Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 9s, https://carcinogenesis.com/

Prevalence, Risk Factors and Clinical Outcomes of Dysnatremia in Patients Admitted to Medical Intensive Care Unit: A Prospective Observational Study

Gaurav kumar[1], Pratik kaware[2], Prachi shah[3], Sandip vala[4], Kishan majithia[5]

[1]Senior Resident, Shri M P Shah Medical College, Jamnagar,Gujarat

[2]Senior Resident, Manipal hospital,Pune, Maharashtra

[3]Senior Resident, Shri M P Shah Medical College, Jamnagar,Gujarat

[4]Senior Resident, Shri M P Shah Medical College, Jamnagar,Gujarat

[5]Senior Resident, Shri M P Shah Medical College, Jamnagar,Gujarat

ABSTRACT

Dysnatremia, encompassing both hyponatremia and hypernatremia, is a frequent electrolyte abnormality among critically ill patients and is associated with adverse clinical outcomes. This prospective observational study was conducted to determine the prevalence of dysnatremia, identify associated risk factors, and evaluate its impact on clinical outcomes among patients admitted to the Medical Intensive Care Unit (MICU). A total of 100 adult patients with normal serum sodium levels at admission were enrolled and followed during their MICU stay. Serum sodium levels were monitored daily, and patients were categorized into eunatremic, hyponatremic, or hypernatremic groups. Demographic characteristics, comorbidities, hemodynamic status, need for mechanical ventilation, vasopressor use, and length of ICU stay were recorded. Dysnatremia developed in a substantial proportion of patients during ICU stay, with hyponatremia being more common than hypernatremia. Patients with dysnatremia had significantly longer ICU stay and higher rates of mechanical ventilation and mortality compared to eunatremic patients. Major contributing factors included sepsis, renal dysfunction, inappropriate fluid therapy, diuretic use, and hormonal disturbances. The study highlights the importance of early detection and careful management of sodium imbalance in MICU patients to improve outcomes and reduce ICU-related morbidity and mortality.

Keywords: *Dysnatremia; Hyponatremia; Hypernatremia; MICU; Electrolyte imbalance; Critical illness*

How to Cite: Gaurav kumar, Pratik kaware, Prachi shah, Sandip vala, Kishan majithia, (2025) Prevalence, Risk Factors and Clinical Outcomes of Dysnatremia in Patients Admitted to Medical Intensive Care Unit: A Prospective Observational Study, *Journal of Carcinogenesis*, *Vol.24*, *No.9s*, 702-705

1. INTRODUCTION

Sodium is the principal extracellular cation and plays a vital role in maintaining plasma osmolality, extracellular fluid volume, nerve impulse transmission, and muscle contraction. Normal serum sodium concentration is tightly regulated between 135 and 145 mmol/L by renal function, thirst mechanism, antidiuretic hormone, and the renin–angiotensin–aldosterone system. Any deviation from this narrow range leads to dysnatremia, which includes hyponatremia and hypernatremia. In critically ill patients, dysnatremia is particularly common due to the combined effects of underlying disease, altered mental status, impaired renal function, medications, and aggressive fluid therapy. Dysnatremia is not merely a biochemical abnormality but is associated with neurological dysfunction, prolonged hospitalization, mechanical ventilation, and increased mortality. Several international studies have demonstrated a U-shaped relationship between serum sodium levels and mortality, indicating that both low and high sodium concentrations independently predict poor outcomes. In MICU settings, dysnatremia may be present at admission or may develop during hospitalization, often reflecting iatrogenic factors such as inappropriate fluid administration, diuretic use, or vasopressor therapy. Indian data regarding MICU-specific dysnatremia patterns remain limited, and regional differences in patient profiles and ICU practices may influence prevalence and outcomes. Therefore, local evidence is essential for designing effective ICU protocols. The present study was conducted to evaluate the prevalence of dysnatremia among MICU patients, assess associated risk factors, and determine its effect on ICU length of stay and mortality in a tertiary care hospital.

