

STUDY OF SYMPTOMATIC HYPONATREMIA IN ELDERLY PATIENTS

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ABSTRACT

To determine the etiology of randomly selected 100 symptomatic hyponatremic elderly patients. To explore the clinical profile of the hyponatremia. This cross sectional study was conducted in SREE BALAJI MEDICAL COLLEGE AND HOSPITAL with 100 patients. History and clinical examinations were recorded in all patients at admission. History specially included compulsive water drinking and intake of diuretics. This was followed by a plasma and urinary osmolality determination as well as urinary sodium estimation. In our study total incidence of hyponatremia was 14.3% incidence of symptomatic hyponatremia were 5%, out of 100 patients 24 patients had siadh(24%) which was the commonest cause of hyponatremia. SIADH and euvolumichyponatremia formed the largest subgroup in the study. Drugs, especially diuretics such as furosemide and hydrochlorothiazide, have also contributed fairly for the cause of hyponatremia. These results correlated significantly with other studies.

Keywords

Hyponatremia, Diuretics, Siadh syndrome of inappropriate antidiuretic hormone

Introduction

Hyponatremia is one of the treatable cause of electrolyte disorder with neuropsychiatric manifestations, early diagnosis and prompt treatment will save the patient from fatal complications.[1] Hyponatremia is defined as a serum sodium concentration (Na⁺) less than 135mEq/L. Disorders of serum sodium concentration are caused by abnormalities in water homeostasis that lead to changes in the relative ratio of sodium to body water. 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.[2-4]

The clinical features are developed due to swelling of the brain tissue as hyponatremia induces hypotonicity in the circulation. The majority of the clinical manifestations of hyponatremia are neuropsychiatric, including lethargy, psychosis, and seizures, designated as hyponatremic encephalopathy. [5] The degree of clinical impairment is related not to the absolute measured level of lowered serum Na⁺ concentration but to both the rate and the extent of the drop in ECF osmolality. 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 severity of symptoms and mortality, allow for less intensive hospital care, decrease the duration of hospitalization. So the treating clinician should have a high index of suspicion to diagnose hyponatremia.[6,7]

Elaborate history taking and relative investigations are precious tools for the management of hyponatremia.

MATERIALS AND METHODS

STUDY POPULATION

This study was conducted in SreeBalaji Medical College, Chennai, and Tamil Nadu during the period of July 2014 to July 2015. Total number of people included in this study were 100.

STUDY DESIGN

This study is a cross-sectional study.

INCLUSION CRITERIA

- Patients above age 65 years.
- Symptomatic patients with serum sodium level less than 135.

EXCLUSION CRITERIA

- Asymptomatic patients.
- Age below 65 years.
- Hypercholesterolemia
- Patients treated with mannitol.

DESCRIPTION OF THE STUDY

The lab values of serum sodium of all patients from July 2014 to July 2015 was studied from which incidence of hyponatremia was calculated. Out of this hyponatremic patients, a sample size of 100 patients were randomly selected by SIMPLE RANDOM SAMPLING, FROM THE TABLE OF RANDOM NUMBERS satisfying the inclusion criteria.

Data collection

In the hospital, all the patients, as a routine, blood samples were taken and serum electrolytes were done in central biochemistry laboratory. The records were followed up for patients with hyponatremia and values repeated once for confirmation. A standard proforma was used to record to detailed history of present complaints, past history such as diabetes mellitus, systemic hypertension, Ischemic heart disease, dyslipidemia, neurological, chronic kidney disease / renal disease, regulatory and endocrine problems. A detailed drug history was also recorded. Findings on clinical exam including volume status of patient's were recorded. Based on investigations and management of a patient, the following data was recorded. Initial serum, sodium, final sodium at discharge/death, calculated serum osmolality, urine osmolality, urine spot sodium and endocrine work up (as and when required) were done.

The fluid management and drugs, if used were also noted. The probable cause was correlated and the outcome of hospitalization was recorded.

