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Research Article

A STUDY OF HYPONATRAEMIA IN ELDERLY PATIENTS OF ICU

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ABSTRACT

Disorders of sodium and water metabolism are common in hospitalized patients and sometimes found in outpatients also. Because of senile changes and chronic co-morbidities associated with elderly and impairment of salt, water metabolism occur. All physicians should be aware of the etiology, pathophysiology and clinical profile of hypo- natraemia. This study was conducted at a rural teaching hospital in Nandyal town of Andhra Pradesh, wherein a total of 840 elderly sick patients admitted to the ICU were screened, of whom 302 patients (36%) were detected to have hyponatremia (< 135 mMol/L). The mean age of the patients was 72 yrs with a range of 60 yrs to 99 yrs. Of these patients 42% were males and 58% were females. Patients with CNS symptoms were treated with intravenous 3% saline infusion to raise their serum sodium levels by 0.5 mMol/L per hour to a maximum of 12 mMol/L increase in serum sodium per day. Patients who did not have any CNS symptoms were treated based on severity of their presenting illness with either Intravenous hypertonic saline or oral correction with salt supplementation. In our study, it was noted that people who died had associated morbidities like severe sepsis with septic shock, progressive malignancy, progressive renal failure, and progressive cerebrovascular disease

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INTRODUCTION

Background

Both hyponatremia and hypernatremia can cause substantial morbidity and mortality, and ironically, incorrect treatment can add to the problem⁽¹⁾. Serum sodium concentration and serum osmolality normally are maintained under precise control by homeostatic mechanisms involving thirst, antidiuretic hormone (ADH), and renal handling of filtered sodium. Clinically significant hyponatremia is relatively uncommon and is nonspecific in its presentation⁽²⁾.

About 40% of the body's sodium is contained in bone. Approximately 2-5% occurs within organs and cells and the remaining 55% is in blood plasma and other extracellular fluids. The amount of sodium in blood plasma is typically 140mmol/L, a much higher amount than is found in intracellular sodium (about 5 mMol/L). This asymmetric distribution of sodium ions is essential for human life. It makes possible proper nerve conduction, the passage of various nutrients into cells, and the maintenance of blood pressure⁽³⁾. Physician should have a clear appreciation of the roles that iatrogenic interventions and lapses in nutrition and nursing care frequently play in upsetting the homeostatic balance in elderly

patients, particularly those who are in long-term institutional and inpatient settings⁽⁴⁾. Hyponatremia is defined as a serum sodium concentration of less than 135 meq per L (135 mmol per L). It is estimated that nearly 7 percent of healthy elderly persons have serum sodium concentrations of 135 meq per L or less.⁽¹⁾ Cross-sectional studies suggest that hyponatremia may be present in 15 to 18 percent of patients in chronic care facilities. ⁽²⁾ Among nursing home patients who require acute hospitalization, the prevalence of hypernatremia has been reported to be more than 30 percent.⁽⁵⁾ Thus, it would be an unusual day in many physicians' practices that at least one diagnostic or therapeutic issue related to water metabolism did not arise⁽⁴⁾.

Aims and Objectives

Our aim is to classify severity of hyponatremia in hospitalized elderly to study clinical feature and etiology of hyponatremia in elderly hospitalized patients and to correlate with outcome following treatment.

MATERIALS AND METHODS

All elderly patients (60 yrs and older) admitted in medical ICU between 1st August 2015 and 31st of July 2016. The period of study is 12 months. All those patients who are above 60 years

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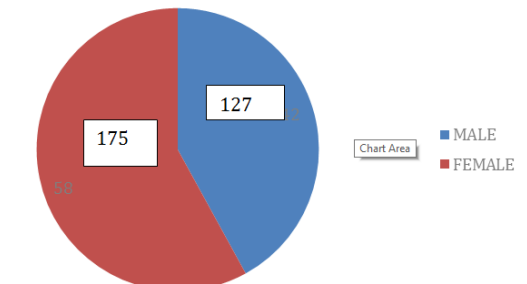
of age admitted in I.C.U and whose Serum sodium was less than 135 mmol/L were included in the study. Those patients who are below 60 years of age and having Serum sodium above 135mmol/L were excluded from the study. When the serum sodium is less than 125mmol/L then the plasma and urine sample are sent for measurement of osmolality by freezing point depression osmometer. Serum electrolytes and urine spotsodium are measured by ion sensitive electrode method. Based on the type of hyponatraemia and severity of symptoms patients are started on correction of hyponatraemia by taking account the standard guidelines and formulas (Classic & Adrougue). Patient's outcome is recorded.

