronic kidney disease	35.29
Dyslipidemia	69.56
Metabolic encephalopathy (past history)	31.57
Liver function test abnormality	24

Out of 42% patients had hyponatremia, 12.5% patients found with urine Na^+ level below 20, while other 87.5% had urine Na^+ level more than 20. It indicates that most of the patients had hyponatremia due to renal loss of sodium other than extra renal cause. This test was carried out only in those patients who had hyponatremia.

Table 4: Clinical profile of urine sodium level in hyponatremic patients.

Urine Na+	Patients with hyponatremia (%)
Urine Na+ (below 20)	12.5%
Urine Na+ (more than 20)	87.5%

DISCUSSION

This study was undertaken keeping in view of frequent occurrence of hyponatremia in the elderly sick patients who are at high risk for development of electrolyte disturbance as these people have age related physiological changes in the function of kidneys and other multiple co-morbid conditions. In the present study it was found that hyponatraemia had a complex and multifactorial etiology in the majority of patients.

In the present study total 50 cases of hyponatremia were taken, out of which 42% patients developed metabolic encephalopathy. In previous few available literatures, similar studies are found to be reported but comparative studies are not available regarding the prevalence of hyponatremia in metabolic encephalopathy patients.

In the present study, hyponatremia (serum sodium <135 meq/L) was observed in 42% of intensive care unit patients. While in Ashish Upadhyay et al hyponatremia (serum sodium <135 mEq/L) was observed in 42.6% in the acute hospital care group patients.[9] Majority of the patients in this study were males, in compared to this, in the study by Agarwal et al predominantly 64.3% patients were males.[10] This is contrary to the finding of MY Rao et al where 55 patients were females and 45 patients were males with preponderance of hyponatremia in elderly sick females.[11]

Most of the patients in our study were in the age group of 61-80 years. The mean age of patients with hyponatremia in the present study was 70 years. This is similar to the study by Rao MY et al in which it was found that mean age of the patients with hyponatremia was 72 years.[11] On the other hand, Agarwalet al in their study had most patients who were young.[10] The mean age of patients was 48.7±16.7 years (15-82 year).

Increased loss of sodium from the body was observed in 57% patients, most commonly via gastrointestinal route (nausea/vomiting). This is more than that reported by Agrawal et al where it was found 26 (37.1%).[10] Confusion was observed in 62% patients with hyponatremia which is compared with the study by Agrawal et al where it was 29 (41.4%), but in MY Rao et al study it was found only 2%. Only 14% of the patients with hyponatremia were presented with delirium. This is comparable with Agrawal et al (17.1%).[10] 9% of the patients with hyponatremia presented with seizures. While in Rao MY et al only 4% had developed seizure and Agrawal et al study it was 29.9%.[10,11]

The common co-morbid conditions were hypertension 55.93%, diabetes mellitus 43.85%, chronic renal failure 35.29% according to the present study, as compared to this 62, 51 and 22 percent respectively was reported by MYRao et al study.[11] Only 31.5%of patients with hyponatremia in the present study had chronic liver disease, which is less than Ashish Upadhayay et al study in which 14 percent patients found with chronic liver disease.[9]

While 69.56% had dyslipidemia, 31.57% had past history of metabolic encephalopathy and 24% had liver function test abnormality in the present study.

Most of the patients in the present study had multiple co-morbid conditions of which hypertension and diabetes were the most common. Glucose being an osmotically active molecule, hyperglycemia can induce a fall in serum sodium levels by shifting water from intra-cellular to extra-cellular compartments. It has been calculated that serum sodium falls by 1.6 to 2.4 mmol/L for every 5 mmol/L rise in serum glucose levels.[12] Hyponatremic hypertensive syndrome is a well-known entity, the most common association being in patients with essential hypertension receiving diuretics.[13] Most of the hypertensive patients in our study group were on thiazide or potassium sparing diuretics which are known to interfere with metabolism of various electrolytes and predispose them to electrolyte imbalance. Along with their effect on sodium-chloride co-transporter channel, thiazide diuretics are known to cause non-osmotic release of vasopressin.[14]

Syndrome of inappropriate antidiuretic hormone (SIADH) was observed only in 4% patients of our study, which was most common cause of hyponatremia found in MY Rao et al study i.e. 30%.[11] Of all the etiologies, the worrisome cause is drug induced hyponatremia of which a major chunk was diuretic induced. Many studies have reported that drugs especially thiazide diuretics are a major cause of hyponatremia in elderly.[15-18]

Analysis of the causes of hyponatremia in the present study patients revealed that most of the patients had multiple etiological factors in elderly patients with hyponatremia. Other factors found to reduce dietary salt intake were intake of only liquid feeds and patients put on Ryle's tube feeds. The conventionally fed fluids in our country, orally or through Ryle's tube are sugar based like fresh fruit juices, milk, tea and coffee, glucose water and tender coconut water. Soups and canned juices with salt are not a part of our traditional meal. This has made inappropriate feeds an important factor responsible for the development of in-hospital hyponatremia. This agrees with the causes of hospital acquired hyponatremia as reported earlier.[19,20] A larger study with controls needs to be done to establish the effect of salt restriction and inappropriate Ryle's feeds in patients.

Though JNC VIII recommends diuretics as the first line drug for treatment of hypertension, a word of caution should be maintained while prescribing diuretics in the elderly and when required doses should be modified according to body weight and should begin with the lowest dose.

Urine spot sodium test was done only in patients who had hyponatremia, to differentiate between renal and extra renal loss of sodium. Urinary osmolality and plasma osmolality could not be determined in the present study.

CONCLUSION

In the present study, hypertension was found a major risk factor for hyponatremia. Common causes of hyponatremia found are intake of diuretics and excessive renal loss. Most of the hypertensive patients in the present study group were on thiazide or potassium sparing diuretics. Diabetes mellitus and dyslipidemia were important co-morbidities of hyponatremia.

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