Original Article

Etiological Evaluation of Hyponatremia in Adult Patients Admitted into a Tertiary Care Hospital in Bangladesh

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ABSTRACT

Hyponatremia, characterized by low sodium levels in the blood, is indeed a common electrolyte disorder, particularly among hospitalized patients. The clinical diagnosis can be challenging due to the varied symptoms it presents, and its etiology can be diverse. A cross-sectional, observational study was conducted in the Department of Medicine, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from September 2016 to March 2017, to evaluate the causes behind hyponatremia in adult patients. A total of 50 patients presented with clinical features and investigation-proven hyponatremia enrolled in this study as the study population purposively. Data was collected in pre-designed data collection sheet. Data compilation, sorting and analysis were conducted using the MS-Excel & SPSS version 22.0. The majority of patients experienced multifactorial etiology for hyponatremia. The most prevalent cause was gastrointestinal loss (20%), followed by chronic renal insufficiency (16%), congestive cardiac failure (12%), cerebrovascular disease (10%), cirrhosis of the liver (10%), meningitis (6%), and thiazide diuretics (6%). Bronchogenic carcinoma and hypothyroidism were identified as the least common contributors to hyponatremia. Our study revealed a statistically significant difference between male and female participants in gastroenteritis causing hyponatremia (p=0.031). Gastrointestinal loss (gastroenteritis), cirrhosis of the liver, and bronchogenic carcinoma were predominant causes in the male population, accounting for 21.2%, 12.1%, and 6.07% respectively. In contrast, chronic renal insufficiency, hypothyroidism, and meningitis were important causes of hyponatremia in the female population, present in 17.6%, 11.7%, and 11.7% respectively. Recognizing the risk factors associated with symptomatic hyponatremia is crucial for devising effective preventive strategies.

Keywords: *Hyponatremia, gastroenteritis, chronic renal insufficiency, congestive cardiac failure, cirrhosis of liver*

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INTRODUCTION

Electrolyte imbalance arises when the levels of electrolytes are abnormally high or low due to various pathophysiological factors, including nutritional status, acid-base imbalances, medications, comorbid conditions (particularly renal disease), or acute illness[1,2]. Hyponatremia, defined as a serum sodium concentration (Na^+) below 135 mEq/L, is the most common electrolyte abnormality in hospitalized patients and is linked to elevated mortality rates[3]. The symptoms of hyponatremia are often nonspecific and can vary based on the underlying disorder[4]. Elderly patients, particularly those with comorbid conditions like cardiac, hepatic, and renal failure, are more susceptible to hyponatremia, as indicated by various studies[5,6]. The etiology of hyponatremia is diverse, necessitating a tailored treatment strategy. The diagnostic and therapeutic approach is multifactorial, classifying hyponatremia into hypovolemic, hypervolemic, and euvolemic categories

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based on its presentation. Given its multifactorial nature, accurate history-taking, clinical examination, and laboratory investigations are crucial for a comprehensive evaluation. Early recognition and prompt treatment are essential to mitigate symptom severity and reduce mortality in hospitalized patients. Routine laboratory investigations, chest radiographs and electrocardiography (ECG) were conducted as needed. The grading and severity of hyponatremia were determined following the Joint European Guidelines[7]. Maintenance of fluid balance charts has been reported as low as 17% and 40% in some studies[8,9]. The diagnosis of SIADH requires specific criteria to be met, including hyponatremia with hypo-osmolality, excessive renal sodium excretion, and euvolemia, with normal thyroid and adrenal function[10]. In a retrospective study, hypervolemia with underlying chronic kidney disease (CKD) and chronic liver disease (CLD) were identified as the most common presentations of hyponatremia[10]. Patients were managed medically based on the underlying etiology, and those requiring assisted ventilation, such as non-invasive ventilation (NIV), underwent endotracheal intubation and were managed in the intensive care unit (ICU). The present study aims to evaluate the causes behind hyponatremia in adult patients.

METHODS

This cross-sectional, observational study was conducted in the Department of Medicine, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from September 2016 to March 2017. A total of 50 patients with clinically evident and investigation-confirmed hyponatremia admitted into the medicine department of the mentioned hospital were included in this study. Sample selection was done using a purposive sampling technique. Information regarding age, socio-demographic characteristics, clinical presentation, and etiological factors was collected through an interview-based questionnaire from the patients or their relatives. Inclusion criteria for this study comprised patients presenting with clinical features of hyponatremia confirmed by the investigation, aged ≥18 years, of both genders, and providing informed written consent. Exclusion criteria included patients receiving mannitol and pregnant women.

Data was collected in pre-designed data collection sheet. Data compilation, sorting and analysis were conducted using the MS-Excel. Data were then presented through tables expressed in frequencies with percentage. Chi-square tests were performed to compare between male and female. A p-value <0.05 was considered as statistically significant. Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS) software version 22.0 for windows (SPSS Inc, Chicago, Illinois, USA).

