



## Clinical Profile and Management of Hyponatremia among Patients Admitted to a Tertiary Care Hospital: A Cross-sectional Study

Md. Mizanur Rahman 1 \*, Roksana Haque 2 , Abi Umar - Al -Fattah 3

<sup>1</sup>Professor (CC), Dept of Medicine, Tairunnessa Memorial Medical College & Hospital, Gazipur, Bangladesh,

Email: mnmch14@yahoo.com,  
Orcid ID: 0000 0002-6295-5211

<sup>2</sup>Associate Professor, Dept of Obstetrics and Gynecology, Bikrampur Bhuiyan Medical College, Srinagar, Munshiganj, Bangladesh,

Email: rhaque21@yahoo.com,  
Orcid ID: 0000-0002-3955-5420

<sup>3</sup>Assistant Registrar, Tairunnessa Memorial Medical College & Hospital, Gazipur, Bangladesh,  
Email: abufattah006@gmail.com,  
Orcid ID: 0000-0002-9954-4360

\*Corresponding author

Received: 04 June 2022  
Revised: 01 August 2022  
Accepted: 10 August 2022  
Published: 22 August 2022

### Abstract

**Background:** Hyponatremia is one of the most common laboratory dispute which may occur in many clinical conditions. Hyponatremia complication may include significant co-morbidities like heart failure, liver cirrhosis, and nephrotic syndrome in addition to diuretic use. **Material & Methods:** This study was a retrospective cross-sectional study, conducted at the department of Medicine in Tairunnessa Memorial Medical College. The study was conducted during the period of January 2019- April 2022. The total sample size for this study was 94. **Results:** Most patients 24(25.5%) were aged between 41-50 years and followed by 5(5.3%) were aged 11-20 years. Most of the respondents 65(69%) were female and 29(31%) were male. Most of the respondents 49(52.1%) were housewife. Diarrhoea was seen in 50(53.2%) cases and followed by vomiting in 27(28.7%), nausea in 15(16%), general weakness in 10(10.6%), anorexia in 41(43.6%). HTN&BA, DM, CKD in 6(6.4%), severe pre eclampsia in 3(3.2%), chronic kidney disease in 2(2.1%), COPD in 2(2.1%). Hyponatremia was found mild in 68(72.3%) cases, moderate in 24(25.5%) cases and severe in 2(2.1%) cases and followed by Hypokalaemia ( $K^+ < 3.6$  mmol/l) was found in 59(62.8%), normal  $K^+$  level in 31(33%) cases and mild-moderate hyperkalaemia in 3(3.2%) cases. Hypochloridaemia ( $Cl^- < 96$  mmol/l) was found in 62(66%), normal  $Cl^-$  level in 29(30.9%) cases and hyperchloridaemia in 3(3.2%) cases. Tab. Nacl was prescribed to 67(71.3%) patients, normal saline to 79(84%), Hypertonic saline (3% Nacl saline) to 5(5.3%), Cholera Saline to 3(3.2%) and others suggestion along with prescribed medicine was given to 94(100%) patients. **Conclusions:** Hyponatremia is one of the common electrolyte abnormalities which can be seen among hospitalized patients. It is mostly seen in elderly and critically ill patients who are admitted to the ICU.

**Keywords:-** Hyponatremia, Serum Electrolytes,  $Na^+$ (mmol/l).

## INTRODUCTION

Hyponatremia is one of the most common laboratory dispute which may occur in many clinical conditions.<sup>[1]</sup> Hyponatremia complication may include significant co-morbidities like heart failure, liver cirrhosis, and nephrotic syndrome in addition to diuretic use. Hyponatraemia can also be defined as a common electrolyte disorder among

hospitalized patients happening in up to 22%.<sup>[2,3,4]</sup> Severe hyponatremia is also associated with substantial morbidity and mortality in many cases. Hyponatremia has become an enigma because of its association with a plethora of underlying disease states with multiple etiologies and several pathophysiological mechanisms.<sup>[5]</sup> In many studies, hyponatremia was defined as a serum

sodium level less than 135 mmol/l. However, an abnormal sodium level does not always denote abnormal sodium balance, it may happen due to abnormal water balance also. It is such a disease state when excess of water in relation to the sodium in the extracellular fluid with multiple etiologies and several pathophysiological mechanisms.<sup>[6]</sup>

