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Study of Prevalence of Hyponatremia in Elderly and Its Relevance with Outcomes

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ABSTRACT

Hyponatremia is the commonly seen electrolyte disorder in almost 50% of elderly in-patients. Multiple aetiologies, comorbidities and impaired ability to maintain water and electrolyte homeostasis play a major role. Therefore, it is important to evaluate the prevalence, etiologies, comorbidities and outcomes of hyponatremia in elderly admitted patients. A retrospective observational study was done over a period of 6 months on 100 adult patients in the age group of ≥60 years who were admitted in the Department of General Medicine. The data was retrieved from hospital documentation and systematically analyses using SPSS26 software system. Frequencies and percentages were analyzed using Descriptive statistical tools. Trends were analyzed using Chi-square test. The mean age of the patients in our study population was 65.08±11.02 years and mean Na+level was 132.91±6.39mmol/l. Out of 100 patients, 52 (52%) were female and 48 (48%) were male. Out of 48 males, 26 (54.16%) had Hyponatremia and out of 52 females, 34 (65.38%) had Hyponatremia. In our study population, the prevalence of Hyponatremia was 60%. Type 2 Diabetes Mellitus (25%) and Hypertension (20%) were the most common comorbidities. The common presenting complaint was generalized weakness (40%) followed by lethargy and body pain (20%) and giddiness (20%). Out of 100 patients, 18 (18%) patients had COPD, 8 (8%) patients had CKD, 7 (7%) patients had CAD, 4 (4%) patients had CVA, 4 (4%) patients had CLD, 6 (6%) patients had Malignancy and 8 (8%) patients had Pulmonary Tuberculosis. Out of 60 patients, 34 (56.66%) had mild, 20 (33.33%) had moderate and 6 (20%) had severe hyponatremia. Mild cases of Hyponatremia (56.66%) were treated with 0.9%NS and severe hyponatremia (20%) was treated with 3%NS and tolvaptan. Improvement was observed in 55 (91.66%) patients and the mortality rate was 5 (8.33%). Hyponatremia may prolong the hospital stay but the outcome of the patients mainly depends upon etiology and severity of comorbidities. A systematic approach can significantly improve the assessment and management.

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Key Words
Hyponatremia, elderly in-patients, comorbidities

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INTRODUCTION

Sodium ion is an essential electrolyte that is important to maintain water balance, to regulate muscle function and helps in transmission of nerve signals[1]. Hyponatremiai.e.,serum sodium level <135 mEq/l is the most observed electrolyte disorder especially in elderly in-patients.The prevalence of hyponatremia is reported as almost 50% of elderly admissions in tertiary care centers[2-5]. Hyponatremia can be classified as mild (131-135mEq/l), moderate (121-130mEq/l) and severe (≤120mEq/l) and the clinical presentation of the patients vary from mild complaints like nausea, malaise and lethargy to neurological presentations like altered sensorium, seizures and coma in severe cases[1-3]. Multiple etiologies and associated comorbidities such as chronic kidney disease, congestive cardiac failure, respiratory infections, chronic liver disease, volume overload and age related dehydration due to impairment of water-excretion, decrease in GFR and high sensitivity to osmotic stimuli results in impaired ability to maintain water and electrolyte homeostasis[1-7]. Prolonged hospital stays[3] and mortality rate of 7.1% was observed[2]. Elderly patients being more susceptible to develop electrolyte disorders and increased morbidity associated with hyponatremia[7] makes it important to evaluate the prevalence, etiologies, comorbidities and outcomes in elderly in-patients admitted with hyponatremia[3].

