

Hyponatraemia in Hospitalised Elderly Patients

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Summary

This study aims to investigate the incidence and causes of hyponatraemia in hospitalised elderly patients. There was a total of 407 new patients. 55 (13.5%) patients were found to have at least one episode of hyponatraemia during their hospitalization. There were 58 deaths. Fifteen out of 55 (27.3%) patients who had hyponatraemia died compared to 43 out of 352 (12.2%) normonatraemic patients (chi-square significant, $p < 0.01$). The three most common causes of hyponatraemia were syndrome of inappropriate antidiuretic hormone secretion (SIADH), poor oral intake and diuretics. The two most common causes of SIADH were lower respiratory tract infection and stroke.

Key Words: Geriatric, Aetiology, Incidence, Mortality, SIADH

Introduction

The incidence of hyponatraemia and its causes in hospitalised elderly patients in Singapore is unknown. Hyponatraemia has been reported to be present in 2.5 to 11.3% of elderly hospitalized patients^{1,2}. A prospective study was therefore conducted in the Department of Geriatric Medicine at a government hospital. The department operates on an age-related admission policy and all medical patients aged 75 years and above are admitted directly from the emergency department.

Materials and Methods

All patients admitted into the 38-bedded acute geriatric ward at a government hospital over a 4-month period were prospectively screened for hyponatraemia. Hyponatraemia was defined as a serum sodium of less than 130 mmol/L measured using ion selective electrode technique (COBAS

Integra 700). The age, sex, length of stay and outcome were documented for all patients. Patients who developed hyponatraemia any time during their hospitalization were further evaluated for the cause of hyponatraemia, mental symptoms and measures taken to correct hyponatraemia.

Patients with hyponatraemia were evaluated according to a standardised diagnostic protocol as follows:

1. Patients with multiple episodes of hyponatraemia during the same admission or readmissions, were counted as a single case of hyponatraemia.
2. As far as possible, the serum and urine osmolality and spot urine sodium were done on the day of hyponatraemia or at the latest by the following day. For patients admitted after office hours, during weekends or public holidays, blood for the tests were taken the next working day.
3. If spot urine sodium could not be collected by voiding, it was collected by in-out catheterization.

4. Thyroid function test (free T₄ and TSH) and 8 a.m. serum cortisol were done for all patients, but not necessarily on the same day as the hyponatraemia.
5. The mental states at the time of hyponatraemia and during recovery were recorded.
6. Presence or absence of mental symptoms was also noted at the time of hyponatraemia.
7. The management of patients was left to the respective team doctors and the role of the investigators was only to request for investigations relevant to the study.

Syndrome of Inappropriate ADH secretion (SIADH) was defined using the following criteria²:

- * hyponatraemia
- * decreased serum osmolality with inappropriately increased urine osmolality
- * absence of oedematous states
- * normal thyroid and adrenal functions
- * urine sodium greater than 20 mmol/l

Statistical analysis was done using the SPSS version package. The chi-square test was used in the determination of statistical significance for proportions. The unpaired t-test was used for comparison of the difference in mean age and the mean length of stay of the hyponatraemic and non-hyponatraemic groups.

Results

Over the 4-month period, from 11th February to 10th June 1998, there were 488 admissions and readmissions. There were 211 (43.2%) male and 277 (56.8%) female patients. When repeat admissions were discounted, there was a total of 407 new patients comprising 165 (40.5%) male and 242 (59.5%) female patients.

Fifty-five (13.5%) out of 407 new patients were found to have had at least one episode of hyponatraemia during their hospitalization. The mean serum sodium was 125.1 mmol/l (range 110 to 129). Of the 55, 22 were males and 33 were females (chi-square not significant, $p=0.97$).

There was no significant difference in the mean age of patients with hyponatraemia (82.4 years, range 75 to 92) compared to normonatremic patients (83.0 years, range 75 to 99).

Seventeen (30.9%) patients with hyponatraemia were dehydrated, 31 (56.4%) were euvolemic and 7 (12.7 percent) were oedematous.

There were 58 deaths out of the total of 407 patients. Fifteen out of 55 (27.3%) patients who had hyponatraemia died compared to 43 out of 352 (12.2%) patients who had a serum sodium of at least 130 mmol/l (chi-square significant, $p<0.01$).

Twenty-four (43.6%) hyponatraemic patients had mental symptoms: 20 (36.4%) were drowsy, 2 (3.6%) had delirium, 1 (1.8%) had abulia and 1 (1.8%) had both drowsiness and seizures. All 24 patients with mental symptoms had concomitant medical conditions that could have contributed to the mental symptoms: 13 had sepsis, six had acute stroke, one had hepatic failure, one had end-stage renal failure, one had hypoglycaemia, one had head injury and one had post-ictal drowsiness. During recovery, the mental status in four patients remained unchanged whilst the mental status in nine patients recovered. 11 patients with mental symptoms died. 4 out of 31 (12.9%) patients without mental symptoms died compared to 11 out of 24 (45.8%) patients with mental symptoms (chi-square significant, $p<0.01$). The ages of those with and without mental symptoms were 81.8 years (range 75 - 92) and 83.2 years (range 79 - 90) respectively ($p>0.05$, unpaired t-test).

