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To Study the Occurrence of Hyponatremia in Hospitalised Patients at a Tertiary Set-Up

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Abstract:-

BACKGROUND: Hyponatremia is one of the commonest electrolyte disturbances encountered in medical wards. Therefore, this observational study was taken up to explore the clinical profile of hyponatremia and its effect on morbidity, mortality and hospital stay.

AIMS:

1. To assess the occurrence of hyponatremia in hospitalized patients.

2. To explore the clinical profile, need for treatment of symptoms, etiology and length of hospital stay.

METHODS: A retrospective, observational study was carried out over 4 month duration from August 2022 to November 2022. All patients admitted over the time period, who developed hyponatremia during hospital stay were included. Based on the severity of hyponatremia , patients were divided into 3 groups- mild/moderate/severe. The underlying cause of hyponatremia was analysed and association between hyponatremia and morbidity/ length of hospital stay was explored.

RESULTS: Our study included a total of 46 patients, out of which 24 patients were female and 22 male. Out of 46 in-hospital patients in our study, 35 patients(76.1%) had mild hyponatremia and 11 patients(23.9%) had moderate hyponatremia.Out of all the symptomatic patients, 14 patients (63.6%) needed correction of hyponatremia while 2 patients did not require correction. Among patients with mild hyponatremia , 7 patients were given oral correction, 2 were given IV correction. Among patients with moderate hyponatremia, 6 patients were given oral correction, 5 patients were given IV correction. Sepsis was found to be the leading cause of in-hospital hyponatremia, seen in 17.4% of individuals.

Average length of hospital stay was found to be between 6-10 days while patients were being treated for hyponatremia along with their primary disorder.41.3% individuals were discharged in less than 5 days. 2 individuals had >10 days of hospital stay.

CONCLUSION: Hyponatremia is a common complication in hospitalized patients and given the correlation between the degree of hyponatremia and prognosis, the early and accurate identification and treatment of this condition can reduce the associated morbidity, mortality and length of hospital stay.

Keywords:- *Hyponatremia, Elderly, Sepsis*

I. INTRODUCTION

Disorders of serum Na+ concentration are caused by abnormalities in water homeostasis, leading to changes in the relative ratio of Na+ to body water.[5] Hyponatremia is a clinical condition characterized by a serum sodium concentration of < 135 mmol/L, regardless of changes in the extracellular fluid volume. This is the common electrolyte disorder observed in clinical settings [1–4], with incidences ranging from 15 to 30% among hospitalized patients.[6].

However, in elderly patients, the prevalence rate has been reported to be even higher up to 50%.[6]

Multiple aetiologies, association of comorbids play a major role in hyponatremia of elderly patients. Prolonged hospital stay and increased mortality are the consequences.[7]

Ageing results in impairment of water-excretory capacity due to *decreased GFR, reduction in total body water content, higher sensitivity to osmotic stimuli, and associated with multiple comorbidities and exposure to multiple drugs* . Besides, *low salt diet* followed by many elderly patients and *hypoproteinemia* due to background illness or *malnutrition* may also contribute to hyponatremia in this age group. Therefore, ageing itself is considered a significant risk factor for hyponatremia.[8,9]Other factors include: increased prevalence of comorbidities, frequent use of drugs that may lead to hyponatremia, age-related changes in homeostasis, and cognitive dysfunction.[10]

Hyponatremia is almost always the result of an increase in circulating AVP and/or increased renal sensitivity to AVP.The underlying pathophysiology for the exaggerated or “inappropriate” AVP response differs in patients with hyponatremia as a function of their ECFV.[5]

A. Symptoms

Hyponatremia induces generalized cellular swelling, a consequence of water movement down the osmotic gradient from the hypotonic ECF to the ICF. The symptoms of hyponatremia are primarily neurologic, reflecting the development of cerebral edema within a rigid skull.[5] Acute hyponatremic encephalopathy ensues when volume regulatory mechanisms are overwhelmed by a rapid decrease in tonicity, resulting in acute cerebral edema. Early symptoms can include nausea, headache, and vomiting. However, severe complications can rapidly evolve,

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including seizure activity, brainstem herniation, coma, and death.

Winzeler et al. found that serum sodium was positively correlated with mortality, and serum sodium<125 mmol/L was significantly correlated with 1-year mortality, recurrence rate of hyponatremia, and readmission rate.[11] It is recognized that severe hyponatraemia can be symptomatic and life threatening. In most cases, hyponatraemia is mild and asymptomatic; however, recent evidence shows that mild chronic 'asymptomatic' hyponatraemia, particularly in an older population, may contribute to impaired cognition, increased risk of falls and fractures[12]

Patients with chronic hyponatremia usually develop neurologic symptoms when sodium level falls below 110 mEq/L due to acute exacerbation [13]

Considering the aging of the population, the increased susceptibility to electrolyte disturbances and the increased incidence rate associated with hyponatremia in old people, hyponatremia is of increasing importance.

