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Research Article

Clinical Profile, Etiological Spectrum, and Three-Month Outcomes of Hyponatremia in Hospitalized Geriatric Patients: A Prospective Longitudinal Observational Study

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ABSTRACT

Background: Hyponatremia is the most common electrolyte disorder among hospitalized older adults and is associated with increased morbidity, mortality, prolonged hospitalization, and poor clinical outcomes. Data on its clinical profile and outcomes in South Indian geriatric patients remain limited.

Objectives: To evaluate the clinical profile, etiological spectrum, and three-month outcomes of hyponatremia among hospitalized geriatric patients.

Materials and Methods: A prospective longitudinal observational study was conducted in the Department of General Medicine, PES Institute of Medical Sciences and Research, Kuppam, from March 2024 to September 2025. Fifty-seven patients aged ≥60 years with serum sodium <130 mEq/L were enrolled. Clinical features, etiological factors, laboratory findings, treatment, serial serum sodium levels, complications, and outcomes were recorded. Data were analyzed using IBM SPSS Statistics version 23.0. A p-value <0.05 was considered statistically significant.

Results: Acute hyponatremia (82.5%) and hypervolemic hyponatremia (57.9%) were the predominant presentations. Drug-induced hyponatremia (29.8%), infections (28.1%), and SIADH (28.1%) were the leading etiologies. Mean serum sodium increased significantly from 122.03 ± 6.37 mEq/L at admission to 136.24 ± 2.95 mEq/L at discharge and 139.95 ± 2.48 mEq/L at three months ($p<0.001$). Recovery was observed in 86.0% of patients at discharge and 96.5% at three months, with mortality in one patient (1.8%).

Conclusion: Hyponatremia in hospitalized geriatric patients was predominantly acute and hypervolemic, with drug-induced causes, infections, and SIADH accounting for most cases. Early etiological evaluation, medication review, and individualized management resulted in significant improvement in serum sodium concentrations and favorable three-month outcomes.

Keywords: Hyponatremia, Older Adults, Geriatric Medicine, SIADH Electrolyte Disorders, Clinical Outcomes.

INTRODUCTION

Hyponatremia, defined as a serum sodium concentration below 135 mmol/L, is the most common electrolyte disorder encountered in clinical practice and is associated with considerable morbidity and mortality worldwide (1,2). It is frequently observed among hospitalized patients, particularly in elderly

individuals and critically ill populations, where its prevalence and clinical impact are substantially higher (3,4). Hyponatremia may result from a variety of underlying conditions, including heart failure, liver cirrhosis, renal disease, endocrine disorders, and the use of medications such as diuretics and antidepressants (5,6).

The clinical manifestations of hyponatremia range from mild nonspecific symptoms to severe neurological complications. Acute severe hyponatremia can lead to cerebral edema, seizures, coma, and death, whereas chronic hyponatremia has been associated with gait disturbances, falls, fractures, cognitive impairment, and reduced quality of life, particularly among older adults (7,8). In addition, hyponatremia has emerged as an independent predictor of prolonged hospitalization, adverse clinical outcomes, and increased mortality in patients with several chronic diseases (4,9).

Elderly individuals are particularly vulnerable to hyponatremia because of age-related physiological changes affecting water and sodium homeostasis. Reduced renal concentrating capacity, altered vasopressin regulation, multiple comorbidities, and polypharmacy significantly increase the risk of developing sodium imbalance in this population (10,11). The widespread use of thiazide diuretics further contributes to the burden of hyponatremia among older adults (12).

In India, hyponatremia is commonly encountered in hospitalized patients, with several studies highlighting its high prevalence among elderly individuals and its association with significant morbidity (13–15). Despite its clinical importance, data regarding the etiological profile, clinical presentation, and outcomes of hyponatremia in geriatric patients remain limited in many regions. Understanding these factors is essential for early diagnosis, appropriate management, and prevention of complications.

With the rapidly growing elderly population worldwide and in India, the burden of age-related electrolyte disorders is expected to increase substantially in the coming decades. Therefore, the present study was undertaken to evaluate the clinical profile, etiological factors, and outcomes of hyponatremia among geriatric patients admitted to a tertiary care hospital.

