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Evaluation of Hyponatremia in Elderly: A Cross-sectional Study

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Abstract:
Background*: Hyponatremia occurs when the serum sodium concentration reaches below 135 mEq/l. It is a common electrolyte disorder in the elderly. Types of hyponatremia include hypervolemic, hypovolemic and euvolemic types. Since the existing literature is not enough to draw conclusions on hyponatremia, we want to determine the prevalence and pattern of hyponatremia in relation to age, gender and severity among elderly patients.*
Objective:*This study was done to know the pattern of hyponatremia among elderly patients attending our tertiary care centre.*
Materials and Methods*: This study was done at tertiary care teaching hospital in the Department of General Medicine at Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India from August 2022 to January 2023. 200 elderly patients were included as per the eligibility criteria.Male aged above 60 years, with serum sodium levels below 135 mmol.l were included. Age, gender, severity of hyponatremia, urine and serum osmolality were assessed.*
Results*: Most of the patients were aged 61 to 70 years. Most of the patients were females. Most of the patients had moderate hyponatremia. Incidence of SIADH is 3%. Reasons for severe hyponatremia include presence of hypertension, diabetes, ischemic heart disease, chronic renal and lung disorders. The mean serum osmolality of all 200 patients is 274.5±6.74.mOsm/kg.*
Conclusion:Identifying the causes and risk factors of hyponatremia will help provide appropriate management. We recommend a systematic approach in diagnosis of hyponatremia using history taking, clinical examination, and laboratory findings to establish the mechanism of hyponatremia, which can significantly improve the assessment and management of hyponatremia.
Key Words: *Hyponatremia, elderly, sodium levels, electrolytedisorder, cross-sectional study*

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I. Introduction

Hyponatremia occurs when the serum sodium concentration reaches below 135 mEq/l[1].It is a common electrolyte disorder in elderly. Types of hyponatremia includehypervolemic, hypovolemic and euvolemic types.[2] Raises levels of antidiuretic hormone (ADH) and continued fluid intake are main reasons for all three types of hyponatremia. Symptoms differ from individual to individual. In mild cases, patients may be asymptomatic, where as in severe cases patients may present with neurologicalmanifestations like weakness, altered sensorium, or even coma[3].

Patients with serum sodium levels less than 130 mEq/L are usually symptomatic.Symptoms occurring early in hyponatremia include decreased appetite, nausea, vomiting, headache, and irritability. Severe hyponatremia can make the patients more prone to develop neuropsychiatry symptoms. These symptoms range from restlessness, altered consciousness, psychosis, lethargy, seizures to coma. Early diagnosis and proper treatment could decrease mortality and morbidity, allowing less costs related to intensive care units, and decreased duration of hospitalization.

Hyponatremia is seen in 5 to 28% of hospitalized patients. Around 26% of elderly patients have hyponatremia.[5,6]Inadequate nutrition, low solute intake and hot weather could be the reasons for hyponatremia in India. Since, existing literature is not enough to draw conclusions on hyponatremia, we want to determine the prevalence and pattern of hyponatremia in relation to age, gender and severity among elderly patients.

Hypothesis: We assume that there is no significant difference in symptoms among patients with varying severity of hyponatremia.

Objective: This study was done to know the pattern of hyponatremia in the elderly.

II. Material And Methods

This cross-sectional study was carried out at a tertiary care center in IndiafromAugust 2022toJanuary 2023.
Study Design: Cross-sectional study
The study is cross-sectional, as all parameters in the study were measured at single point of time without forward or backward follow up.
Study Location: This study was done at tertiary care teaching hospital in the Department of General Medicine at Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India.
Study Duration: August 2022 to January 2023
Sample size: 200subjects
Sample size calculation: The sample size was estimated based on the study done by Singh A et al. who reported the incidence of hyponatremia in the elderly as 27%.[7]
At a confidencelevel of85%, taking error as 5%,the minimum sample size obtained was 164.So, we included 200 patients considering a few dropouts.

Subjects & selection method: The study population was drawn from patients who are attending the outpatient unit of general medicine department, coming with complaints of dizziness, headache etc. suspected to have electrolyte abnormalities.