B. Types

Hyponatremia can be of three types-hypertonic hyponatremia, isotonic hyponatremia or hypotonic hyponatremia. Hypotonic hyponatremia is the most common type encountered in clinical practice and further categorised in three-ways based on patient's volume status-hypervolemic, euvolemic and hypovolemic. Hyponatremia, resulting from hyperlipidemia, paraproteinemia is pseudohyponatremia.

Exercise-associated hyponatremia, an important clinical issue at marathons and other endurance events, has similarly been linked to both a "nonosmotic" increase in circulating AVP and excessive free water intake.

C. Chronic Hyponatremia

Persistent, chronic hyponatremia results in an efflux of organic osmolytes (creatine, betaine, glutamate, myoinositol, and taurine) from brain cells; this response reduces intracellular osmolality and the osmotic gradient favoring water entry. The cellular response to chronic hyponatremia does not fully protect patients from symptoms, which can include vomiting, nausea, confusion, and seizures, usually at plasma Na+ concentration <125 mmol.

Even patients who are judged "asymptomatic" can manifest subtle gait and cognitive defects that reverse with correction of hyponatremia; notably, chronic "asymptomatic" hyponatremia increases the risk offalls.

II. AIMS

- To assess the occurrence of hyponatremia in hospitalized patients.
- To explore the clinical profile, need for treatment of symptoms, etiology and length of hospital stay.

III. MATERIALS AND METHODS

A retrospective, observational study was carried out over 4 month duration from August 2022 to November 2022.Ethical Committee approval and informed consents were taken prior to the study. All patients admitted over the time period, who developed hyponatremia during hospital stay were included.Clinical data including demographics, presenting symptoms, comorbid, drug history, clinical examination findings, volemic status, laboratory investigations, treatment and final outcome were recorded. Patients with hypernatremia were excluded. Based on the severity of hyponatremia , patients were divided into 3 groups- mild/moderate/severe. The underlying cause of hyponatremia was analysed and association between hyponatremia and morbidity/ length of hospital stay was explored.

Excel and SPSS software packages were used for data entry and analysis. Chi-square test was applied to find the significance of difference between two proportions. A *P* value of less than 0.05 was accepted as indicating statistical significance.

IV. RESULTS

Table 1: Age Distribution

	Frequency	Percentage(%)
<20 years	1	2.2
21 to 30 years	4	8.7
31 to 40 years	4	8.7
41 to 50 years	11	23.9
51 to 60 years	11	23.9
>60 years	15	32.6
Total	46	100

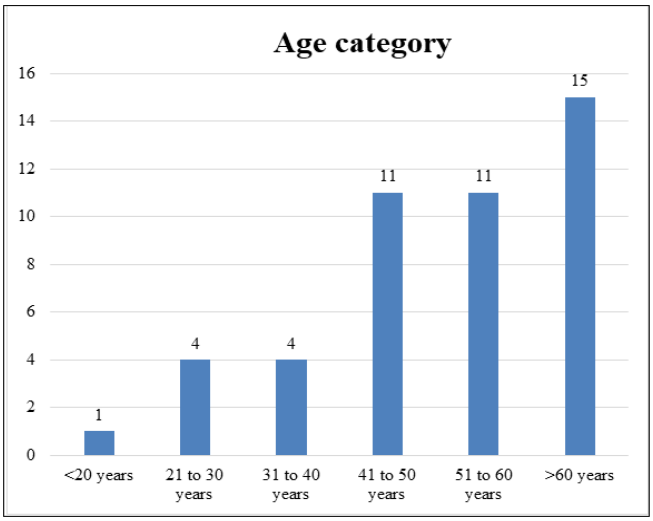

Fig. 1: Age category

Table 2: Sex

	Frequency	Percentage
Female	24	52.2
Male	22	47.8
Total	46	100

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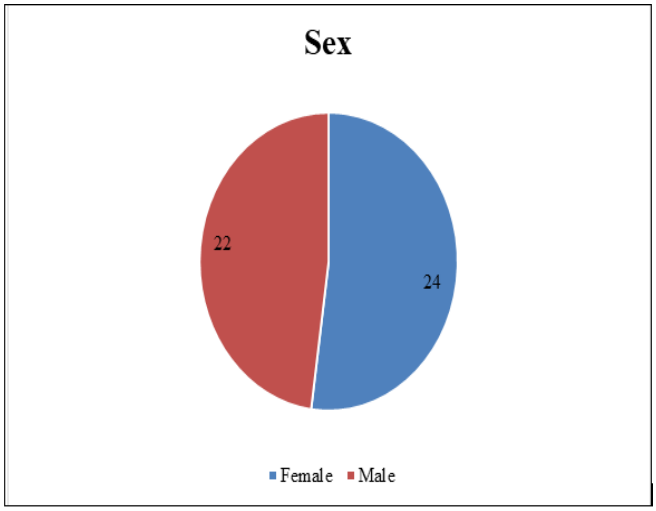