To our knowledge, prospective longitudinal data evaluating the clinical profile, etiological spectrum, serial sodium correction, and three-month outcomes among hospitalized geriatric patients with hyponatremia remain limited in South India.

MATERIALS AND METHODS

Study design and setting

A longitudinal observational study was conducted in the Department of General Medicine at PES Institute of Medical Sciences and Research (PESIMSR), Kuppam, Andhra Pradesh, India. The study included geriatric patients presenting to the emergency department, outpatient department, and medical wards with hyponatremia.

Study period and participants

The study was carried out over 18 months from March 2024 to September 2025. Patients aged 60 years and above with serum sodium levels <130 mEq/L at presentation were eligible for inclusion. Patients with known endocrine disorders such as hypothyroidism or adrenal insufficiency and those unwilling to provide informed consent were excluded.

Sample size and sampling

Based on the average annual number of geriatric hyponatremia cases treated at the institution during the preceding year, the estimated sample size was 57 participants. Consecutive eligible patients presenting during the study period were recruited until the required sample size was achieved.

Data collection and study procedures

After obtaining written informed consent, demographic details, clinical history, comorbidities, medication history, and presenting symptoms were recorded using a structured study proforma. A detailed clinical examination was performed with particular attention to neurological and volume status assessment.This study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Laboratory investigations included serum electrolytes, renal function tests, complete blood count, and serum osmolality. Additional investigations such as urine sodium, urine osmolality, thyroid function tests, serum cortisol estimation, and neuroimaging studies (CT/MRI brain) were performed whenever clinically indicated.

Serum sodium levels were monitored at admission and subsequently at 12, 24, 48, and 72 hours. Further measurements were obtained as clinically indicated during hospitalization. Following discharge, patients were followed up in the outpatient department for a period of three months, during which serial serum

sodium measurements and clinical outcomes were documented.

Information regarding etiology, type of hyponatremia (hypovolemic, euvolemic, or hypervolemic), treatment administered, rate of sodium correction, complications, duration of hospital stay, and final outcomes were recorded prospectively.

Study variables

The independent variables included age, sex, comorbidities, type and etiology of hyponatremia, and biochemical parameters such as serum sodium, serum osmolality, urine sodium, and urine osmolality. Outcome variables included clinical manifestations, duration of hospital stay, rate of sodium correction, complications, recovery status, and mortality.

Ethical considerations

The study was approved by the Institutional Ethics Committee of PES Institute of Medical Sciences and Research, Kuppam. Written informed consent was obtained from all participants or their legally authorized representatives. Confidentiality of participant information was maintained throughout the study.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the study findings. Categorical variables, including demographic characteristics, comorbidities, type and severity of hyponatremia, clinical presentation, etiology, complications, duration of hospital stay, and clinical outcomes, were presented as frequencies and percentages. Continuous variables were expressed as mean ± standard deviation (SD). Serial serum sodium levels measured at admission, 12 hours, 24 hours, 48 hours, 72 hours, discharge, and 3-month follow-up were compared with baseline values using paired t-tests. Pearson's chi-square test was used to assess the association between hyponatremia type (acute/chronic) and etiology, duration of hospital stay, short-term outcome, and long-term outcome. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 57 geriatric patients with hyponatremia were included in the study. The participants were almost equally distributed between the age groups of 60–69 years (49.1%) and ≥70 years (50.9%). Males constituted 61.4% of the study population. Hypertension (52.6%) and diabetes mellitus (43.9%) were the most common comorbidities. Acute hyponatremia was observed in 82.5% of patients, while 57.9% had hypervolemic hyponatremia. Moderate hyponatremia was present in 54.4% of participants. Mixed clinical manifestations were the most common presentation (36.8%), followed by asymptomatic (26.3%) and neurological symptoms (24.6%) (**Table 1**).

Drug-induced hyponatremia was the most common etiology (29.8%), followed by infections (28.1%) and syndrome of inappropriate antidiuretic hormone secretion (SIADH) (28.1%). More than half of the patients (52.6%) did not develop complications during the study period, while neurological complications were observed in 22.8%. Most patients (66.7%) had a hospital stay of ≤7 days. At discharge, 86.0% of patients had recovered, and recovery increased to 96.5% at the 3-month follow-up. Mortality was recorded in one patient (1.8%) (**Table 2**).

