

Original Article

A Randomised control trial to assess the frequency of Hyponatremia in patients visiting indoor medical ward of Tertiary Care Hospital

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ABSTRACT:

Background: Hyponatremia can cause permanent disability or death. An overly rapid correction of hyponatremia may also expose patients to dramatic consequences. Furthermore, it is vital to also carefully consider chronic hyponatremia, which is associated with systemic detrimental effects and with a senescence effect. Hence, we planned the present study to assess the frequency of hyponatremia in randomly selected patients admitted in Guru Nanak Dev Hospital, Amritsar, Punjab. **Materials & methods:** The study included one thousand patients (n=1000) of confirmed hyponatremia selected from the randomly selected cases admitted in emergency and indoor medical wards of Guru Nanak Dev Hospital, Amritsar. Information regarding their age, sex and clinical diagnosis was collected. The data was statistically analyzed. **Results:** In the following case study of Hyponatremia, the total no. of patients assessed were 1000, following which 190 were recorded positive with hyponatremia. In accounting to 190 positive case, 127 (66.8%) were males and 63 (33.2%) were females. In the following case study of Hyponatremia, the total no. of patients scanned were 1000, following which 190 were recorded positive with hyponatremia. Out of which 36 patients were from ICU and 154 patients from ward. Amongst the 36 hyponatremic patients who were admitted in ICU, 14 patients expired. **Conclusion:** Our study emphasizes that these patients are at substantially increased mortality risk. Hence; an early detection and correction of hyponatremia can greatly prevent unfavorable outcomes, comorbidities and mortality.

Key words: Emergency department, Hyponatremia, Outcome.

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INTRODUCTION

Sodium is vital for fluid balance and cellular homeostasis. Sodium absorption occurs quantitatively in the distal small bowel and the colon. Sodium balance in the body is closely linked to that of water and is maintained by the kidneys finely.¹

A condition of true sodium and water depletion can occur only in pathologic conditions, such as severe adrenal insufficiency, sodium-losing kidney disease, extensive burns, chronic diarrhea, uncontrollable vomiting, extreme and prolonged sweating, diabetic ketoacidosis, excessive intake of diuretics, or continuous gastric suction.^{2,3}

Hyponatremia, defined as a serum sodium concentration less than 135 mmol/L, is the most common disorder of fluid and electrolyte imbalance in the body. Hyponatremia is present in 15–20 % of emergency admissions to hospital and is seen in up to 20 % of critically ill patients as observed by Funk G C et al. It can lead to a wide spectrum of clinical symptoms, from subtle to even life threatening and is associated with increased

mortality, morbidity and length of hospital stay in patients presenting with a range of conditions.⁴⁻⁶

Hyponatremia can cause permanent disability or death. An overly rapid correction of hyponatremia may also expose patients to dramatic consequences. Furthermore, it is vital to also carefully consider chronic hyponatremia, which is associated with systemic detrimental effects and with a senescence effect.⁷

Hence, we planned the present study to assess the frequency of hyponatremia in randomly selected patients admitted in Guru Nanak Dev Hospital, Amritsar, Punjab.

MATERIALS & METHODS

The study included one thousand patients (n=1000) of confirmed hyponatremia selected from the randomly selected cases admitted in emergency and indoor medical wards of Guru Nanak Dev Hospital, Amritsar. The patients were followed up till 6 months. The data was statistically analyzed. Biochemical testing was performed in the department of Biochemistry

of Govt. Medical College, Amritsar. Chest x-ray, Thyroid Function Tests, 2D echocardiography and ultrasound abdomen was done when indicated. Complete clinical examination and proper detailed history was recorded of all the hyponatremic patients admitted in medical wards at the time of admission. Finally, the clinical evaluation of volume status was observed and recorded.

Hyponatremic patients were screened for the following biochemical parameters:

- 1) Random blood sugar (by GOD-PAP Trevoler’s method)
- 2) Blood urea (by Berthelot method)
- 3) Complete blood count
- 4) Serum creatinine (by Jaffe’s method)
- 5) Serum Electrolytes (serum sodium and serum potassium by colorimetric method)
- 6) Complete urine examination (spot)
- 7) Serum osmolality (using the formula $2Na + Glucose/18 + blood\ urea\ nitrogen/2.8$ where glucose and blood urea nitrogen are measured in mg/dL)
- 8) Spot urinary sodium (photometric method)

STATISTICAL ANALYSIS

The data was collected, systematically analyzed statistically according to the standard statistical methods. SPSS software version 17.0 was used for assessment of results

RESULTS

In the following case study of Hyponatremia, the total no. of patients scanned were 1000, following which 190 were recorded positive with hyponatremia. In accounting to 190 positive case, 127 (66.8%) were males and 63 (33.2%) were females.