Fig. 2: Sex

Table 3: Co morbidities

	Frequency	Percentage
Hypertension	12	26.1
Diabetes Mellitus	10	21.7
Chronic Kidney Disease	3	6.5
CCF	1	2.2
CVA	2	4.3
RAD	4	8.7
OSA	1	2.2
Epilepsy	1	2.2

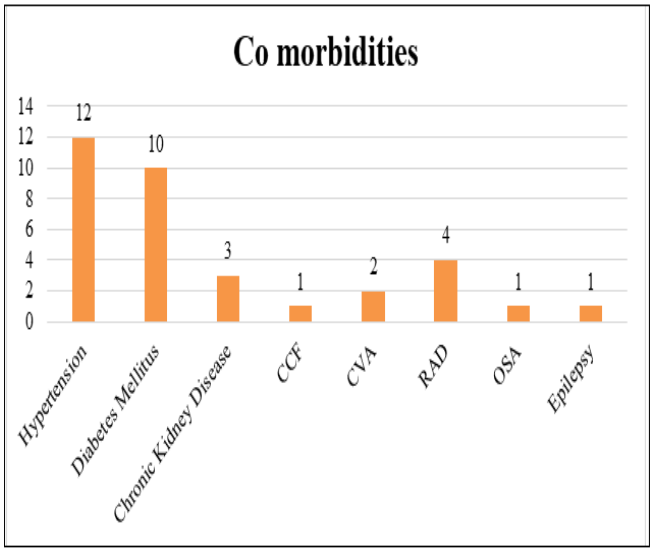

Fig. 3: Co morbidities

Table 4: Category

	Frequency	Percentage
Mild	35	76.1
Moderate	11	23.9
Total	46	100

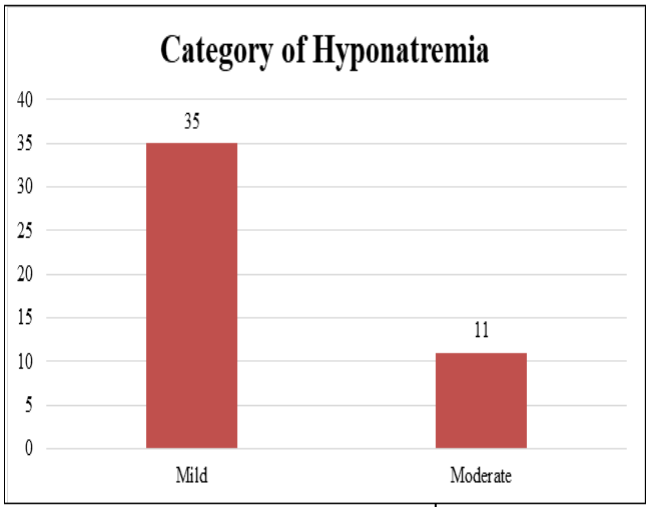

Fig. 4: Category of Hyponatremia

Table 5: Hyponatremia

	Frequency	Percentage
D1	1	2.2
D2	9	19.6
D3	19	41.3
D4	14	30.4
D5	2	4.3
D6	1	2.2
Total	46	100

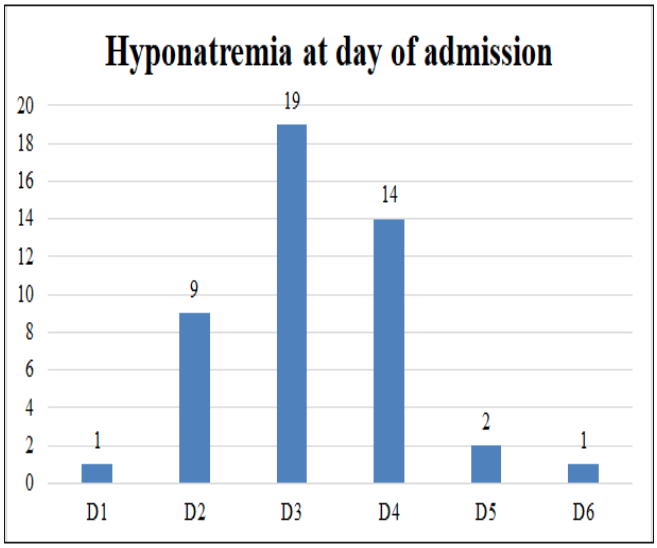

Fig. 5: Hyponatremia at day of admission

Table 6: Symptoms

	Frequency	Percentage
ALTERED SENSORIUM	6	13.0
GEN WEAKNESS	6	13.0
GIDDINESS	3	6.5
GIDDINESS, IRRELEVANT SPEECH	1	2.2
NIL	30	65.2
Total	46	100