The mean serum sodium level at admission was 122.03 ± 6.37 mEq/L. A significant and progressive increase in serum sodium levels was observed during follow-up, reaching 124.11 ± 6.48 mEq/L at 12 hours, 128.80 ± 5.46 mEq/L at 48 hours, and 136.24 ± 2.95 mEq/L at discharge (all $p<0.001$). At the 3-month follow-up, the mean serum sodium level further increased to 139.95 ± 2.48 mEq/L, indicating sustained correction of hyponatremia (**Table 3 & Figure 1**).

The etiology of hyponatremia showed a statistically significant association with hyponatremia type ($p=0.031$), with all cases of SIADH and chronic liver disease presenting as acute hyponatremia. Duration of hospital stay also differed significantly between acute and chronic hyponatremia ($p=0.020$), with acute cases more commonly discharged within seven days. Short-term outcomes were significantly associated with hyponatremia type ($p=0.016$), as recovery was higher among patients with acute hyponatremia compared to those with chronic hyponatremia. However, no significant association was observed between hyponatremia type and long-term outcomes at three months ($p=0.802$), with recovery rates exceeding 95% in both groups (**Table 4**).

DISCUSSION

The present longitudinal study evaluated the clinical profile, etiological spectrum, and outcomes of hyponatremia among geriatric patients admitted to a tertiary care hospital.

Hyponatremia is one of the most common electrolyte disturbances encountered in elderly individuals and is associated with significant morbidity because of age-related physiological changes, multiple comorbidities, and polypharmacy (11). The findings of the present study demonstrated that males constituted the majority of patients, hypertension and diabetes mellitus were the predominant comorbidities, and most patients presented with acute and hypervolemic hyponatremia.

The age distribution in the present study was almost equally divided between patients aged 60–69 years and those aged ≥70 years. Similar findings were reported by Khan et al. (16), who observed that hyponatremia was prevalent across the elderly age spectrum. Chandregowda et al. (1) also reported that advancing age was associated with an increased burden of hyponatremia among hospitalized geriatric patients. Patil et al. (18) found that the majority of patients belonged to the 71–80-year age group, while Manju et al. (19) reported a mean age of nearly 74 years among affected individuals. These findings collectively indicate that advancing age remains one of the strongest risk factors for the development of hyponatremia. Male predominance observed in the present study is comparable to findings reported by Khan et al. (16), Patil et al. (18), Manju et al. (19), and Bhattacharjee et al. (20), all of whom documented a higher proportion of males among elderly patients with hyponatremia. Similar observations were reported by Hawkins (10). Although the exact explanation remains uncertain, differences in healthcare-seeking behavior, prevalence of chronic diseases, and hospitalization patterns may contribute to this finding.

Hypertension and diabetes mellitus were the most common comorbid conditions identified in the present study. Comparable findings have been reported by Patil et al. (18) and other Indian studies evaluating elderly patients with hyponatremia. These chronic diseases frequently require treatment with antihypertensive agents and diuretics, which can predispose patients to sodium imbalance. The influence of underlying comorbidities on outcomes was highlighted by Mannheimer et al. (21), who demonstrated that excess mortality associated with hyponatremia is often attributable to underlying illnesses rather than the electrolyte disturbance alone. Acute hyponatremia accounted for more than four-fifths of cases in the present study. Similar observations have been reported by Khan et al. (16) and Sundar et al. (24), where acute infections, medication use, and systemic illnesses were major precipitating factors. Acute reductions in serum sodium are clinically important because they may result in cerebral edema and neurological deterioration if not recognized promptly (7).

Hypervolemic hyponatremia was the predominant volume status in the present study. In contrast, Patil et al. (18), Manju et al. (19), Bhattacharjee et al. (20), and Sundar et al. (24) reported euvolemic hyponatremia as the most common presentation. Hypervolemic hyponatremia is typically associated with disorders such as heart failure, chronic kidney disease, and liver disease, where persistent vasopressin secretion leads to water retention and dilutional hyponatremia (5,22). Differences in volume status distribution between studies may reflect variations in referral patterns and underlying disease burden. Moderate hyponatremia was slightly more common than severe hyponatremia in the present study. Bhattacharjee et al. (20) similarly reported that moderate and severe sodium deficits constituted the majority of cases among hospitalized elderly patients. Earlier diagnosis through routine biochemical testing may explain the predominance of moderate cases in the present study. Since severity of hyponatremia has been linked to adverse outcomes and mortality, early detection remains important (21).

