Section: General Medicine

Original Research Article

STUDY OF PREVALENCE, AETIOLOGY AND MORTALITY OUTCOME OF HYPONATREMIA IN PATIENTS ADMITTED IN ICU

Chandrakala[1], Girish Ronad[2], Suresh G[3], Sunil Reddy M[4], Danesh Pattanshetty[5], Mohammed Merajul Haq[6]

[1]Professor and HOD, Department of General Medicine, FOMS, KBNU, India.
[2]Associate Professor, Department of General Medicine, FOMS, KBNU, India.
[3-6]Junior Resident, Department of General Medicine, FOMS, KBNU, India.

Received : 03/06/2025
Received in revised form : 16/07/2025
Accepted : 05/08/2025

Keywords:
Hyponatremia, Critically ill

Corresponding Author:
Dr. Suresh G
Email: gadekalsuresh@gmail.com

DOI: 10.47009/jamp.2025.7.4.266

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

Int J Acad Med Pharm
2025; 7 (4); 1402-1405

ABSTRACT

Background: Hyponatremia is a common electrolyte imbalance reported among critical ill ICU patients. The outcome of patients varies among patients with and without hyponatremia. The existing literature shows varying burden and outcome of this condition. Hence, the need to evaluate the same in our setting. **Aim:** To estimate the prevalence, aetiology and outcome of patients having hyponatremia admitted in the ICU. **Materials and Methods:** The present prospective observational study was carried out among 135 patients admitted in ICU between 1stJanuary 2024–30thjune 2024 (6 months duration). Patients were grouped as group A those with hyponatraemia and group B without hyponatraemia. Serum sodium level < 135 mmol/L was diagnosed as hyponatremia. All study participants were observed till their hospital stay to assess the outcome. **Result:** A total of 135 patients were admitted in ICU during the study period were included. The mean age of patients in group A 53.3 ± 8.3 years and group B 51.6 ± 6.4 years. Female patients were 54.81%. Hyponatremia was seen in 31.1% patients. Pulmonary (33.3%) diseases were the commonest causes followed by neurological (25.1%), gastrointestinal (14.8%) and cardiac (12.6%). The proportion of mortality among hyponatraemic patients was 66.7% versus 15% among those without hyponatremia which was statistically highly significant (p=0.000). The need for mechanical ventilation and duration of ICU stay were more (p =0.001) in hyponatraemic patients. **Conclusion**: The patients with hyponatremia have high mortality with poor prognosis. Early detection, careful monitoring and treatment of hyponatremia would improve the outcome of the critically ill patients.

INTRODUCTION

Hyponatremia is an electrolyte imbalance characterized by decreased serum sodium level below 135 mmol/liter.[1] The prevalence of hyponatremia among hospitalized patients varies from 3.4% to 39.4% which is even higher in ICU setup. It is generally classified based on the serum osmolality, volume status and urinary sodium as hypertonic, isotonic or hypotonic. Hypotonic hyponatremia can be further classified as hypervolemic, euvolemic and hypovolemic. Hypervolemichyponatremia occurs due to increased sodium along with increased water in body while hypovolemic hyponatremia occurs with increased sodium and water in the body. Euvolemichyponatremia occurs when there is normal sodium level in the body with only increase in total water levels. The most common cause of hyponatremia is due to water retention leading to dilutionalhyponatremia, which is seen due to excess water intake with the inability of the kidney to excrete water.[2] These are common among critical ill patients due to other ailments resulting in greater risk of mortality irrespective to the grade and type of hyponatremia. The symptoms caused by hyponatremia can range from nausea, tiredness when there is mild reduction in the serum sodium, to decrease in the level of consciousness, headache, seizures and coma in severe cases.

Cause of hyponatremia varies depending on the age. Common causes in adults are use of thiazide diuretics, syndrome of inappropriate secretion of antidiuretic hormone, transurethral prostatectomy, polydipsia among psychiatric individuals and in postoperative state.[2]

The management of hyponatremia mainly depends on the duration of hyponatremia and the volume status. Inappropriate treatment can have serious

ISSN (O): 2687-5365; ISSN (P): 2753-6556

neurological consequences. Very limited study has been done to assess the presence of hyponatremia among intensive care unit (ICU) admitted patients.[3] Previous report postulates the possibility of hyponatremia being an independent risk factor for mortality. This study was done to assess the prevalence, aetiology and outcome of critically ill patients having hyponatremia admitted in the ICU.

