



Research Article

## Assessment of Clinical Features, Etiology and Severity of Hyponatremia in Critically Ill Patients Admitted to MICU

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### ABSTRACT

**Background:** Hyponatremia is the most common electrolyte disorder encountered in critically ill patients and is associated with significant morbidity and mortality. Despite its high prevalence, data on clinical profile and etiological patterns in Indian ICU settings remain limited.

**Objective:** To assess the clinical features, etiology, and severity of hyponatremia in critically ill patients admitted to the Medical Intensive Care Unit (MICU).

**Materials and Methods:** This cross-sectional observational study was conducted over two years (October 2015–October 2017) in the MICU of a tertiary care center. A total of 100 adult patients with moderate to severe hyponatremia (serum sodium  $\leq 125$  mEq/L) were included. Detailed clinical evaluation, biochemical investigations including serum and urine osmolality, and urine sodium were performed. Hyponatremia was classified based on volume status and osmolality. Statistical analysis was performed using appropriate tests, with  $p < 0.05$  considered significant.

**Results:** Among 100 patients, 59% were males and 41% females, with a mean age of  $58.94 \pm 16.10$  years. The majority (54%) had severe hyponatremia ( $< 120$  mEq/L). Common presenting symptoms included vomiting (28%) and confusion (26%). CNS manifestations were observed in 61% of patients. Euvolemic hyponatremia was most common (50%), followed by hypervolemic (33%) and hypovolemic (17%). Syndrome of inappropriate antidiuretic hormone secretion (SIADH) was the leading etiology (46%), with infections accounting for 56.52% of SIADH cases, predominantly tuberculosis (57.7%). A significant association was found between severe hyponatremia and confusion ( $p < 0.001$ ). Overall mortality was 6%.

**Conclusion:** Hyponatremia in critically ill patients commonly presents with neurological symptoms and is predominantly euvolemic in nature. SIADH, particularly due to infections like tuberculosis, is the leading cause. Early recognition and etiological evaluation are essential to reduce morbidity and mortality.

**Keywords:** Hyponatremia; SIADH; MICU; Electrolyte imbalance; Tuberculosis.

### INTRODUCTION

Hyponatremia, defined as a serum sodium concentration of less than 135 mEq/L, is the most common electrolyte disorder encountered in hospitalized patients, particularly in intensive care settings [1]. It reflects a disturbance in water balance rather than sodium deficiency and is primarily mediated by inappropriate secretion or action of antidiuretic hormone (ADH) [2]. The prevalence of hyponatremia ranges from 15–30% among hospitalized patients and may reach up to 25% in ICU settings [3,4]. Moderate to severe hyponatremia is associated with significant neurological complications including cerebral edema, seizures, coma, and death [5]. The severity of symptoms depends on both the degree and rapidity of sodium decline [6].

Critically ill patients are particularly vulnerable due to multiple contributing factors such as sepsis, renal dysfunction, medications, and inappropriate fluid administration [7]. The syndrome of inappropriate antidiuretic hormone secretion

(SIADH) is one of the most common etiologies, especially in association with pulmonary infections, CNS disorders, and malignancies [8]. In developing countries like India, infections such as tuberculosis play a significant role in the pathogenesis of hyponatremia through mechanisms including SIADH, adrenal insufficiency, and CNS involvement [9,10,11]. Despite its clinical importance, distinguishing the etiology of hyponatremia remains challenging due to overlapping clinical presentations and multifactorial causes [12].

Hence, this study was undertaken to evaluate the clinical features, etiology, and severity of hyponatremia in critically ill patients admitted to MICU.

## OBJECTIVE

To assess the clinical features, etiology and severity of hyponatremia in critically ill patients admitted to MICU.

## MATERIALS AND METHODS

This study was a cross-sectional observational study conducted over a period of two years (October 2015–October 2017) in the Medical Intensive Care Unit of a tertiary care hospital.