The table no. 2 exhibits the various diagnosis and diagnostic frequency along with percentage of the 190 patients suffering from hyponatremia. It panoply that patients suffering from Pneumonia {40 (21.1%)} were

most significantly recorded amongst the screened hyponatremic patients, followed by the Renal failure {30 (15.8%)}. It also illustrates that patients suffering from Stroke and Meningitis were also found highly positive with hyponatremia accounting {24(12.6%)} and {24(12.6%)} respectively of the total hyponatremic patients.

In addition to the above there were 21(11.1%) patients diagnosed with chronic cardiac failure amongst hyponatremic patients. In contrast only 1 (0.5%) patient of hyponatremia was diagnosed with primary adrenal insufficiency.

In larger context of description , the patients suffering from acute Gastroenteritis , acute pancreatitis, brain metastasis , bronchogenic carcinoma , cirrhosis , hypothyroidism , liver metastasis and tuberculosis were 5 , 2 , 9 , 7 , 8 , 2 , 1 , 16 amongst the hyponatremic patients

The table 3 illustrates the outcome of the patients found positively hyponatremic. A total of 190 patients were screened hyponatremia. From the total of 190 patients, 94 were cured whereas 78 remained diseased. In accounts to 190, 18 patients expired who were suffering from hyponatremia.

Table 4 shows the outcome of patients suffering from hyponatremia. 100 percent of the patients of the acute gastroenteritis group, hypothyroidism group and the acute pancreatitis group were complete cured. Out of the 30 patients with renal failure, death occurred in 4 patients.

In the following case study of Hyponatremia, the total no. of patients scanned were 1000, following which 190 were recorded positive with hyponatremia. Out of which 36 patients were from ICU and 154 patients from ward.

In the following case study of Hyponatremia, the total no. of patients scanned were 1000, following which 190 were recorded positive with hyponatremia. Amongst these hyponatremic patients, 36 were admitted in ICU of which 14 patients expired.

Table 1: Gender-wise distribution of hyponatremic patients

Gender	No. of hyponatremic patients	Percentage
Male	127	66.8
Female	63	33.2
Total	190	100

Table 2: Represents the patients with different diagnosis and diagnostic frequency.

Diagnosis	Frequency	Percent
Acute gastroenteritis	5	2.6
Acute pancreatitis	2	1.1
Brain metastasis	9	4.7
Bronchogenic carcinoma	7	3.7
Chronic cardiac failure	21	11.1
Cirrhosis	8	4.2
Hypothyroidism	2	1.1
Liver metastasis	1	.5
Meningitis	24	12.6
Pneumonia	40	21.1
Primary adrenal insufficiency	1	.5
Renal failure	30	15.8
Stroke	24	12.6
TB	16	8.4
Total	190	100.0

Table 3: Outcome of patients suffering from hyponatremia

Outcome	Frequency	Percent
Cured	94	49.5
Diseased	78	41
Expired	18	9.5
Total	190	100.0

Table 4: Outcome of patients suffering from hyponatremia according to diagnosis

Diagnosis	Cured	Diseased	Expired
Acute gastroenteritis	5	0	0
Acute pancreatitis	2	0	0
Brain metastasis	0	6	3
Bronchogenic carcinoma	0	4	3
Chronic cardiac failure	5	15	1
Cirrhosis	0	8	0
Hypothyroidism	2	0	0
Liver metastasis	0	1	0
Meningitis	21	0	3
Pneumonia	38	1	1
Primary adrenal insufficiency	0	1	0
Renal failure	0	26	4
Stroke	7	15	2
TB	14	1	1
Total	94	78	18

Table 5: Number of hyponatremic patients in ICU vs ward

	Number of patients
ICU	36
Ward	154
Total	190

Table 6: Outcome of hyponatremic patients admitted in ICU

	Number of ICU patients
Cured	8
Expired	14
Diseased	12
On treatment	2
Total	36

DISCUSSION

In the following case study of Hyponatremia, the total no. of patients scanned were 1000, following which 190 were recorded positive with hyponatremia. In accounting to 190 positive case, 127 (66.8%) were males and 63 (33.2%) were females. In the present study, Hyponatremia was found to be present in 190 patients. The frequency of occurrence of Hyponatremia was found to be 19 percent. In one of the previous study, the frequency of hyponatremia on ICU admission was 34.3% of all ICU admissions. Recent studies which have reported hyponatremia to occur in about 30-40% of ICU patients as observed by DeVita *et al.*^{8,9}

