



## A STUDY OF SYMPTOMATIC HYPONATREMIA IN ELDERLY PATIENTS BASED ON HOSPITAL ADMISSIONS

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### ABSTRACT

One of the commonest electrolyte disturbance in elderly hospitalised patients is hyponatremia. As there is no proper profiling for symptomatic hyponatremia in elderly patients. So our objective is to study the clinical features and the etiology of hyponatremia in hospitalized elderly patients and to classify the severity of hyponatremia in hospitalized elderly. All elderly patients admitted in ICU with serum sodium level of  $\leq 125$  mmol/L were included in our study. 50 such symptomatic patients were studied. CNS symptoms included were drowsiness, lethargy, confusion, seizures and coma. There was female preponderance for cases (55%). common co-morbid conditions were Hypertension (62%) and diabetes mellitus (51%). The common cause of Hyponatremia was SIADH (30) followed by drugs of which diuretics was the main contributor. Hence Hyponatremia was common in females than male counterparts and they better tolerate than them. Diuretics should be cautiously used in elderly patients.

### KEYWORDS :

#### INTRODUCTION

Disorders of sodium and water are common in hospitalised inpatients than in the outpatients. Both hyponatremia and hypernatremia causes morbidity and mortality. Incorrect treatment can also add to the problem. Hyponatremia is defined as a serum sodium concentration of less than 135 mEq per L.<sup>1, 2</sup> Patients with clinically significant hyponatremia usually present with nonspecific or neurological symptoms attributable to cerebral edema. When coupled with history of altered fluid balance, these symptoms suggest the possibility of hyponatremia, which can cause substantial morbidity and mortality.<sup>3</sup> Studies also suggest that hyponatremia may be present in 15 to 22% percent of patients in chronic care facilities.<sup>1</sup> The incidence is still more in the elderly owing to the impaired ability to maintain water and electrolyte homeostasis in response to dietary and environmental changes.<sup>4</sup> The management has to be modified due to physiological changes with age affecting the renal and other systems. As data regarding the incidence of hyponatremia in elderly is limited. This study was done to know the common clinical features and etiology of hyponatremia in elderly hospitalized patients and to correlate the outcome of these patients with admission serum sodium levels.

#### MATERIALS AND METHODS

The study was done between 1<sup>st</sup> of July 2017 and 31 of February 2018 in our institution. Elderly patients (60 yrs and older) admitted in Medical Intensive Care Unit (ICU) with admission diagnosis of symptomatic hyponatremia (serum sodium  $\leq 125$  mmol/L) were included in the study. Relevant history, symptoms and signs at presentation, past history, drug history and examination findings were noted. Volemic status of the patient was also assessed. Routine blood -complete blood count, renal function test, electrolytes, liver function tests, serum osmolality, urine routine, urine osmolality, chest radiograph and imaging studies were done to rule out other co-morbid conditions. Serum cortisol level and Serum T3, T4 and TSH were done when indicated. All patients were treated for hyponatremia based on the hospital protocol. The normal range of the sodium in our laboratory is 135-145 mmol/L. Serum and urine osmolality were measured. The normal range for serum and urine osmolality are 275-293 mOsm/Kg H<sub>2</sub>O and 500-850 mOsm/Kg H<sub>2</sub>O respectively.

#### STATISTICAL ANALYSIS

Excel (Microsoft Office 2007) and SPSS (SPSS inc, Chicago) software packages were used for data entry and analysis. The student 't' test was used to determine whether there was a statistical difference between improved and expired subjects in the parameters measured. The Proportions were compared using Chi-square test of significance. One way analysis of variance was used to test the difference between the groups. In all the above test "p" value of less than 0.05 was accepted as indicating statistical significance.