METHODS

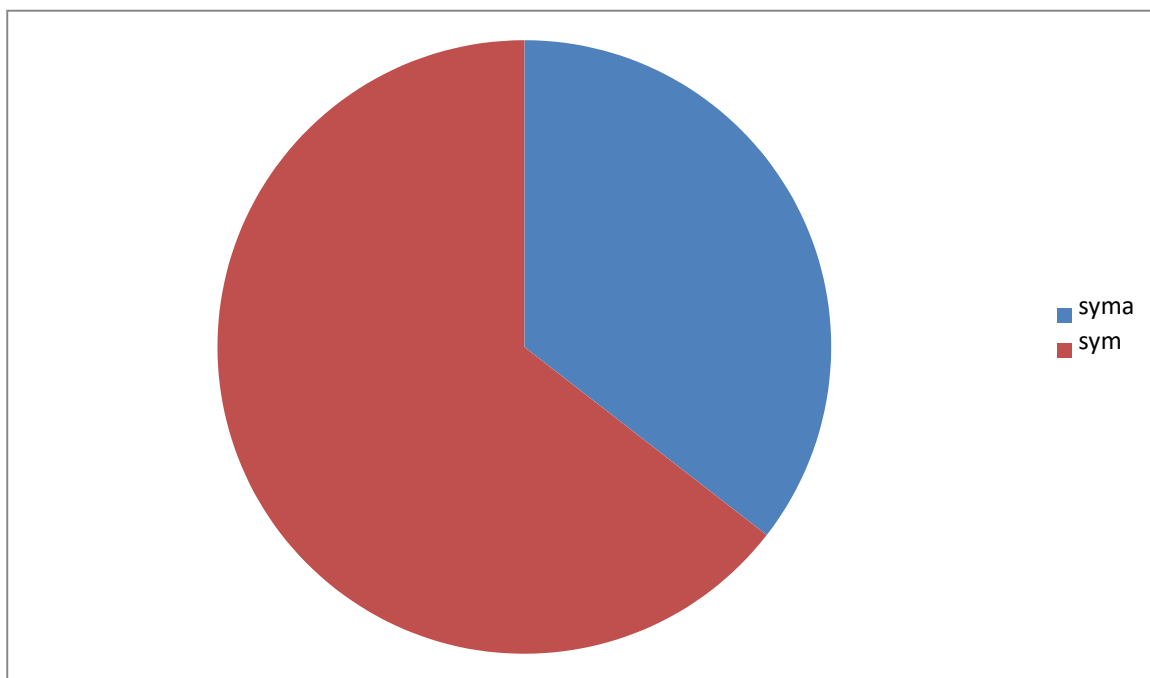
1. Serum Sodium – I.S.ELECTRODE (Ion selective Electrophoresis).
2. Serum Potassium – I.S.ELECTRODE (Ion selective Electrophoresis).
3. UREA – Urease Glutamate Dehydrogenase method
4. Creatinine – modified Jaffe Kinetic method

5. SUGAR – Hexokinase method
6. LFT – Enzymes – kinetic
7. TFT – Automated ELISA reader
8. Urine Na – I.S.ELECTRODE
9. Urine K – I.S. ELECTRODE 10.Lipids – ENZYMATIC METHOD

RESULTS AND DISCUSSION

The total number of patients admitted in the medicine ward during the study period was 6895. The number of patients with hyponatremia less than 135 mmol/L was about 985 patients (14.3%).The number of patients admitted with symptomatic hyponatremia was about 350 patients(5%).The number of patients with severe hyponatremia with serum sodium less than 120 mmol/L was 250patients (3.6%).

FIGURE -1 : DISTRIBUTION OF HYPONATREMIC PATIENTS



No of symptomatic patients: 350 No of asymptomatic patients: 635

Table 1 :SEX DISTRIBUTION

NUMBERS n =100	
MALE	FEMALE
65	35

Mean, median and mode of the age of the patients are 75.37,68 and 66 respectively.

