

Study of Clinical Profile of Hyponatremia in the Medical Intensive Care Unit at Tertiary Health Care Institute

Dr. Manish Khokhar¹, Dr. N. R. Rahod²

¹M.D. Medicine, Assistant Professor of Medicine, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India

²M.D. Medicine, Department of Medicine, Shri M.P. Shah Government Medical College, Jamnagar, Gujarat, India

1. Introduction

Hyponatremia is the most common electrolyte disturbance with a reported prevalence of up to 22% in hospitalized patients. This disorder is always the result of an increase in circulating AVP and/or increased renal sensitivity to AVP, combined with an intake of free water; a notable exception is hyponatremia due to the low solute intake. The clinical presentation has a wide spectrum, varying from asymptomatic patients to ones having seizures and coma. Symptoms range from nausea and malaise, with mild reduction in the serum sodium, to lethargy, decreased level of consciousness, headache, seizures, and coma. Hyponatremia can be **classified** on the basis of serum osmolality, volume status, and urinary sodium into hypertonic, isotonic and hypotonic types. Hypotonic hyponatremia is further classified into hypervolemic, euvolemic and hypovolemic as follows: 1) **Hypovolemic hyponatremia**: Decreased total body sodium and decreased total body water. The sodium deficit exceeding water deficit. 2) **Euvolemic hyponatremia**: Normal body sodium with an increase in total body water. 3) **Hypervolemic hyponatremia**: Increase in total body sodium with a greater increase in total body water.

The syndrome of inappropriate antidiuretic hormone secretion (**SIADH**) is an important cause of hyponatremia but different aetiologies can dominate in different clinical settings. The incidence is much more in the elderly mainly owing to impaired ability to maintain water and electrolyte homeostasis in response to dietary and environmental changes. Clinically hyponatremia is often unrecognized when it is mild or when it develops slowly. But **severe hyponatremia** (plasma sodium < 120 mEq/L), particularly of rapid onset is associated with substantial morbidity and can be life-threatening. Also moderate to severe hyponatremia bears substantial associated morbidity and mortality. (12) The treatment of hyponatremia depends on the duration of hyponatremia and volume status of the patients. There is a serious neurologic sequel if hyponatremia is inappropriately treated. Hyponatremia is associated with varying morbidity. Morbidity varies widely in severity; serious complications can arise from the disturbances itself as well as from the underlying causative conditions.

2. Aims and Objectives

- 1) To study the clinical profile of the patients admitted with hyponatremia in the medical intensive care unit.
- 2) To study the various etiological factors of hyponatremia among patients admitted to medical intensive care unit.

3. Material and Methods

The present study entitled "Study of clinical profile of hyponatremia in the medical intensive care unit at tertiary health care institute" was carried out in the department of medicine, during the period of December 2015- May 2018

Study Design: Observational descriptive study.

Setting: The present study will be done in the department of medical intensive care unit and tertiary health care institute.

Study Participants: The adult patients admitted to the medical intensive care unit are randomly selected as per the inclusion and exclusion criteria.

Sample Size: 100

Inclusion Criteria

All the patients irrespective of gender, admitted in the medical intensive care unit with documented evidence of hyponatremia. (Defined as a serum sodium level of less than 135 mEq/L.)

Exclusion Criteria

- 1) Pediatric patients below 13 years of age.
- 2) A patient who is not willing to participate in the study.
- 3) Normal values:
- 4) Serum sodium-135-145 mEq/L, Blood sugar level -60-110 mg%, Blood urea level-15-40 mg%, Urine spot sodium level <20 mEq/L, Serum osmolality -280-295 mOsmol/kg/L

Methodology

The present study was conducted in a medical intensive care unit of a tertiary care teaching hospital. A total of 100 patients were included in the present study according to the inclusion and exclusion criteria. Written informed consent was taken from all the patients if they were conscious and alert and from legally acceptable representative if they were unconscious. The detailed history was elicited and

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examination was done as per a proforma with emphasis on the aetiological factors, symptoms, and signs of hyponatremia. The sodium deficit was calculated using the formula:

$$\text{Deficit} = (\text{Normal sodium level} - \text{Measured sodium level}) / \text{Total body water.}$$

Therapy with salt added diet, normal saline and hypertonic saline started singly or in combination based on the severity of the patient's condition, taking care that no more than 1500 mEq of sodium was given in a single day.