MATERIALS AND METHODS

This was a retrospective observational study conducted on 100 patients. The demographic data, clinical history, associated co-morbidities, treatment given and the outcomes of the selected patients were taken from medical records department of the hospital and systematically analysed using SPSS26 software system. Data on serum sodium levels was retrieved from the laboratory database. The study included male and female patients aged ≥60 years with hyponatremia, admitted between July 2022 to December 2022 in the Department of General Medicine. Patients on diuretics and patients with pseudohyponatremia were excluded from the study. Serum electrolytes of these patients were analysed using EasyLyte electrolyte analyser. Descriptive statistical analysis was done to find frequencies and percentages. Analyss of trends was done using Chi-square test and P value <0.05 was considered as statistically significant.

Aim of the Study:

- To determine the prevalence of hyponatremia in elderly hospitalized patients.
- To study etiology and clinical outcomes of hospitalized hyponatremic elderly patients.

RESULTS AND DISCUSSIONS

In our study, a total of 100 elderly in-patients were enrolled out of which 60 patients had Hyponatremia i.e., serum sodium<135 mEq/l. The prevalence of Hyponatremia in our study subjects, i.e., elderly in-patients was 60% (Table 1).

Table 1: Basic Characteristics of the Study

Sl. No.	Basic Characters		Average /No(100)
1.	Age (Mean and SD)	65.08±11.02	
2.	Sex (No)	Male	48
		Female	52
3.	Na+ level (Mean and SD)	132.912±6.39	
4.	Etiologies (No)	DM	25
		HTN	20
		COPD	18
		CKD	8
		CAD	7
		CVA	4
		CLD	4
		Malignancy	6
		Pulmonary Tuberculosis	8
5.	Prevalence of Hyponatremia (%)		60%
6.	Mortality Rate (%) of		60 (8.3%)

The mean age of the study population was 65.08±11.02 (Table 1) with the most common age group being 60-69 years (47%) followed by 70-79 years (26%) (Table 2).

Table 2: Age and Sex Distribution

Age	Male	Female	Total	
			No.	%
60-69	26	21	47	47
70-79	14	12	26	26
80-89	12	8	20	20
90-99	3	4	7	7
Total	48	52	100	100.0
P-value	P = 0.237,	NS	-	-

Of 100 patients, 48 (48%) were Male amongst which 26 (54.16%) had Hyponatremia and 52 (52%) were Female of which 34 (65.38%) had Hyponatremia (Table 3).

Table 3: Gender Wise Distribution of Hyponatremia

Gender	No of Patients with Normal Na+level	%	No of Patients having hyponatremia	%	Total
Male	22	45.83%	26	54.16%	48
Female	18	34.61%	34	65.38%	52

The male to female ratio was 1:1.08. Out of 100 patients,25% had Type 2 Diabetes Mellitus which was the most observed pre-existing condition followed by Hypertension (20%), COPD (18%), CKD (8%), Pulmonary Tuberculosis (8%), CAD (7%), Malignancy (6%), CVA (4%) and CLD(4%) (Table 1 and 4).

Table 4: Etiologies

Etiologies	No.	%
DM	25	25
HTN	20	20
COPD	18	18
CKD	8	8
CAD	7	7
CVA	4	4
CLD	4	4
Malignancy	6	6
Pulmonary Tuberculosis	8	8
Total	100	

The most frequent presenting complaint was Generalized weakness (40%) followed by Lethargy and

Body Pain, Giddiness and Difficulty in Breathing (20%) (Table 5).

Table 5: Symptoms

Presenting complaints	No.	%
Generalized weakness	40	40.0
Lethargy and Body Pain	20	20.0
Giddiness	20	20.0
Difficulty in Breathing	20	20.0
Total	100	100.0

The mean serum sodiumlevel of the patents included in the study was 132.91±6.39 (Table 1). When classified, 34 patients (56.66%) had mild hyponatremia (serum sodium level 131–135 mEq/l), 20 patients (33.33%) had moderate hyponatremia (serum sodium level 121-130 mEq/l) and 6 patients (20%) had severe hyponatremia (serum sodium ≤120 mEq/l) (Table 6).