FIGURE - 2 AGE DISTRIBUTION AMONG THE PATIENTS

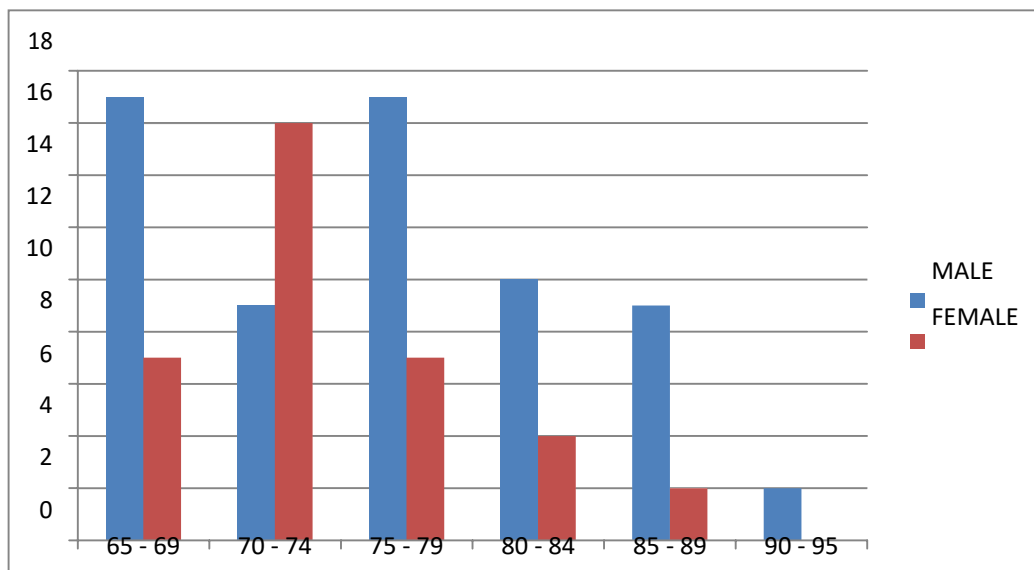


FIGURE – 3: VOLUME STATUS OF THE PATIENTS

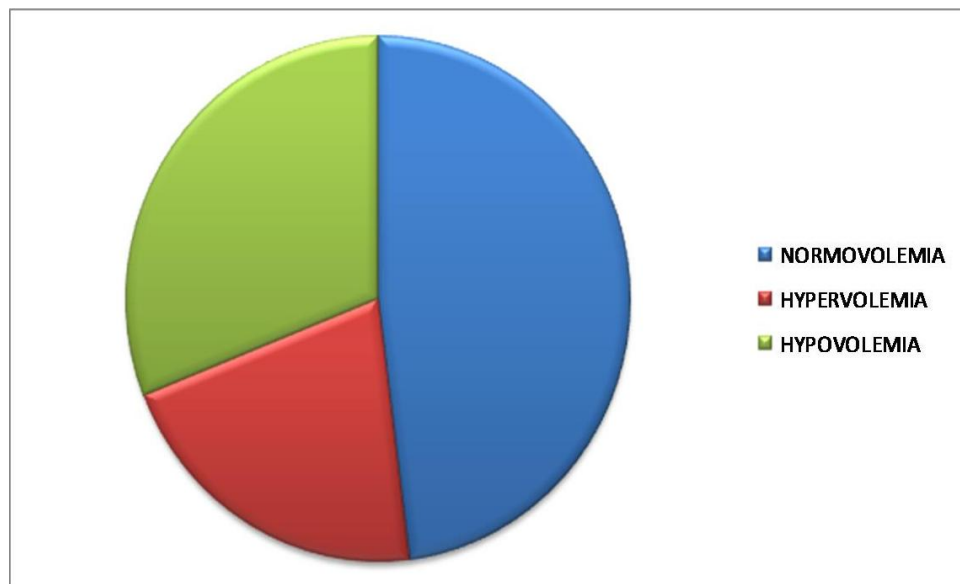
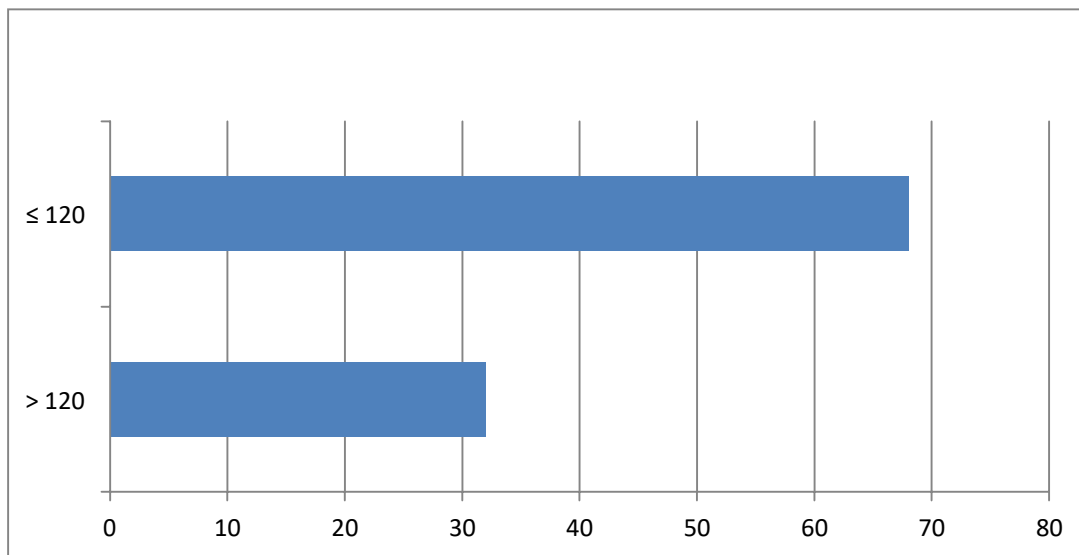


