

# Study of Clinical Presentation and Etiology of Patients Admitted with Hyponatremia

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## ABSTRACT

**Introduction:** Hyponatremia is one of the commonest electrolyte disorders among hospitalized patients which is a manifestation of various diseases. Identifying the etiology and risk factors for hyponatremia will help in reducing its incidence in hospitalized patients and minimize the complications associated.

**Material and methods:** The Prospective observational study involved a sample size of 200 patients and was carried out over a period of 18 months from November 2018 to April 2020. Patients admitted under department of General Medicine in Northern Railway Central Hospital, New Delhi with hyponatremia (serum sodium level <135meq/l) and age >18 years were enrolled in the study.

**Results:** Symptoms of hyponatremia range from asymptomatic to mild ones (nausea, headache, and lethargy) to severe symptoms (seizures and coma). Hypertension (43%) and diabetes mellitus (23.5%) were the commonest comorbid conditions in cases of hyponatremia. Chronic Kidney disease was observed to be the most common cause of Hypervolemic hyponatremia followed by Heart Failure. It was observed in our study that Hypervolemic hyponatremia was the most common type comprising of followed by Hypovolemic hyponatremia and Euvolemic hyponatremia. The most common causes of Hypovolemic hyponatremia were vomiting, use of diuretics and diarrhea. Among Euvolemic hyponatremia, SIADH was the most common cause followed by Hypothyroidism, Poor oral intake, HFU (Hypotonic fluid use) and Post-op HFU.

**Conclusion:** Hyponatremia, being an electrolyte imbalance, may lead to catastrophe, if not recognized and treated correctly. The recognition of risk factor and timely intervention are thus, imperative in the treatment of sodium imbalance.

**Keywords:** Hyponatremia, Sodium, SIADH, CKD

## INTRODUCTION

Hyponatremia is defined as serum sodium level <135meq/l. Hyponatremia is one of the commonest electrolyte disorders among hospitalized patients, occurring in upto 22% of them<sup>1</sup>. It is not a disease but a manifestation of various disorders. An abnormal sodium level does not necessarily imply abnormal sodium balance, but can be due to abnormal water balance as well<sup>2</sup>. It occurs primarily due to imbalance in water homeostasis, antidiuretic hormone (ADH) regulation, and renal handling of filtered sodium. Clinical manifestations of hyponatremia are related to osmotic water shift leading to increased intracellular fluid accumulation, neuronal swelling and cerebral oedema. It is more common in the elderly patients with multiple medical comorbidities. Hyponatremia has also been associated with considerable morbidity and

mortality in many chronic diseases<sup>3</sup>.

Joint European guidelines classify hyponatremia according to serum sodium concentration<sup>4</sup>:

- Mild: 130-134 mmol/L
- Moderate: 125-129 mmol/L
- Profound: <125 mmol/L

Identifying the etiology and risk factors for hyponatremia will help in reducing its incidence in hospitalized patients and minimize the complications associated. Hence this study was undertaken in hospitalized patients to assess the clinical profile and etiology of hyponatremia, not only to aid in the treatment of patients but also to prevent further morbidity and mortality.

## MATERIAL AND METHODS

The Prospective observational study involved a sample size of 200 patients and was carried out over a period of 18 months from November 2018 to April 2020. The study was approved by the ethical committee of Northern Railway Central Hospital, New Delhi. Patients admitted under department of General Medicine in Northern Railway Central Hospital, New Delhi with hyponatremia ( serum sodium level <135meq/l) and age >18 years, were enrolled in the study. Patients who were referred or lost in the follow up, those having severe hyperglycemia (Blood Sugar >400 mg/dl) and hyperlipidemia, known cases of paraproteinemias, patients on mannitol therapy or with recent major surgery or head trauma, patients with severe malnutrition were excluded from the study.

