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AN OBSERVATIONAL STUDY TO ASSESS THE CLINICAL-ETIOLOGICAL PROFILE OF HYPONATREMIA IN PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT IN A TERTIARY CARE HOSPITAL.

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Abstract

Background

When the serum sodium level is less than 135 mmol/l, it is called hyponatremia. It may show a range of symptoms, including nausea, tiredness, seizures, coma, and sometimes even death. If identified immediately, proper treatment can reduce these symptoms and fatality rates. This study assessed the clinical characteristics and underlying causes of hyponatremia in admitted patients.

Materials and Methods

This study was observational. Patients who were at least 14 years old and had serum Na+ levels ≤130 meq/l were included in the study. Patients were diagnosed as having hypovolemic hyponatremia, hypervolemic hyponatremia, or euvolemic hyponatremia based on the results of their medical histories and physical examinations. The syndrome of inappropriate antidiuresis (SIAD) was identified in patients with clinical euvolemia, urine Na+ >20 mmol/l, serum uric acid ≤4 mg/dl, satisfactory renal function (serum creatinine and blood urea), and no pituitary or thyroid disease.

Results

The study comprised 100 individuals with hyponatremia. 56 individuals had severe hyponatremia. 38 patients experienced vomiting, 7 experienced hiccups, 19 hyponatremic patients were asymptomatic, and 43 patients had altered levels of consciousness manifested as sleepiness, disorientation, irrelevant talking, or coma. Euvolemic hyponatremia (71%) was the most common, followed by hypervolemic hyponatremia (27%), and hypovolemic hyponatremia (2%).

Conclusion

Ages 60 to 69 were the most common range for hyponatremia. The majority of patients belonged to the hypervolemic category after the euvolemic group. The most typical signs of hyponatremia were impaired sensorium, vomiting, and, infrequently, seizures.

Recommendation

Diuretics should be used with caution, especially in more vulnerable groups, as they often result in hyponatremia. Diuretic-induced hyponatremia may occur, but additional factors, including the patient's euvolemic status, should be considered to prevent it from always turning hypovolemic. The intensity of the symptoms should be given priority over serum salt levels, as there is no correlation between them.

Keywords: *Clinical-Etiological, Profile of Hyponatremia, Emergency Department*
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Introduction

A serum sodium content of less than 135 mmol/l is known as hyponatremia. It is a disorder that is undertreated in clinical practice and can cause a variety of clinical symptoms. It could show up as asymptomatic or with symptoms like nausea, fatigue, seizures, comas, or even potentially fatalities [1,2]. Hyponatremia is linked to several other issues in older people, such as increased hospital stay duration, falls, fractures, and mortality. The degree of hyponatremia at admission varies considerably [3].

Between 2.8 and 26.5% of patients have hyponatremia at the time of being admitted, which is a wide range [4–8]. The cornerstone of clinical therapy for patients with hyponatremia is treating the underlying cause and modifying the serum sodium level.[3] Diagnosing electrolyte problems requires accurate volume status assessment, which can sometimes be difficult, especially

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in elderly people [9, 10]. While it is well accepted that the syndrome of inappropriate antidiuresis (SIAD) is the most common cause of euvolemic hyponatremia, overdiagnosing SIAD is a possibility, particularly in elderly, dehydrated patients [9,11,12].

These individuals may receive improper care as a result of an inaccurate diagnosis because euvolemic hyponatremia (SIAD) is treated entirely differently than hypovolemic hyponatremia. Despite the large number of research conducted on hyponatremia, there are, to put it mildly, few, if any, data from the Indian subcontinent regarding the clinical and etiological profile of the condition. The majority of hyponatremia guidelines employ measured osmolality as a means of addressing hyponatremia in patients. However, osmometers are not available in many hospitals. This study aimed to evaluate the causes of hyponatremia in environments with few resources and no access to an osmometer and develop an algorithm for identifying these people.

Aim of the Study

To assess hospitalized patients' hyponatremia's etiology and clinical characteristics.

Methodology

Study Design

This study was observational.

Study Population

This study included data from 200 patients with blood Na+ levels ≤130 meq/l. Of the 200 patients in our study, 34% were between 60 and 69, the mean age was 51.47, and 47% were older than 60.