All were analyzed by required routine/ specific investigations relevant to evaluate electrolytes particularly serum Sodium levels on admission and every day during treatment, then as and when indicated. In patients who fulfill the selection of severe hyponatremia (serum Sodium < 125 m mol /L) investigated for Serum Osmolality, Urine Osmolality, Urine spot Sodium, Serum Cortisol level when indicated, Serum T3, T4, TSH when indicated and Imaging studies relevant to the admission diagnosis before treatment started treatment as per general prevalent practice in ICU and Outcome following treatment noted.

OBSERVATIONS AND RESULTS

1. Total no of Elderly patients admitted in 12 months: 840 patients.
2. Total No of patients with hyponatremia (serum Sodium < 135mmol/L): 320 patients (36%).
3. Total No. of patients with severe hyponatremia (serum Sodium < 125mmol/L):22 (7%).
4. Male: Female distribution:

Male	127
Female	175
Total	302



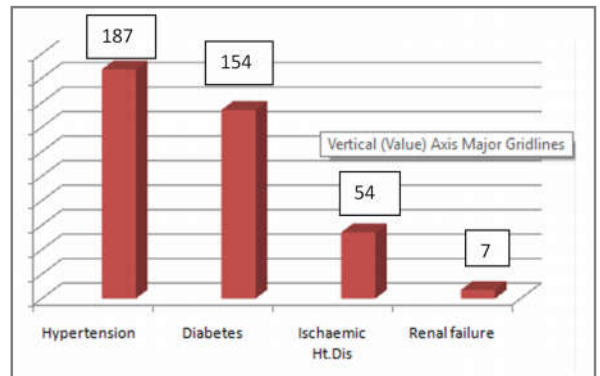
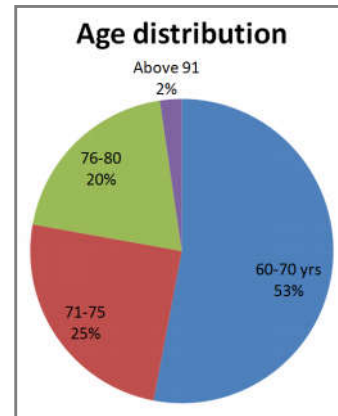
Among the 302 patients who presented with hyponatremia 175 patients (58%) were female and 127 patients(42%) were male, which indicates preponderance of severe hyponatremia among elderly female patients.

The age distribution of the patients

Among the patients studied, maximum number (160) ranged between age 60-70 Yrs, next elderly group (75) were between 71 -75 yrs whereas (60) patients were between 76-80 yrs and (7) patients were above 81 yrs.

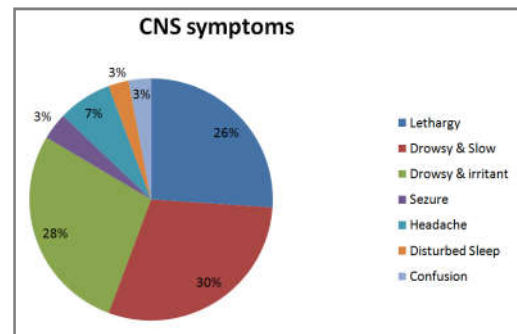
The co- morbid diseases

In patients studied the common co-morbiditis were headed by Hypertension (187) followed by Diabetes (154), Ischemic heart disease (54) and renal failure (7).



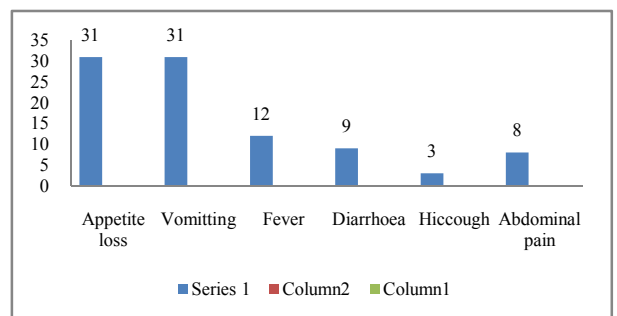
The CNS symptoms observed in Clinical profile

Lethargy 87 (28.8%), Drowsy and slow 99(32.7%), Drowsy and irritant 93 (32.7%), Seizure 12(4%), Headache 24 (8%), Disturbed sleep9 (3%), Confusion 6 (2%), and Unresponsive 10(3.3%).



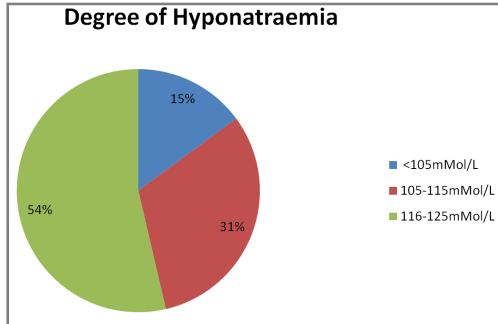
Other symptoms

Non CNS symptoms noted in 72 patients. They are Appetite loss 31 (43%), Vomitting 31 (43%), Fever 12(17%), Diarrhoea 9 (12.5%), Hiccough 3 (4.2%) and Abdominal pain 8 (11%).