Mixed clinical manifestations were the most common presentation, followed by asymptomatic and neurological symptoms. Chandregowda et al. (15) reported that nausea and vomiting were frequent presenting symptoms, while Khan et al. (16) observed that dizziness, lethargy, and behavioral changes were common. Manju et al. (19) similarly identified lethargy, drowsiness, and abnormal behavior as predominant symptoms. The substantial proportion of asymptomatic patients in the present study highlights the importance of routine electrolyte screening in elderly individuals. Renneboog et al. (8) demonstrated that even mild chronic hyponatremia can result in subtle cognitive impairment, gait instability, and falls. Drug-induced hyponatremia emerged as the most common etiology in the present study. This finding underscores the growing impact of polypharmacy among older adults. Warren et al. (22) emphasized that medications remain an important precipitating factor for hyponatremia and may contribute directly or

indirectly through SIADH. Falhammar et al. (23) demonstrated that newly initiated antihypertensive medications significantly increase the risk of severe hyponatremia. Similarly, Sundar et al. (24) and Bhattacharjee et al. (20) identified drug exposure as a major contributor to hyponatremia among elderly patients.

Infections and SIADH were the next most common etiological factors in the present study. Sundar et al. (24), Patil et al. (18), and Bhattacharjee et al. (20) similarly reported SIADH as one of the leading causes of hyponatremia in hospitalized elderly patients. Warren et al. (22) highlighted that SIADH remains the most common cause of hypotonic hyponatremia and may occur secondary to pulmonary disease, central nervous system disorders, malignancies, and medications. These observations emphasize the importance of detailed etiological assessment before initiating treatment. More than half of the participants did not develop complications during hospitalization, while neurological complications were the most common adverse events among those affected. Bhattacharjee et al. (19) reported a higher frequency of confusion and seizures among patients with severe hyponatremia. Sundar et al. (23) also demonstrated that neurological deterioration was strongly associated with lower serum sodium concentrations. These findings reinforce the importance of prompt diagnosis and cautious correction of sodium deficits.

Most patients in the present study had a hospital stay of less than seven days. Sahu et al. (24), while studying electrolyte abnormalities in critically ill patients, emphasized the importance of routine electrolyte monitoring and early correction to reduce complications and improve outcomes. Early recognition and appropriate treatment of hyponatremia likely contributed to the relatively shorter hospital stay observed in the present study. A favorable clinical outcome was observed in the majority of patients. Recovery was achieved in 86.0% of patients at discharge and increased to 96.5% at three months, while mortality was limited to a single patient. These outcomes compare favorably with those reported by Manju et al. (18), Patil et al. (17), and Sundar et al. (23), where mortality ranged from 12% to 17%. The lower mortality observed in the present study may reflect earlier diagnosis, effective management, and the predominance of reversible causes.

Serial serum sodium measurements demonstrated a progressive and sustained improvement from admission through the three-month follow-up period. The mean serum sodium concentration increased from 122.03 ± 6.37 mEq/L at admission to 139.95 ± 2.48 mEq/L at three months. Similar findings were reported by Pelouto et al. (25), who demonstrated successful correction of hyponatremia with contemporary therapeutic approaches and careful biochemical monitoring. These findings support the importance of regular follow-up and individualized treatment strategies. Hyponatremia has significant implications beyond immediate clinical outcomes. Turgutalp et al. (26) demonstrated that hyponatremia contributes to increased healthcare costs, prolonged hospitalization, and greater resource utilization among elderly patients. Furthermore, Ngcobo (27) highlighted that age-related pharmacokinetic and pharmacodynamic alterations substantially increase vulnerability to adverse drug effects, emphasizing the importance of individualized prescribing and medication monitoring in older adults.

