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Hyponatraemia in ED: Risk Factor Conundrum

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Abstract

Aims of the Study: Profound hyponatraemia (<125 mmol/l) is frequent in the emergency department. Its incidence appears to increase with age and in patient's on antihypertensive medication particularly diuretics.Our objectives were to investigate impact of diuretics on the incidence of profound hyponatraemia and identify its risk factors. *Methods*: The incidence of profound hyponatraemia among patients admitted to the emergency department of our hospital was observed over one year. Risk factors for profound hyponatraemia were analysed in a observational study. Each adult patient admitted during the study periods with a blood sodium level <135mmol/l was taken into study. *Results*: A total of 50 patients of hyponatraemia were analysed, of which 11 patients were in sepsis,10 had renal failure and 8 patients had heart failure as risk factor.Patients on diuretics were 19, of which 9 patients were on combination of thiazide with angiotensin receptor blockers. *Conclusions*: Out of patients analysed in our ED, the most common risk factor was found to be sepsis followed by renal failure, heart failure and diuretics mainly comprising the thiazide group. Female patients were more commonly and were affected at an early age compared to male patients.

Keywords: Diuretics; Hyponatraemia; Risk Factors.

Introduction

One of the most common electrolyte disturbance presenting to the emergency department is Hyponatraemia. Hyponatraemia is represented by excess of body water relative to sodium content of the body. It is defined as serum sodium concentration of less than 135mEq/L.Even though profound hyponatraemia (<125 mmol/l) carries with it high morbidity and mortality, only a limited number of studies have investigated the incidence of this disorder and its risk factors in patients admitted to emergency departments [1].

Among the risk factors for profound hyponatraemia, studied in our Emergency department, gastrointestinal and third space losses, drugs especially diuretics were commonly observed compared to our expectations.

The objectives of our study were to:

1. To identify the risk factors for hyponatraemia.
2. To identify antihypertensive medication as a risk factor in hyponatraemia patients

Methods

Study Design

The incidence of profound hyponatraemia among patients admitted to the emergency department of Bapuji Hospital located in Davanagere, Karnataka was observed and observational study was done. Risk factors for profoundhyponatremia were analysed and observational study was done.

Participants and Setting

All adult patients (18 years old) who had their

blood sodium levels measured at the emergency department of our hospital during the year (2016–2017) were included. Patients with blood sodium levels of less than 135 mmol/l were identified. When blood glucose was elevated, blood sodium concentrations were corrected for plasma glucose levels [1]. After correction, all patients with blood sodium levels of less than 125 mmol/l were considered as profound hyponatraemia cases [1].

Types of profound hyponatraemia cases were classed according to patient volaemic status (hypo, normo- or hypervolaemic) and mechanism in accordance with the guidelines of the European Society of Endocrinology, the European Society of Intensive Care Medicine, the European Renal Association, and the European Dialysis and Transplant Association [1].

To identify the types, risk factors and impact of profound hyponatraemia, three types of data were extracted from patient files: (1) demographic data (gender, age, place of residence, date of admission to the emergency department, duration of stay in the emergency department, death during stay); (2) laboratory data (blood sodium level,urine sodium level, urea and plasma creatinine level, glomerular filtration rate calculated using the CKD-EPI formula); (3) clinical data (initial diagnoses, active comorbidities on admission, diuretics on admission).

Results

Among hyponatremia patients under study, gender distribution was 26 male & 24 female patients.Mean age of the patients was 65.07 years(±12.737) with least age being 38. (Table 1).

