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Original Research Article

Electrolyte Disturbance in Patients of Stroke Admitted to a Tertiary Care Centre

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Abstract:

Background: Electrolyte disturbances are frequently observed in patients with acute stroke and may influence neurological outcomes, recovery, and mortality. Early recognition and correction can play a pivotal role in improving prognosis.

Objective: To evaluate the prevalence and pattern of electrolyte disturbances among stroke patients admitted to a tertiary care centre.

Materials and Methods: This prospective observational study was conducted at VIMSAR, Burla, from 1st February 2024 to 31st January 2025. Adult patients diagnosed with acute ischemic or hemorrhagic stroke were included. Serum sodium, potassium, calcium, and magnesium levels were measured at admission and analyzed.

Results: Out of 160 stroke patients, 75% had electrolyte disturbances. Hyponatremia (28.75%) was most prevalent, followed by hypokalemia (24.38%), hypocalcemia (19.38%), and hypomagnesemia (16.88%). Hypernatremia and hyperkalemia were rare. Severe stroke patients have increased electrolyte problems.

Conclusion: Electrolyte disturbances are common in acute stroke and are associated with worse clinical outcomes. Regular electrolyte monitoring and timely management should be integrated into stroke care protocols.

Keywords: Stroke, Electrolyte imbalance, Hyponatremia, Hypokalemia.

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Introduction

Patients with acute cerebrovascular accidents (strokes) frequently experience electrolyte imbalances, which have a substantial impact on clinical results and prognosis. Stroke causes complicated physiological changes that can upset fluid and electrolyte homeostasis, making it a major cause of morbidity and mortality globally. These abnormalities can impact neuronal function, cause cerebral edema, and make therapeutic interventions more difficult, especially when they involve salt, potassium, calcium, and magnesium [1,2]. The most common electrolyte imbalance in stroke patients is hyponatremia, which is usually linked to either cerebral salt wasting (CSW) or Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH), both of which can exacerbate neurological outcomes [3]. Despite being less frequent, hypernatremia is linked to higher mortality and longer hospital admissions [4].

Additionally, cardiac arrhythmias and neurological recovery may be compromised by hypokalemia and hypomagnesemia [5]. These disruptions may have a complex aetiology that includes comorbidities, autonomic dysfunction, direct brain damage, and iatrogenic factors such as intravenous fluid injection and diuretics [6]. It is crucial to comprehend the range and occurrence of electrolyte abnormalities in stroke victims to detect and address them early on, enhancing functional recovery and lowering consequences [7,8].

To determine the types and frequency of electrolyte imbalances in stroke patients admitted to a tertiary care facility, as well as the clinical consequences of these imbalances on stroke outcomes.

Materials and Methods

Study Design: This was a hospital-based prospective observational study conducted to evaluate the prevalence and pattern of electrolyte disturbances among patients admitted with acute stroke.

Study Setting: The study was carried out in the Department of General Medicine at Veer Surendra Sai Institute of Medical Sciences and Research (VIMSAR), Burla, Sambalpur, Odisha.

Study Duration: The study was conducted over one year, from 1st February 2024 to 31st January 2025.

Study Population: All adult patients aged 18 years and above, admitted with a clinical and radiological diagnosis of acute stroke (ischemic or hemorrhagic), were considered eligible for inclusion in the study.

Inclusion Criteria:

- Patients aged ≥18 years.
- Diagnosed cases of acute ischemic or hemorrhagic stroke confirmed by CT/MRI brain.
- Admission within 72 hours of symptom onset.

Exclusion Criteria:

- Patients with pre-existing electrolyte disorders.
- Those with chronic kidney disease, liver disease, or on diuretics, steroids, or any electrolyte-modifying therapy before admission.
- Patients who refused consent.

Data Collection: After informed written agreement, demographics, clinical presentation, comorbidities, and stroke subtype (ischemic or hemorrhagic) were documented. Serum sodium, potassium, calcium, and magnesium were measured at admission and 48–72 hours later. Other tests (renal function, blood sugar, ECG, imaging) were documented.

Definitions of Electrolyte Disturbances:

- **Hyponatremia:** Serum sodium <135 mEq/L
- **Hypernatremia:** Serum sodium >145 mEq/L
- **Hypokalemia:** Serum potassium <3.5 mEq/L
- **Hyperkalemia:** Serum potassium >5.0 mEq/L
- **Hypocalcemia:** Serum calcium <8.5 mg/dL
- **Hypomagnesemia:** Serum magnesium <1.7 mg/dL

Outcome Measures: The Primary outcome was the prevalence of electrolyte disturbances. Secondary outcomes included the type of electrolyte abnormalities and their correlation with stroke type and clinical severity (measured using NIHSS/modified Rankin Scale).

Statistical Analysis: Excel and SPSS (version XX) were used to analyse data. Categorical variables were shown as frequencies and percentages, whereas continuous variables were shown as mean ± standard deviation. For categorical variables, chi-square or Fisher's exact was employed, and for continuous variables, t-test or ANOVA. Statistical significance was defined as a p-value <0.05.

