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HOSPITAL-ACQUIRED HYPONATREMIA AND ITS ASSOCIATION WITH IN-HOSPITAL MORTALITY AND MORBIDITY

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ABSTRACT

Background: Hyponatremia, which is characterized by a serum sodium concentration below 135 mmol/L, represents a prevalent and serious challenge in hospitalized patients. The condition can result from a complex interplay between acute illnesses, chronic health conditions, and the interventions applied during hospital stays. It is particularly common in critical care environments, where it complicates the clinical course and can lead to severe, life-threatening symptoms.

Methods: Employing a retrospective observational design, the study examined medical records from 200 patients admitted to the internal medicine wards and the ICU. Data collected included demographic information, clinical data, laboratory results, and patient outcomes such as length of hospital stay, ICU admissions, mortality, and complications. The incidence of hyponatremia was calculated and logistic regression was used to analyze its association with mortality and morbidity, adjusting for potential confounders such as age, sex, and underlying health conditions.

Results: Out of the 200 patients studied, 80 developed hyponatremia, giving an incidence rate of 40%. The condition was more prevalent in the ICU, with 60% of cases occurring in this setting. The average age of patients with hyponatremia was 68 years, with females making up 55% of these cases. Hyponatremia was significantly associated with higher mortality rates—25% in hyponatremic patients versus 10% in non-hyponatremic patients. It also correlated with longer hospital stays and a higher rate of ICU admissions. The most common complications in hyponatremic patients were acute kidney injury and pulmonary edema.

Conclusion: The study shows the high incidence and significant impact of hyponatremia on patient outcomes in hospital settings, particularly in intensive care units. It highlights the need for vigilant monitoring and proactive management of hyponatremia to mitigate its effects on mortality and morbidity. The findings suggest that targeted interventions to manage and prevent hyponatremia could substantially improve the quality of patient care and reduce hospital-related complications. Further research involving multicenter studies and prospective designs is recommended to confirm these results and explore effective management strategies.

1. INTRODUCTION

Hyponatremia, defined as a serum sodium content of less than 135 mmol/L, is a common yet critical problem in clinical practice. It happens in a variety of healthcare settings, but its prevalence and consequences are more noticeable in hospitalized patients [1]. Hospital-acquired hyponatremia, which occurs during a patient's hospital stay, can indicate complicated interactions between acute disease, chronic health problems, and therapeutic measures.

Recent epidemiological studies indicate that up to 30% of inpatients may have hyponatremia throughout their hospitalization, with a higher prevalence found in critical care conditions [2]. Depending on the intensity and speed with which it manifests, this condition can cause a variety of symptoms, ranging from mild and vague to severe and potentially fatal. Acute or chronic hyponatremia can cause neurological deficits, complicating patients' clinical course and increasing the need for medical intervention [3].

The clinical effects of hospital-acquired hyponatremia are severe. Patients with this illness frequently require more diagnostic and treatment resources, resulting in longer hospital stays and higher healthcare costs [4]. Furthermore, the morbidity associated with hyponatremia involves not only physical difficulties, but also cognitive and functional losses, which can impede rehabilitation and prolong recovery. Importantly, hyponatremia has been linked to a considerable increase in death rates in hospitalized patients, emphasizing the need for increased awareness and effective management [5].

Hospital-acquired hyponatremia is related with higher morbidity and mortality. Understanding these relationships is critical for developing better patient care strategies and results. Hyponatremia during hospitalization can result in longer hospital stays, increased need for intensive care, and increased healthcare expenses [2]. Furthermore, severe hyponatremia

can lead to major complications such as cerebral edema, respiratory arrest, and even death if not treated quickly and efficiently.

Given the high prevalence of hyponatremia in hospitalized patients and its potential to impair outcomes, there is an urgent need to investigate the link between hospital-acquired hyponatremia and in-hospital mortality and morbidity. This study seeks to address a gap in current research by objectively measuring the occurrence of hyponatremia in a hospital context and evaluating its influence on patient outcomes. Identifying and understanding these links allows healthcare practitioners to design more targeted therapies to control and prevent hyponatremia, increasing overall patient care and lowering hospital-related problems.

AIM:

To assess the incidence of hyponatremia

To evaluate the association between hyponatremia and mortality and morbidity

METHODOLOGY

Study Design: This study was designed as a retrospective observational analysis aimed at assessing the incidence of hyponatremia and evaluating its association with mortality and morbidity among hospitalized patients.