Table 1: Gender distribution of the hyponatraemia patients in our study

Gender	No. of Patients	Percent
Female	24	48.0
Male	26	52.0
Total	50	100.0

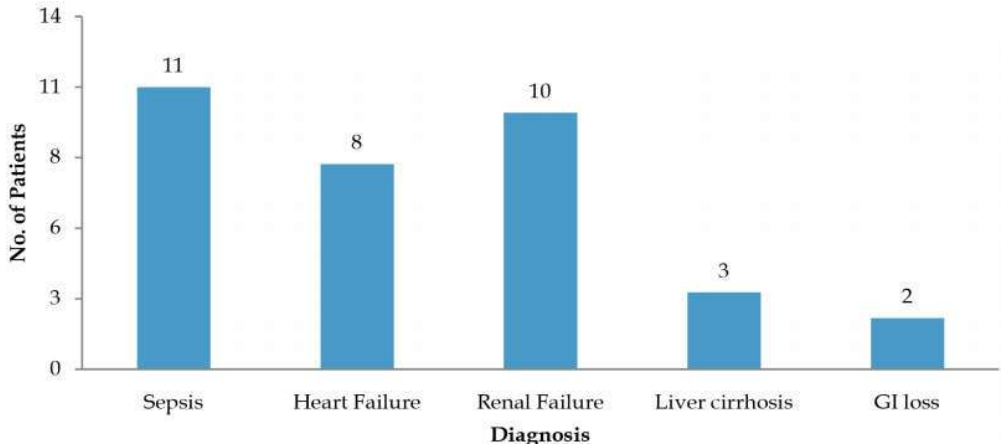
Mean blood sodium (± SD) in patients with hyponatraemia was 115.09 mmol/l (±9.88), the lowest individual value being 98 mmol/s. Mean urine sodium was 74.70 mmol/l (±41). Mean glomerular filtration rate was 57.82 (±32.323) with glomerular filtration rate being <90 in 78% and >90 in 22% of the patients.The serum creatinine level was <0.8mg/dl in 16% patients, whereas patients with serum creatinine 0.8-1.2mg/dl and >1.2mg/dl were 42% each. (Table 2).

Risk Factors of Hyponatremia

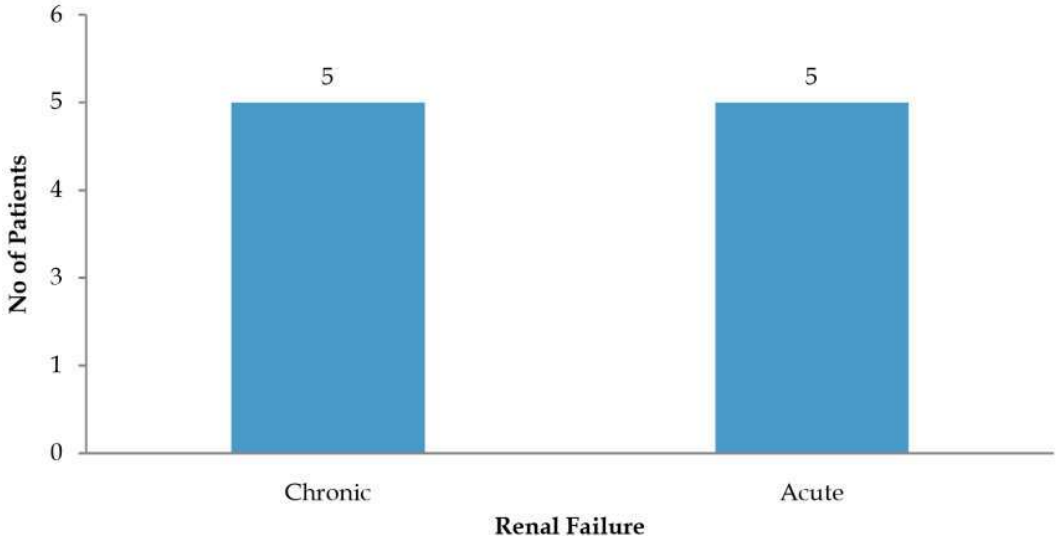
Out of the 50 patients under study renal failure was seen in 10 (20%) patients, patients with sepsis were 11 (22%), heart failure was apparent in 8 (16%) patients, cirrhosis was seen in 3 (6%) and gastrointestinal losses in 2 (4%) of the patients. Among the patients with renal failure both acute and chronic failure was found to be equally distributed. (Graph 1 and 3.)

Patients on anti-hypertensive Medication

Among the patients under study, long term anti hypertensives were being taken by 19,out of which 3 patients (6%) were on ARB and thiazides each, 9 (18%) patients on combination of ARB and thiazides and remaining 4 (8%) were on loop diuretics. (Graph 2).