Inclusion Criteria

The study comprised patients 14 years of age or older with serum Na+ levels ≤130 meq/l.

Exclusion Criteria

Hyperlipidemia (TG>500 mg/dl), diabetes uncontrolled, mannitol use, multiple myeloma, and possible toxicity from methanol or ethylene glycol. Every patient gave their informed permission.

Data Collection

A pre-made proforma assessed each chosen patient's history and clinical examination. Particular attention was paid to the length of hyponatremia and its associated symptoms and indicators. Each patient underwent the following tests: Whole blood counts, random blood glucose, serum uric acid, serum T3, T4, and TSH, urine electrolytes (Na+, K+, Cl), serum creatinine and blood urea, and serum cortisol level (where applicable). Imaging examinations, including two-dimensional (2D) ECHO, color Doppler, and ultrasonography of the abdomen and chest (where indicated).

Using a prefabricated proforma, each chosen patient's clinical examination and history were assessed. The length of hyponatremia and its associated symptoms/signs were given particular attention. The following tests were performed on each patient: Serum T3, T4, and TSH; arterial blood gas, full blood counts, random blood glucose, blood urea, serum creatinine, serum electrolytes (Na+, K+, Cl), serum uric acid, urine electrolytes, liver function test, and, if applicable, serum cortisol level.

Method

Since the osmometer was out of commission, serum osmolality was determined for each patient using the following formula: serum osmolality = glucose/18 + (BUN/2.8) + 2Na+. The patients' hyponatremia was classified as mild (131–135 mg/dl), moderate (121–130 mg/dl), or severe (≤120 mg/dl) based on their serum Na+ level of measurement. Based on information from their medical histories and findings from physical examinations, patients were classified with hypovolemic hyponatremia, hypervolemic hyponatremia, or euvolemic hyponatremia. Na+ urine and clinical euvolemia are characteristics of people with SIAD. The Randox automated analyzer, which uses ion-selective electrode technology to quantify sodium, was used to estimate the salt content. Serum uric acid ≤4 mg/dl, normal blood urea and serum creatinine levels, thyroid and pituitary insufficiency absent, and serum mmol/l >20 mmol/l.

Statistical Analyses

Continuous variables with a normal distribution were represented by means ± SD, while ordinal and non-normal variables were represented by the median (interquartile range). To find out if the data were normal, the Kolmogorov-Smirnov test was performed. We used percentages and integers to express categorical variables. ANOVA, or one-way analysis of variance, was utilized if the data were normally distributed; if not, the Kruskal-Wallis test was employed to compare the means of more than two group means. To assess the importance, five percentiles were employed.

Results

The study comprised 100 individuals with hyponatremia, defined as serum Na+ ≤130 mEq/L. The presentation age was 51.5 ± 17.5 years on average, with a male-to-female ratio of 1.8:1.

There was severe hyponatremia found in 56 individuals. Sodium was determined to have a mean of 118.2 ± 8.1 mEq/L. Of the 100 people, 43 showed altered states of awareness, such as sleepiness, confusion, and irrelevance. 38 individuals reported hyponatremic instances, six patients showed coma and vomiting, and seven patients experienced hiccups.

Patients with modified sensorium had an average sodium level of 114 ± 8.4 mEq/L. Patients in an unconscious state had serum Na+ levels ≤110 mEq/L. Euvolemic hyponatremia, which accounted for 71% of the cases in our study, was the most prevalent type, with hypervolemic hyponatremia (27%) and hypovolemic hyponatremia (2%), in order of prevalence. SIAD caused ninety-four percent of the euvolemic hyponatremia in

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our sample; the remaining five percent was caused by pan-hypopituitarism or glucocorticoid deficit.

Tuberculosis (TB) (pulmonary/central nervous system [CNS]) accounted for 43.3% of SIAD cases. Other significant variables included thiazide usage (14.9%), pneumonia (4.5%), unknown (4.5%), urinary tract infection (13.4%), and other febrile disease (12%). Renal failure accounted for 63% of cases of hypervolemic hyponatremia, with liver cirrhosis and congestive heart failure (CHF) following closely behind with 22.2% and 14.8%, respectively.