Detailed history was taken which included history of fluid loss (e.g., vomiting, diarrhea, diuretic therapy) and compulsive fluid ingestion. History consistent with one of the causes of SIADH, such as small cell carcinoma or central nervous system disease was also obtained. On examination, signs of extracellular volume depletion such as decreased skin turgor and a low jugular venous pressure, signs of peripheral edema and/or ascites which can be due to heart failure, cirrhosis or renal failure and signs suggestive of adrenal insufficiency or hypothyroidism were elicited.

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Investigations included Complete blood count – Hemoglobin (Hb), total leukocyte count (TLC), differential leukocyte count (DLC) and platelet count, Serum Urea, Serum Creatinine, Random Blood Sugar (RBS), Urine routine examination (RE) and microscopic examination (ME) and specific gravity, Serum electrolytes and Serum osmolality. Urine osmolality was done in patients with hypo-osmolar hyponatremia (serum osmolality < 270 mOsm/L), by freezing point depression method and Urine spot sodium was asked for in patients with hypo-osmolar hyponatremia (serum osmolality < 270 mOsm/L).

Excel and SPSS (Statistical Package for Social Sciences) software, version 19 were used for data entry and analysis

## RESULTS

Out of the total 200 patients enrolled in the study, the maximum numbers of patients were in the age group 61 – 70 yrs (39.5%). 70.5% of the total patients were between

the age 51 to 80 years, the mean age being 56.5 years. 78 patients were female and 122 were male.

Total 96 (48%) patients were asymptomatic with documented hyponatremia. Among them, 20 patients had mild hyponatremia, 69 patients had moderate and 7 patients had severe hyponatremia. The lowest serum sodium level among asymptomatic patients was 119 meq/L (Mean- 127.95 meq/L; SD- 2.22 meq/L).

Among symptomatic cases (52%), several patients had combination of symptoms. All the patients had lethargy, 17.5% patients had altered sensorium due to hyponatremia and 30% had postural dizziness. 3.5% patients had seizures at the time of presentation. None of the patient had coma due to hyponatremia.[Table 1]

A significant number of patients had pre-existing illness. 86 (43%) had Hypertension while 47 (23.5%) had Diabetes Mellitus, 36(18%) had chronic kidney disease (CKD), 23 (11.5%) had congestive heart failure (HF), 17 (8.5%) had

Symptoms	Severity of Hyponatremia			Total Patients	Percentage (%)
	Mild	Moderate	Severe		
Asympomatic	20	69	7	96	48
Lethargy	0	37	67	104	52
Postural dizziness	0	40	20	60	30
Seizure	0	1	6	7	3.5
Altered sensorium	0	2	33	35	17.5
Coma	0	0	0	0	0

**Table-1:** Frequency of symptoms and severity of hyponatremia

Pre-existing comorbidity	Severity of Hyponatremia			Total Patients	Percentage (%)
	Mild	Moderate	Severe		
Hypertension	7	52	27	86	43
Diabetes Mellitus	2	28	17	47	23.5
Heart failure	2	12	9	23	11.5
Chronic Liver Disease	1	6	10	17	8.5
Chronic kidney Disease	0	23	13	36	18
Adrenal insufficiency	0	0	3	3	1.5
Hypothyroidism	2	6	1	9	4.5

**Table-2:** Distribution of pre-existing illnesses

Etiology	Severity of Hyponatremia			Total Patients	Percentage (%)
	Mild	Moderate	Severe		
Poor Oral Intake	0	1	7	8	4
Hypothyroidism	2	6	1	9	4.5
Vomiting	4	20	5	29	14.5
Heart Failure	2	12	9	23	11.5
Chronic Kidney Disease	0	23	13	36	18
SIADH	1	6	20	27	13.5
Diuretics	5	20	3	28	14
Adrenal Insufficiency	0	0	3	3	1.5
Hypotonic Fluid Use	3	4	0	7	3.5
Cerebrovascular Accident	0	0	1	1	0.5
Chronic Liver Disease	1	6	10	17	8.5
Post-op Hypotonic Fluid Use	1	0	0	1	0.5
Diarrhoea	1	8	2	11	5.5
Total	20	106	74	200	100