MATERIALS AND METHODS

The present prospective observational study was carried out among 135 patients admitted in the ICU between 1st January 2024 to 30th June 2024 (6 months duration). All critically ill patients age ≥18 years admitted during this duration were included in the study. Patients with blood glucose level >13mmol/L and on drugs affecting serum sodium level, patients with paraproteinemia were excluded.

A detailed clinical history and examination was done for all 135 patients admitted in the ICU during the study period. The patients were classified as euvolemic, hypervolemic and hypovolemic status based on serum sodium and volume status. The patients with serum sodium level <135mmol/L were taken as hyponatraemic (group A) and serum sodium level 135-145 mmol/L were considered as eunatraemic (group B).All patients were followed up till their stay in the hospital to assess the outcome.

Statistical analysis: Microsoft excel were used for data entry and statistical analyses were carried out by using the Statistical Package for Social Sciences version 20.0 for Windows (SPSSInc Chicago Illinois USA). Exploratory data analysis was carried out to describe the study population where categorical variables were summarized using frequency tables and continuous variables were summarized using measures of central tendency and dispersion as mean and standard deviation. Inferential statistics was done using Chi-square test and t-test for qualitative and quantitative data respectively with a p value less than 0.05 being considered to be statistically significant.

RESULTS

The present study included 135 patients who were admitted in the ICU. The patients were grouped into group A, patients with hyponatremia and group B, patients without hyponatremia. Out of 135, 31.1% (42) of patients had hyponatremia. The mean age of patients in group A was 53.3 ± 8.3 years and group B was 51.6 ± 6.4 years.Female patients constituted 22 in group A and52 in group B. The greater number of patients was seen in the age group 41-70years in both the groups. The mean sodium level was 126.4 ± 5.7mmol/l in group Aandwas 141.2 ± 3.3mmol/lin group B. The most common presentation was drowsiness (73.8%) followed by confusion (59.5%), breathlessness (45.2%),lethargy (40.4%), cough (33.3%) headache (21.4%) and nausea/vomiting (11.9%) ingroup A and in group B cough (33.3%) followed by drowsiness(23.6%), confusion(21.5%),breathlessness(20.4%),lethargy (17.2%),loosestools(13.9%), headache(12.9%), nausea/vomiting(12.9%) (Table 4).In group A 7.1% patients were unconscious and in group B (4.3%) were unconscious.(Table2):The most common aetiology was respiratory diseases(33.3%) followed by neurological (25.1%), gastrointestinal (14.8%) and cardiac (12.6%) in both the groups respectively(Table 3). Among the 42 patients of hyponatremia, euvolemia, hypervolemia and hypovolemic hyponatremia was documented among 52%, 29% and 19% respectively(Table 5). The need for mechanical ventilation was 66.6% in group A and 19.3% in group B which was highly significant(p value 0.001). the mean duration of hospital stay was 14.6 ± 3.6 days in group A and 9.6± 4.9 days in group B which was highly significant with p value 0.001. The mortality rate was 66.7% in group A and 15% in group Bwhich was statistically highly significant (p 0.000)(Table 6).

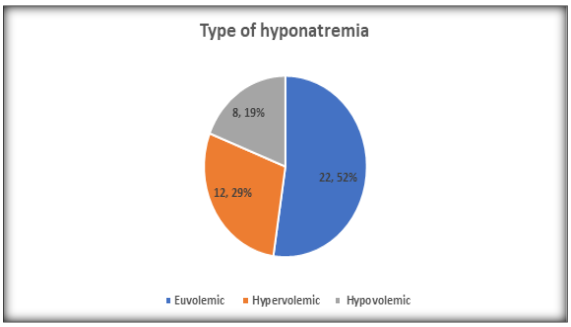

Figure 1: Type of hyponatremia

Table 1: Age and sex distribution of patientss

GROUP A				GROUP B			
Age	**male**	**female**	**Total**	**Age**	**Male**	**Female**	**Total**
21-30	1(2.3%)	1(2.3%)	2(4.6%)	21-30	4(4.3%)	6(6.4%)	10(10.7%)
31-40	5(11.9%)	3(7.1%)	8(19%)	31-40	8(8.6%)	10(10.7%)	18(19.3%)
41-50	4(9.5%)	5(11.9%)	9(21.4%)	41-50	6(6.4%)	11(11.8%)	17((18.2%)
51-60	4(9.5%)	6(14.2%)	10(23.8%)	51-60	12(12.9%)	11(11.8%)	23((24.7%)
61-70	4(9.5%)	5(11.9%)	9(21.4%)	61-70	9(9.6%)	11(11.8%)	20(21.5%)
>70	2(4.7%)	2(4.7%)	4(9.5%)	>70	2(2.1%)	3(3.2%)	5(5.3%)
Total	20(47.6%)	22(52.3%)	42(100%)		41(44.08%)	52(55.9%)	93(100%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 2: Basic characteristics of study