Hyponatremia classification is based on the volume status and plasma osmolality in which there remains excess fluid volume.<sup>[7]</sup> The clinician should follow the recommended guidelines to properly treat the patients. When the condition is improved, the guideline suggest that the sodium level should not be increased more than 10 mmol/L during the 24 hr. Besides, more than 8 mmol/L should not increase in any subsequent day until a serum sodium level of 130 mmol/L is attained.<sup>[8,9,10]</sup> When an acute decrease (more than 10 mmol/L) occurs in the sodium level in absence of any severe symptoms, it is suggested to identify the cause and infusing a single IV infusion of 150 mL 3% hypertonic saline over 20 min. On the other hand, avoiding an increase more than 10 mmol/L in the first 24 hr and not >8 mmol/L in the second 24 hr is also recommended in patients with moderate or profound chronic hyponatremia in absence of any severe symptoms, and also the cause should be identified firstly. During clinical assessment of patients with hyponatremia artefactual causes of hyponatremia should be considered in all cases. These include severe hyperlipidaemia or hyperproteinaemia when the aqueous fraction of the serum specimen is reduced because of the volume occupied by the macromolecules (although these artefactual causes are dependent on the assay technology).

Transient hyponatremia may also occur due to osmotic shift of water out of cells during hyperosmolar states caused by acute hyperglycaemia or by mannitol infusion but in these cases plasma osmolality is normal.

Some studies also emphasized the fluid restriction as the first line of therapy in Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) or expanded extracellular fluid.<sup>[11,12]</sup> Hence, for the management of such clinical conditions due to pathophysiological changes may become difficult in a developing country like Bangladesh where the medical incentives are not sufficient. The aim of this study was to evaluate the common clinical features and management of hyponatremia among patients who are admitted to a tertiary care hospital.

### Objectives

The objective of this study was to evaluate the common clinical features and management of hyponatremia among patients who are admitted to a tertiary care hospital.

### MATERIAL AND METHODS

This study was a retrospective cross-sectional study, conducted at the department of Medicine in Tairunnessa Memorial Medical College. The study was conducted during the period of January 2019- April 2022. The total sample size for this study was 94.

### Inclusion criteria

- Those with complete patient information and investigation reports in the medical records were included in the study.

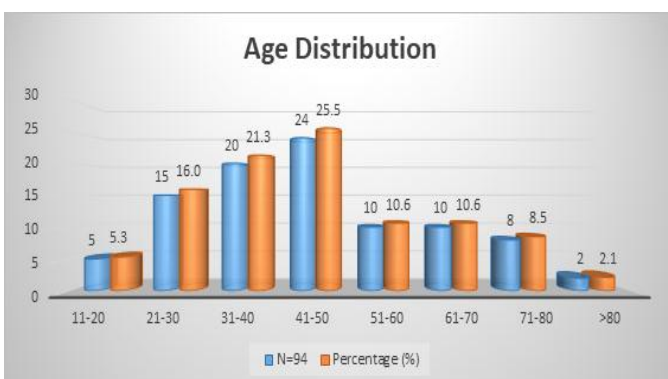
- The patients admitted to medicine indoor, medicine ICU with hyponatremia, defined as serum sodium concentration [Na<sup>+</sup>] less than 135 mmol/l, were included in the study.

### Exclusion criteria

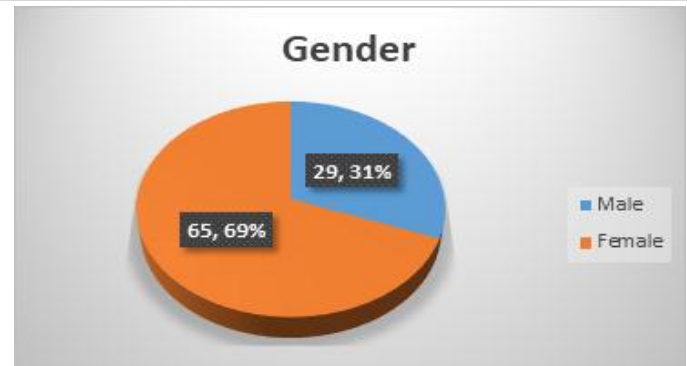
- Patients with grossly incomplete data such as demographics, results of laboratory investigations, and treatment outcome were excluded.
- The patients with hyperproteinemia and/or hypertriglyceridemia were excluded from the study.