#### Presenting Symptom On Admission:

Symptom	Percentage %
Drowsiness	32
Irrelevant speech	31
Lethargy	28
Headache	9
Unresponsiveness	6
Seizure	4
Disturbed sleep	3
confusion	2

#### Percentage Of Different Hyponatremia In The Study:

TYPE OF HYPONATREMIA	PERCENTAGE
Hypovolemic Hypo osmolar	25
Hypervolemic Hypo osmolar	28
Isovolemic Hypo osmolar	57

#### Common Causes Of Hyponatremia In Elderly

CAUSE	PERCENTAGE
Cirrhosis	2
CSW	2
CCF	5
Hypothyroidism	4
GI loss	12
Renal loss	21
Drug induced	24
SIADH	30

#### RESULTS

Among elderly patients admitted to medical ICU during 8 month period, 39% had serum Sodium  $< 135$  mmol/L and 8% had serum Sodium  $\leq 125$  mmol/L. The mean age of patients with hyponatremia in this study was 72 years with a range of 60 to 99 yrs. Among them 26 were females and 24 were males with preponderance of hyponatremia in females. The mean sodium level on admission was 112 mMol/L and after correction was 128 mMol/L.

#### DISCUSSION

Lethargy, drowsiness with slow response and irrelevant talk were the common presenting symptoms in our study (table 1). Since the CT scan did not show any structural abnormality, these symptoms were attributed to hyponatremia. Some of them also presented with other non-CNS symptoms like abdominal pain, reduced appetite which could not be explained by hyponatremia. On admission, 57% were euvolemic, 28% were overloaded and 25% were dehydrated. The most common presentation of hyponatremia noted in our study was Isovolemic Hypo-osmolar hyponatremia (table 2).

There was no significant difference when the type of hyponatremia was analyzed with the outcome ( $p > 0.2559$ ). The common co-morbid

conditions were Hypertension (62%), diabetes mellitus (51%), renal failure (23%) and ischemic heart disease (17%). The common causes of hyponatremia were SIADH (30%) followed by Drugs (24%). Frusemide (16%), Mannitol (3%), Metazolone (3%) and Cisplatin (2%) were the drugs found to be associated with drug induced hyponatremia. None of them were on Diuretics when SIADH was found to be the cause of hyponatremia.<sup>10</sup> patients succumbed to their primary illness with possible significant contribution secondary to hyponatremia. This study was done keeping in view of frequent occurrence of hyponatremia in elderly sick patients who are already at increased risk of development of electrolyte disturbance due to age related physiological change in function of the kidneys and other comorbid illness.

The prevalence was more in females than males in our study. Chronic hyponatremia is common in postmenopausal women.<sup>5</sup> Studies have shown that female gender by itself is an important risk factor for the development of severe complications.<sup>6</sup> 60% of the cases in a prospective study on hyponatremia by Clayton et al were females.<sup>4</sup> Increased intracranial space as a result of age related brain atrophy also play an important role in brains adaptation to hyponatremia in postmenopausal females. There are evidence to support this- the elderly female rat brain to hyponatremia is highly dependent on physical factors like brain-to-skull size ratio. These finding suggest that even in presence of cerebral edema, if brain is able to swell without a significant increase of intracranial pressure, possibility of patients survival may be increased.

Only 4% of the total patients presented with seizures in this study. Studies shows that both aging and male gender confer protection against hyponatremia induced seizures due to unclear reasons.<sup>7</sup>

Most of the patients had multiple co-morbid conditions of which hypertension and diabetes were the most common. Glucose is an osmotically active molecule. hyperglycemia induces fall in serum sodium levels by shifting water from intra cellular to extracellular compartments. It has been calculated that for every 5mmol/L rise in glucose levels, serum sodium falls by 1.6 to 2.4 mmol/L.<sup>8</sup>

Hyponatremic hypertensive syndrome is a known entity, the most common association being, patients with essential hypertension on diuretics.<sup>9</sup> Most of the hypertensive patients in our study group were on thiazide or potassium sparing diuretics which are known to interfere with electrolyte metabolism and cause electrolyte imbalance. Thiazide diuretics along with effect on sodium-chloride co-transporter channel, can cause non-osmotic release of vasopressin.<sup>10</sup>