Inclusion criteria:
1. Patients aged above 60 years
2. Either sex
3. Patients with a serum sodium less than 135 mEq/ L.
4. Patients who provided informed consent

Exclusion criteria:
1. Patients with incomplete data
2. Patients with severe hepatic and renal and cardiac disorders that interrupt data collection.
3. Patients who are using diuretics.

Methodology:
After Involving patients as per the inclusion and exclusion criteria, data collection was done on history, clinical examination, and investigations. We assessed hydration status of patient, tachycardia, skin turgor, condition of mucous membranes etc. we gave treatment to all patients, which include oral fluid restriction, oral sodium supplementation, normal saline infusion, and hypertonic saline based on severity of hyponatremia. The data was subjected to statistical analysis and then a conclusion was drawn.

Parameters assessed:
- Age
- Gender
- Incidence of symptoms
- Types of symptoms
- The severity of hyponatremia as per serum sodium levels
- Causes of severe hyponatremia
- Severity of hyponatremia is assessed as per the following table:
  Mild: 130 to 135 mmol/L
  Moderate: 125 to 129 mmol/L
  Profound or severe: Below 125 mmol/L.
- Serum osmolality
  Serum osmolality calculation: The formula was given by Dorwart and Chalmers in 1975.[8]Serum osmolality = 1.86(Na) + (glucose/18) + (BUN/2.8) + 9.
- Incidence of Syndrome of inappropriate secretion of anti-diuretichormone (SIADH)

Ethical considerations: Permission was obtained from the Institutional ethical committee attached to ApolloInstitute of Medical Sciencesand Research before conducting the study. Every patient was explained the whole process and advantages of the study. After he/she accepts, an informed consent form is given in local language or the patient's understandable language and the person was asked to sign it or put a thumb impression.

Statistical analysis

Data was analyzed using Epi info software version 7.2.5.Results were expressed as percentages and mean with standard deviation. Results were presented in tabular forms and graphs in pie and bar diagrams.

III. Results

The current study included 200 elderly patients aged above 60 years.

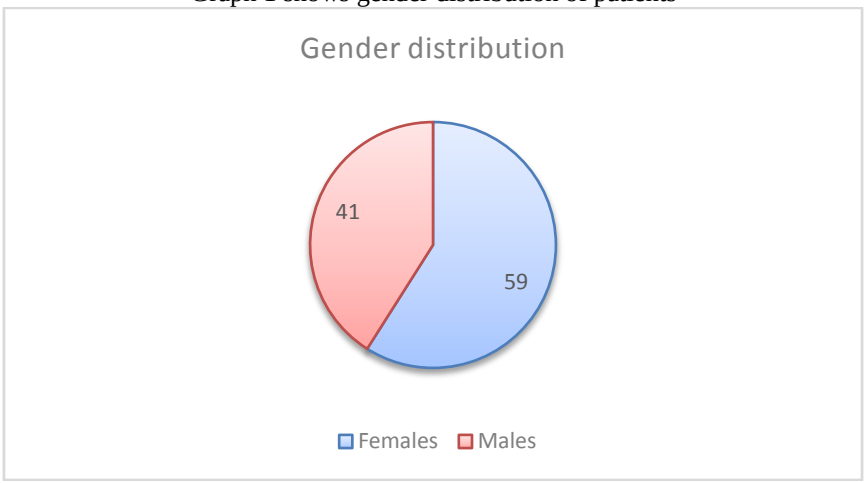
Demographic features: Most of the patients belonged to the age group 61 to 70 years. The mean age was 64.3±7.2 years.

