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AN OBSERVATIONAL STUDY OF PREVALENCE OF HYPONATREMIA IN NEUROSURGICAL PATIENTS IN A TERTIARY CARE HOSPITAL

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Abstract

Introduction: Hyponatremia is a common electrolyte abnormality in hospitalized patients. It could be mild with nausea and vomiting or severe with lethargy, seizures, and loss of consciousness. In the critically ill, especially neurocritically ill patients, hyponatremia is also a common electrolyte disorder and is associated with clinical prognosis. Hyponatremia may induce neurological complications including cerebral edema, increased intracranial pressure (ICP), seizures, altered mentality, and brain death due to exacerbation of brain edema. In addition, neurocritically ill patients may be more vulnerable to hyponatremia and may develop clinical symptoms in the absence of severe hyponatremia.

Materials and Methods: This is an observational study done in the Department of Neurosurgery, Kurnool Medical College & GGH, Kurnool. 30 patients undergoing elective & emergency neurosurgical procedures at all age groups were included. The study period was 6 months from August 2022 to January 2023. Patients on pharmacotherapy affecting body electrolytes, those who had comorbidities with associated sodium abnormality and spine surgeries were excluded from the study. To diagnose hyponatremia, the serum sodium cut off level was taken as less than 135 mEq/L.

Results: Majority of patients came between 41 to 50 years, of which 18 (60.7 %) were emergency cases and 12 (39.3 %) were elective. The prevalence of hyponatremia among the study population was found to be 34.4 % pre-operatively. To diagnose hyponatremia, the serum sodium cut off level was taken as less than 135 mEq/L.

Conclusion: Our study showed the prevalence of hyponatremia in 34.4% of neurosurgical patients which is more than orthopaedic and general surgery patients, which demands effective approaches for an accurate and timely diagnosis of this electrolyte disorder thereby preventing the occurrence of life-threatening complications due to a low serum sodium concentration. Although hyponatremia is often mild and self limiting, treatment with fluid restriction is

generally unsatisfactory. The use of hypertonic saline is still the treatment of choice for acute symptomatic hyponatremia.

Key Words: Hyponatremia, fluid restriction, comorbidities, seizures.

INTRODUCTION

Hyponatremia is a common electrolyte abnormality in hospitalized patients. It could be mild with nausea and vomiting or severe with lethargy, seizures, and loss of consciousness. In the critically ill, especially neurocritically ill patients, hyponatremia is also a common electrolyte disorder and is associated with clinical prognosis.[1] Hyponatremia may induce neurological complications including cerebral edema, increased intracranial pressure (ICP), seizures, altered mentality, and brain death due to exacerbation of brain edema. In addition, neurocritically ill patients may be more vulnerable to hyponatremia and may develop clinical symptoms in the absence of severe hyponatremia.[2]

Hyponatremia occurs in a broad spectrum of patients. It affects all age groups and both sexes equally but is most commonly found in elderly persons because of an increase frequency of comorbidities, that can lower serum sodium levels (example cardiac, hepatic or renal failure).[3]

Patients in whom the serum sodium concentration is greater than 130 mEq/L are usually asymptomatic, whereas those in whom these values are lower may have symptoms. Symptoms occurring early in hyponatremia are usually anorexia, nausea, vomiting. Some patients may have headache and irritability. As serum sodium levels falls further patients develop neuropsychiatry symptoms. These symptoms range from restlessness, altered consciousness, lethargy, seizures to coma. There are serious neurological sequelae associated with hyponatremia and its management.[4]

As the symptomatology varies markedly the diagnosis of hyponatremia is difficult to establish. Thorough evaluation for hyponatremia mandates accurate history taking and clinical examination along with various investigations. Prompt recognition and optimal management of hyponatremia in hospitalized patients may reduce in-hospital mortality and symptom severity, allow for less intensive hospital care, decrease the duration of hospitalization and associated costs, and improve the treatment of underlying comorbid conditions and patient's quality of life.[5]

MATERIALS AND METHODS

This is an observational study done in the Department of Neurosurgery, Kurnool Medical College & GGH, Kurnool. 30 patients undergoing elective & emergency neurosurgical procedures at all age groups were included. The study period was 6 months from August 2022 to January 2023. Patients on pharmacotherapy affecting body electrolytes, those who had comorbidities with associated sodium abnormality and spine surgeries were excluded from the

study. To diagnose hyponatremia, the serum sodium cut off level was taken as less than 135 mEq/L.

The sample size was calculated as 61 with a prevalence of 62 % from a study. Informed consent was obtained from each patient. All relevant data as per the structured questionnaire was used for data collection. This includes a detailed history of comorbidities and assessment of the general physical status of the patient along with complete physical and systemic examination. Basic & relevant investigations were noted for confirmation of diagnosis and preoperative workup.