### Study Population

- Total sample size was 100 patients.
- Adult patients ( $\geq 18$  years) with moderate to severe hyponatremia (Serum sodium  $\leq 125$  mEq/L) admitted to MICU were included.
- Patients having hyperglycemia, hyperlipidemia, paraproteinemia, and on mannitol therapy were excluded.

**Data Collection and analysis:** Demographic data (age, sex); Clinical presentation; Physical examination including hydration status; Laboratory investigations like Serum sodium, Serum and urine osmolality, Urine sodium, Renal function tests were noted. Hyponatremia was classified based on Volume status (euvolemic, hypovolemic, hypervolemic), and Osmolality. Statistical Analysis was computed using SPSS software. Categorical variables were expressed in the form of percentages; continuous variables in the form of mean  $\pm$  SD. Appropriate statistical tests of significance (Chi-square / Fisher's exact test) were applied. P value of  $\leq 0.05$  was considered as statistically significant.

## RESULTS

In the present study of 100 adult patients with hyponatremia, 59% were males and 41% were females. The male to female ratio was 1.43:1. In the present study no association was found between sex and severity of hyponatremia ( $p=0.642$ ). The mean age of population under study was  $58.94 \pm 16.10$  years. Most affected age group was 61–70 years (29%). In this study the severity of hyponatremia was comparable in all the age groups ( $p=0.098$ ). In the present study no association was found between sex and severity of hyponatremia ( $p=0.642$ ).

CNS symptoms present in 61% patients. In this study, confusion was observed to be significantly high in patients with severe hyponatremia as compared to moderate hyponatremia (84.62 vs 15.38%;  $p<0.001$ ). No statistically significant association was observed in cases of other clinical features ( $p>0.05$ ). High urine sodium significantly associated with SIADH ( $p<0.001$ ). SIADH strongly associated with euvolemic hypoosmolar hyponatremia ( $p<0.001$ ). However, no association was found between severity and causes of hyponatremia ( $p=0.328$ ).

**Table 1. Demographic Profile**

Variable	Number	Percentage
Male	59	59%
Female	41	41%

**Table 2. Clinical Presentation**

Symptom	Number	Percentage
Vomiting	28	28%
Confusion	26	26%
Seizure	9	9%
Coma	4	4%

**Table 3. Severity and Type of Hyponatremia**

Category	Number	Percentage
Severe ( $<120$ )	54	54%
Moderate (120–125)	46	46%
Type	Number	Percentage

Euvolemic hypoosmolar	50	50%
Hypervolemic hypoosmolar	31	31%
Hypovolemic hypoosmolar	17	17%
Hypervolemic isoosmolar	2	2%

