



## CLINICAL PROFILE OF PATIENTS OF HYONATREMIA IN A TERTIARY CARE CENTRE

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### ABSTRACT

**Background:** The prompt recognition 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 co morbid conditions and patients' quality of life.

**Methods:** The patients admitted in medical wards, aged > 18 years with serum sodium levels less than 135 mEq/L were included in the study.

**Results:** Out of 120 patients there were 83 (69%) males. Altered sensorium 43 (35.8%), shortness of breath 30 (25%), vomiting 20 (16.7%), fatigue 18 (15%) and dizziness 14 (11.7%), headache (6.7%), seizures (6.7%) and anorexia (6.7%) were main symptoms at presentation to hospital. The euvoletic hyponatremia was most common in 65 (54.2%), followed by hypervolemic in 41 (34.2%) and hypovolemic in 14 (11.7%) patients. 66 (55%) patients had moderately severe, 42 (35%) had severe hyponatremia and 12 (10%) cases were of mild severity of hyponatremia. Kidney disease, 33 (27.5%), diabetes mellitus 28 (23.3%), recurrent vomiting (16.7%), drug induced (12.5%) and alcohol induced (8.3%) were main underlying etiologies associated with hyponatremia.

**Conclusion:** In this study of hyponatremia in hospitalized patients, about one third patients presented with altered sensorium and seizure and anorexia were noted only in minority. The majority of patients had moderately severe and severe hyponatremia. The euvoletic hyponatremia was noted in more than half of patients of hyponatremia. The kidney diseases, diabetes mellitus and hypothyroidism were main co-associated morbidities in the study group. The thiazide diuretic was most common diuretic culprit for drug induced hyponatremia.

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## INTRODUCTION

Hyponatremia is a common medical problem usually seen among hospitalized patients. Unidentified hyponatremia can be life threatening. Prompt recognition and treatment of hyponatremia is life saving. Hyponatremia is defined as plasma sodium concentration <135 meq/l. Hyponatremia is seen in up to 22% of hospitalized patients [1].<sup>1</sup> It is commonly seen in the elderly patients, mainly due to impaired water and electrolyte balance in response to diet, drugs and environmental changes.

Its prevalence among non-hospitalized elderly patients has been estimated to be between 7-11.4%, increasing to 11-22.5% among hospitalized patients.<sup>1</sup>

Serum sodium levels and serum osmolality are normally maintained under precise control by homeostatic mechanisms involving thirst, anti-diuretic hormone and the renal handling of filtered sodium.

Hyponatremia occurs in a broad spectrum of patients who are asymptomatic or critically ill. It occurs due to disruption of sodium and water homeostasis, normally maintained by complex multisystem physiological mechanism. Hyponatremia can be due to medications- diuretics, antidepressants and pain medications. Heart, kidney and liver problems, SIADH, chronic severe vomiting or diarrhea are other causes of hyponatremia.<sup>2</sup>

Majority of patients with hyponatremia are asymptomatic. Most patients with hyponatremia have non-specific symptoms, or symptoms due to an underlying disease or disorder. Symptomatology depends more on the rate of development of electrolyte abnormality than on its severity. Clinically hyponatremia is often unrecognized when it is mild or when it develops gradually but severe hyponatremia (serum sodium < 120 mmol/l), particularly of rapid onset, is associated with substantial morbidity and can be life threatening.<sup>3</sup>

The clinical manifestations of hyponatremia are produced by brain swelling and are primarily a function of the rate of fall of serum sodium concentration and not the absolute level.

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Symptoms occurring early in hyponatremia is 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. As the symptomatology vary markedly the diagnosis of hyponatremia is difficult to establish. 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 co morbid conditions and patients' quality of life. So the treating clinician should have a high index of suspicion to diagnose hyponatremia.<sup>2</sup>

Hyponatremia is subdivided diagnostically in to three groups, depending on clinical history and volume status.<sup>4</sup>

**Hypovolemic hyponatremia:** total body water and total sodium are low e.g. gastrointestinal losses and renal sodium losses.

**Euvolemic hyponatremia:** total body water increases but total sodium is normal e.g. hypothroidism and SIADH.

**Hypervolemic hyponatremia:** Both total body water and total sodium increases e.g. heart failure and liver failure.

**Redistributive hyponatremia:** Total body water and total sodium remain unchanged, e.g. hyperglycaemia and after administration of mannitol there is shifting of water from intracellular to extracellular compartment.<sup>5</sup>

**METHODS**

The present study was hospital based prospective study conducted in patients admitted in the medical wards of Indira Gandhi Medical College, Shimla over a period of one year i.e. from 1<sup>st</sup> June 2018 to 31<sup>st</sup> May 2019.