Data collection: Case meeting above inclusion criteria have been selected randomly and studied.

Once selected in the study, the following information about patient had been collected:

- 1) Demography: Name, age, sex, address, contact number.
- 2) Detail of admission: chief complaint of a patient for which patient is being admitted in the hospital, the cause for his/her admission and the most probable diagnosis of his/her primary condition.
- 3) Disease status of the patient: the most probable cause for his/her hyponatremia was noted when the patient was enrolled in the study. A detailed history of the complaint and past medical history were reviewed.
- 4) Past significant medical history: the special detailed medical history of diseases like - diabetes mellitus, hypertension, liver disorder, kidney disease, previous neurological disease, pulmonary diseases tumor and malignancy details of chemotherapeutic drugs in case of malignancy.
- 5) Drug history: there was a special emphasis on drug history. Detailed information regarding the particular drug, its dosages, its route of administration, the duration for which the drug was consumed. The following classes of drugs were especially looked for: diuretics, an anti-hypertensive drug, an antipsychotic drug, ACE inhibitor, chemotherapeutic drugs etc.
- 6) Another significant history: every patient has been evaluated for following history: diarrhea/vomiting, headache & fever (s/o meningitis), convulsion, compulsive water drinking, recent head injury.
- 7) Examination of patients: weights of the patient (whenever possible), vitals (pulse rate, blood pressure, etc), edema, JVP/CVP, evidence of dehydration (tongue, skin turgor, CVP), systemic examination (CVS, RS, Per abdominal), neurological examination.
- 8) Laboratory investigations of the patients: the patients have been evaluated with following baseline laboratory investigation, which was also helpful for classifying the type hyponatremia.

Follow up of the patients: patients once enrolled in the study have been followed in regard of his/her neurological status, other symptoms of the hyponatremia and corresponding serum sodium level. The frequency of follow up depends on the basis of symptoms and mode of administration of the therapy for correction of the hyponatremia. Care was taken not to increase serum sodium not more than 12 mEq/L per day. The amount of sodium to be infused was calculated by multiplying deficit in serum sodium concentration by total body water.

The endpoint of the study:

There were two endpoints of the study.

- 1) Discharge of the patient from the study – the patient has been discharged from the study if he/she fulfills any of the two criteria –
 - a) Correction of hyponatremia i.e. serum sodium level >125 mEq/L at any point
 - b) Discharge against medical advice.
- 2) Death of the patient.

4. Statistical Analysis

Data were statistically described in terms of frequencies (number of cases) and percentages when appropriate. For comparing qualitative data, the Chi-square test was performed. A probability value (p-value) less than 0.05 was considered statistically significant.

5. Results

In the present study, out of 100 patients with hyponatremia admitted in the intensive care unit, 63 % were males and 37% were females. The ratio of male:female being 1.7:1. In the present study out of the 100 cases studied, the majority of the patients 46 were in the age group of 51-70 years of age. Out of this, 35 patients had mild hyponatremia, 8 had moderate hyponatremia and 3 had severe hyponatremia.

Out of the 25 (25%) patients within the age group of 31-50, 13 patients had mild hyponatremia, 8 patients had moderate hyponatremia, 4 patients had severe hyponatremia. Out of the 14 patients within the age group of >70 years of age, 4 patients had mild hyponatremia, 5 patients had moderate hyponatremia, 5 patients had severe hyponatremia. Out of the 12 patients within the age group of 18-30 years of age 8 patients had mild hyponatremia, 4 patients had moderate hyponatremia and no one had severe hyponatremia. 2 patients had mild hyponatremia and 1 patient had moderate hyponatremia within the age group of <18 years of age. Out of the 100 cases studied the presenting symptoms were confusion in 33% (33/100), malaise in 30% (30/100), lethargy in 32% (32/100), headache in 26% (26/100), altered sensorium in 11% (11/100), tremors in 11% (11/100). Other symptoms such as convulsion in 7% (7/100), unconscious in 5% (5/100). Most of the patients were asymptomatic 44% (44/100).