In this study, the patients were selected by reviewing the hospital's Hyponatremia nominal register. All the information in the hospital course and treatment given were recorded properly. The consent from the patients was taken in written after making them aware about the study purpose. The data required for the purpose of this study are age and gender of patient, chief complaints, results of laboratory investigations (Serum electrolytes at presentation). The ethical approval was given by the hospital authority. The statistical analysis was done using the statistical tool "Statistical Package for Social Sciences (SPSS) version 21".

## RESULTS



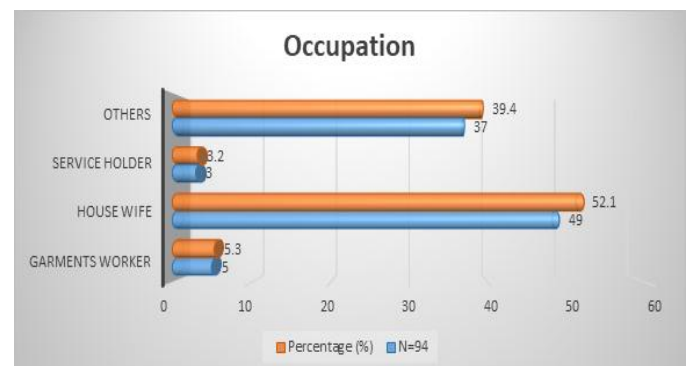
**Figure 1:** Age Distribution of the Respondents



**Figure 2:** Gender Distribution of the Respondents

[Figure 1] shows the age distribution of the respondents. The most 24(25.5%) were aged between 41-50 years and followed by 5(5.3%) were aged 11-20 years, 15(16%) were 21-30 years, 20(21.3%) were 31-40 years, 10(10.6%) were 51-60 years, 10(10.6%) were 61-70 years, 8(8.5%) were 71-80 years and 2(2.1%) were >80 years.

[Figure 2] shows the gender distribution of the respondents where most of the respondents 65(69%) were female and 29(31%) were male.



**Figure 3:** Occupation of the Respondents

[Figure 3] illustrates the occupation of the respondents. Most of the respondents 49(52.1%) were housewife and followed by 5(5.3%) were garments worker, 3(3.2%) were service holder and 37(39.4%) were from other occupations.

[Table 1] shows the chief complaints of the respondents. Diarrhoea was seen in 50(53.2%) cases and followed by vomiting in 27(28.7%), nausea in 15(16%), general weakness in 10(10.6%), anorexia in 41(43.6%), disoriented in 3(3.2%), fever in 13(13.8%), urinary incontinence in 42(44.7%), burning sensation during micturition in 30(31.9%), unconscious in 3(3.2%) and 5(5.3%) other complaints was also noted.

[Table 2] denotes the significant co-morbidities among the respondents. Hypothyroidism was found in 1(1.1%) cases and followed by HTN in 1(1.1%), HTN&BA, DM, CKD in 6(6.4%), sever pre eclampsia in 3(3.2%), chronic kidney disease in 2(2.1%), COPD in 2(2.1%), DM in 2(2.1%), stroke in 6(6.4%), UTI in 3(3.2%), old PTB in 1(1.1%), CCF (Conjestic Cardiac Failure) in 2(2.1%), Cirrhosis of Liver in 4(4.2%) and Nephrotic Syndrome in 3(3.2%) cases.

[Table 3] shows the serum Electrolytes testing result among the study patients. Hyponatremia was found mild in 68(72.3%) cases, moderate in 24(25.5%) cases and severe in 2(2.1%) cases and followed by Hypokalaemia ( $K^+ < 3.6$  mmol/l) was found in 59(62.8%), normal  $K^+$  level in 31(33%) cases, mild-moderate hyperkalemia in 3(3.2%) cases and severe hyperkalemia in 1(1.1%) case. Hypochloridaemia ( $Cl^- < 96$  mmol/l) was found in 62(66%), normal  $Cl^-$  level in 29(30.9%) cases and hyperchloridaemia in 3(3.2%) cases.

[Table 4] denotes the treatment given to the study patients. Tab. Nacl was prescribed to 67(71.3%) patients, normal saline to 79(84%), Hypertonic saline (3% Nacl saline) to 5(5.3%), Cholera Saline to 3(3.2%), and others suggestion along with prescribed medicine was given to 94(100%) patients.