**Operational Definitions**

Hyponatremia was classified according to serum sodium level

Mild: 130-135mmol/l  
 Moderate: 120-129mmol/l  
 Severe: <120mmol/l

**Acute hyponatremia** was defined as onset of symptoms within 48 hours

**Chronic hyponatremia** was defined as onset of symptomatic for > 48 hours.

**Severity of hyponatremia according to symptoms**

**Moderately symptomatic:** with nausea without vomiting, headache, confusion.

**Severely symptomatic:** with vomiting, cardiorespiratory distress, seizure and glassgow comma scale below 8.<sup>5</sup>

**Inclusion Criteria**

Indoor patients of medical wards with serum sodium levels less than 135 mEq/L of age > 18 years or more were selected for the study.

**Exclusion Criteria**

- Patients of age less than 18 years.
- Indoor patients of medical wards with serum sodium levels > 135 mEq/L.

Patients suspected to have metabolic derangement were evaluated for biochemical abnormalities. The blood samples of these patients were sent for analysis within twenty minutes after the collection of samples. A detailed history was delineated with special thrust to the events occurring prior to admission and the symptomatology whatsoever these patients manifested at the time of admission were recorded. The information thus obtained was recorded in the performa.

The data was entered in excel sheet and was analyzed using Epi-info software. Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance.

**RESULTS**

Out of 120 patients there were 83 (69%) males and 37 (31%) females with male to female ratio was 1:2.24. The mean age of patients was 57.89±18.57.

**Table 1** Distribution of symptoms of hyponatremia (n=120)

Symptom	(n)	(%)
Altered sensorium	43	35.8
Nausea	3	2.5
Vomiting	20	16.7
Headache	8	6.7
Shortness of Breath	30	25
Fatigue	18	15
Dizziness	14	11.7
Seizure	8	6.7
Anorexia	8	6.7

The distribution of symptoms at admission is given in Table 1. The etiology of hyponatremia among patients in the study group is given in Table 2.

**Table 2** Etiology of hyponatremia (n=120)

ETIOLOGY	(n)	(%)
Kidney Disease	33	27.5
Diabetes Mellitus	28	23.3
Recurrent Vomiting	20	16.7
Drug Induced	15	12.5
Alcohol Induced	10	8.3
Chronic Liver Disease	6	5
Heart Diseases	5	4.2
SIADH	5	4.2
Tuberculosis	9	7.5
Hypertension	21	17.5

**Table 3** Classification of types of hyponatremia (n=120)

Type of Hyponatremia	(n)	(%)
Euvolemic	65	54.2
Hypervolemic	41	34.2
Hypovolemic	14	11.7

**Table 4** Distribution of Patients on the basis of severity of hyponatremia (n=120)

Severity	(n)	(%)
Mild	12	10
Moderate	66	55
Severe	42	35

**Table 5** Mean and SD of sodium, serum and urine osmolality

Type of Hyponatremia	Sodium (Mean±SD)	Serum Osmolality (Mean±SD)	Urine Osmolality (Mean±SD)
Euvolemic	123.62±78.05	254.4±17.51	316.28±102.21
Hypervolemic	122.45±19.97	280.8±21.17	286.36±32.97
Hypovolemic	165.64±159.92	267.64±23.69	300.31±71.81

In present study of 120 cases of hyponatremia, 12 (10%) cases were of mild severity, 66 (55%) were moderately severe and 42 (35%) cases were having severe hyponatremia and euvolemic hyponatremia the most common type of hyponatremia noted in 65 (54.2%).

The details of type and severity of hyponatremia is given in Table 3 and Table 4 respectively. The Mean and SD of sodium, serum and urine osmolality is given Table 5

## DISCUSSION

In our study conducted on 120 patients, there were 83 males and 37 females and male to female ratio was 2.24:1. In general, in our hospital population, there were more males admitted than females, hence, this slight increase in males was not very significant.

In the present study, hyponatremia was seen more commonly in patients above 45 years than in younger patients. The ratio between numbers of patients above 45 years in comparison of below 45 years was 2.52:1. Similar trend was also observed by Hochman<sup>6</sup> and Vurgese<sup>7</sup> in their study has shown that elderly patients were more prone for hyponatremia. The mean age in the present study was 57.89±18.57 years (mean±SD) which was comparable to studies by Anderson<sup>16</sup> where the mean age was 58 years and study done by Vurgese<sup>7</sup> where the mean age was 57.05 ± 2SD. The various factors responsible for hyponatremia in elderly are decreased glomerular filtration rate, impaired ability of kidney to conserve sodium, increased release of arginine vasopressin to a given osmotic stimulus, various drugs taken by them, decreasing appetite and concomitant illnesses.<sup>8</sup>