The findings of the present study have important clinical implications. Elderly patients frequently present with nonspecific symptoms, and a substantial proportion may remain asymptomatic despite significant biochemical abnormalities. Therefore, routine electrolyte monitoring, careful medication review, identification of underlying etiologies, and structured follow-up should form integral components of geriatric care. The present study has certain limitations. The relatively small sample size and single-center design may limit the generalizability of the findings. Nevertheless, the longitudinal design and three-month follow-up provide valuable insights into the clinical profile, etiological spectrum, and outcomes of hyponatremia among elderly patients in a real-world clinical setting.

Clinical Implications:

The findings of this study emphasize the importance of routine electrolyte monitoring, careful medication review, and early identification of reversible causes of hyponatremia among hospitalized older adults. Incorporating these measures into routine geriatric care may reduce neurological complications, shorten hospital stay, and improve overall clinical outcomes.

Limitations: The study was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability

of the findings. In addition, multivariable regression analysis was not performed because of the limited sample size. Larger multicenter prospective studies are required to validate these findings and further evaluate independent predictors of clinical outcomes.

CONCLUSION

Hyponatremia among geriatric patients was predominantly acute and hypervolemic, with drug-induced causes, infections, and SIADH accounting for most cases. Most patients achieved favorable outcomes following appropriate treatment. Early diagnosis, systematic etiological evaluation, medication review, and regular monitoring of serum sodium remain critical for improving outcomes in this vulnerable population.

REFERENCES

1. Janicic N, Verbalis JG. Evaluation and management of hypoosmolality in hospitalized patients. Endocrinol Metab Clin North Am. 2003;32:459–81.
2. Adrogue HJ, Madias NE. Hyponatremia. N Engl J Med. 2000;342:1581–9.
3. Clayton JA, Le Jeune IR, Hall IP. Severe hyponatraemia in medical in-patients: Aetiology, assessment and outcome. Q J Med. 2006;99:505–11.
4. Nzerue CM, Baffoe-Bonnie H, You W, Falana B, Dai S. Predictors of outcome in hospitalized patients with severe hyponatremia. J Natl Med Assoc. 2003;95:335–43.
5. Lee WH, Packer M. Prognostic importance of serum sodium concentration and its modification by converting-enzyme inhibition in patients with severe chronic heart failure. Circulation. 1986;73:257–67.
6. Hannon MJ, Thompson CJ. The syndrome of inappropriate antidiuretic hormone: prevalence, causes and consequences. Eur J Endocrinol. 2010;162(Suppl 1):S5–12.
7. Moritz ML, Ayus JC. The pathophysiology and treatment of hyponatraemic encephalopathy: an update. Nephrol Dial Transplant. 2003;18:2486–91.
8. Renneboog B, Musch W, Vandemergel X, Manto MU, Decaux G. Mild chronic hyponatremia is associated with falls, unsteadiness, and attention deficits. Am J Med. 2006;119(1):71.e1–8.
9. Waikar SS, Mount DB, Curhan GC. Mortality after hospitalization with mild, moderate, and severe hyponatremia. Am J Med. 2009;122:857–65.
10. Hawkins RC. Age and gender as risk factors for hyponatremia and hypernatremia. Clin Chim Acta. 2003;337:169–72.
11. Soiza RL, Cumming K, Clarke JM, Wood KM, Myint PK. Hyponatremia: special considerations in older patients. J Clin Med. 2014;3(3):944–58.
12. Clayton JA, Rodgers S, Blakey J. Thiazide diuretic prescription and electrolyte abnormalities in primary care. Br J Clin Pharmacol. 2006;61:87–95.
13. Rao MY, Sudhir U, Kumar TA, Saravanan S, Mahesh E, Punith K. Hospital-based descriptive study of symptomatic hyponatremia in elderly patients. J Assoc Physicians India. 2010;58:667–69.
14. Jain AK, Nandy P. Clinico-etiological profile of hyponatremia among elderly age group patients in a tertiary care hospital in Sikkim. J Family Med Prim Care. 2019;8(3):988–94.
15. Chandregowda, Mahesh K, Unnikrishnan A. Study of clinical profile of hyponatremia in elderly patients admitted to medical wards at Mandya Institute of Medical Sciences, Mandya. Int J Adv Med. 2021;8(3):594.
16. Khan ZA, Agrawal PK, Alam MF, Ahmad S, Jahan N, Sharma A, et al. Study of clinical profile and etiological profile of hyponatremia in elderly patients. Int J Med Sci. 2024;14(6):72-6.
17. Patil et al. Clinico etiological profile and outcomes of hyponatremia in hospitalized elderly patients. Eur J Cardiovasc Med. 2024;14(1):146-52.
18. Manju et al.Clinico-etiological profile of hyponatremia among elderly patients admitted in medical ward of rural tertiary care hospital Dr. RPGMC Kangra at Tanda, Himachal Pradesh. Int J Health Clin Res. 2020;3(9):45-50.
19. Bhattacharjee J, Deuri A, Kausar N, Talukdar PM. Clinical profile of euvolemic hyponatremia and its outcome in elderly hospitalized patients. Int J Pharm Clin Res. 2024;16(10):454-60.
20. Mannheimer B, Lindh JD, Issa I, Andersson Franko M, Falhammar H,