2. MATERIALS AND METHODS

This prospective observational study was conducted in the Medical Intensive Care Unit of a secondary–tertiary care teaching hospital over a period of nine months from August 2024 to April 2025. Adult patients aged more than 14 years admitted to MICU with normal serum sodium levels at admission and with a minimum ICU stay of 24 hours were included. Patients with pre-existing dysnatremia, pregnancy, end-stage renal disease, discharge against medical advice, or those receiving investigational drugs were excluded. Consecutive purposive sampling was used, and all eligible patients were enrolled during the study period. Serum sodium was measured at admission and subsequently every 24 hours or as clinically indicated using venous blood samples. Hyponatremia was defined as serum sodium <135 mEq/L, hypernatremia as >145 mEq/L, and values between 135–145 mEq/L were considered eunatremia. Patients were monitored for clinical parameters including hemodynamic status, need for mechanical ventilation, vasopressor support, and comorbidities such as diabetes, hypertension, renal disease, liver disease, and sepsis. Risk factors evaluated included fluid therapy, diuretic use, gastrointestinal losses, hormonal disorders, renal dysfunction, and medication exposure. Laboratory investigations included CBC, renal and liver function tests, serum osmolality, urine sodium, and urine osmolality when required. Data were recorded in structured proformas and entered into Microsoft Excel. Statistical analysis was performed using Jamovi software. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's t-test were used where appropriate, and $p < 0.05$ was considered statistically significant. Ethical clearance was obtained from the Institutional Ethics Committee, and informed consent was taken from patients or their legal guardians.

3. RESULTS

Table 1. Age Distribution of Study Participants (n=100)

Age Group (years)	Frequency	Percentage
<30	9	9%
31–40	6	6%
41–50	18	18%
51–60	29	29%
61–70	30	30%
>70	8	8%
Total	**100**	**100%**

Mean age was 55.6 ± 14.8 years, with median and mode of 60 years, indicating predominance of elderly patients in MICU

Table 2. Gender Distribution

Gender	Frequency	Percentage
Male	55	55%
Female	45	45%
Total	**100**	**100%**

Table 3. Mechanical Ventilation Requirement

Mechanical Ventilation	Frequency	Percentage
Yes	50	50%
No	50	50%

Table 4. Hemodynamic Status

Status	Frequency	Percentage
Euvolemic	63	63%
Hypovolemic	29	29%
Hypervolemic	8	8%

Patients developing dysnatremia showed significantly longer ICU stay and higher mortality compared to eunatremic patients. Dysnatremia was more frequently observed among patients requiring mechanical ventilation, vasopressors, and those with sepsis or renal dysfunction.