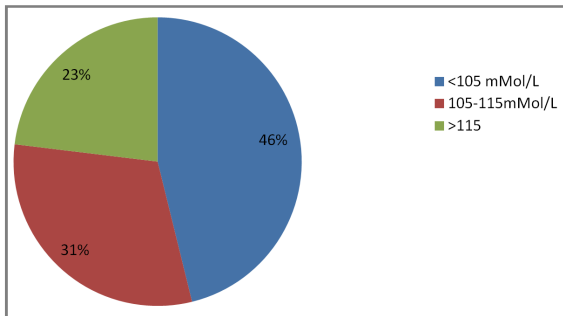
Degree of Hyponatraemia

45 patients had very severe hyponatremia with serum sodium levels less than 105 mMol/L., 95 patients had serum sodium values between 105 – 115 mMol/L, and 162 patients had serum sodium values between 115-125mMol/L.



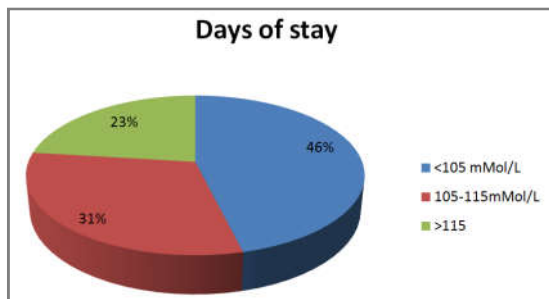
Aetiology of hyponatremia

The following aetiology was found in our patients; SIADH 91 (30%) followed by Drugs 57 (24%) of which diuretics form a major chunk., renal salt wasting 63 (21%), Gastrointestinal losses 39 (13%), endocrine disorders 12 (4%) Cardiac 6 (3%), cerebral salt wasting 9 (3%), cirrhosis of liver 7 (2%).



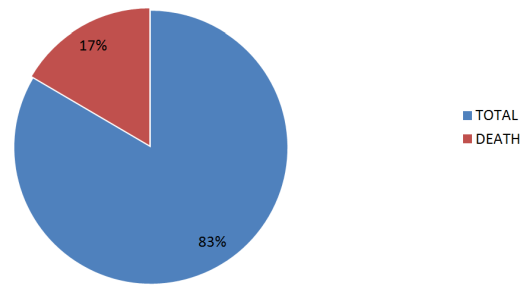
Mean duration of ICU stay

Amongst the patients of hyponatraemia in our study depending on the serum sodium concentration severity, those whose serum sodium was below 105 mmol/L took about 6 days where as those below 115 mmol/l and 105 mmol/l took 4 days and those having above 115 mmol/l took about 3 days to recover.



Result of Treatment

Out of the 302 patients studied, 60 (19.96%) patients who were having severe hyponatraemia below 105-115 mmol/l succumbed inspite of best effort to correct their dyselectraemia



DISCUSSION

There has been a rapid increase in number of elderly people world over. It is estimated that the proportion of elderly people will increase from 7.7% (76 millions), in year 2001 to about 11% (142 millions), in year 2020⁽⁵⁾.

In our study the common co morbid conditions were Hypertension 187(62%), Diabetes mellitus 154(51%), Ischemic heart disease and heart failure 54(18%), and renal failure7 (2.3%), other conditions being chronic liver disease, cerebrovascular disease. and they are on multiple medications like ACE inhibitors, ARB, Oral hypoglycemic agents and diuretics which can interfere with metabolism of various electrolytes and predispose them to electrolyte imbalance.

In the present study patients with serum sodium ranged between 125-135 mMol/L. were rarely having any symptoms referable to hyponatremia.. those patients who had serum sodium levels below 125mMol/L had varied CNS symptoms like lethargy, drowsiness with slow response or irrelevant talk, headache, disturbed sleep, confusion, seizures or unresponsiveness. All these patients were evaluated with imaging studies of brain (CT brain plain & contrast where indicated) and there was no structural lesion attributable to the CNS symptoms, so these CNS symptoms were attributed to hyponatremia. This finding is consistent with the available literature^(6,7,8).

The other common symptoms in the patients with serum sodium levels <125mMol/L were vomiting, diarrheas, decreased appetite, hiccough, pain abdomen and fever with sweating. These symptoms could not be interpreted as they could be either cause or effect of hyponatremia and are also found in other conditions without hyponatremia.