Table 6: Level of Na+

Na+level	No	%
Mild (131-135)	34	56.7%
Moderate (121-130)	20	33.3%
Severe ≤120	6	20.0%
Total	60	

Mild cases of Hyponatremia (56.66%) were treated with 0.9% Normal Saline, patients having moderate hyponatremia (33.33%) were treated with 0.9% Normal Saline and Tolvaptan and Severely Hyponatremic patients (20%) were treated with Tolvaptan and 3% Normal Saline (Table 7).

Table 7: Treatment

Na+level	0.9% NS	Tolvaptan	3% NS
Mild (131-135)	34	0	0
Moderate (121-130)	20	20	0
Severe ≤120	0	6	6
P-value		P=0.000, HS	

Improvement was seen in 55 (91.66%) patients and the mortality rate due to Hyponatremia in this study is 8.33%. Statistically, no significant association was seen between Hyponatremia and mortalities (P>0.05) (Table 8).

Table 8: Outcome with Levels of Na+

Na+ level	Improved		Mortalities	
	No.	%	No.	%
Mild (131-135)	31	91.2	3	8.8
Moderate (121-130)	19	95.0	1	5.0
Severe ≤120	5	83.3	1	16.7
P-value			P=0.654, NS	

The prevalence of hyponatremia in the elderly patients is high due to age related physiological impairment in water and electrolyte homeostasis and other co-morbidities[2,6,8]. Hyponatremia may be associated with increased morbidity and mortality in several chronic conditionsand leads to increased health care cost due to prolonged hospitalization[6]. Therefore, diagnosing the etiology along with its appropriate management is essential[2]. The prevalence of hyponatremia in this study was 60%. In the study done by Miller M *et al.*, the prevalence of hyponatremia was 53% of elderly in-patients[9]. Few other studies have also observedhyponatremia in almost 50% of geriatric admissions[2-5,10]. A study by Asma Rafi *et.al.* showed that most of the patients i.e., 52% were in the age group of 56-65 years patients followed by 18.4% in the age group >65 years and 12.8% patients in the age group of 46-55 years with a mean age of study population being 62.4 years[13]. Another study by Jain AK et. al. found most patients with hyponatremia i.e., 53% in age group of 65-74 years followed by 39% in the age group of 75-84 years and 8% in the age group of >85 years[6]. A study by Dash SC *et. al.* had mean age of 69.87±7.94 years.3In our study, the mean age of study population was 65.08±11.02 years comparable to study by Lokesh N K *et. al.* (68.62 years)[5], Dash SC et. al. (69.87±7.94 years)[3] and Asma Rafi *et.al.*(62.4 years)[13]. The common age group affected in our study was 60-69 years i.e., 47% followed by 26% in the age group of 70-79 years, 20% in the age group of 80-89 years and 7% patients in the age group of 90 years and above which can be compared to the study by Kaeley N *et. al.* that showed the most patients affected i.e., 70.8% were in age group of 61-70 years followed by 25% patients in the age group of 71-80 years[2]. A study by Mannheimer B et. al. found that men hospitalized due to hyponatremia were at two-fold risk of mortality as compared to women due to greater burden of comorbidities which is associated with bad prognosis. The study also found that hyponatraemic females were at higher risk of cerebral edema[11] as female sex hormones such as estrogen have been shown to inhibit the activity of the Na+-K+-ATPase pump and tend to impair brain adaptation to hyponatremia, while androgens enhance it[12]. Studies done by Kaeley[2] and Asma Rafi[13] show slight female preponderance that is consistent with our study that shows 65.38% females had Hyponatremia as compared to 54.16% males. Other studies by Lokesh[5] and Jain[6] found slight male preponderance which is not consistent with our study. Study by Lokesh N K *et. al.* found that the common comorbidities associated with hyponatraemic patients wereHypertension (58%) followed by Type-2 diabetes mellitus (50%), Cardiac disease (31%), Respiratory illnesses (16%) and chronic kidney disease (10%)[5]. Another study by Jain AK *et. al.* showed that the common pre existing illnesses present in hyponatraemic patients were hypertension (68%), followed by Type-2 Diabetes mellitus (46%) and chronic kidney disease (CKD) (19%).6In our study, the most frequent comorbid condition associated with hyponatremia was Type 2 Diabetes Mellitus (25%) followed by Hypertension (20%) concordant with study by Kaeley N *et. al.* that showed 33.7% patientshad Type-2 Diabetes mellitus followed by 27.9% patients with hypertension[2]. Clinical symptoms of patients with hyponatremia vary from mild like malaise and lethargy to severe neurological presentations like seizures and altered sensorium[2]. The CNS is the most involved systemand the symptoms are noticeable if there is a