**Table 4. Etiology of Hyponatremia**

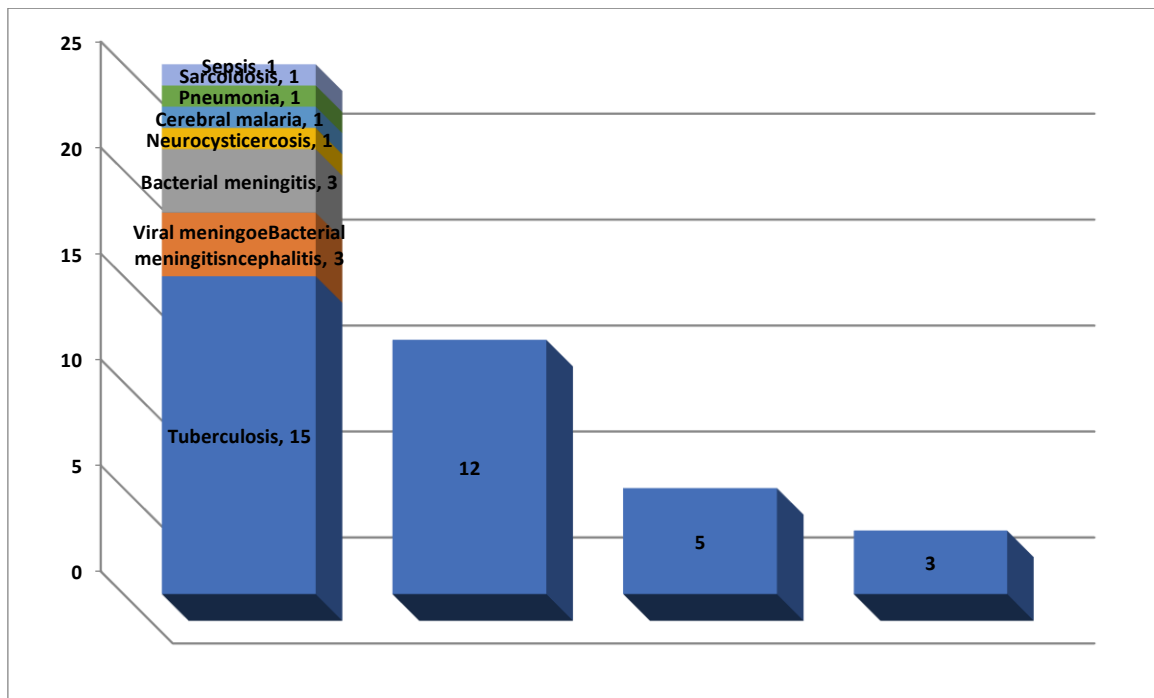
Cause	Number	Percentage
SIADH	46	46%
Renal	13	13%
GI loss	11	11%
Cirrhosis	10	10%
Drugs	10	10%
Cardiac	10	10%

**Table 5. Outcome**

Outcome	Number	Percentage
Improved	94	94%
Expired	6	6%

**DISCUSSION**

Hyponatremia remains a complex clinical entity with diverse etiologies and presentations. In the present study, a male predominance (59%) was observed, which is consistent with findings reported by Rahil et al. [13]. However, no significant association between sex and severity was observed, suggesting that gender may not influence disease progression. The majority of patients were elderly, with a mean age of 58.94 years. Aging is known to impair water and electrolyte homeostasis, increasing susceptibility to hyponatremia [14]. Similar findings have been reported in previous studies [15,16]. Vomiting (28%) and confusion (26%) were the most common presenting symptoms. Notably, confusion was significantly associated with severe hyponatremia ( $p < 0.001$ ), consistent with the known neurological manifestations of acute sodium decline [5,6]. CNS involvement was observed in 61% of patients, similar to findings reported by Rao et al. [17]. Euvolemic hyponatremia was the most common type observed, accounting for 50% of cases. SIADH was identified as the leading cause (46%), consistent with earlier studies [8,18]. The strong association between SIADH and euvolemic hyponatremia was statistically significant ( $p < 0.001$ ).



**Chart 1: Causes of SIADH in the Study Group (n = 46)**

A key finding of this study is the predominance of infection-related SIADH, particularly tuberculosis (57.7%). Tuberculosis is a well-recognized cause of hyponatremia through mechanisms such as ectopic ADH secretion, adrenal involvement, and CNS infection [9,19,20]. Previous studies have also highlighted the association between tuberculosis and SIADH [21].

Other causes included renal dysfunction (13%), gastrointestinal losses (11%), cirrhosis (10%), drug-induced causes (10%), and cardiac failure (10%), reflecting the multifactorial nature of hyponatremia in critically ill patients [7,12]. The mortality in this study was 6%, which is comparable to other ICU-based studies like Padhi et al. [22]. Early recognition and targeted management may have contributed to improved outcomes.

## CONCLUSION

Hyponatremia is a common and clinically significant electrolyte disorder in critically ill patients. It is not merely a biochemical abnormality but a marker of underlying disease severity and systemic dysfunction. It predominantly presents with neurological manifestations and is most commonly euvoletic in nature. SIADH is the leading cause, with infections—especially tuberculosis—playing a major role in developing countries. Early diagnosis, careful evaluation of etiology, and appropriate management are essential to reduce morbidity and mortality.

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