All patients were treated according to a standardized regimen based on recommendation in various studies. Patients with CNS symptoms were treated with intravenous 3% saline infusion to raise there serum sodium levels by 0.5 mMol/L per hour to a maximum of 12 mMol/L increase in serum sodium per day. Patients who did not have any CNS symptoms were treated based on severity of their presenting illness with either Intravenous hypertonic saline or oral correction with salt supplementation. Though cerebral demyelination is described as a rare complication associated with symptomatic hyponatremia⁽⁷⁾. Animal data have shown that correction of hyponatremia by >20–25 mEq/l can result in cerebral demyelination⁽⁹⁾. This has resulted in a mistaken belief that a rapid rate of correction is likely to result in cerebral

demyelination⁽¹⁰⁾. Recent data have now shown that the rate of correction has little to do with development of cerebral demyelinating lesions, and that lesions seen in hyponatremic patients are more closely associated with other co-morbid factors or extreme increases in serum sodium^(11,12,13,14,15,16). Consistent with these data, in our study also we did not encounter any complications related to relative rapid correction with a maximum correction of 12 mEq/L / day. In our study a statistically better response in terms of survival was demonstrated among patients who presented with CNS symptoms of hyponatremia and responded to treatment than compared to those who did not show any CNS symptoms of hyponatremia. This data is consistent with the data in the literature⁽⁶⁾. Appropriate correction of hyponatremia in patients with symptomatic hyponatremia is recommended in accordance to the guidelines for correction of hyponatremia. In general, the plasma sodium should not be corrected to >125–130 mEq/L. Assuming that total body water comprises 50% of total body weight, 1 ml/kg of 3% sodium chloride will raise the plasma sodium by 1 mEq/l⁽⁶⁾.

Among the patients included in the study there was slight preponderance of elderly females (58%) as compared to males (42%). When the mortality outcomes were compared with respect to gender distribution it was noticed that females though had higher risk of hyponatremia, they responded better to treatment with a mortality of 9.09% as compared to 33.33% in males with hyponatremia. age-related brain atrophy. On the basis of the results of these studies, it appears that physical factors may be the more dominant factor of the two in ensuring brain survival during hyponatremia in elderly female subjects. These findings suggest that even in the presence of cerebral edema, if the brain is able to swell without generating a significant increase of intracranial pressure, the prospects for patient survival may be substantially improved. Studies employing magnetic resonance imaging evaluation of the brain have shown, elderly patients with severe hyponatremia (plasma sodium of ~108 mEq/L) and significant cerebral edema may exhibit only minimal symptoms of encephalopathy. Many studies in the past indicate a higher mortality in the elderly patients with severe hyponatremia, with a mortality ranging from 33% to 86%.^(6,7,8). In this study a mortality of 20% was found in the series of patients studied. And among those who succumbed the cause of death was secondary to severe sepsis or other conditions like progressive cerebrovascular disease, advanced malignancy and acute coronary event. In our study it was noted that people who died had succumbed to severe sepsis with septic shock, progressive malignancy, progressive renal failure, and progressive cerebrovascular disease. However the extent of contribution of hyponatremia to death is debatable as even those patients who succumbed to their illness had received correction for hyponatremia as per the standardized regimen of treatment. In this study the commonest cause of hyponatremia was due to SIADH 91(30%) followed by Drugs 57 (24%) of which diuretics form a major chunk., renal salt wasting 63(21%), Gastrointestinal losses 39(13%), endocrine disorders 12(4%) Cardiac 6(3%), cerebral salt wasting 9 (3%), cirrhosis of liver 7(2%). Of these etiologies the worrisome cause is Drug induced hyponatremia as a major chunk of drugs that cause hyponatremia are diuretics. Though JNC VII recommends diuretics as the first line drug for treatment of hypertension, a word of caution should be maintained while

prescribing diuretics in the elderly and when required doses should be modified according to body weight and should begin with the lowest dose.

CONCLUSIONS

The mean age of patients with hyponatremia in our study was 72 years. There were 58 female patients and 42 male patients, showing slight preponderance of hyponatremia in elderly sick females.

In our study patients had CNS symptoms attributable to hyponatremia and these symptoms were Lethargy (87), drowsiness with slow response or irrelevant talk (93), headache (24), disturbed sleep (9), confusion (6), unresponsiveness (20) and seizures (12). The common co - morbid conditions were Hypertension (187), diabetes mellitus (154), renal failure (7) and ischemic heart disease (54). The etiology of hyponatremia noted in our study, in decreasing order of occurrence is SIADH, drug induced, renal loss, GI loss, endocrinal, dilutional (Cardiac & cirrhosis), cerebral salt wasting. The commonest type of hyponatremia noted in our study was isovolemic hyposmolar hyponatremia. The Mean serum sodium levels at admission were 113.89 mEq/L, with a range from 97 mEq/L to 125 mEq/L. In our study 80 patients survived and 20 patients succumbed to their primary illness with possible significant contribution secondary to hyponatremia. Female patients had better tolerated hyponatremia and its correction with a mortality of 9.09% as compared to males with a mortality of 33.33%.

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