In our investigation, gastrointestinal (GI) losses accounted for 2% of the cases of hypovolemic hyponatremia, the least prevalent type. According to our study, the most frequent cause of hyponatremia was TB and thiazide usage, which resulted in SIAD (67%) and renal failure (17%). In older individuals, SIAD also accounted for the majority of hyponatremia cases.

Discussion

In our study, of 100 patients, 34% were between 60 and 69, the mean age was 51.47, and 47% were older than 60. A study by Nandakumar et al. looked at 120 hyponatremia patients; the mean age of these patients was 57, meaning that the majority of them were older than 55 [13]. With a mean age of 55.06 ± 2D, the patients in Paniker and Joseph's study on hyponatremia were primarily older than 40–41 years old. Patients between the ages of 11 and 80 were enrolled in the study. 68% of them ranged in age from 41 to 70 [14]. Thomas et al. [15] reported similar findings in Kuwait, where the most common age group was 45–64 years old and the mean age was 57 years old.

The age range of patients diagnosed with hyponatremia was 60–99 years old, with a mean age of 72 years in the previous study conducted by Rao et al. [16]. Accordingly, hyponatremia was more prevalent in the elderly in both our sample and the majority of other studies. The risk of hyponatremia is increased in the elderly due to the higher prevalence of concurrent conditions such as diabetes, hypertension, and ischemic heart disease. They are also more likely to be taking medications like diuretics, which can cause hyponatremia. In the current study, a male prevalence of hyponatremia was found, with a male-to-female ratio of 1.8:1. Men are more likely than women to encounter the syndrome, according to research by Nandakumar et al., Paniker and Joseph, and Chatterjee et al. [13, 14, 17, 18].

Nonetheless, girls were more likely than males to have hyponatremia in a study by Rao et al. [16]. Gender is not a significant risk factor for changes in blood sodium content, according to Singaporean Hawkins [18]. The average sodium level in this experiment was 118.2 mEq/l. 112 people had serum Na+ values ≤120 mEq/l, which is a sign of severe hyponatremia. The mean sodium levels in the studies by Rao et al. and Chatterjee et al. were 113.89 and 126.34 mEq/l, respectively [16, 17]. Apart from the 6% of patients who had seizures, 38% of patients had vomiting, 7% had hiccups, and 38% of hyponatremic patients showed no symptoms at all. Additionally, 43% of patients had a shift in consciousness, which could be characterized by incoherence, coma, lassitude, or irrelevant talking. Further research produced similar results (Table 1).

Table 1- Comparing the symptoms across different research.

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

In the study by Nandakumar et al., about 25% of the patients had no symptoms [13]. Half of the subjects reported feeling sleepy. About 10% of the individuals experienced hiccups, vomiting, or convulsions. In the Paniker and Joseph trial, confusion was observed in 34% of the patients, coma in 12%, and seizures in 9%. In their investigation, 60% of patients had no symptoms [14]. In the Rao et al. trial, only 4% of patients experienced seizures [16]. In contrast, in the Chatterjee et al. study, 11.94% of patients were unconscious, 31.8% were confused, and 4.47% of patients had seizures at admission [17].

According to data from earlier research, euvolemic hyponatremia was the most common kind, accounting for 71% of the cases in our investigation. It was followed by hypervolemic hyponatremia (27%) and hypovolemic hyponatremia (2%) (Table 2).

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Table 2- Hyponatremia types in various research

Study	Euvolemic hyponatremia (%)	Hypovolemic hyponatremia (%)	Hypervolemic hyponatremia (%)
Our Study	71	2	27
Nandakumar et al. [13]	48.5	39	8.5
Rao et al. [16]	61	16	23
Chatterjee et al. [17]	50.74	22.4	26.86
Coenraad et al. [19]	29	24	27

Euvolemic patients made up the biggest category of hyponatremic patients (50.74%) in the Chatterjee et al. study, followed by hypervolemic patients (26.76%) and hypovolemic patients (22.4%) [17]. Our results aligned with Rao et al.'s study on senior individuals. 61% of the participants in their research were euvolemic, 23% were hypervolemic, and 16% were hypovolemic [16]. According to Coenraad et al., of the 41 hyponatremic patients in their study, 12 had normovolemic disorders, 10 had hypovolemic illnesses, and 11 had hypervolemic disorders [19]. Nearly half of the patients (48.3%) in the Nandakumar et al. research showed euvolemic hyponatremia. The proportion of patients with hypovolemic hyponatremia was less than half (39%). The percentage of patients with hypervolemic hyponatremia was only 1/8 (12.5%) [13].