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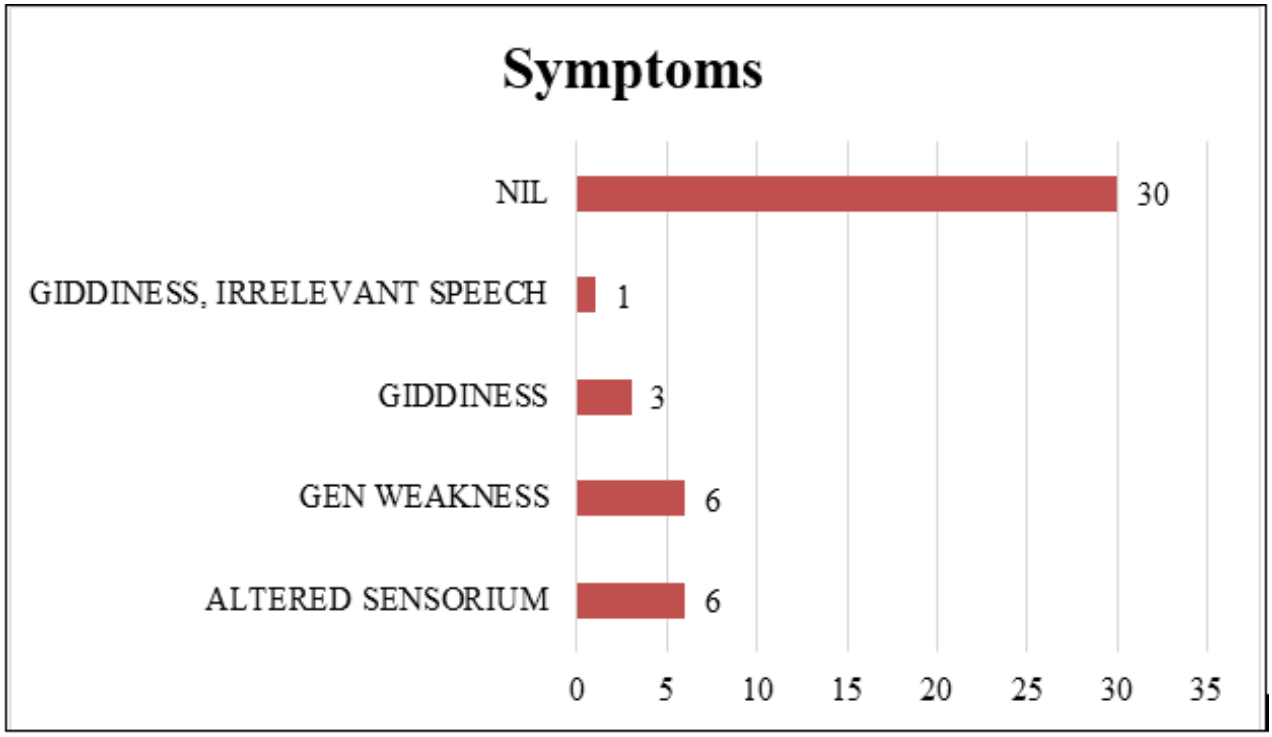