Characteristics	Number of individuals
Age in years (mean)	
Sex male	42
Female	93
Prevalence of hyponatraemia	3.4% to 39.4%
Serum sodium level	
<135	42
135-145	93
Mortality	28 (66.7%)

Table 3: Aetiology of hyponatraemia

Cause for admission	Hyponatremia		Total (N=135)
	Present (Group A) (n=42)	Absent (Group B) (n=93)	
Cardiac	5 (11.9%)	12 (12.9%)	17 (12.6%)
Neurological	10 (23.8%)	24 (25.8%)	34 (25.1%)
Pulmonary	14 (33.3%)	31 (33.3%)	45 (33.3%)
Gastrointestinal	7 (16.6%)	13 (13.9%)	20 (14.8%)
Sepsis	4 (9.5%)	9 (9.6%)	13 (9.6%)
Others*	2 (0.5%)	4 (4.3%)	6 (4.4%)

Table 4: Clinical features of patients

Clinical feature	Group A	Group B
Drowsiness	31 (73.8%)	22 (23.6%)
Confusion	25 (59.5%)	20 (21.5%)
Lethargy	17 (40.4%)	16(17.2%)
Headache	9 (21.4%)	12 (12.9%)
Nausea/vomiting	5 (11.9%)	12 (12.9%)
Loose stools	7(16.6%)	13 (13.9%)
Breathlessness	19(45.2%)	19(20.4%)
Cough	14(33.3%)	31(33.3%)
Unresponsive	3(7.1%)	4 (4.3%)

Table 6: Outcome of patients admitted in ICU (N=135)

Outcome	Hyponatremia		p-value
	Present (n=42)	Absent (93)	
Need for MV			
Yes	28 (66.6%)	18 (19.3%)	0.000*
No	14 (33.3%)	74 (79.6%)	
Duration of ICU stay (days)	14.6 ± 3.6	9.6 ± 4.9	0.001*
At discharge			
Survived	14 (33.3%)	69 (84.9%)	0.000*
Death	28 (66.7%)	24 (15.0%)	

MV-mechanical ventilation

DISCUSSION

Hyponatremia is an electrolyte abnormality commonly seen among critically ill patients. Estimating its burden and aetiology is important to help early detection and predicting individual at greater risk. In our study a total 135 patients admitted in ICU were included. The mean age of patients was 54.57 ± 4.8 years. Bilal et al,[4]ad a similar age distribution to our study while most of the other studies by Mohammed et al,[5] Rajesh et al.3and Sim et al,[6] the most common age group affectedwas between 60 to 64 years. Hawkins et al found increased age to be a strong independent risk factor for hyponatremia.[7]In our study the most common affected age group was 61-70 years. It may be due to age related decreased ability to cope with disease as well as sodium and water balance. In our study the age of those with and without hyponatremia was similar.

Out of 135 patients, female patients were 52.3% with female predominance. Few studies found female predominance in their study.[8,3]while Bilal et al and Mohammed et al. had more males with hyponatremia than female.[4] Sim et al. found significant difference in the sex among those with and without hyponatremia.[6] Most of the studies were done among a small sample size. There is a need for large scale studies to assess if sex has a role in causing hyponatremia.

In our study, the prevalence of patients with hyponatremia was 31.1%. Rajesh at al. had a similar prevalence of 34.2%.[3] Sim et al. and Zang et al. had a much lower prevalence of 16.2% and 24.7% respectively,[6,9]while Mohammed et al. and Rao et al. had higher prevalence of 41.2% and 42.9% respectively.[5,8] There is wide variation in the presentation of hyponatremia across the studies.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

This could be due to several factors such a sample population, presence of co-morbid conditions of critically ill patients.