Table no 1: Shows the age distribution of patients

Age	No of patients	% of patients
61 to 70	110	55
71 to 80	48	24
81 to 90	42	21%

Gender: Most of the patients were females

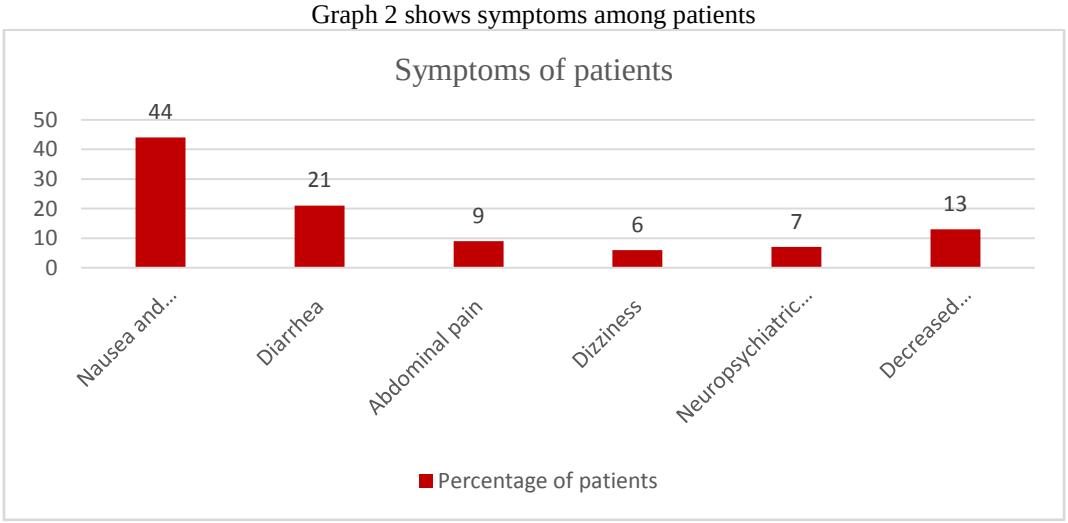
Graph 1 shows gender distribution of patients



Symptoms: Among 200 patients, 34 were asymptomatic. 166(83%) were symptomatic.

The following symptoms were seen:

Graph 2 shows symptoms among patients



Serum sodium levels: Among 130 patients, serum soidum levels are in the range: 125 to 130, indicating that moderate hyponatremia is more common compared to mild and severe hyponatremia in the current study. Only 14 patients had severe hyponatremia. The mean serum sodium levels of all patients was 131.76± 1.5 mg/dl.

Table 2: Serum sodium levels among patients and severity

Serum sodium mmol/l	No of patients	Stage of hyponatremia	% of patients
Below 125	14	Severe	7%
125 to 130	130	Moderate	65%
131 to 134	56	Mild	28%

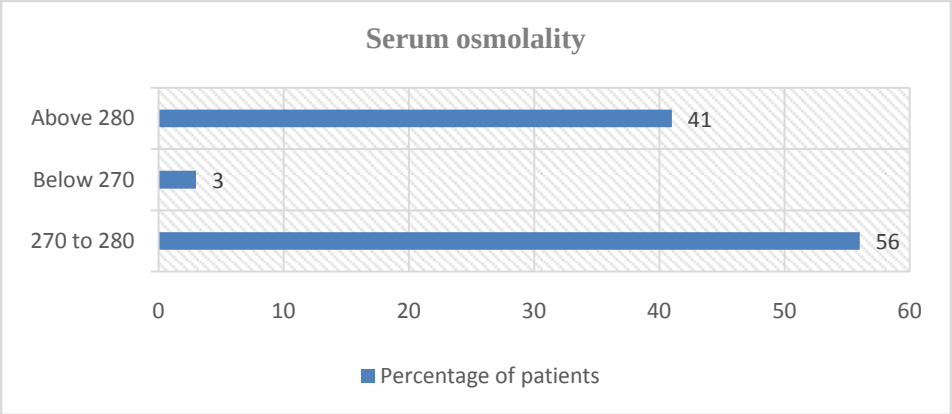
Severe hyponatremia: Causes and comorbidities: Among 14 cases of severe hyponatremia, all these 14 patients had multiple etiologies.