SIADH was the most common cause of hyponatremia in this study. almost half the patients with severe hyponatremia had SIADH in the study done by Clayton et al.<sup>4</sup> Laczi, in his Hungarian study reported that SIADH was the most common cause of euvolemic hyponatremia.<sup>11</sup>

Of all the etiologies, the worrisome cause is Drug induced hyponatremia secondary to diuretics. Many studies reported that drugs especially, thiazide diuretics are the major cause of hyponatremia in elderly.<sup>3,5,12,13</sup> Though JNC VIII recommends, diuretics as first line of drugs for treatment of hypertension, caution should be maintained while prescribing diuretics in elderly with modification of required doses according to body weight and should begin with lowest doses.

Many studies in the past indicate a higher mortality in the elderly patients with severe hyponatremia, with mortality ranging from 33% to 86%.<sup>14</sup> In the present study the mortality rate was 20%. Sterns reported a mortality rate of 5% when the serum sodium levels was <105 mmol/L.<sup>14</sup>

When the mortality outcomes were compared with respect to gender distribution it was noticed that females though had higher incidence of hyponatremia, responded better to treatment compared to males with hyponatremia (p=0.0026).

Baran et al reported that the association of hyponatremia and outcome was not causal, rather it appears to be a marker of an underlying disease which carries poor prognosis.<sup>15</sup>

## CONCLUSION

Hyponatremia is common in female, SIADH being the most common cause. diuretics should be used in caution in elderly to prevent symptomatic hyponatremia and hospital admissions.

## REFERENCES

1. Janicic N, Verbalis JG. Evaluation and management of hyposmolality in hospitalized patients. *Endocrinol Metab Clin North Am* 2003;32:459-481.
2. Schrier R. The patient with hyponatremia or hypernatremia. In: Schrier RW, ed. *Manual of Nephrology*. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2000:21-36.
3. Adrogue H, Madias N. Hyponatremia. *N Engl J Med* 2000;342:1581-1589.
4. Clayton J.A., Le Jeune I.R., Hall I.P. Severe hyponatraemia in medical in-patients: aetiology, assessment and outcome. *QJ Med* 2006;99:505-511
5. Naureen Tareen, David Martins, Glenn Nagami, Barton Levine, Keith C. Norris. Sodium Disorders in the Elderly. *J Natl Med Assoc* 2005;97:217-224
6. Ayus JC, Arieff AI. Chronic hyponatremic encephalopathy in postmenopausal women: association of therapies with morbidity and mortality. *JAMA* 1999;281:2299-2304.
7. Arieff AI, Kucharczyk J, Ayus JC, et al. Age, gender and vasopressin affect survival and brain adaptation in rats with metabolic encephalopathy. *Am J Physiol* 1995;268:143-1152.
8. Hillier TA, Abbott RD, Barrett EJ. Hyponatremia: evaluating the correction factor for hyperglycemia. *Am J Med* 1999;106:399-403.
9. Agarwal M, Lynn KL, Richards AM, Nicholls G. Hyponatremic- Hypertensive Syndrome with Renal Ischemia: An Underrecognized Disorder. *Hypertension* 1999;33:1020-1024
10. Hamburger S, Koprivica B, Ellerbeck E, Covinsky JO. Thiazide-induced syndrome of inappropriate secretion of antidiuretic hormone. Time course of resolution. *JAMA* 1981;246:1235-1236.
11. Laczi F. [Etiology, diagnostics and therapy of hyponatremias] [Article in Hungarian]. *Orv Hetil* 2008;149:1347-54.
12. Reynolds RM, Padfield PL, Seckl JR. Disorders of sodium balance. *BMJ* 2006;332:702-5
13. Gerard McDade. Hyponatraemia and drug use (and abuse). *BMJ* 2006;332:853
14. Sterns, RH. Severe symptomatic hyponatremia: treatment and outcome. A study of 64 cases. *Ann Intern Med* 1987;107:656-664.
15. Baran D, Hutchinson TA. The outcome of hyponatremia in a general hospital population. *Clin Nephrol* 1984;22:72-6.