Hyponatremia according to volume status is classified into euvolemic hyponatremia, hypovolemic hyponatremia, and hypervolemic hyponatremia. Out of the 100 cases studied most common type of hyponatremia was euvolemic which was seen in 61% of the patients followed by hypervolemic which was seen in 23% of the patients followed by hypovolemic seen in 16 % of the patients.

Out of the 100 patients, 62% had mild hyponatremia, 26% had moderate hyponatremia, 12 patients had severe hyponatremia. Out of the 62 patients of mild hyponatremia, 41 were males and 21 were females. 26 patients of moderate hyponatremia 15 were males and 11 were females. Out of the 12 patients of hyponatremia, 7 were males and 5 were

females. In the study population, mortality was 5%. Out of this, 4% associated with serum sodium level <120 and 1% with serum sodium level 120-125.

6. Discussion

In this prospective study, conducted at tertiary care hospital during the period from December 2013 – MAY 2016, we included 100 cases of hyponatremia admitted to the Medical ICU. The aim of our study was to study the clinical profile of cases of hyponatremia with respect to the epidemiological characteristics, common clinical features, the severity of hyponatremia, laboratory parameters and mortality associated with hyponatremia. The observations made in 100 cases of hyponatremia is discussed and compared with other studies.

Demographic Profile

In our study of 100 patients, we observed a male preponderance with 63% of our cases were males and 37% were females with a male to female ratio of 1.7:1. Most common age group affected with mild hyponatremia was 51-70 yrs of age whereas severe hyponatremia was common in patients above 70 yrs of age. Thus, mild hyponatremia is the most prevalent form of hyponatremia; however, the severity of hyponatremia increases as age advances. Acute vs chronic hyponatremia: In our study, we found that 84 % of patients were found to have acute hyponatremia and 16 % of patients were found to have chronic hyponatremia. The study was done at Grady Memorial Hospital, a large tertiary teaching hospital, found that 82.14% had acute hyponatremia, and 16.67% had chronic hyponatremia. Thus as observed in our study and the one done in Grady memorial hospital, hyponatremia usually has an acute onset. Symptoms of hyponatremia. In our study, we found that a significantly high number of patients (44%) were asymptomatic. Among the symptomatic cases, confusion was the most common presenting symptoms in (33%). Other common symptoms were headache (26%), malaise (30%), lethargy (32%), nausea (15%), tremors (11%), altered sensorium (11%) and convulsion (7%).

Comorbidities

In our study, we found that most common comorbid conditions associated with hyponatremia was Hypertension (46%), Diabetes mellitus (32%), Ischemic heart disease (6%), Renal failure (7%). Thus most of the patients in our study had multiple co-morbid conditions of which Hypertension and Diabetes were the most common. The hyponatremic hypertensive syndrome is a well-known entity, the most common association being in patients with essential hypertension receiving diuretics. Glucose being an osmotically active molecule, hyperglycemia can induce a fall in serum sodium levels by shifting water from intra-cellular to extra-cellular compartments. Thus, the knowledge of co-morbidities may go a long way in understanding the etiopathogenesis of hyponatremia in patients.