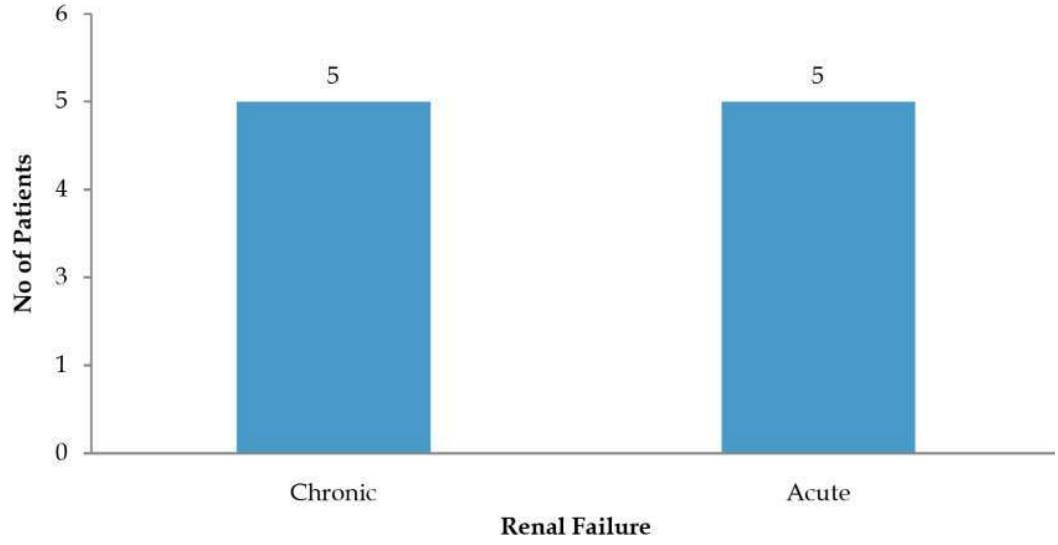


Graph 1: Diagnostical distribution of the risk factors forhyponatraemia implicated in our study



Graph 2: Antihypertensive drug category distributed in hyponatraemia patients in our study

ARB- angiotensin receptor blockers
Thiazide-thiazide diuretics
Loop- loop diuretics



Graph 3: Comparison of acute and chronic renal failure as risk factor for hyponatraemia

Table 2: EGFR- estimated glomerular filtration rate

	Minimum	Maximum	Mean	Std. Deviation
AGE	38	85	65.02	12.737
Serum sodium DAY 1	97.6	128	115.09	9.88
SERUM CREATININE	1	20	1.94	2.758
URINE SODIUM	11	181	74.70	41.010
EGFR	2	120	57.82	32.323

Discussion

Hyponatremia is commonly observed in emergency departments and may be associated with an excess of mortality, especially when profound (<125 mmol/l) [1]. Hyponatremia though was apparent in the population under study, but was asymptomatic in the majority. Symptoms seen in the patients presenting to our ED were nausea, vomiting, headache, and decreased level of consciousness ranging from dizziness, seizures, altered mental status to coma. Risk factors for developing profound hyponatraemia were the use of thiazide and potassium- sparing diuretics, age, renal losses due to renal failure.

The use of diuretics has been recognised to be associated with serious conditions in patients admitted to the emergency department [13]. National guidelines suggest that diuretics may negatively impact patient outcome and international experts strongly recommend using diuretics with caution in the elderly because of the high risk of hyponatraemia [14].

Various risk factors for profound hyponatraemia were identified in our study. We found that the majority of patients with hyponatraemia were elderly, as previously described [15,16]. Diuretics, mainly thiazides, are recognised as major risk factors for developing hyponatraemia [14,17,18]. It was deduced from our study that use of thiazide diuretics had significant association with development of hyponatremia, suggested by Liamis et al. [15].

Psychiatric disorders leading to an increased risk of hyponatremia has not been exclusively researched earlier. The heightened risk may be due to the use of psychotropics in that population, as these drugs are usually associated with the syndrome of inappropriate antidiuretic hormone secretion [1,9,19,20]. Unfortunately, we did not specifically record the use of medications other than diuretics, and therefore could not confirm this hypothesis [15,21,22].

In-hospital morbidity and mortality was high observed in patients who had profound hyponatraemia on admission [10,12,15,23]. This may be explained by various factors such as age, frequent comorbid conditions such as cancer, heart failure or cirrhosis, and severe admission conditions such as sepsis and stroke.

Our study has various limitations. First, study was done in a single institution,over a fixed period of 1 year, with a small sample size, hence cannot be generalised to whole population. Second, the investigator was not blinded hence the possibility of selection bias. Third ,the clinical evaluation of volaemic status has low specificity and sensitivity, which may lead to misclassification bias [1]. In relatively high proportion of patients the mechanism of hyponatremia was not found. In addition, we used calculated osmolarity to classify our patients, which may underestimate osmolarityin patients with alcohol intoxication, lactic acidosis, ketoacidosis, advanced chronic kidney diseases, masked hyperlipidaemia or hyperproteinaemia. Finally,our medication assessment was limited to antihypertensives, especially diuretics as these drugs are usually recognised as being a high risk for hyponatraemia or other serious conditions [13]. Hence, we could not analyse the association of other drugs implicated with risk of profound hyponatremia,like psychotropic drugs.

Conclusion

In conclusion, the most common mechanism of profound hyponatraemia was the use of thiazidediuretics. Our observations should encourage doctors to be cautious regarding the use of thiazide diuretics. Close monitoring of electrolytes in patients taking diuretics could be a way to prevent the development of hyponatraemia in these patients.

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