FIGURE - 4: VARIABILITY OF SERUM SODIUM AMONG THE PATIENTS



X AXIS =NO OF PATIENTS
 YAXIS =SERUM SODIUM LEVELS

TABLE 2: ETIOLOGICAL DISTRIBUTION OF HYPONATREMIC PATIENTS

ETIOLOGICAL DISTRIBUTION OF HYPONATREMIC PATIENTS	
CAUSES	NUMBER OF PATIENTS
SIADH	24
DRUG INDUCED (DIURETICS)	16
VOLUME OVERLOAD	14
HYPOTHYROIDISM	13
VOLUME LOSS	12
MULTIFACTORIAL	10
ADRENAL INSUFFICIENCY	6
RENAL FAILURE	5

TABLE 3: SERUM SODIUM LEVELS

MEAN	119
MEDIAN	118
MODE	119

TABLE 4: ASSOCIATED CHRONIC DISEASES

HEART FAILURE	20
DIABETES MELLITUS	8
HYPOTHYROIDISM	15
HYPERTENSION	15
DCLD	7
HYPOADRENALISM	6
CKD	3

There are so many drugs causing hyponatremia been mentioned earlier in the literature but in our study diuretics are the common drugs used especially loop diuretics and k⁺ sparing diuretics.[9] They were classified under drug induced hyponatremia straightaway since there is negligible numbers of drugs other than diuretics causing hyponatremia.[10] In the present study, total incidence of hyponatremia is 14.3%.In a study done by chatterjee in eastern india the incidence of hyonatremia happened to be 16.4%.But our study deals with the symptomatic hyponatremia which yielded 5% incidence from the total population. In the present study serum sodium below 135 with symptoms were selected.[11] There male population was showing preponderance in our study, where they have outnumbered the female population. There were 65 males and 35 females in our study.In other studies such as Vergese et al (male 56%, female 44%), Chatterjee(male 62.69, female 37.31) which have also shown male predominance in the incidence of the disease.[12]

Table 5: SHOWS THE POPULATION STUDY

GENDER	CHATTERJEE STUDY (%)	VERGESE STUDY ^[32] (%)	PRESENT STUDY (%)
MALE	62.69	56	65
FEMALE	37.31	44	35

The volemic status of the patient was assessed clinically and divided into normovolemic, hypovolemic and hypervolemic patients. In our study 48 % were normovolemic, 31% were hypovolemic and 21% were hypervolemic.

Table 6: Normovolemic, Hypovolemic And Hypervolemic Patients

HYPONATREMIA	RAO STUDY % [33]	CHATTERJEE STUDY%	PRESENT STUDY%
EUVOLEMIC	61	50.74	48
HYPERVOLEMIC	23	26.86	21
HYPOVOLEMIC	16	22.4	31

This results correlates with other studies as well. In the studies done by Rao, euvolemic were 61%, hypervolemic were 23% and hypovolemic were 16%. In the study done by Chatterjee, euvolemic were 50.74%, hypervolemic were 26.86% and hypovolemic were 22.4%. In the present study, SIADH was the most common cause of hyponatremia in the present study representing 24% of cases. In other studies by Hochman, SIADH represented 28.3% of cases, 34% in the study by Anderson, 32.84% in the study by Chatterjee and 34.8% in the study by Vurgese. This correlates with other studies on hyponatremia. [13-15] Infections especially pneumonia was found to be the commonest disease associated with SIADH in our study. We used barter and Schwartz criteria mentioned earlier for the diagnosis of SIADH. Serum ADH which is mentioned in the minor criteria for diagnosis of SIADH in some studies not been done in our study.

The patients are treated with 3% normal saline, normal saline, fluid restriction, oral salt, diuretics according to the volume status, primary disease and the cause of hyponatremia. [16] All patients were monitored, investigated and treated routinely with the daily electrolytes. Most of the patients recovered with the treatment except 4 patients who died despite of the treatment.