Treatment of Hyponatremia

Treatment modalities used in our study were fluid restriction alone, fluid restriction with oral salt replacement, hypertonic saline, and normal saline. The most common modalities used in our study was a fluid restriction in 84 % of patients .fluid

restriction was not used in 16 cases of hypovolemic hyponatremia. In 38 cases of euvolemic mild hyponatremia and 12 cases of mild hypervolemic hyponatremia fluid restriction alone was the modality of the treatment. In 10 cases of severe hyponatremia (9 euvolemic and 1 hypervolemic hyponatremia), all of whom were symptomatic, the fluid restriction was used with 3 % normal saline. In 10 cases of moderate isovolemic hyponatremia and 4 cases of moderate hypervolemic hyponatremia all of whom were symptomatic 3 % saline with fluid restriction was used. Of the 24 cases of symptomatic hyponatremia in whom hypertonic saline was used 10 % of patients started on oral salt tablets and 4 % patients were started on vaptans. In 16 cases of hypovolemic hyponatremia, 0.9% NS was used in 10 cases. In remaining 6 cases of hypovolemic hyponatremia, who were symptomatic, 0.9 % NS with hypertonic saline was used. Thus more common modalities used in our study was a fluid restriction in 74 % patients. Fluid restriction with 3% saline was used in 24 % patients.

7. Summary & Conclusions

- From our study of 100 hyponatremia patients admitted in ICU, we found that the most common age group affected was between 51-70 yrs of age (46%).
- Male patient were predominately affected (63%). We found the male preponderance with a male: female ratio of 1.7:1.
- With respect to the degree of hyponatremia, in our study, most of the patients had mild hyponatremia. We observed that severe hyponatremia was more common in elderly.
- 84% of our cases had acute onset of hyponatremia.
- In our study we found that a significantly high number of patients were asymptomatic (44%). Among the symptomatic cases, confusion was the most common presenting symptoms (33%). Other common symptoms were headache (26%), malaise (30%), lethargy (32%), nausea (15%), tremors (11%), altered sensorium (11%) and convulsion (7%).
- Older patients were more symptomatic compared to younger patients.
- The most common associated comorbidity was HTN followed by DM.
- 61% of the cases had euvolemic, 23% cases had hypervolemic and 16% had hypovolemic type of hyponatremia. So most common type of hyponatremia was euvolemic hyponatremia in our study.
- In our study, common etiology associated with hyponatremia were central the nervous system in 29 patients, respiratory system in 23 patients, the gastrointestinal system in 19 patients with other etiology such as, cardiovascular system in 8 patients, drugs in 3 patients, other included hypothyroidism, Cushing syndrome etc in 8 patients.
- Among the cases of hypervolemic hyponatremia CCF and acute renal failure where the most common causes followed by alcoholic liver disease and nephrotic syndrome.
- Among the cases of hypovolemic hyponatremia most common etiology was acute pancreatitis followed by acute gastroenteritis and others included burns and diuretic therapy.

- The common etiology of SIADH was pneumonia followed by stroke followed by meningitis.
- In lab analysis we found a mean sodium level of 126 mEq/L with the majority of our patients having a hyposmolar state with serum osmolality between 265-280.
- 29 % of our cases had urinary sodium less than 20, of which majority (14 %) had hypovolemic and 15 % had hypervolemic hyponatremia. 71 % had urinary sodium more than 20.
- The more common treatment modalities used in our study was a fluid restriction in 74 % patients. Fluid restriction with 3% saline was used in 24 % patients. 0.9 % NS saline was used in some cases of hypovolemic hyponatremia. Vaptans were used in few patients of SIADH.
- Mortality was most commonly seen in the age group between 51-70 year of age with severe hyponatremia.

References

- [1] Upadhyay A, Jaber BL, Madias NE. Incidence and prevalence of hyponatremia. *Am J Med* 2006;119:S305.
- [2] Hawkins RC. Age and gender as risk factors for hyponatremia and hypernatremia. *Clin Chim Acta* 2003;337:169-72.
- [3] Shapiro DS, Sonnenblick M, Galperin I, Melkonyan L, Munter G. Severe hyponatremia in elderly hospitalized patients: prevalence, etiology and outcome. *Intern Med J* 2010;40:574-80.
- [4] Janicic N, Verbalis JG. Evaluation and management of hyperosmolality/hyperosmolarity in hospitalized patients. *Endocrinol Metab Clin North A* 2003;32:459–481.
- [5] 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.