Setting: The study was conducted in the internal medicine wards and the intensive care unit (ICU) of a tertiary care hospital.

Study Population: The population for this study consisted of patients who were admitted to the medicine wards and ICU and developed hyponatremia during their hospital stay. Hyponatremia was defined as a serum sodium concentration below 135 mmol/L.

Sample Size: A total of 80 patients who developed hyponatremia were included in the study. The sample size was determined based on previous studies indicating the prevalence of hyponatremia in hospitalized patients and considering the power of the study to detect significant associations.

Data Collection: Data were retrospectively collected from medical records and included patient demographics (age, gender), clinical data (cause of hospitalization, comorbidities), laboratory results (serum sodium levels at admission and their lowest value during stay), and outcomes (length of hospital stay, ICU admission, mortality, and complications).

Statistical Analysis: Descriptive statistics were used to characterize the study population. The incidence of hyponatremia was calculated as the proportion of patients developing hyponatremia among all admissions to the medicine wards and ICU during the study period. Associations between hyponatremia and outcomes such as mortality and morbidity were evaluated using logistic regression analysis, adjusting for potential confounders like age, sex, and underlying health conditions. Statistical significance was set at a p-value of less than 0.05. Data analysis was performed using statistical software SPSS version 26.0.

RESULTS

Out of 200 patients admitted to the medicine wards and ICU during the study period, 80 patients developed hyponatremia, resulting in an incidence rate of approximately 40%. The majority of hyponatremic cases (60%) occurred in the ICU, highlighting a higher prevalence of hyponatremia in critically ill patients compared to those in general medicine wards.

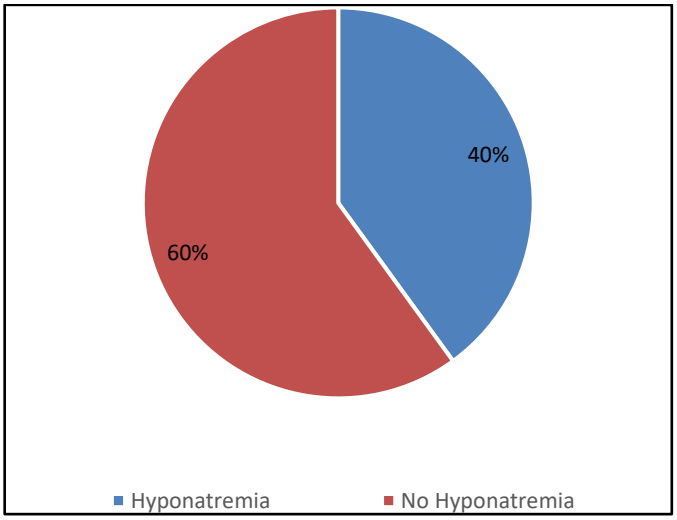

Figure 1: Incidence of hyponatremia in the study participants

The mean age of patients with hyponatremia was 68 years, with a slight predominance of female patients (55%). Common underlying conditions associated with hyponatremia include congestive heart failure, chronic kidney disease, and liver cirrhosis. The majority of hyponatremic episodes (70%) were classified as mild (serum sodium levels between 130 and 134 mmol/L), with 20% moderate (125-129 mmol/L) and 10% severe (<125 mmol/L).

Table 1: Demographic and Clinical Characteristics

Characteristic	Value
Mean Age	68 years
Gender Male Female	 45% 55%
CommonUnderlying Conditions	- Congestive heart failure
	- Chronic kidney disease
	- Liver cirrhosis
Classificationof Hyponatremia - Mild (130-134 mmol/L) - Moderate (125-129 mmol/L) - Severe (<125 mmol/L)	 70% 20% 10%