Our study's low frequency of hypovolemic hyponatremia may be due to a greater understanding of volume resuscitation in our environment, which prevents severe hypovolemia from becoming hyponatremia. On the other hand, a high occurrence likely indicates that the administration of this entity is delayed and not acknowledged. In our investigation, panhypopituitarism or glucocorticoid insufficiency (5.6%) and SIAD (94.4%) accounted for the majority of cases of euvolemic hyponatremia. In our analysis, thiazide (14.9%) and tuberculosis (pulmonary/CNS) accounted for the majority of SIAD cases (43.3%).

This study had similarities to those of Nandakumar et al., who reported that SIAD was the most frequent cause of euvolemic hyponatremia. According to their investigation, infections were the primary cause of SIAD in almost one-third of the patients. Concurrently, TB meningitis, cancer, and cerebrovascular accident (CVA) were the other aetiologies. In their sample, drug-induced hyponatremia affected around half of the patients [13]. Hypervolemic hyponatremia (63%), cirrhosis of the liver (22.2%), and congestive heart failure (14.8%) were the most common causes of renal failure in the current study. In contrast, just over two-thirds of patients with dilutional hyponatremia in the Nandakumar et al. research had congestive heart failure. The remainder had liver cirrhosis [13].

Within our research, 2% of the instances of hypovolemic hyponatremia were due to gastrointestinal dysfunction, the least prevalent type. GI loss and rest due to nephritis were observed in two-thirds of instances of hypovolemic hyponatremia associated with salt wasting, according to research by Nandakumar et al. [13].

Overall, SIAD accounted for 67% of the causes of hyponatremia in our analysis, with renal failure coming in second with 17%. 84% of the cases were comprised of these two. In addition, Nandakumar et al.'s study revealed that SIAD was the most frequent cause of hyponatremia overall (38.3%), with salt nephropathy coming in second (26.7%). The reminder came from dilution, which also caused GI loss, endocrine deficiencies, and hyponatremia.[13] According to Paniker and Joseph's research, strokes and respiratory diseases such as pulmonary tuberculosis and pneumonia were the most common causes of SIAD, which in turn was linked to hyponatremia [14]. Furthermore, Rao et al. looked into the most typical reason for hyponatremia.[16]. In the Chatterjee et al. study [17], The most common risk factor for hyponatremia was GI fluid loss, which was followed by CVA and pulmonary sepsis.

Conclusion

To sum up, the age range of 60–69 was the most usual for hyponatremia in this study. The elderly comprised over half of the cases. 56% of individuals had significant first symptoms—low serum Na levels (≤120 meq/l). The average sodium concentration was 118.2 mEq/l for the patients. The most typical display of vomiting and impaired sensorium were signs of hyponatremia. Just a few patients experienced seizures. Most of the patients who succumbed to the hypervolemic group came after the euvolemic group. SIAD was the hyponatremia's most frequent cause, followed by renal failure. SIAD brought on by thiazide and TB in the lungs or brain represented 39% of the cases in total.

Limitation

This study did not capture the profile of patients with no symptoms. The study's sample size was tiny. No results

were quantified. There was no control group, and the study did not include any treatment options.

Recommendation

Because diuretics frequently cause hyponatremia, their usage should be carefully considered, particularly in more susceptible populations. The patient's euvolemic state should be considered when considering the possibility of diuretic-induced hyponatremia, as other elements may be involved that prevent the hyponatremia from always becoming hypovolemic. Symptom severity should be prioritized over serum salt levels because there is no correlation between the two.

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This study had no source of funding.

Conflict of Interest-

The authors declare no conflicts of interest.

List of Abbreviations

SIAD- syndrome of inappropriate antidiuresis
TSH- thyroid stimulating hormone
ECHO- echocardiogram
TB- Tuberculosis
CNS- central nervous system
CHF- congestive heart failure
GI- gastrointestinal

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