This study was approved by the Ethical Review Committee of Shaheed Suhrawardy Medical College, Dhaka, Bangladesh.

RESULTS

The majority of patients (34%) fell into the age range of 51 to 60 years. Among male patients, the highest incidence (33.33%) was observed in the age group of 51 to 60 years. Female patients were evenly distributed, with 35.29% in the age groups of 41-50 and 51 to 60 years, showing the highest frequencies (Table-I). The present study indicated that anorexia, nausea, confusion, and lethargy were the most common presentations, observed in 58%, 50%, 48%, and 46% of patients, respectively (Fig. 1). Among the physical signs, the majority of patients exhibited generalized oedema (36%), followed by high blood pressure (30%), plantar extensor (20%), hypotension (16%), and dehydration (14%) (Table-II). The present study showed that 25 patients had serum sodium (Na+) levels 130-134 mmol/L, 14 patients had 121-129 mmol/L, and 11 patients had serum sodium (Na+) levels <120 mmol/L (Table-III). The present study demonstrated that among patients with hyponatremia, the frequency of mild hyponatremia was observed in 50% of patients, moderate hyponatremia in 28% of patients, and severe hyponatremia in 22% of patients (Fig. 2). In this study, the majority of patients with hyponatremia had a multifactorial etiology: gastrointestinal loss, such as gastroenteritis, was the most common cause, accounting for 20% of cases, followed by chronic renal insufficiency (16%), congestive cardiac failure (12%), cerebrovascular disease (10%), cirrhosis of the liver (10%), meningitis (6%), and thiazide diuretics (6%). Bronchogenic carcinoma and hypothyroidism were among the least common causes of hyponatremia (Table-IV). The etiology of hyponatremia varied between male and female patients; we found a statistically significant difference between male and female participants in gastroenteritis causing hyponatremia (p=0.031). Gastrointestinal loss (gastroenteritis), cirrhosis of the liver, and bronchogenic carcinoma were predominant causes in the male population, accounting for 21.2%, 12.1% and 6.07% of patients, respectively. In contrast, chronic renal insufficiency, hypothyroidism, and meningitis were important causes of hyponatremia in the female population, present in 17.6%, 11.7%, and 11.7% of female patients, respectively (Table-V).

Table-I: Age distribution of the study population. (N=50)

Age (years)	Male (n= 33)		Female (n= 17)		Total	
	n	%	n	%	n	%
18-30	4	12.12%	0	0%	4	8.00%
31-40	6	18.18%	3	17.64%	9	18.00%
41-50	9	27.27%	6	35.29%	15	30.00%
51-60	11	33.33%	6	35.29%	17	34.00%
>60	3	9.09%	2	11.76%	5	10.00%

Fig. 1: *Clinical presentation of the patients. (N=50)*

Table-II: *Distribution of patients according to physical signs (N=50)*

Signs	n	%
Generalized oedema	18	36%
Hypertension	15	30%
Planter extensor	10	20%
Hypotension	8	16%
Dehydration	7	14%
Papilledema	7	14%
Neck rigidity	6	12%
Kerning's sign	5	10%
Bedside urinary protein	5	10%
Pleural effusion	4	8%
Striae	3	6%
A mass lesion in the lung	2	4%

Table-III: *Evaluation of serum sodium levels in the study population. (N=50)*

Serum sodium conc.	Male (n=33)		Female (n=17)		Total (n=50)	
	n	%	n	%	n	%
130-134 mmol/L	17	51.50%	8	47.10%	25	50.00%
121-129 mmol/L	9	27.30%	5	29.40%	14	28.00%
<120 mmol/L	7	21.20%	4	23.50%	11	22.00%

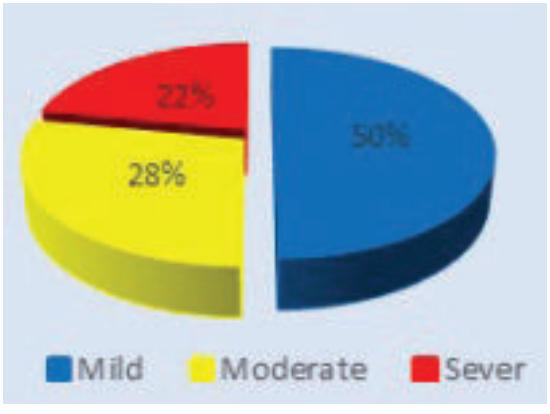

Fig.-2: *Severity and overall categorization of hyponatremia. (N=50)*

Table-IV: *Etiological distribution of hyponatremia. (N=50)*

Etiology	n	%
Gastroenteritis	10	20%
Chronic renal insufficiency	8	16%
Congestive cardiac failure	6	12%
Cerebrovascular disease	5	10%
Cirrhosis of liver	5	10%
Meningitis	3	6%
Diabetic ketoacidosis	3	6%
Thiazide diuretics	3	6%
Hypothyroidism	2	4%
Bronchogenic Ca	2	4%
Idiopathic	2	4%
Anticonvulsants	1	2%