Fig. 6: Symptoms

Table 7: Correction given

	Frequency	Percentage
None	24	52.2
HD	2	4.3
IV	6	13.0
ORAL	14	30.4
Total	46	100

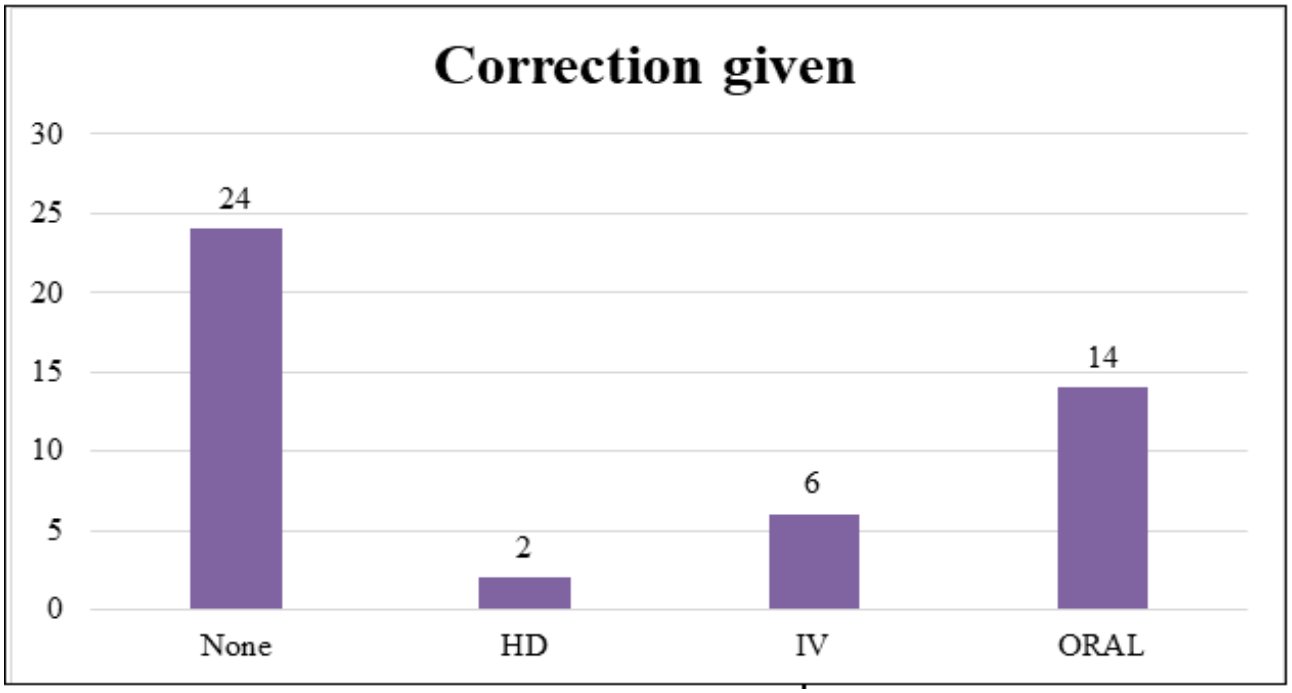

Fig. 7: Correction given

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Table 8: Duration of hospital stay

	Frequency	Percentage
<5 days	19	41.3
6 to 10 days	25	54.3
>10 days	2	4.3
Total	46	100