In present study, only 12 (10%) patients had mild hyponatremia whereas 90% had moderate and severe hyponatremia. The major pre-existing illnesses of the patients observed in our study were kidney diseases including acute and chronic renal failure (33;27.5%), diabetes mellitus (28;23.3%), vomiting (20;16.7%), heart failure (5;4.2%) and chronic liver diseases (6;5%) and hypothyroidism (4;3.3%). In our study diabetes and hypertension were major risk factor for hyponatremia. Patients with diabetes mellitus have hyponatremia possibly due to associated renal failure, SIADH, due to drug therapy and also some amount of pseudo hyponatremia due to excess blood sugar causing hyperosmolar hyponatremia<sup>[2]</sup> and hypertensive patients are prone to hyponatremia due to diuretic use. The studies on hyponatremia have not demonstrated direct correlation between hyponatremia and hypertension, although correlation of hyponatremia with age<sup>9</sup> and diuretic use is evident.<sup>10</sup> Maqbool M *et al* observed that the third most common cause of hyponatremia in their study was gastrointestinal losses in 10 (10%) patients followed by chronic kidney disease 8(8%), chronic liver disease 6(6%) and chronic heart failure in 6(6%) patients.<sup>11</sup>

Diuretic use were the most common cause under drugs for hyponatremia in our study, present in 7/15 (46.6%) of the patients in the study taking medication, out of which 6/15

patients were on thiazide diuretics (40%), 1/15 patient was on combination of thiazide diuretic and SSRI (6.6%) and 1 patient was on ARB (6.6%). Thiazide diuretics are a common cause of severe hyponatraemia.<sup>12</sup> Up to a third of elderly patients taking a thiazide at hospital admission are hyponatremic and 14% of patients prescribed a thiazide diuretic in primary care have a sodium below the normal range.<sup>10,13</sup>

Saeed *et al*<sup>14</sup>, studied hyponatremia in hospitalized patients and in 19 out of 57 patients (33.3%) it was associated with diuretic use. In a study by Huda *et al*<sup>5</sup>, 14 out of 22 (63.6%) patients of hyponatremia on diuretics were taking thiazide diuretics.

SIADH is one of the commonest cause of hyponatremia<sup>2</sup> but in our study there were only 5(4.2%) cases of SIADH. In other studies by Hochman<sup>6</sup>, SIADH represented 28.3% of cases, 34% in the study by Anderson<sup>15</sup> and 34.8% in the study by Vurgese.<sup>7</sup>

Vomiting is one of the strongest known stimuli for ADH release.<sup>2</sup> This was the third most common cause (20; 16.7%) of hyponatremia in our study after the kidney diseases and diabetes.

In our study 10 (8.3%) of patients were alcoholic while Agarwal<sup>16</sup> *et al* observed 13 (18.6%) of patients in their study as alcoholic. Krishnamurthy<sup>17</sup> *et al* observed alcohol intake as etiological factor in 8.1% of their patients. True volume depletion mainly due to gastrointestinal fluid losses represents the chief cause of hyponatraemia in alcoholic patients. Effective volume depletion predisposes toward the development of hyponatraemia by its effects on renal water excretion and thirst. In fact, hypovolaemia is a potent stimulus to ADH secretion, resulting in water retention. Furthermore, volume depletion can directly or indirectly stimulate thirst and consequently increase water intake leading to hyponatremia.<sup>18</sup>

In our study 20 (16.6%) of the patient had multiple etiological factors for hyponatremia. In recent studies varying proportions of the patient have been associated with multiple etiologies of hyponatremia. In study by Clayton<sup>19</sup> *et al* 75% of the patients of hyponatremia had multiple etiologies while in study by Nzerue<sup>20</sup> *et al* only 10.9% of the patients had multiple etiological factors. These studies emphasize the importance of establishing the various factors responsible for hyponatremia in the patient so that relevant corrective measures are taken during the treatment.

The hydration status of the patients was diagnosed on the basis of clinical examination and was divided into euvolemic, hypovolemic and hypervolemic states. In the present study, 65 patients were euvolemic, 41 patients were hypervolemic and 14 patients were hypovolemic representing 54.2%, 34.2% and 11.7% of the patients respectively.

This correlated with other studies where euvolemic, hyponatremia was the commonest. In study by Anderson<sup>15</sup>, 34% had euvolumia, 35% had hypovolumia and 31% had hypervolumia. In study by Hochman<sup>6</sup>, 50% patients had euvolumia, 30.5% had hypovolumia and 19.5% had hypervolumia.

Hence, hyponatremia which is one of the common electrolyte abnormalities encountered in our day to day clinical practice. There is an increasing tendency for it to occur with increasing age, hypertension, diabetes mellitus and use of drugs (diuretics) and with diuretics being used as a preferred choice

of antihypertensive agents especially in the elderly, it is becoming common and can occasionally result in increased morbidity and mortality.<sup>6,15</sup> So, diuretics should be used with caution and in low doses in elderly patients and also close monitoring for serum sodium and potassium should be done in all these patients.

A number of studies have evaluated the incidence and etiology of hyponatremia in general, but there are very few relevant studies related to hyponatremia in inpatients in medical wards. Delineating the cause of hyponatremia is important in order to impart specific treatment tailored to the etiology.

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