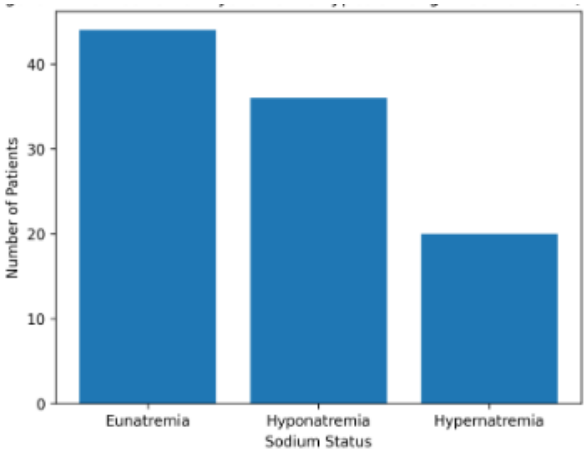

Figure 1. Age-wise Distribution of MICU Patients

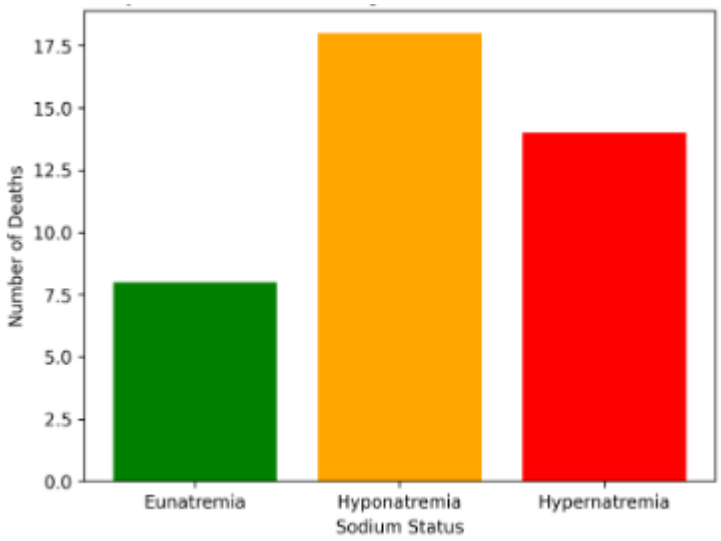

Figure 2. Distribution According to Hemodynamic Status

4. DISCUSSION

The present study demonstrates that dysnatremia is highly prevalent among MICU patients and is associated with adverse outcomes including prolonged ICU stay and increased mortality. Elderly patients constituted the majority of cases, consistent with known physiological vulnerability such as impaired thirst response and reduced renal concentrating ability. Similar findings have been reported in international ICU cohorts where age was an independent risk factor for sodium imbalance. The strong association between dysnatremia and mechanical ventilation observed in this study supports earlier reports that neurological dysfunction and muscle weakness due to sodium imbalance increase ventilator dependence. Hemodynamic instability and vasopressor use further contribute to renal hypoperfusion and hormonal dysregulation, promoting sodium disturbances. Hyponatremia in MICU patients is often linked to SIADH, fluid overload, and renal impairment, whereas hypernatremia usually reflects free water loss, inadequate intake, or iatrogenic sodium administration. Previous multicenter studies have shown mortality rates of 30–60% in ICU-acquired hypernatremia, underscoring its clinical significance. The multifactorial etiology identified in this study highlights the role of preventable factors such as inappropriate fluid prescription and delayed monitoring. Frequent sodium assessment and protocol-based fluid management could significantly reduce hospital-acquired dysnatremia. The study is limited by single-center design and relatively small sample size, but it provides valuable regional data that can guide ICU practice in similar healthcare settings.

5. CONCLUSION

Dysnatremia is a common and clinically significant complication among patients admitted to MICU and is strongly associated with prolonged ICU stay, increased ventilator requirement, and higher mortality. Elderly patients and those with hemodynamic instability, renal dysfunction, and sepsis are particularly vulnerable. Regular monitoring of serum sodium,

individualized fluid therapy, and early identification of risk factors are essential strategies to improve patient outcomes. Incorporating standardized electrolyte management protocols in MICU practice may substantially reduce morbidity and mortality related to sodium imbalance.

.

REFERENCES

[1] Adrogué HJ, Madias NE. Hyponatremia. N Engl J Med. 2000;342(21):1581–1589.
[2] Adrogué HJ, Madias NE. Hypernatremia. N Engl J Med. 2000;342(20):1493–1499.
[3] Verbalis JG, Goldsmith SR, Greenberg A, Korzelius C, Schrier RW, Sterns RH, et al. Diagnosis, evaluation, and treatment of hyponatremia: expert panel recommendations. Am J Med. 2013;126(10 Suppl 1):S1–S42.
[4] Lindner G, Funk GC. Hypernatremia in critically ill patients. J Crit Care. 2013;28(2):216.e11–216.e20.
[5] Stelfox HT, Ahmed SB, Khandwala F, Zygun D, Shahpori R, Laupland K. The epidemiology of intensive care unit–acquired hyponatremia and hypernatremia in medical-surgical intensive care units. Crit Care. 2008;12(6):R162.
[6] Funk GC, Lindner G, Druml W, Metnitz B, Schwarz C, Bauer P, et al. Incidence and prognosis of dysnatremias present on ICU admission. Intensive Care Med. 2010;36(2):304–311.
[7] Waikar SS, Mount DB, Curhan GC. Mortality after hospitalization with mild, moderate, and severe hyponatremia. Am J Med. 2009;122(9):857–865.
[8] Filippatos TD, Makri A, Elisaf MS, Liamis G. Hyponatremia in the elderly: challenges and solutions. Clin Interv Aging. 2017;12:1957–1965.
[9] Moritz ML, Ayus JC. Prevention of hospital-acquired hyponatremia: a case for using isotonic saline. Pediatrics. 2003;111(2):227–230.
[10] Vijayakumar S, Erdjument-Bromage H, Tempst P, Al-Awqati Q. Impact of solute intake on urine flow and water excretion. J Am Soc Nephrol. 2008;19(6):1076–1091.
[11] Ginès P, Berl T, Bernardi M, Bichet DG, Hamon G, Jiménez W, et al. Hyponatremia in cirrhosis: from pathogenesis to treatment. Hepatology. 1998;28(3):851–864.
[12] Kumar S, et al. Prevalence and outcome of dysnatremia in ICU patients: a prospective observational study from India. Indian J Crit Care Med. 2021;25(8):889–895.
[13] Rose BD, Post TW. Clinical physiology of acid–base and electrolyte disorders. 5th ed. New York: McGraw-Hill; 2001.
[14] Boron WF, Boulpaep EL. Medical physiology. 3rd ed. Philadelphia: Elsevier; 2020.
[15] Dimeski G, Mollee P, Carter A. Effects of hyperlipidemia on plasma sodium, potassium, and chloride measurements by indirect ion-selective electrode system. Clin Chem. 2006;52(1):155–156.