**Table 1:** Chief Complaints of the Respondents

Chief Complaints	N=94	Percentage (%)
Diarrhoea	50	53.2
Vomiting	27	28.7
Nausea	15	16.0
General weakness	10	10.6
Anorexia	41	43.6
Disoriented	3	3.2
Fever	13	13.8
Urinary incontinence	42	44.7
Burning Sensation During Micturition	30	31.9
Unconscious	3	3.2
others	5	5.3

**Table 2:** Significant co-morbidities among the Respondents

Significant co-morbidities	N=94	Percentage (%)
Hypothyroidism	1	1.1
HTN	1	1.1
HTN&BA, DM, CKD	6	6.4
Severe pre eclampsia	3	3.2
Chronic kidney disease	2	2.1
COPD	2	2.1
DM	2	2.1
Stroke	6	6.4
UTI	3	3.2
Old PTB	1	1.1
CCF (Congestive Cardiac Failure)	2	2.1
Cirrhosis of Liver	4	4.2
Nephrotic Syndrome	3	3.2

**Table 3:** Serum Electrolytes Testing Result among the Study Patients

Serum Electrolytes	Range	N=94	Percentage (%)
Hyponatremia Na+(mmol/l)	Mild (125-135)	68	72.3
	Moderate (115-124)	24	25.5
	Severe ( $\leq 114$ )	2	2.1
K+(mmol/l)	Hypokalaemia (<3.6)	59	62.8
	Normal (3.6-5.2)	31	33.0
	Mild-Moderate Hyperkalemia (5.3-6.4)	3	3.2
	Severe Hyperkalemia (>6.5)	1	1.1
Cl- (mmol/l)	Hypochloridaemia <96	62	66.0
	Normal (96-106)	29	30.9
	Hyperchloridaemia (107-140)	3	3.2

**Table 4:** Treatment Given to the Study Patients

Treatment	N=94	Percentage (%)
Tab. Nacl	67	71.3
Normal saline	79	84.0
Hypertonic saline (3% Nacl saline)	5	5.3
Cholera Saline	3	3.2
Others	94	100

## DISCUSSION

Guidelines had recommend to initiate 3% Hypertonic Saline (3% NaCl saline) in severe cases of hyponatremia or when the serum sodium levels is  $\leq 114$  mmol/l.<sup>[13]</sup> But in reality, many clinicians have a preference to prescribe normal saline or sodium chloride (NaCl) tablets to ensure better treatment with minimal risk, lower adverse events and also for additional safety concerns. Also, if these interventions are not given due concern, these can cause delayed hyponatremia improvement and increase complications. The most 25.5% were aged between 41-50 years and followed by 5.3% were aged 11-20 years, 16% were 21-30 years, 21.3% were 31-40 years, 10.6% were 51-60 years, 10.6% were 61-70 years, 8.5% were 71-80 years and 2.1% were >80 years [figure I]. Dr. Manish Patni et al in their study found majority of the patients 48 % were <55 years of age and followed by 34% were aged between 35-55 years and 18% belonged to 16-35 years.<sup>[14]</sup> Aqeel Raheem, AL-Barqawi et al., in their study reported the most affected age group was 46-60 years.<sup>[15]</sup> Rahil A I, Khan F Y et al. in their study also reported similarity with this present study.<sup>[16]</sup> Most of the respondents 69% were female and 31% were male [figure II]. In the study of Zurnuq et al., most of the respondents 59% were also found female and 41% were male.<sup>[17]</sup> In contrast to this present study, Nandakumar, Hiremath P.B et al. observed 44 cases and among them 36.7% were females and 63.3% were males.<sup>[18]</sup> Nandini Chatterjee, and Nilanjan Sengupta also reported

62.69% patients were male and 37.31% patients were female.<sup>[19]</sup> In this study, most of the respondents 52.1% were housewife and followed by 5.3% were garments worker, 3.2% were service holder and 39.4% were from other occupations [figure III]. Diarrhoea was seen in 53.2% cases and followed by vomiting in 28.7%, nausea in 16%, general weakness in 10.6%, anorexia in 43.6%, disoriented in 3.2%, fever in 13.8%, urinary incontinence in 44.7%, burning sensation during micturition in 31.9%, unconscious in 3.2% and 5.3% other complaints was also noted [table I]. Dr. Nikhil Bakhtar in their analysis reported that two-third or 61.0% patients with hyponatremia who were diagnosed with particular diseases like hypertension, type 2 diabetes mellitus, ischemic heart disease, chronic liver disease and chronic kidney disease. Also there were one third patients who had hyponatremia with non-specific symptoms. 18% had chronic liver disease and 39.0% patients had other diseases like MVP, AF (recovered), COPD, PUO, Lt supraclavicular lymphadenopathy, Sensory Motor Neuropathy, Dilated Cardiomyopathy, Severe MR, Severe TR, Mild Pericardial Effusion, Drug Induced Lupus, Severe Acute Pancreatitis, ALI, UTI, AKI, Septicemia, etc.<sup>[20]</sup> In this presents study, significant co-morbidities was seen in some patients although in a lower number. Hypothyroidism was found in 1.1% cases and followed by HTN in 1(1.1%), HTN&BA, DM, CKD in 6.4%, sever pre eclampsia in 3.2%, chronic kidney disease in 2.1%, COPD in 2.1%,