Table 3- Causes of Severe hyponatremia

Etiology	**Severe Hyponatremia(n)**
Hypertension	8
Diabetes mellitus	3
Ischemic heart disease	1
Chronic renal disease	1
Chronic lung disease	1

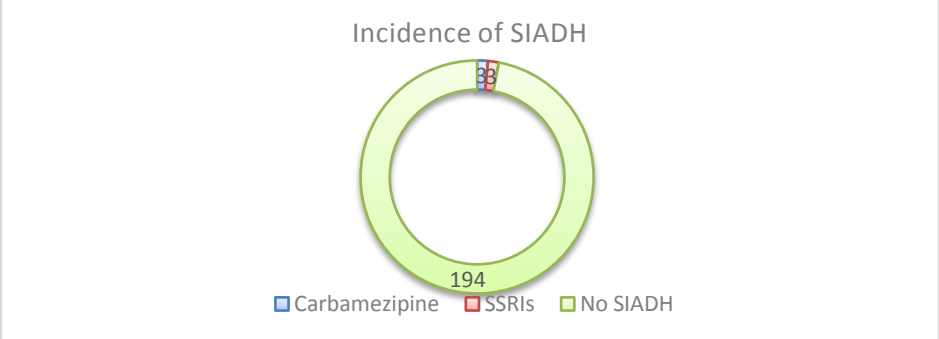
Serum osmolality:
The mean serum osmolality of all 200 patients is 274.5±6.74.mOsm/kg**.** 56% of the patients had this value ranging from 270 to 280 mOsm/kg.Only 6 patients with severe hyponatremia had values less than 270.

Graph 3shows serum osmolality in patients



SIADH Among Patients:
Only 6 patients had SIADH in this study. Among them, 3 patients were using carbamazepine and 3 were using selective serotonin reuptake inhibitors(SSRIs).

Graph 4 shows SIADH incidence



IV. Discussion

In the current study, 200 elderly patients were included.

Most of the patients were aged 61 to 70 years. Most of the patients were females. Most of the patients had moderate hyponatremia. Incidence of SIADH is 3% in our study. Reasons for severe hyponatremia include presence of hypertension, diabetes, ischemic heart disease, chronic renal and lung disorders. The mean serum osmolality of all 200 patients is 274.5±6.74.mOsm/kg. Most of the patients had osmolality ranging from 270 to 380 mOsm/kg body weight. 86% of patients were symptomatic and the most common symptom was nausea and vomiting.

As per previous studies, Hyponatremia was linked to presence of chronic diseases, especially with chronic heart and liver disorders.[9-10]

In the study by**Ehtesham et al.**[11]**,** hyponatremia was more commonly seen in male patients with male: female ratio of 1.8:1. This finding was in contrast to current study findings.

Clayton[12]reported that 36% of patients had neurological symptoms at presentation. In the current study, 3.5% of patients had neuropsychiatric symptoms. **Nzerue**[13]reported death in 20% and sepsis in 9% of patients with hyponatremia. In the current study, no patient was expired or developed sepsis.

Saeed[14] et al reported that 37 % of patients had hyponatremia due to chronic renal disorders, chronic lung disorders and heart failure. They found that hyponatremia in 33.3% cases was due to diuretic use. In our study, we excluded patients who were using diuretics.

In a study by **Huda**[15] et al, 63.6% patients of hyponatremia on diuretics were found to be taking thiazide diuretics. This implies that thiazide diuretics have more tendency to cause hyponatremia.

Vomiting is one of the strongest known stimuli for ADH release.[16] Vomiting was the most common symptom in the current study.

In this study, 8% of patients had SIADH.

In Saeed et al[14] study, the incidence of SIADH among hyponatremia patients was 14.03% while in study by Huda et al.[15]it was 19.8%. In our study, it was 3%.

The mortality was between 20 to 27% in previous studies.[17]The mortality among hyponatremia patients in our study was zero.

V. Conclusion

Knowing the causes and risk factors of hyponatremia will help to provide appropriate management.We recommend a systematic approach in the diagnosis of hyponatremia by history taking, clinical examination, and laboratory findings to establish the mechanism of hyponatremia, which can significantly improve the assessment and management of hyponatremia

The study is self-sponsored and there are no conflicts of interest.

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