Twenty-nine patients received no treatment for hyponatraemia and their mean serum sodium was 125.5 (range 117 to 129). Fluid restriction, oral sodium chloride tablets, intravenous normal or dextrose saline and intravenous 3 percent saline were prescribed in six, two, thirteen and three patients respectively. One patient had both fluid restriction and intravenous 3 percent saline and

Table I
Probable Causes of Hyponatraemia

Causes	Frequency (Percentage)
SIADH*	20 (36.5)
Poor oral intake	15 (27.3)
Diuretics	8 (14.5)
Salt losing nephropathy	4 (7.3)
Cardiac failure	3 (5.4)
Vomiting and diarrhea	2 (3.6)
No identifiable cause found	3 (5.4)
Total	55 (100.0)

* SIADH - Syndrome of Inappropriate antidiuretic hormone secretion

one had fluid restriction, oral sodium chloride tablets and intravenous 3 percent saline therapy. The probable causes of hyponatraemia and SIADH are as listed on Table I and Table II respectively.

There was no significant difference ($p=0.06$) in the mean length of stay of patients with hyponatraemia (9.0 days) compared to those without hyponatraemia (8.1 days).

Discussion

Hyponatraemia, the most common electrolyte abnormality, is defined variedly as a serum sodium of less than 130 or 135 mmol/L. Hyponatraemia has been reported to be present in 2.5% of hospitalised elderly patients in a geriatrics textbook¹. In a 10-month study, hyponatraemia was found to be present in 11.3 percent of in-patients of a Geriatric Department². This figure is closer to our own study. The high rate of hyponatraemia in our study could be explained by the fact that most of the patients were elderly and frail and were hospitalised mainly for acute medical conditions.

Garcia *et al* reported that the average length of stay of hyponatraemic patients was between 1.44 and 9.2 days longer than in the case of

Table II
Probable Causes of SIADH

Causes	Frequency (percentage)
Pneumonia	8 (40)
Stroke	3 (15)
Lung cancer	1 (5)
Pulmonary tuberculosis	1 (5)
Head injury	1 (5)
Idiopathic	6 (30)
Total	20 (100)

normonatraemic patients⁴. We were not able to show a difference in the length of stay.

In our study, we also found that doing thyroid function and serum cortisol did not provide additional diagnostic value in determining the cause of the hyponatraemia. They were useful only as part of the workup for the diagnosis of SIADH which includes exclusion of hypothyroidism and hypoadrenalism.

Hyponatraemia often affects the central nervous system and can lead to fatigue, lethargy, disorientation, confusion, seizures and coma. It develops most commonly in the elderly with acute illness and in nursing home populations⁵. In their study, Hirshberg and Ben-Yehuda found that in their cohort of hyponatraemic patients, 48 percent were fully alert, 42 percent were stuporic and 10 percent had seizures⁶. In our study, 56.4 percent patients did not have any mental symptoms whilst 43.6 percent had some mental symptoms. It is interesting to note that all of our patients with mental symptoms had concomitant serious medical conditions causing or contributing to the symptoms. Hyponatraemic patients were found to have a significant increase in mortality as reported elsewhere⁴. Interestingly, when hyponatraemic patients with mental symptoms were compared to those without symptoms, the former were also noted to have significantly higher mortality. Patients with mental symptoms were probably sicker from concomitant medical conditions which led to higher the mortality.

Sunderam and Mankikar reported that 73 percent of hyponatraemia were caused by diuretic or intravenous therapy³. Musialik *et al* reported that the main causes of hyponatraemia were diuretics, diarrhoea and vomiting⁷. Kumar and Berl reported that SIADH was the commonest cause of hyponatraemia⁸. We found that in our study, the causes of hyponatraemia were not always obvious and often of multifactorial aetiology. Therefore, the identified causes were at best probable. We found that SIADH, poor oral intake and diuretic therapy were the three major causes of hyponatraemia.

From an analysis of fifty elderly in-patients with SIADH, Hirshberg and Ben-Yehuda found that 60 percent of the cases were idiopathic and the two main causes identified were pneumonia (18 percent) and medication (12 percent)⁵. Kumar and

Berl reported that the commonest causes of SIADH were malignancies, pulmonary disease and central nervous system disorders⁷. The malignancy most commonly associated with SIADH in the elderly has been reported to be small cell carcinoma of the lung⁵. In our study cohort, lower respiratory infection and stroke were the main causes of SIADH.

Conclusion

The incidence of hyponatraemia in our study of hospitalised elderly over a 4-month period was 13.5%. The most common cause of hyponatraemia was SIADH and the most common cause of SIADH was lower respiratory tract infection. Hyponatraemia and mental symptoms were associated with increased mortality.

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