Among the cause of hyponatremia, pulmonary (33.3%) causes was the highest in our study followed by neurological (25.1%), gastrointestinal (14.8%) and cardiac (12.6%). Sim et al,[6] also had pulmonary causes to be the most common aetiology followed by sepsis (40.6%), cardiac (6.5%) and gastrointestinal (6.5%). Rajesh et al,[3] found severe sepsis and trauma to be the leading cause while Bilal et al,[4] identified multiple factors of which syndrome of inappropriate anti-diuretic hormone (SIADH) i.e. 34% to be the most common followed by drugs i.e 15% due to thiazide and loop diuretics, renal failure (12%), hepatic failure (11%) and gastrointestinal losses (9%). Zhan et al,[9] found respiratory causes to be the highest (25%) followed by tumours (23%). Thus, the causes resulting in hyponatremia varies across the studies.

Among the clinical presentation of patients with hyponatremia, drowsiness was the found to be most common symptom (73.8%) followed by confusion (59.5%), lethargy (40.4%) and headache (21.4%). Nausea/vomiting and unresponsiveness was seen among 11.9% and 7.1% cases respectively. Others studies by Bilal et al,[4] and Rao et al,[8] also had a similar proportion of clinical presentation in their study. Thus.critically ill patients with showing drowsiness along with confusion should be evaluated with serum sodium level.

Among the 42 patients diagnosed of hyponatremia, euvolemia, hypervolemia and hypovolemic hyponatremia was documented among 52%, 29% and 19% respectively. Other studies by Rao et al,[8] Bilal et al,[4] and Mohammed et al,[5] also had similar distribution. All these studies found euvolemic hyponatremia to be the most common type of hyponatremia among ICU patients. Volume status can guide us to evaluate the cause and proper management.

Need for mechanical ventilation, duration of hospital stay and also mortality was more among those with hyponatremia which was statistically significant. Mohammed et al,[5] and Pillai et al,[10] in their study found the need for mechanical ventilation and mortality to be more among hyponatraemic patients but not duration of hospital stay. Rajesh et al,[3] found all three outcomes to be significantly more among hyponatremia patients. While Sim et al,[6] no difference in mortality or duration of ICU stay but increase in the need for renal replacement was significantly more among hyponatraemic patients. Bilal et al,[4] found more mortality among hyponatraemic patients than those without but there was no difference in mortality based on the severity of hyponatremia. Overall, most of the studies the support the presence of hyponatremia increases the need for intervention and mortality among critically ill patients.

CONCLUSION

The patients with hyponatraemia have increased need for mechanical ventilation. The duration of hospital stay and mortality rate was also more among hyponatraemia patients. Early recognition of hyponatraemia in patients presenting with any illnesses and treating them in time would improve the prognosis of the patient.

REFERENCES

1. Fried LF, Palevsky PM. Hyponatremia and hypernatremia. The Medical clinics of North America. 1997;81(3):585–609.
2. Adrogué HJ, Madias NE. Hyponatremia. New England Journal of Medicine. 2000 May 25;342(21):1581-9.
3. Padhi R, Panda BN, Jagati S, Patra SC. Hyponatremia in critically ill patients. Indian J Crit Care Med 2014; 18:83-7.
4. Pathan B, Nagpal RR, Rai DS. Hyponatremia in critically ill patients: Assessment f incidence, etiology, clinical manifestations and outcomes in ICU setting. Journal of Medical Science and Clinical Research. 2018 Mar;6(03):591-8.
5. Uddin MS, Ahsan AA, Faria S, Sultana R. Frequency of hyponatremia and its outcome in critically ill patients. Bangladesh Critical Care Journal. 2021 Oct 15;9(2):68-73.
6. Sim JK, Ko RE, Na SJ, Suh GY, Jeon K. Intensive care unit-acquired hyponatremia in critically ill medical patients. Journal of Translational Medicine. 2020 Jul 2;18(1):268.
7. Hawkins RC. Age and gender as risk factors for hyponatremia and hypernatremia. Clinicachimicaacta. 2003 Nov 1;337(1-2):169-72.
8. Rao MY, Sudhir U, Anil Kumar T, Saravanan S, Mahesh E, Punith K. Hospital-based descriptive study of symptomatic hyponatremia in elderly patients. J Assoc Physicians India. 2010 Nov 1; 58:667-9.
9. Zhang X, Li XY. Prevalence of hyponatremia among older inpatients in a general hospital. European geriatric medicine. 2020 Aug; 11:685-92.
10. Pillai KS, Trivede TH, Mozlick ND. Hyponatremia in ICU. The Journal of the Association of Physicians of India.2018;66(5):48–56.

ISSN (O): 2687-5365; ISSN (P): 2753-6556