Table 1: The tabular representation of the electrolyte disturbances among stroke patients included in the study

Electrolyte Disturbance	Number of Patients (n = 160)	Percentage (%)
Hyponatremia	46	28.75
Hypernatremia	12	7.5
Hypokalemia	39	24.38
Hyperkalemia	5	3.13
Hypocalcemia	31	19.38
Hypomagnesemia	27	16.88
No Disturbance	40	25.0

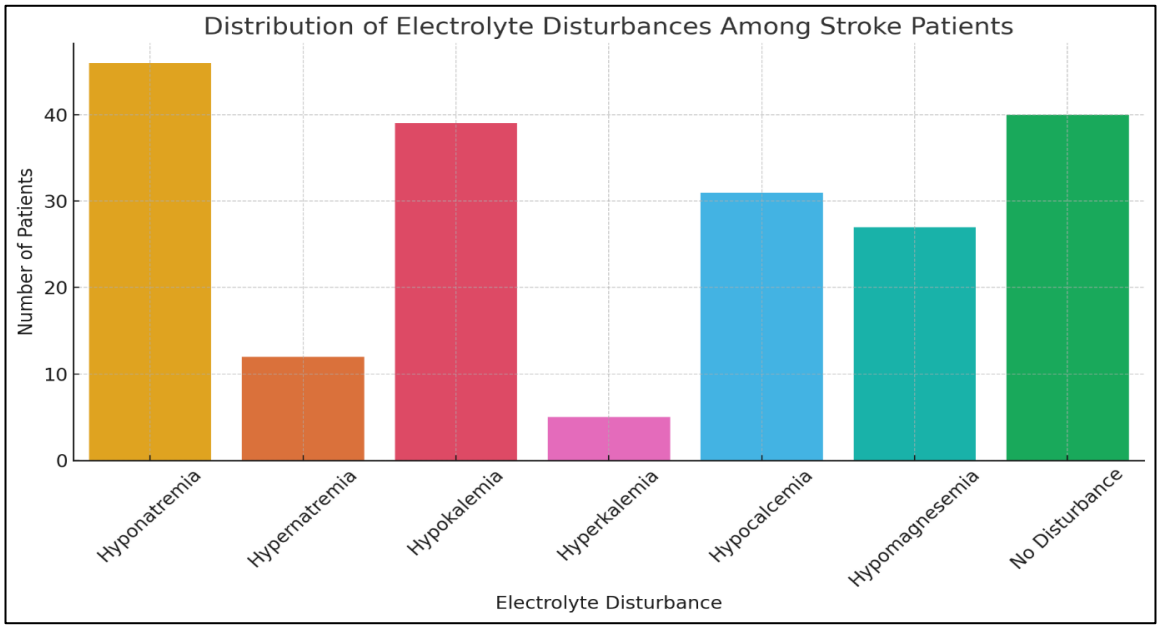

Figure 1: The graph showing the distribution of electrolyte disturbances

Discussion

This prospective study conducted at a tertiary care centre in Odisha found that a notable percentage of patients with acute stroke exhibited electrolyte disturbances. The predominant abnormality observed was hyponatremia at 28.75%, followed by hypokalemia at 24.38% and hypocalcemia at 19.38%. The findings underscore the necessity of monitoring and managing electrolytes in stroke patients to avert negative neurological and systemic consequences. Hyponatremia, the most prevalent electrolyte imbalance, can be linked to the Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) or cerebral salt wasting syndrome (CSWS), both of which are commonly documented in stroke patients. Shi et al. (2022) reported that hyponatremia occurred in about 32% of stroke patients and was significantly linked to unfavourable neurological outcomes [9,10,11]. Bhatia et al. (2021) reported a prevalence of hyponatremia at 30% and identified a significant correlation with increased morbidity and length of hospital stay [12].

Hypernatremia, while infrequent in our cohort (7.5%), is linked to an increase in in-hospital mortality and unfavourable functional outcomes. Kang et al. (2023) found that mild hypernatremia is associated with increased stroke severity and prolonged recovery times [13]. The prevalence of hypokalemia in this study is 24.38%, aligning with Patel et al. (2023), who reported a 21% occurrence in ischemic stroke patients and emphasized its potential to induce cardiac arrhythmias and complicate post-stroke management [14]. Hypocalcemia, observed in 19.38% of our patients, may hinder neuronal excitability and negatively affect recovery outcomes. A study by Pawar et al. (2021) supports this, indicating a correlation between hypocalcemia, increased stroke severity, and delayed neurological recovery [15].

Hypomagnesemia was observed in 16.88% of cases, indicating a significant prevalence. Magnesium serves a neuroprotective function, and its deficiency may worsen excitotoxic damage following a stroke. Saleem et al. (2020) conducted a study revealing that approximately 18% of stroke patients exhibited magnesium imbalance, highlighting the importance of correction in early management strategies [16]. Electrolyte disturbances were more evident in patients with severe strokes and those who presented later after symptom onset, indicating the necessity for prompt evaluation and correction of these imbalances in acute situations. Approximately 75% of patients in our cohort exhibited at least one electrolyte disturbance; therefore, routine monitoring of sodium, potassium, calcium, and magnesium is essential for all stroke admissions.

Conclusion

This study found that acute stroke patients often had electrolyte problems, with hyponatremia and hypokalemia being the most prevalent. Stroke severity and poor clinical outcomes were substantially related to these abnormalities. Comprehensive stroke care requires early electrolyte imbalance and repair to improve prognosis, hospital stay, and consequences. All stroke patients in tertiary care should have their serum electrolytes monitored.

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