Skov J. Mortality and causes of death in patients hospitalized with hyponatremia: a propensity-matched cohort study. Eur J Intern Med. 2025;138:76–82.

21. Warren AM, Grossmann M, Christ-Crain M, Russell N. Syndrome of inappropriate antidiuresis: from pathophysiology to management. Endocr Rev. 2023;44(5):819–861.
22. Falhammar H, Skov J, Calissendorff J, Nathanson D, Lindh JD, Mannheimer B. Associations between antihypertensive medications and severe hyponatremia: a Swedish population-based case-control study. J Clin Endocrinol Metab. 2020;105(10):e3696–e3705.
23. Sundar B, Shetty V, Chandrakar S, Bhori M. Study of clinical profile and outcome of hyponatremia in hospitalized patients. Int J Acad Med Pharm. 2023;5(2):702-7.
24. Sahu UP, Farooquee MR, Hasan O, Ehtesham S, Hasan R. *A Cross-Sectional Study on the Observation of Clinical Profiles and AssociatedElectrolyte Disturbances in Patients Admitted to the Pediatric Intensive Care Unit (PICU) at a Tertiary Care Center*. Cureus. 2025;17(1):e77698. doi:10.7759/cureus.77698.
25. Pelouto A, Monnerat S, Refardt J, Zandbergen AAM, Christ-Crain M, Hoorn EJ. Clinical factors associated with hyponatremia correction during treatment with oral urea. Nephrol Dial Transplant. 2025 Feb 4;40(2):283-293.
26. Turgutalp K, Ozhan O, Gok Oguz E, Horoz M, Isgoren S, Yelken B, et al. Clinical features, outcome and cost of hyponatremia-associated admission in elderly patients. Int Urol Nephrol. 2013;45(1):265–273.
27. Ngcobo NN. Influence of ageing on the pharmacodynamics and pharmacokinetics of chronically administered medicines in geriatric patients: a review. Clin Pharmacokinet. 2025;64(4):335–367.

Table 1. Baseline characteristics of geriatric patients with hyponatremia (N=57)

Variable	Categories	n	%
Age in years	60–69 years	28	49.12
	≥70 years	29	50.88
Sex	Male	35	61.40
	Female	22	38.60
Morbidities	Diabetes mellitus	25	43.86
	Hypertension	30	52.63
	Chronic kidney disease	2	3.51
	Chronic liver disease	1	1.75
	Heart failure	3	5.26
Type of hyponatremia	Acute hyponatremia	47	82.46
	Chronic hyponatremia	10	17.54
Volume Status	Hypervolemic	33	57.89
	Euvolemic	21	36.84
	Hypertonic	3	5.26
Severity	Moderate severity	31	54.39
	Severe severity	26	45.61
Clinical Symptoms	Mixed symptoms	21	36.84
	Asymptomatic	15	26.32
	Neurological symptoms	14	24.56
	Gastrointestinal symptoms	7	12.28

Table 2. Etiology, complications, hospital stay, and outcomes (N=57)

Variable	Categories	n	%
Etiology	Drug-induced	17	29.82
	Infections	16	28.07
	SIADH	16	28.07
	CKD-related	4	7.02