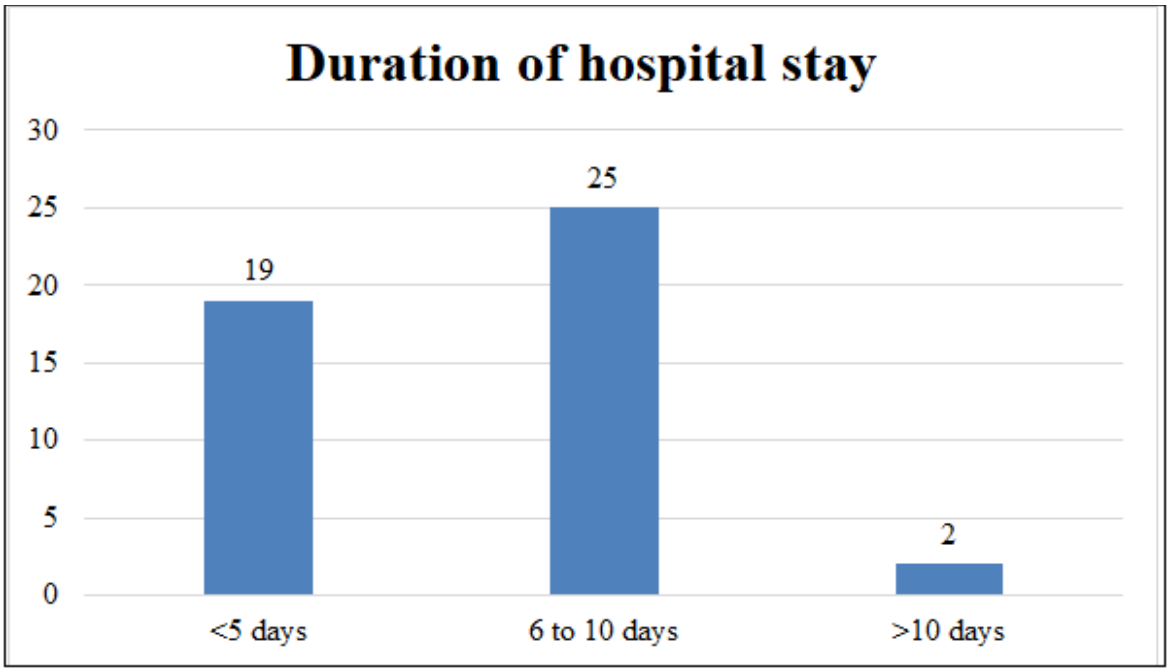

Fig. 8: Duration of hospital Stay

Table 9: Etiology

	Frequency	Percentage
AKI	4	8.7
AKI, SEPSIS	2	4.3
ALCOHOLIC LIVER DISEASE	3	6.5
CONGESTIVE CARDIAC FAILURE	3	6.5
CVA	4	8.7
DRUG INDUCED	7	15.2
GI FLUID LOSS	2	4.3
LOW SALT INTAKE, DYSLIPIDEMIA	1	2.2
PNEUMONIA/TB	1	2.2
PSEUDOHYPONATREMIA	2	4.3
SEPSIS	8	17.4
THIRD SPACING	1	2.2
Others	8	17.4
Total	46	100

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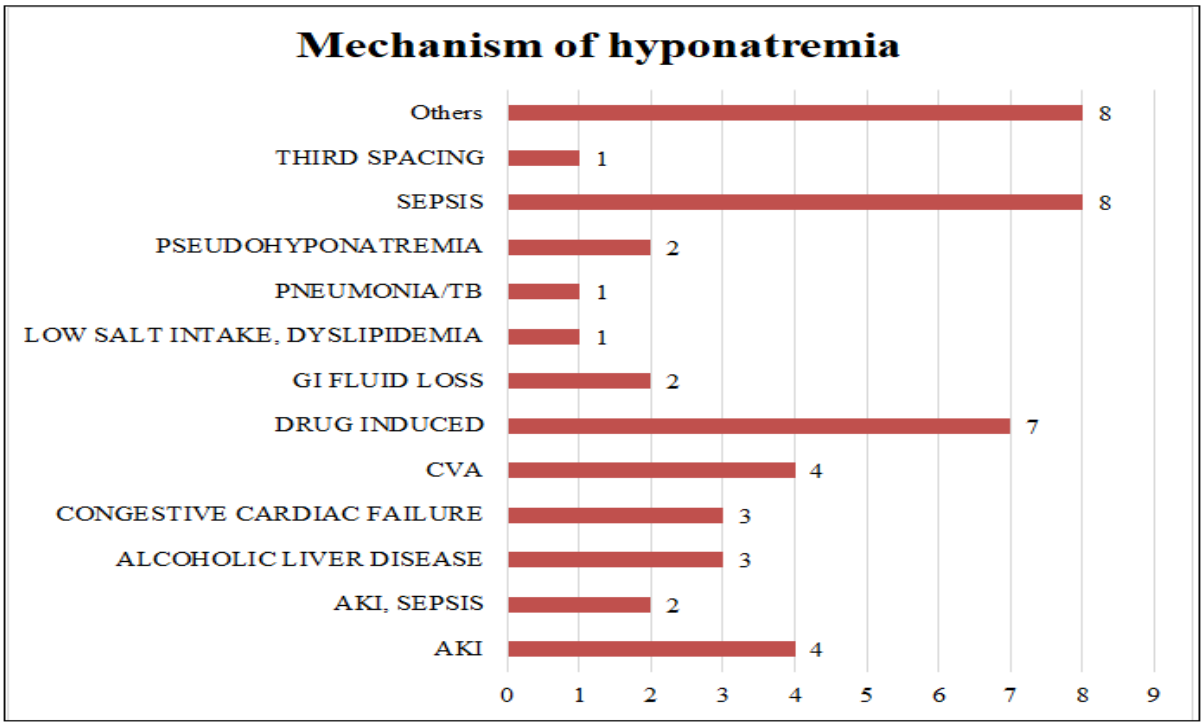

Fig. 9: Mechanism of hyponatremia

Table 10: Treatment with Symptoms

	Given	Not given	P value
Symptomatic	14 (63.6)	2 (8.3)	<0.001
Asymptomatic	8 (36.4)	22 (91.7)	
Total	22 (100.0)	24 (100.0)	