**Table-3:** Etiology of hyponatremic patients with severity

Types	Severity of Hyponatremia			Total patients	Percentage (%)
	Mild	Moderate	Severe		
Hypovolemic	10	48	13	71	35.5
Euvolemic	7	17	29	53	26.5
Hypervolemic	3	41	32	76	38
Total	20	106	74	200	100

**Table-4:** Clinical categories of patients with hyponatremia

chronic liver disease (CLD) and 9 (4.5%) patients had hypothyroidism and 3 (1.5%) had Adrenal Insufficiency. [Table 2]

Chronic Kidney Disease was observed to be the most common cause of hyponatremia in this study (n=36) followed by vomiting (n=29), use of diuretics (n=28), SIADH (n=27), HF (Heart Failure) (n=23), CLD (Chronic Liver Disease) (n=17), diarrhea (n=11), Hypothyroidism (n=9), POO (Poor oral intake) (n=8), HFU (Hypotonic fluid use) (n=7), AI (Adrenal insufficiency) (n=3), CVA (Cerebrovascular accident) (n=1) and Post-op HFU (n=1). [Table 3]

Among patients taking diuretics, 27 patients were on thiazide diuretics alone, 3 patients were taking a combination of both loop diuretics and thiazide diuretics, 12 were taking a combination of both loop diuretics and spironolactone and 14 patients were taking only loop diuretics.

It has been observed that 38% of the patients were hypervolemic, 35.5% of the patients were hypovolemic and only 26.5% were euvolemic. [Table 4]

## DISCUSSION

Hyponatremia is one of the commonest electrolyte abnormalities observed among hospitalized patients. It is seen mainly in elderly population<sup>5</sup>. The condition is important to recognize because of the potential morbidity, mortality, and the economic impact on the patient and the health care. Symptoms range from nausea and malaise, with mild reduction in sodium, to lethargy, decreased level of consciousness, headache, seizures and coma in severe cases. Overt neurological symptoms most often are due to very low serum sodium levels usually <115 mEq/L, resulting in intracerebral osmotic fluid shifts, and brain edema. It is associated with a plethora of underlying disease states and its multiple etiologies with differing pathophysiological mechanism makes diagnosis challenging<sup>6</sup>. This study was as an attempt to describe the clinical profile and to find the etiology among patients with mild-to-severe hyponatremia. Out of 200 patients included in our study, the majority were in the age group of >50 years (70.5%). Bilal Pathan et al had observed the similar age distribution with majority of the patients (25%) were from the age group of 61-70 years<sup>7</sup>. Thomas Abraham Vurgese et al, from Kuwait reported similar finding in their study, where the commonest age group was 45-64 years and the mean age was 57 years<sup>8</sup>. The higher incidence in the elderly may be explained by the impaired water and electrolyte homeostasis due to dietary and environmental variations<sup>9</sup>. The elderly were more likely to have comorbid conditions that predispose to hyponatremia such as diabetes, hypertension and ischemic heart disease.

They are also more likely to be on drugs such as ACE-I and diuretics, which produce hyponatremia. In our study, slight male preponderance was noted. A similar gender distribution pattern was reported by Rahil A I et al.<sup>10</sup>, Sunayana et al<sup>11</sup> and Nandini et al<sup>12</sup>.

Symptoms of hyponatremia range from mild (nausea, headache, and lethargy) to severe (seizures and coma)<sup>13</sup>. In our study 48% patients were asymptomatic at presentation. Among symptomatic cases (52%), several patients had combination of symptoms. All the symptomatic patients had lethargy. CNS symptoms such as altered sensorium and seizures were high in patients with severe hyponatremia as compared to moderate or mild hyponatremia. None of the patient had coma due to hyponatremia. Nandini et al<sup>12</sup> observed that largest percentage of patients (48.2%) were asymptomatic and 4.47% patients had seizures, correlating with our study. Aqeel Raheem et al observed that symptoms attributable to hyponatremia such as mental confusion, anorexia, nausea, vomiting and headache were nonspecific and may be due to the underlying conditions<sup>14</sup>.