	Congestive heart failure	3	5.26
	Chronic liver disease	1	1.75
Complications	Neurological complications	13	22.81
	Seizures	5	8.77
	Gastrointestinal complications	5	8.77
	Falls	3	5.26
	Cerebral complications	1	1.75
Duration of Stay	≤7 days stay	38	66.67
	8–14 days stay	16	28.07
	15–30 days stay	3	5.26
Short-term Outcome	Recovered (short-term)	49	85.96
	Not recovered (short-term)	7	12.28
	Death (short-term)	1	1.75
Long-term Outcome	Recovered (3 months)	55	96.49
	Not recovered (3 months)	1	1.75
	Death (3 months)	1	1.75

Table 3. Serial serum sodium levels during follow-up (N=57)

Time point	Mean ± SD (mEq/L)	p value
Admission	122.03 ± 6.37	Reference
12 hours	124.11 ± 6.48	<0.001
24 hours	125.82 ± 6.20	<0.001
48 hours	128.80 ± 5.46	<0.001
72 hours	131.99 ± 4.88	<0.001
Discharge	136.24 ± 2.95	<0.001
3 months	139.95 ± 2.48	<0.001

**Paired t-test*

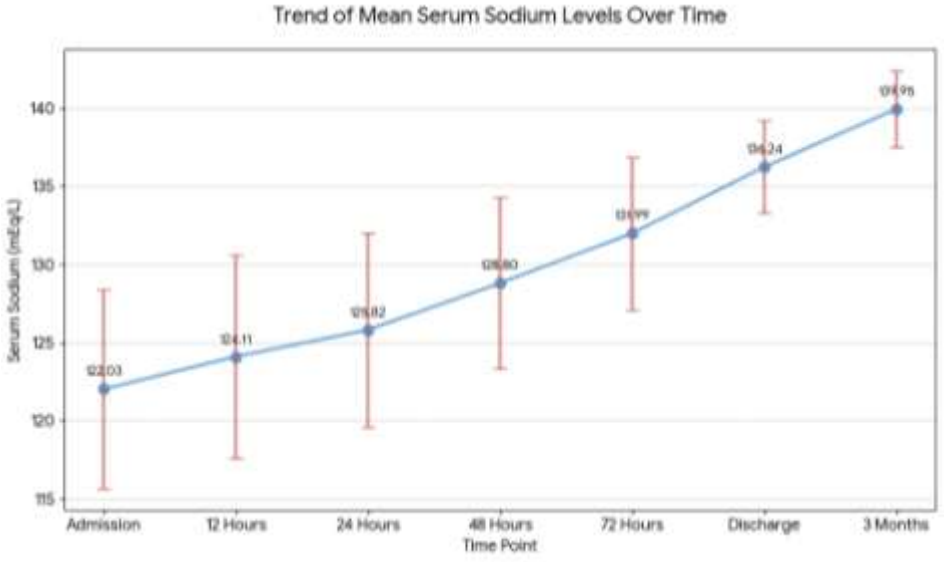

Figure 1. Trend of mean Serum Levels

Table 4. Association of hyponatremia type with etiology, duration of hospital stay, and clinical outcomes (N=57)

Variable	Acute n (%)	Chronic n (%)	p value
Etiology			
CHF	2 (66.67)	1 (33.33)	0.031
CKD	3 (75.00)	1 (25.00)	

CLD	1 (100.00)	0 (0.00)	
Drug-induced	10 (58.82)	7 (41.18)	
Infections	15 (93.75)	1 (6.25)	
SIADH	16 (100.00)	0 (0.00)	
Duration of hospital stay			
≤7 days	33 (70.21)	5 (50.00)	0.020
7–14 days	11 (23.40)	5 (50.00)	
14–30 days	3 (6.38)	0 (0.00)	
Short-term outcome			
Death	1 (2.13)	0 (0.00)	0.016
Not recovered	4 (8.51)	3 (30.00)	
Recovered	42 (89.36)	7 (70.00)	
Long-term outcome			
Death	1 (2.13)	0 (0.00)	0.802
Not recovered	1 (2.13)	0 (0.00)	
Recovered	45 (95.74)	10 (100.00)	

**P values obtained using the Pearson chi-square test.*