DM in 2.1%, stroke in 6.4%, UTI in 3.2%, old PTB in 1.1%, CCF (Conjestic Cardiac Failure) in 2.1%, Cirrhosis of Liver in 4.2% and Nephrotic Syndrome in 3.2% cases [table II]. Jain and Nandy in their study reported some significant co-morbidities among the study patients where hypertension was seen in most 68% patients and diabetes mellitus in 46%, drugs intake in 34%, vomiting 32%, and poor intake 31%.<sup>[21]</sup> J. R. Rawal, H. S. Joshi et al. in their study found the significant comorbidities as Hypertension 64.22%, DM 32.41% and Ischemic Heart Disease 67.42%.<sup>[22]</sup> Hyponatremia was found mild in 72.3% cases, moderate in 25.5% cases and severe in 2.1% cases and followed by hypokalaemia ( $K^+ < 3.6$  mmol/l) was found in 62.8%, normal in  $K^+$  level 33% cases, mild-moderate hyperkalaemia in 3.2% cases severe hyperkalaemia in 1.1% cases. Hypochloridaemia ( $Cl^- < 96$  mmol/l) was found in 66%, normal  $Cl^-$  level in 30.9% cases and hyperchloridaemia in 3.2% cases [table III]. In the study of Emmanuel A. Anigilaje et al., hypernatremia (sodium  $> 145$  mmol/L) was seen in 5 cases of survival patients and 9 cases of non-survival group where hyponatremia (sodium  $< 135$  mmol/L) was seen in 17 cases of survival patients and 4 cases of non-survival group. Hyperkalemia (Potassium  $> 5.5$  mmol/L) was seen in 14 cases of survival patients and 7 cases of non-survival group.<sup>[23]</sup> Tab. NaCl was prescribed to 71.3% patients, normal saline to 84%, Hypertonic saline (3% NaCl saline) to 5.3%, Cholera Saline to 3.2% and others suggestion along with prescribed

medicine was given to 100% patients [table IV]. Hoorn et al. on reported normal saline was given to 29% patients, fluid restriction was advised to 9% patients, oral sodium chloride supplementation was given to 10% patients, 3% were given hypertonic saline, and 19% patients received no therapy. Also a study conducted by Nzerue et al. reported to give normal saline to 82% patients, fluid restriction to 9% patients, 3% to hypertonic saline and 6% patients were prescribed with other related treatment for hyponatremia.<sup>[24, 25]</sup>

### Recommendation

After analyzing the whole trial, it is suggested that tab. NaCl, normal saline, to be prescribed to the patients with hyponatremia as these drugs resulted a successful recovery among the patients. Also, the clinicians should be aware of the common incidence of hyponatremia in the elderly, especially acutely sick elderly. Besides, the assessment and management of hyponatremia can be done with a systematic approach and following a simple standardized diagnostic algorithms and establish mechanism of hyponatremia, so that this disorder can be managed properly and have good outcome.

### CONCLUSIONS

Hyponatremia is one of the common electrolyte abnormalities which can be seen among hospitalized patients. It is mostly seen in elderly and critically ill patients who are admitted to general wards and ICU. The elder people who are  $> 56$  years are at high risk of presentation of hyponatremia. Hyponatremia can vary among males and females depending

on some factors. Diuretics and salt wasting nephropathy are also considered as significant causes of hyponatremia. Besides, CCF, Cirrhosis of liver, Hypothyroidism and gastro-Intestinal loss are the other causes of hyponatremia. In this study, normal saline resulted much effectiveness in improving

hyponatremia in asymptomatic cases. But, severe cases needed more time to recover as there were many related complications along with hyponatremia. The use of proper drugs in eligible patients assured the recovery in appropriate time and also helped in preventing further complications.

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Source of Support: Nil, Conflict of Interest: None declared