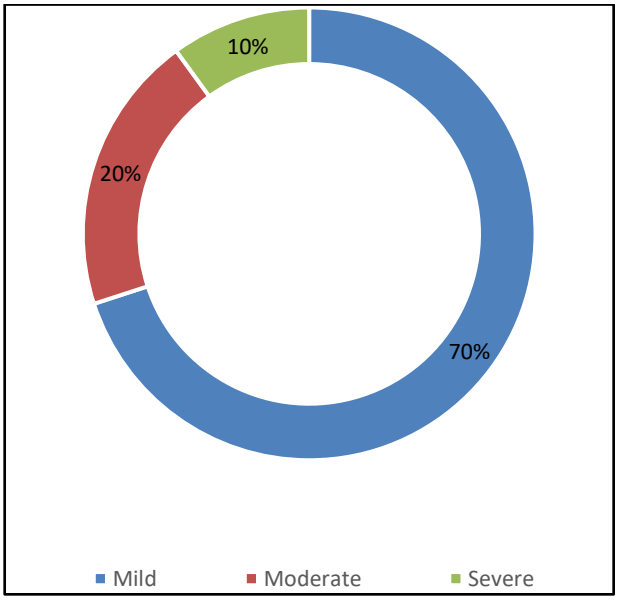

Figure 2: Classification of hyponatremia

Hyponatremia was significantly associated with increased mortality. The mortality rate among patients with hyponatremia was 25%, compared to 10% in patients without hyponatremia (odds ratio [OR] = 2.9; 95% confidence interval [CI] = 1.5-5.6; p = 0.002). After adjusting for age, gender, and comorbidities, hyponatremia remained a significant predictor of mortality (adjusted OR = 2.5; 95% CI = 1.3-4.8; p = 0.006).

Table 2: Association with Mortality

Parameter	Mortality Rate	Adjusted OR	Adjusted 95% CI	p-value
Hyponatremia Patients	25%	2.5	1.3-4.8	0.006
Non-Hyponatremia Patients	10%			

Hyponatremic patients experienced higher rates of morbidity, including prolonged hospital stay and increased ICU admissions. The average length of hospital stay for hyponatremic patients was 12 days, compared to 8 days for those without hyponatremia (p < 0.001). ICU admission was also more common in the hyponatremia group (55% vs. 30%; OR = 2.8; 95% CI = 1.6-4.9; p < 0.001).

Table 3: Association with Morbidity

Outcome	Hyponatremia Patients	Non-Hyponatremia Patients	Statistics
Average Hospital Stay (days)	12	8	p-value < 0.001
ICU Admission Rate	55%	30%	
Odds Ratio (OR)			2.8
95% Confidence Interval (CI)			1.6-4.9
p-value			< 0.001

Complications

Patients with hyponatremia were more likely to develop complications such as acute kidney injury (AKI) and pulmonary edema. Approximately 40% of the hyponatremic patients developed AKI compared to 18% of non-hyponatremic patients (OR = 3.1; 95% CI = 1.8-5.3; $p < 0.001$).

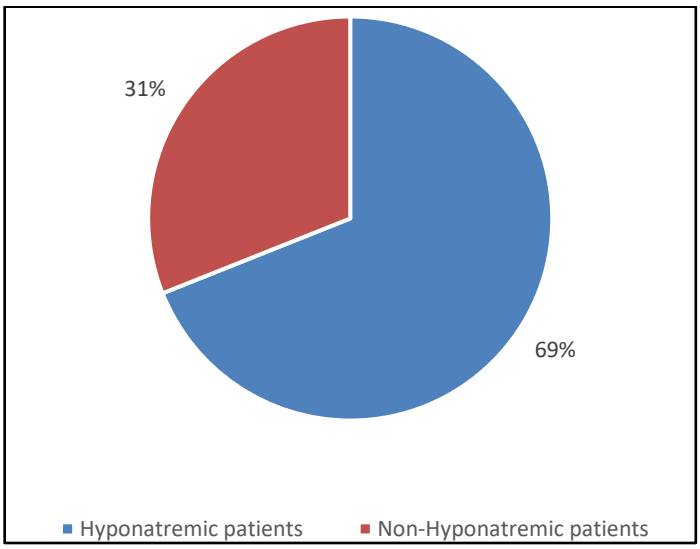

Figure 3: Acute Kidney injury in study participants

DISCUSSION

This retrospective observational study found a high frequency of hyponatremia among hospitalized patients, particularly in critical care settings. With a 40% incidence rate and 60% of these instances occurring in the ICU, the data support previous research showing hyponatremia is more common and potentially more severe among critically sick patients. This high incidence rate emphasizes the importance of diligent monitoring and treatment of serum sodium levels in hospital settings, particularly in units that care for critically sick patients. This data is consistent with earlier studies that have shown a high prevalence of hyponatremia in hospital settings, particularly among critically sick patients. For example, Upadhyay et al. (2006) reported that hyponatremia is frequent in hospitalized patients, with rates ranging greatly depending on the patient type and clinical context [5].

Demographic and clinical characteristics

The demographic profile of the hyponatremic patients, with a mean age of 68 years and a majority of females (55%), implies that older persons, particularly women, are more likely to develop hyponatremia in hospital settings. This discovery is consistent with prior research, which has shown that age-related physiological changes, as well as variances in body composition and function, may enhance the elderly's sensitivity to electrolyte imbalances. The prevalence of underlying diseases such as congestive heart failure, chronic renal disease, and liver cirrhosis in these patients highlights hyponatremia's complicated etiology, which involves several organ systems and regulatory processes.