TABLE 7: CAUSES OF MORTALITY IN THE STUDY

CASE	PRIMARY DISEASE	ETIOLOGY OF HYPONATREMIA
1.	LUNG CARCINOMA	SIADH
2.	PNEUMONIA, SEPSIS	SIADH
3.	DCMP, CKD	MULTIFACTORIAL

4.	AGE,DCLD,CKD	MULTIFACTORIAL
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In the mortality table, siadh holds 50% of the mortality number. It is known that siadh is the disease difficult to diagnose and treat. I strongly recommend early recognition, prompt diagnosis and exact treatment of the disease would be extremely effective in controlling the mortality of the patients with hyponatremia. [17] The recent treatment recommendations and guidelines framed by the European Society of Intensive Care Medicine, European Society of Endocrinology and the European Renal Association –European Dialysis and Transplant Association.

1. For serious symptomatic hyponatremia, the first line of treatment is intravenous infusion of hypertonic saline, with a target increase of 6mmol/L during every 24 hours thereafter until the patient's serum sodium concentration reaches 130 mmol/L.
2. First line of treatment for patients with SIADH and moderate or profound hyponatremia should be fluid restriction; Second line of treatments include increasing solute intake with 0.25 -0.50 g/kg per day of urea or combined treatment with low dose loop diuretics and oral sodium chloride.
3. Lithium, demeclocycline and vaptans are not recommended for patients with moderate or profound hyponatremia.
- 4.

CONCLUSION

Symptomatic hyponatremia is common among the hospitalized patients. Male population outnumbered female population in the incidence of hyponatremia. SIADH and euvolumichyponatremia formed the largest subgroup in the study. Drugs, especially diuretics such as furosemide and hydrochlorothiazide, are a common cause of hyponatremia. Significant number of patients had endocrine abnormalities (hypothyroidism, hypoadrenalism and panpituirism).

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Ethical approval: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

- [1] Chakrapani.M,Shenoy.D,Pillai:A Seasonal variation in the incidence of hyponatremia. The Journal of the Physicians of India 2002, 50:559-562.
- [2] Foster KG: Relation between the colligative properties and chemical composition of sweat. J Physiol (Lond) 1961; 155:490.
- [3] Hendry EB: Osmolarity of human serum and of chemical solutions of biologic importance. ClinChem 1961; 7:156.

- [4] Kugaler JP, Hustead T. Hyponatremia and hypernatremia in the elderly. *AmFam Physician* 2000; 61: 3623 – 30.
- [5] Zerbe RL, Miller JZ, Robertson GL: The reproducibility and heritability of individual differences in osmoregulatory function in normal human subjects. *J Lab Clin Med* 1991; 117:51-59.
- [6] Zerbe RL, Robertson GL: Osmoregulation of thirst and vasopressin secretion in human subjects: Effect of various solutes. *Am J Physiol* 1983; 244:E607- E614.
- [7] Zimmermann EA. Anatomical basis of thirst and vasopressin secretion. *Kidney Int* 1987; 32: SI4.
- [8] Robertson GL. Osmo-regulation of thirst and vasopressin secretion in human subjects: Effect of various solutes. *J Hum Physio* 1983; 244:E607.
- [9] Robertson GL: The regulation of vasopressin function in health and disease. *Rec ProgHorm Res* 1976; 33:333-385.
- [10] Schrier RW, Berl T, Anderson RJ: Osmotic and nonosmotic control of vasopressin release. *Am J Physiol* 1979; 236:F321-F332.
- [11] Raff H, Merrill D, Skelton M, et al: Control of ACTH and vasopressin in neurohypophysectomized conscious dogs. *Am J Physiol* 1985; 249:R281- R284.
- [12] Andresen MC, Doyle MW, Jin YH, et al: Cellular mechanisms of baroreceptor integration at the nucleus tractussolitarius. *Ann N Y AcadSci* 2001; 940:132-141.
- [13] Renaud LP: CNS pathways mediating cardiovascular regulation of vasopressin. *ClinExpPharmacolPhysiol* 1996; 23:157-160.
- [14] Robertson GL. Thirst and vasopressin function in normal and disordered states of water metabolism. *J Lab Clin Med* 1983; 101:351 -4.
- [15] Landnson JH, Apple FS, Koch DD. Misleading hyponatremia due to hyperlipidemia; a method dependent error. *Ann Int Med* 1981; 95: 707-8.
- [16] Mass AHJ, Siggaard-Andersen O, Weisberg HF, Zijlstra WG. Ion-selective electrodes for sodium and potassium: a new problem of what is measured and what should be reported. *ClinChem* 1985; 31:482 – 5.
- [17] Anderson RJ, Chung HM, Kluge R, Schrier RW. Hyponatremia: a prospective analysis of its epidemiology and the pathogenetic role of vasopressin. *Ann Intern Med* 1985; 102: 164 – 168.