In the present study, Hyponatremia was more common in male (66.8 percent) patients, in comparison to females. This study were in concordance with the results obtained by previous authors who also reported similar findings.^{10,11} In one study, of 100 patients admitted with moderate-to-severe hyponatremia, slight male preponderance was observed. A similar gender distribution pattern was reported by Rahil *et al.* wherein 33 (62.3%) patients with hyponatremia were males and 20 (37.7%) were females. The incidence of hyponatremia

is higher in the elderly, owing to the impaired water and electrolyte homeostasis due to dietary and environmental variations. In accordance with other reports, in our study, hyponatremia was more prevalent among the elderly patients than in the younger patients.¹⁰⁻¹⁴

Pneumonia was found to be present in 21.1 percent of patients with hyponatremia. Among hyponatremic patients, Renal failure, Stroke and Meningitis was found to be present in 15.8 percent, 12.6 percent and 12.6 percent of the patients. Cardiac failure and Tuberculosis was found to be present in 11.1 percent and 8.4 percent of the cases. Brain metastasis and cirrhosis were found to be present in 4.7 and 4.2 percent of the cases. Out of 190 hyponatremic patients, death occurred in 9.5 percent of the patients and complete cure occurred in 49.5 percent of the patients. Diseased state was found to be present in 41.1 percent of the patients.

Data from the previous literature stated that Hyponatremia is often encountered in patients with heart failure. In one study, 11.1% of patients with chronic congestive heart failure had hyponatremia.¹⁵⁻¹⁷

A large number of clinical studies have confirmed the association of hyponatremia with increased

morbidity and mortality in patients hospitalized for heart failure or outpatients with chronic heart failure. A recent meta-analysis that included 14766 patients from 22 studies and used as endpoint the death from any cause at 3 years showed that the risk of death is linearly increasing with serum sodium levels < 140 mmol/L. Moreover, hyponatremia was predictive of death in both patients with reduced or preserved ejection fraction. Another recent study, which enrolled 1000 consecutive patients with heart failure of any cause and severity for a median duration of 5.1 years, showed that hyponatremia was associated with a significantly increased mortality risk (HR = 2.10, 95%CI: 1.60-2.77). Notably, it was shown that serum sodium within the reference range has a U-shaped association with mortality risk; specifically, sodium levels of 135-139 mmol/L indicated an increased mortality risk, whereas sodium levels of 140-145 mmol/L were associated with the best prognosis. Hyponatremia has also been found to be an important predictor of survival in several risk models in patients with heart failure.¹⁸⁻²¹

In present study, out of 40 pneumonia cases with Hyponatremia, death occurred in 2.5 percent of the patients. Pneumonia is known to be associated with hyponatremia at the time of admission and it is associated with more severe illness, increased risk of mortality and prolonged hospital stays as reported by Nair *et al.*²²

The association of hyponatremia with respiratory illness has been recognized for more than 70 years. Winkler and Crankshaw first reported low serum [Na⁺] in patients with pulmonary tuberculosis in 1938. Roughly 25 years later, reports of hyponatremia in patients with pneumonia began to surface in the literature. The prevalence of hyponatremia (serum [Na⁺] < 0.001), mechanical ventilation (3.9% vs 2.3%, P ¼ 0.01), longer ICU (6.3 vs 5.3 days, P ¼ 0.07) and hospital lengths of stay (7.6 vs 7.0 days, P < 0.001), and a trend toward higher hospital mortality (5.4% vs 4.0%, P ¼ 0.1) as compared with those with normal serum [Na⁺]. Hyponatremia is also associated with higher illness severity in a variety of other patient populations. The underlying nature of these associations, however, remains obscure.²²⁻²⁶

19% of total patients included in this study were diagnosed hyponatremic. The study collaborated well with the previous studies done regarding hyponatremia. Hence, it can be concluded that hyponatremia is one of the most severe electrolyte disturbance responsible for significant morbidity and mortality in medical wards and ICU, and hence should be managed rigorously.

CONCLUSION

Hyponatremia continues to be prevalent in the patients admitted in emergency and indoor medical wards and might reflect upon the complexity of the medical status of the patient as well as the quality of care given to the patient. However, our study emphasizes that these patients are at substantially increased mortality risk. Hence; an early detection and correction of hyponatremia

can greatly prevent unfavorable outcomes, comorbidities and mortality.

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