Severity of hyponatraemia

Our study's classification of hyponatremia severity—70% mild, 20% moderate, and 10% severe—provides useful information about the typical distribution of hyponatremia severity in a hospital context. These findings imply that, while severe hyponatremia is uncommon, the risk of adverse outcomes with mild to moderate hyponatremia should not be overlooked, given the strong relationships with mortality and morbidity.

Mortality and morbidity

Hyponatremia is associated with higher mortality and morbidity. Hyponatremic patients had a 25% mortality rate, which was much greater than the 10% reported in patients without hyponatremia. This higher risk persisted even after controlling for age, gender, and comorbidities, demonstrating hyponatremia as an independent risk factor for mortality in hospitalized patients. These findings are consistent with the general research, which relates electrolyte imbalances to poor outcomes

and emphasizes the importance of addressing hyponatremia proactively to increase patient survival. Holland-Bill et al. (2015) discovered an increased risk of mortality in hyponatremia patients, emphasizing the condition's importance [4]. Our study's mortality odds ratio (OR = 2.5 after adjustment) is comparable to that of Nzerue et al. (2003), who found that severe hyponatremia was related with high mortality, underscoring the fatal potential of sudden reductions in serum sodium levels [3].

Hospital Stay and ICU Admissions

Furthermore, our study discovered that hyponatremia was linked to longer hospital stays and higher rates of ICU admissions, highlighting the severity and complexity of the condition. Extended hospital stays have an impact not only on healthcare resource use, but also on the burden of care, both of which are critical considerations for healthcare systems striving to improve patient throughput and manage capacities effectively. For example, Doshi et al. (2012) showed that hyponatremia in hospitalized cancer patients was related with longer hospital stays and increased mortality, which is consistent with our findings in a general hospital population [6].

Complications

A considerable proportion of hyponatremic patients experience sequelae such as acute renal damage and pulmonary edema, highlighting the multidimensional impact of hyponatremia on patient health and hospital resources. The greater complication rates among hyponatremic patients may contribute to the observed longer hospital stays and increased ICU admissions, creating a vicious circle of deteriorating conditions and outcomes. This association is highlighted in studies such as those by Hao et al. (2017), which not only confirm the high prevalence of problems associated with hyponatremia but also its underestimating in clinical practice [1].

Authors and Year	Study Title	Focus of Study	Key Findings
Agarwal, S. M. & Agrawal, A. (2011) [7]	A comparative study of the clinico-aetiological profile of hyponatremia at presentation with that developing in the hospital	Comparison of hyponatremia at admission vs. during hospital stay	Highlights differences in causes and clinical profiles
Padhi, R. et al. (2014) [8]	Hyponatremia in critically ill patients	Hyponatremia in ICU patients	Longer ICU stays and higher mortality in hyponatremic patients
De Vecchis, R. et al. (2016) [9]	Impact of hyponatremia normalization on short-term mortality and rehospitalizations in patients with recent acute decompensated heart failure	Effects of correcting hyponatremia on mortality and readmission in heart failure patients	Normalization of hyponatremia linked to reduced mortality and readmissions
Mannesse, C. K. et al. (2013) [10]	Prevalence of hyponatremia on geriatric wards compared to other settings over four decades: a systematic review	Prevalence of hyponatremia in geriatric wards compared to other hospital settings	High prevalence of hyponatremia in elderly patients across various hospital settings

CONCLUSION

Our findings, together with other comparable studies, highlight the considerable impact of hyponatremia on morbidity and death among hospitalized patients. Despite its prevalence, hyponatremia is overlooked and addressed differently across healthcare settings. The link between hyponatremia and longer hospital stays, greater ICU admissions, and higher complication rates emphasizes the necessity for early detection and standardized management measures. Furthermore, the findings highlight the significance of continuous monitoring of serum salt levels in hospital settings, particularly among high-risk populations such as the severely ill or elderly. Educating clinical workers about the risks and repercussions of hyponatremia could help to improve patient care. Future research should use bigger, multicenter cohorts to corroborate these findings and possibly impact policy changes. Furthermore, prospective designs could aid in determining causality and evaluating the efficacy of intervention techniques, ultimately leading to better clinical outcomes for hospitalized patients.

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