rapid decrease in the serum sodium levels resulting in seizures and coma[14]. In a study by Kaeley N *et. al.* giddiness (25.4%) was most common presenting complaint followed by lethargy (22.5%) and 10.4% patients had severeneurological presentationsuch as altered behaviour and seizures. In another study by Dash SC *et. al.* the most common clinical symptom was lethargy (30.2%) followed by nausea and vomiting (28.9%), confusion (19.7%), drowsiness (14.1%) and seizures occurred in 3% patients[3]. In our study, the common presenting complaint was Generalized weakness (40%) followed by Lethargy and Body Pain (20%) and Giddiness (20%). In a study by Chandregowda MK *et. al* nausea and vomiting was the most common presenting symptom (38.66%) followed by lethargy in 36 (24%) patients, confusion in 24 (16%) patients, giddiness in 12 (8%) patients[4]. In another study by Jain AK *et. al.* Lethargy (50%) followed by drowsiness (40%) were the most common symptoms[6]. Although the presenting complaints were same in all studies, the statistical data on number of patients varied. In studies by Kaeley N *et. al.* and Chandregowda MK *et. al.* Hyponatremia was categorized as mild with serum Na+levels between 131-135 mmol/l, moderate having serum Na+levels between 121-130mmol/l and severe with serum Na+levels <120mmol/l[2,4]. In the study by Chandregowda MK *et. al.* 30% patients had mild hyponatremia, 52% patients had moderate hyponatremia and 18% patients had severe hyponatremia[4]. In another study by Bajaj G *et. al.* 36.51% had mild hyponatremia, 43.56% had moderate and 19.91% had severe hyponatremia[8]. In our study a greater number of patients i.e., 56.66% had mild hyponatremia followed by 20 33.33% patients with moderate hyponatremia and 20% with severe hyponatremiasimilar to findings by Kaeley N *et. al.* where 60.5% of patients had mild hyponatremia followed by 27.9% patients in the category of moderate hyponatremia and 15.8% patients with severe hyponatremia[2]. Management of hyponatremia is based on the underlying etiology and the initial step is the determination of the serum sodium levels and the volume status of the patient which is fairly challenging especially in elderly debilitated patients[2]. In a study Chandregowda MK *et. al.* Mortality rate was found to be 11.33%[4]. In another study by Asma Rafi *et.al.* Mortality rate was 14%[13]. Our study findings show that improvement was seen in 91.66% patients and the mortality rate was 8.33% which can be compared to studies by Kaeley N *et. al.* and Bajaj G et. al. and where 92.9 % patients recovered and mortality was seen in 7.1 % patients[2,8].

CONCLUSION

Elderly patients are highly predisposed to hyponatremia due to age-related water and electrolyte imbalance. The presence of comorbidities increases the risk. Early diagnosis is important to prevent morbidity, mortality and prolonged hospital stay leading to economic burden to the family and nation. Hyponatremia prolongs the hospital stay but is not directly related to increased mortality. The outcome is mainly governed by the etiological factors and pre-existing comorbidities. A systematic approach in early detection and correction of hyponatremia prevents unfavourable outcomes and improves the assessment and management significantly.

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