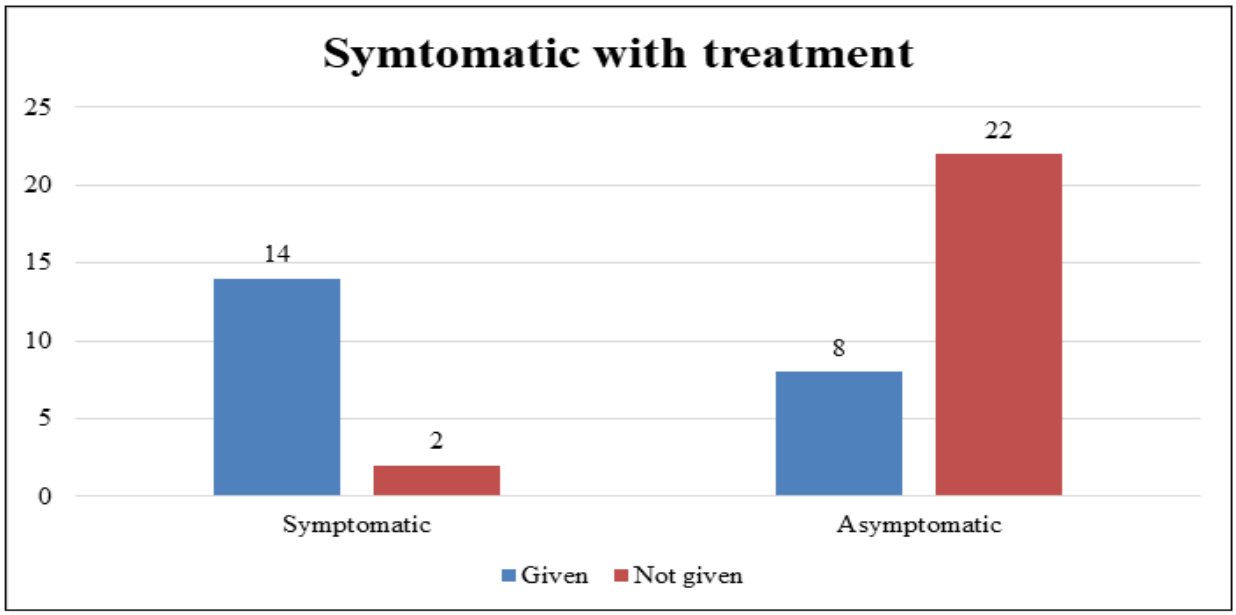

Fig. 10: Symtomatic with treatment

Table 11: Treatment with Category

	Given	Not given	P value
Mild	12 (54.5)	23 (95.8)	0.001
Moderate	10 (45.5)	1 (4.2)	
Total	22 (100.0)	24 (100.0)	

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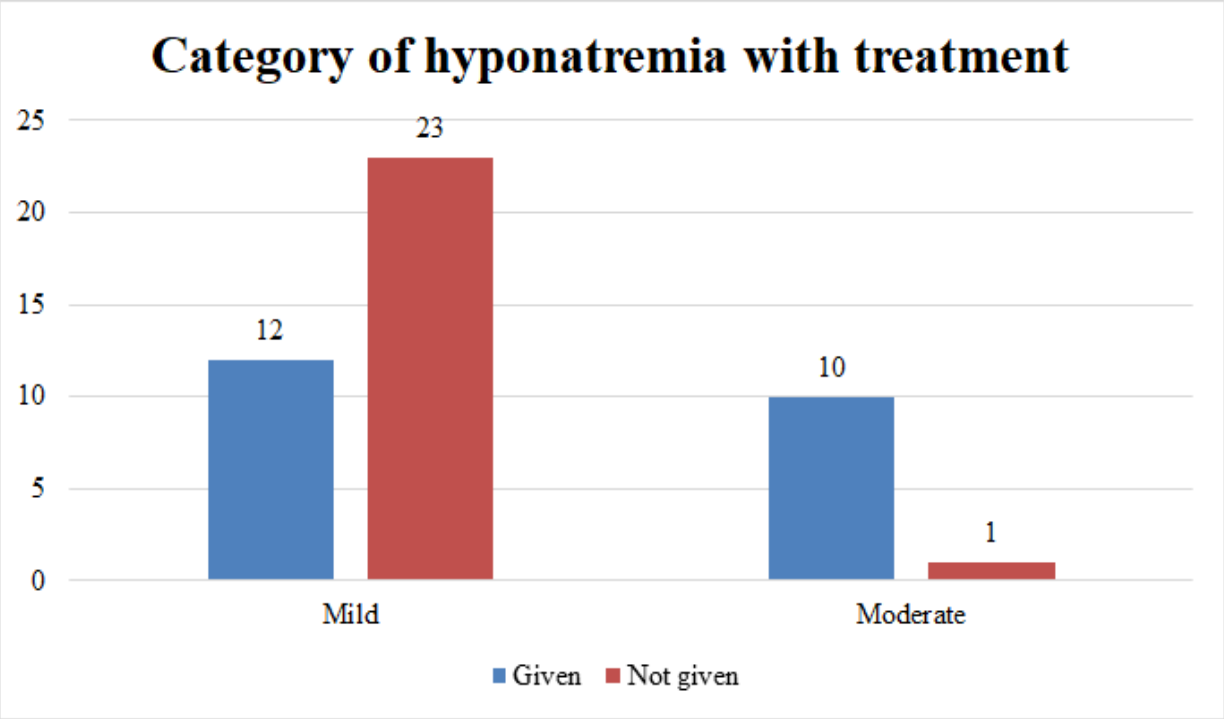

Fig. 11: Category of hyponatremia with treatment

V. DISCUSSION

A retrospective study was conducted in the Dept of Emergency Medicine and data collected over the period of August 2022 to November 2022. All patients who developed hyponatremia during hospital stay were included in the study.