In our study, Hypertension (43%) and diabetes mellitus (23.5%) were the commonest comorbid conditions in cases of hyponatremia which was statistically significant as compared to other comorbid conditions. Similarly, J. R. Rawal et al (2013) observed that the common comorbidities in patients admitted in ICU and having hyponatremia were Hypertension (64.22%) and Diabetes mellitus (32.41%)<sup>15</sup>. Nandakumar et al (2010) observed that the elderly cases were more likely to have comorbid conditions such as diabetes, hypertension and ischemic heart disease<sup>16</sup>. This correlates well with our study. Sumit Mohan et al (2013) noted that hyponatremia was more common in subjects with hypertension, diabetes, coronary artery disease, stroke, chronic obstructive pulmonary disease, cancer, and psychiatric disorders, and less common in those with no comorbidities<sup>17</sup>.

It was observed in our study that Hypervolemic hyponatremia was the most common type comprising of 76 patients (38%) followed by Hypovolemic hyponatremia 71 patients (35.5%) and Euvolemic hyponatremia with 53 patients (26.5%).

Chronic Kidney disease was observed to be the most common cause of Hypervolemic hyponatremia in this study (n=36) followed by Heart Failure (n=23). The most common cause of Hypovolemic hyponatremia was vomiting (n=29), use of diuretics (n=28) and diarrhea (n=11). Among Euvolemic hyponatremia, SIADH (n=27) was the most common cause followed by Hypothyroidism, Poor oral intake, HFU (Hypotonic fluid use) and Post-op HFU. Severity of hyponatremia was found more among hypervolemic and

euvolemic patients.

However, Nandakumar et al (2010)<sup>16</sup>, observed that the most common type of hyponatremia was Euvolemic hyponatremia (54 %) and most common cause was SIADH. Aqeel Raheem et al (2007)<sup>14</sup>, Nandini Chatterjee et al<sup>12</sup> also observed that euvolemic hyponatremia was the most common comprising (52%) of total cases.

Our study is not in agreement with these authors. Clinical assessment of hydration status of patient may be challenging and thus may affect their clinical classification.

Among the patients on diuretic therapy, thiazide was the most common cause of hyponatremia in this study. This observation was in agreement with the study done by Rahil A I and Khan F Y et al<sup>10</sup>, Sumit Mohan et al<sup>17</sup>, Thomas Antony et al<sup>5</sup>.

In the present study, majority of the patients eventually recovered and mortality was noted only in few patients.

## CONCLUSION

Hyponatremia, being an electrolyte imbalance, may lead to catastrophe, if not recognized and treated correctly. The recognition of risk factor is, thus, imperative in the treatment of sodium imbalance. It has been observed to be associated with many grievous conditions like CKD, heart failure, liver cirrhosis etc, hence proper appraisal is crucial in initiation of treatment.

From our study, we can infer that hyponatremia is most common in elderly with increased severity of hyponatremia with increasing age which may possibly be due to associated comorbidities and medications. Hypertension and diabetes mellitus were frequently associated comorbidities with hyponatremia.

Most of the patients were asymptomatic at presentation, while the symptomatic patients had lethargy, altered sensorium and postural dizziness. Only a handful had seizures at the time of presentation and none of the patient had coma due to hyponatremia.

Chronic Kidney Disease, Heart Failure, vomiting, use of diuretics, diarrhea, SIADH, Hypothyroidism, POO (Poor oral intake), HFU (Hypotonic fluid use), Post-op HFU were the conditions found to be associated with hyponatremia in our study.

Because of the association of such variety of disorders with hyponatremia, the importance of proper identification of etiology and clinical presentation is paramount. A systematic approach to the diagnosis with the application of diagnostic algorithms using history, clinical examination and laboratory findings is essential to initiate proper management and hence prevent mortality and morbidity.

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