Pre-operative serum sodium was noted in all patients undergoing both elective and emergency neurosurgeries. Duration of surgery, type and amount of IVF given were noted. Majority of our patients had mild hyponatremia who were managed with avoidance of hypotonic intravascular fluid and drugs causing electrolyte imbalance. Patients with decreasing trend in serum sodium levels associated with clinical deterioration were managed with hypertonic saline. A structured questionnaire was used for data collection.

The statistical analysis was done by entering data into a Microsoft Excel sheet and analysed using Statistical Package for Social Sciences (SPSS) software. Descriptive statistics frequency analysis and percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables.

RESULTS

Majority of patients came between 41 to 50 years, of which 18 (60.7 %) were emergency cases and 12 (39.3 %) were elective. The prevalence of hyponatremia among the study population was found to be 34.4 % pre-operatively. To diagnose hyponatremia, the serum sodium cut off level was taken as less than 135 mEq/L.

S.No	Gender	N (%)
1	Male	22 (75%)
2	Female	8 (25%)
3	Total	30 (100%)

Table 1: Gender distribution

	Number of patients	Percentage
Traumatic brain injury	16	57.4
Subarachnoid haemorrhage (non-traumatic)	4	11.5
Intracranial tumours	10	31.1
Total	30	7100

Table 2: Diagnosis distribution

Plasma Sodium Level	Percentage
Normal	**66%**
Mild	26%
Moderate	8%

Table 3: Distribution of the Study Population According to Different Levels of Serum Sodium

Mild hyponatremia was found to be higher among SAH patients whereas moderate hyponatremia was found to be higher among TBI patients. It was found that the prevalence of hyponatremia was higher among patients above 60 years 13 (72.2 %), P value < 0.01. 62.5 % of patients above 70 years, 44.4 % patients between 51 to 60 years and 40 % of patients between 61 and 70 years presented with mild hyponatremia. 37.5 % patients above 70 years and 10 % patients between 61 and 70 years presented with moderate hyponatremia.

DISCUSSION

In our study, the prevalence of hyponatremia was found to be 34.4 %. A similar study of hyponatremia in neurosurgical patients conducted by Rocha–Rivera et al. where a total of 79 patients were included to assess the incidence, most frequent diagnosis was a head injury which is comparable with our study but the incidence of hyponatremia was 25.3 %. The median age was 40 years, 73.4 % was male. They also observed that patients with a diagnosis of subarachnoid haemorrhage were 8 times more likely to have hyponatremia.[6]

Prevalence of hyponatremia in ambulatory hospital care setting ranges between 11 % to 21 % and increased to 28.2 % in acutely hospitalized patients. The lower limit of sodium taken in our study was 135 which justifies the higher prevalence of hyponatremia in the preoperative period. Our hospital is a tertiary care referral Centre which explains the higher prevalence of hyponatremia in the study population.[7]

Our study population included patients with traumatic brain injury (57.4 %) non-traumatic subarachnoid haemorrhage (11.4 %) intracranial tumours (31.1 %) and pituitary surgery. A similar study by Zahra chitsazian et al. conducted in 2012 on 95 patients with various types of brain injuries showed a prevalence of 31.6 % of hyponatremia which is comparable with our study. They also observed that it was developed during the second week of hospitalization. [8]

Sherlock et al. in a study on 1698 patients with brain injury also showed a 41.7 mean age for hyponatraemic patients, they couldn't find any meaningful correlation between hyponatremia age and sex.[9]

A study conducted by Mark J Hannon in 2014 concluded that hyponatremia is associated with increased morbidity and mortality in hospitalized patients and is common in neurosurgical

patients. They also concluded that the most common cause following neurotrauma being SIADH and cerebral salt wasting is very rare in this setting.[10]

CONCLUSION

Our study showed the prevalence of hyponatremia in 34.4% of neurosurgical patients which is more than orthopaedic and general surgery patients, which demands effective approaches for an accurate and timely diagnosis of this electrolyte disorder thereby preventing the occurrence of life-threatening complications due to a low serum sodium concentration. Although hyponatremia is often mild and self limiting, treatment with fluid restriction is generally unsatisfactory. The use of hypertonic saline is still the treatment of choice for acute symptomatic hyponatremia. It is also essential to differentiate between SIADH and CSW as the treatment modalities are entirely different for these two entities. Hyponatremia frequently occurs in patients with TBI, SAH and intracranial tumours and there is evidence that it is associated with increased morbidity. However, further prospective studies are needed for aetiological evaluation and development of a protocol based management.

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