Our study included a total of 46 patients, out of which 24 patients were female and 22 male. Majority of patients were above 60 years(32.6%). 26.1% of individuals were hypertensive, 21.7% were known diabetics. Other noted common co morbidities were- chronic kidney disease, congestive cardiac failure, cerebrovascular accident, reactive airway disease, obstructive sleep apnea and epilepsy. A total of 46 patients developed hyponatremia while they were being treated for their presenting complaints. Majority of patients developed hyponatremia on day3 (41.3%). 30.4% of patients developed hyponatremia on day day4. Patients were categorized based on severity of hyponatremia.

Patients with serum sodium levels between 130-135mEq/l were categorized into MILD HYPONATREMIA. Patients with serum sodium levels between 125-129mEq/l were termed as MODERATE HYPONATREMIA. SEVERE HYPONATREMIA was indicated by serum sodium levels of ≤124 mEq/l. Out of 46 in-hospital patients in our study, 35 patients(76.1%) had mild hyponatremia and 11 patients(23.9%) had moderate hyponatremia.

65.2% i.e, 30 patients were asymptomatic. 13% of patients who developed in-hospital hyponatremia had altered sensorium. other common symptoms were generalized weakness, giddiness, nausea etc.

Out of all the symptomatic patients, 14 patients (63.6%) needed correction of hyponatremia while 2 patients did not require correction. Of all 30 asymptomatic patients, correction was given to 8 patients(36.4%). Therefore, in my study, 2 symptomatic patients and 22 asymptomatic patients did not undergo correction of hyponatremia.

Correction of hyponatremia was done in the form of oral/ IV formulation. Tab Sodamint 300mg TID was the oral correction given. 3%NS infusion (hypertonic saline containing 513mmol/L of sodium) was the IV formulation used. 14 patients (30.4%) were given oral correction.

Among patients with mild hyponatremia , 7 patients were given oral correction, 2 were given IV correction. Among patients with moderate hyponatremia, 6 patients were given oral correction, 5 patients were given IV correction. Pharmacological correction of hyponatremia not given for 24 patients.

2 patients underwent hemodialysis for correction of hyponatremia associated with AKI and sepsis.

Possible etiological diagnoses for development of in-hospital hyponatremia were identified. Sepsis was found to be the leading cause of in-hospital hyponatremia, seen in 17.4% of individuals. Drug induced hyponatremia was found to be the second most common. Common drugs causing hyponatremia in our study was- diuretics, NSAIDs, ARBs. This was noted in 15.2% of individuals. Other noted causes are AKI and GI fluid loss. Pseudo hyponatremia due to dyslipidemia and hyperglycemia was found in 2 individuals. Third spacing due to Acute pancreatitis causing hyponatremia was seen in 1 patient. Dilutional hyponatremia due to congestive cardiac failure was seen in 3 individuals. 3 individuals developed hyponatremia due to alcoholic liver disease, presented to ED with alcoholic

gastritis and were also diagnosed to have alcohol dependence syndrome.Another attribute to in-hospital hyponatremia was CVA which was seen in 3 individuals who had- left MCA infarct, TBI with SAH, recurrent CVA with SAH. Lastly, hyponatremia was also seen in a patient with Pulmonary Koch's.

Average length of hospital stay was found to be between 6-10 days while patients were being treated for hyponatremia along with their primary disorder.41.3% individuals were discharged in less than 5 days. 2 individuals had >10 days of hospital stay.

The diagnosis of probable etiology of hyponatremia is instrumental in formulating the management strategy, which varies widely. Determinants of therapy are extracellular volume status, the neurological signs and symptoms, the severity and duration of hyponatremia, and the rate at which it developed. The importance of early recognition of hyponatremia and prompt intervention is paramount. It is important to note that patients with even mild hyponatremia, which is usually asymptomatic, are predisposed to develop severe hyponatremias as well as end up with serious adverse outcomes like seizure and re-admissions[14,15]

VI. CONCLUSION

Hyponatremia is a common complication in hospitalized patients and given the correlation between the degree of hyponatremia and prognosis, the early and accurate identification and treatment of this condition can reduce the associated morbidity, mortality and length of hospital stay.

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