Table-V: *Etiology of hyponatremia with different demographic groups. (N=50)*

Etiology	Male (n=33)		Female (n=17)		Odds ratio	95 % CI	p-value
	n	%	n	%			
Gastroenteritis	7	21.20%	3	17.60%	0.2899	0.0941 to 0.8934	0.031
Chronic renal insufficiency	5	15.10%	3	17.60%	0.8333	0.1736 to 3.9999	0.820
Congestive cardiac failure	4	12.10%	2	11.70%	1.0345	0.1696 to 6.3101	0.971
Meningitis	1	3.00%	2	11.70%	0.2344	0.0197 to 2.7921	0.251
Cerebrovascular disease	3	0.90%	2	11.70%	0.75	0.1129 to 4.9821	0.766
Hypothyroidism	0	0%	2	11.70%	0.0925	0.0042 to 2.0450	0.132
Diabetic ketoacidosis	2	6.00%	1	5.80%	1.0323	0.0869 to 12.2670	0.98
Cirrhosis of liver	4	12.10%	1	5.80%	2.2069	0.2269 to 21.4635	0.495
Bronchogenic Ca	2	6.00%	0	0%	2.7778	0.1261 to 61.1781	0.517
Thiazide diuretics	2	6.00%	1	5.80%	1.0323	0.0869 to 12.2670	0.980
Anticonvulsants	1	3.00%	0	0.00%	1.6154	0.0624 to 41.7864	0.772
Idiopathic	2	6.00%	0	0.00%	2.7778	0.1261 to 61.1781	0.517

DISCUSSION

In this study, the majority of patients fell into the age group of 51-60 years, with the highest incidence among male patients in the age group of 51-60 years. Tarif et al.[10] reported a mean age of 54.8±14.8 years, with 43.6% in the age group of 18-40 years, 38.7% in the age group of 40-60 years, and 17.7% in the age group >60 years. The gender distribution in that study showed a male-female ratio of 1:1. Hyponatremia is known to occur more frequently in the elderly, as seen in some of the previous studies[8,9]. Moreover, Filippatos et al.[11] reported that elderly males are more commonly affected. Hyponatremia was evenly distributed among males and females, with the severity of hyponatremia increasing with age, which is consistent with a previous study done by Mohan et al.[12]. The physiological decrease in renal reserve and a higher prevalence of chronic ailments and polypharmacy in the elderly likely contribute to such observations[13]. The present study found that anorexia, nausea, confusion, and lethargy were the most common presentations, observed in nearly half of the patients. In chronic hyponatremia, patients may appear asymptomatic, and mild hyponatremia is characterized by gastrointestinal tract symptoms such as nausea, vomiting, and loss of appetite[14]. Hyponatremia in the elderly may manifest with frequent falls and gait disturbances[15]. In this study, most of the male and female participants had serum sodium level ranged from 130-134 mmol/L. The serum sodium levels on admission were similar to the findings of Yawar et al.[16] – 11% having levels between 100-109 mmol/L. The majority of our patients with hyponatremia had a multifactorial etiology. Gastrointestinal loss, such as gastroenteritis, was the most common cause, accounting for one-fifth of cases, followed by chronic renal insufficiency, congestive cardiac failure, cerebrovascular disease, cirrhosis of the liver, meningitis, and thiazide diuretics. We found a statistically significant correlation between male and female participants (p=0.031), when comparing the frequencies of gastroenteritis as an etiology. However, bronchogenic carcinoma and hypothyroidism were among the least common causes of hyponatremia. In a previous study done by Filippatos et al.[11], the most common etiologies for hyponatremia were congestive cardiac failure, drugs, cirrhosis of the liver, diabetic ketoacidosis, renal disorder, meningitis, hypothyroidism, gastroenteritis, and some other causes. In another study done by Sah & Barla[17] revealed that the most common causes of hyponatremia were vomiting, use of diuretics, and diarrhea. Moreover, several studies revealed that patients found to be hyponatremic were older, and the mean age increased with hyponatremia severity[18,19].

CONCLUSION

Hyponatremia, common in conditions like renal insufficiency, congestive cardiac failure, cirrhosis, stroke, meningitis, and gastroenteritis, requires clinical assessment and investigation for proper

diagnosis and treatment guidance. Severe cases can lead to neurological symptoms, requiring swift correction with hypertonic saline. Identifying risk factors for symptomatic hyponatremia is crucial for preventive strategies. However, the diverse etiologies and variable presentations may cause diagnostic confusion. Hospital prevalence and presentations of acute confusional states vary due to patient characteristics, socioeconomic factors, comorbidities, and complications, with higher rates observed in older patients in critical care. Identifying risk factors and implementing preventive strategies for symptomatic hyponatremia is essential due to its diverse etiologies and variable presentations. Swift correction with hypertonic saline is crucial for severe cases. The higher prevalence in older critical care patients highlights the need for thorough clinical assessment and tailored diagnostic approaches.

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