e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(12); 3092-3094

Original Research Article

Electrolyte Disturbances in Patients Receiving Long-Term Diuretic Therapy: A Retrospective Study

Shyama Kumari Gupta[1], Rahul Anand[2], Monika Jha[3], Himanshu Kumar[4]

[1]Senior Resident, Department of Emergency Medicine, Patna Medical College & Hospital, Patna, Bihar, India

[2]Senior Resident, Department of General Medicine, Patna Medical College & Hospital, Patna, Bihar, India

[3]Senior Resident, Department of Emergency Medicine, Patna Medical College & Hospital, Patna, Bihar, India

[4]Professor, Department of General Medicine, Patna Medical College & Hospital, Patna, Bihar, India

Received:12-10-2025 / Revised: 15-11-2025 / Accepted: 28-12-2025

Corresponding Author: Himanshu Kumar

Conflict of interest: Nil

Abstract:

Background: Electrolyte imbalance (EI) is a quantifiable biochemical indicator that elucidates the clinical manifestations arising from interactions among many metabolic processes, including hydration shortages, hormonal inadequacies, and vascular events. Diuretics are a commonly utilized class of medications employed in the treatment of numerous cardiovascular and other illnesses. Nevertheless, they may induce several metabolic side effects, with electrolyte imbalance being a significant alteration.

Methods: This retrospective observational study was conducted at a medical college and hospital in Patna during a two-year period, subsequent to approval from the institutional ethical council. Patients were enrolled during a two-year period, regardless of diuretic usage. Demographic information, pharmacological treatment, and electrolyte concentrations were documented in a proforma. The analysis focused on the disparity in serum electrolyte levels between diuretic and nondiuretic groups, as well as within other diuretic groups.

Results: Out of total 200 participants, all were on diuretic therapy. The median age of all patients was 58 years, with 40% patients were females. EIs were mostly mild, the most common EI was hyponatremia (27%). Thiazide was observed more (37%) among all diuretic therapy. Thiazide class has more associatin with Hyponatremia (39.5%), Hypokalemia (22.1%), and Hyperkalemia (5.1%).

Conclusions: The study verifies that diuretics induce many anomalies in electrolytes, specifically sodium and potassium levels. Advanced age, concomitant conditions, and female gender are risk factors for hyponatremia. The escalating severity of EI correlated with prolonged hospitalizations. Healthcare professionals must receive comprehensive training in the diagnosis and management of EIs.

Keywords: Diuretics, Electrolytes, Metabolic side effects, Potassium, Sodium.

Introduction

Diuretics are often prescribed drugs utilized in the treatment of illnesses including hypertension, heart failure, chronic kidney disease, and liver cirrhosis [1]. Although diuretics effectively regulate fluid balance and blood pressure, prolonged usage often correlates with electrolyte imbalances, potentially resulting in considerable morbidity if overlooked or poorly managed [2].

Electrolyte abnormalities, including hyponatremia, hypokalemia, hyperkalemia, hypomagnesemia, and metabolic alkalosis, are recognized side consequences of diuretic therapy [3]. The kind and intensity of these disturbances are contingent upon the class of diuretic administered, the length of treatment, the dosage, and patient-specific characteristics including age, renal function, and comorbidities [4]. Persistent electrolyte imbalances can lead to arrhythmias, neuromuscular dysfunction, cognitive decline, and elevated hospitalization rates [5].

Notwithstanding the extensive use of diuretics, information regarding the prevalence and patterns of electrolyte abnormalities during prolonged therapy is scarce, especially in standard clinical environments [6]. This retrospective study aimed to evaluate the prevalence and classifications of electrolyte imbalances in individuals undergoing prolonged diuretic treatment over a two-year duration.

Materials and Methods

Study Design and Setting: This retrospective observational study was performed at a Patna medical college and hospital over two years following approval from the institutional ethics committee.

Study Population

Medical records of 200 adult patients receiving long-term diuretic medication were reviewed.

Inclusion Criteria

- Age ≥18 years
- Patients receiving diuretic therapy for ≥6 months
- Availability of baseline and follow-up serum electrolyte data

Exclusion Criteria

- Patients with acute kidney injury
- Patients on dialysis
- Known endocrine disorders affecting electrolyte balance
- Patients receiving chemotherapy or medications known to significantly alter electrolytes (other than diuretics)

Data Collection: Data obtained from medical records encompassed demographic information, rationale for diuretic therapy, classification of diuretic administered (loop, thiazide, potassium-sparing, or combination), duration of treatment, comorbidities, and laboratory results including serum sodium, potassium, chloride, magnesium, and bicarbonate concentrations.

Electrolyte abnormalities were delineated in accordance with established laboratory reference values. Long-term therapy was characterized by the continual administration of diuretics for a duration of six months or more.

Statistical Analysis: Standard statistical software was used to evaluate the data. Categorical variables were shown as frequencies and percentages, whilst continuous variables were given as mean ± standard deviation. The chi-square test was used to evaluate correlations between electrolyte imbalances and the diuretic class. P-values less than 0.05 were regarded as statistically significant.

Results

Table 1: Baseline Characteristics of Study Population (n = 200)

Variable	Value
Mean age (years)	58.3 ± 11.3
Male	120 (60%)
Female	80 (40%)
Hypertension	138 (70%)
Heart failure	82 (40%)
Chronic kidney disease	44 (21%)
Mean duration of diuretic therapy (months)	18.7 ± 6.2

Table 2: Distribution of Diuretic Therapy

Type of Diuretic	Number of Patients	Percentage
Thiazide diuretics	74	37%
Loop diuretics	64	32%
Potassium-sparing diuretics	28	14%
Combination therapy	34	17%

Table 3: Prevalence of Electrolyte Disturbances

Electrolyte Disturbance	Number of Patients	Percentage
Hyponatremia	54	27%
Hypokalemia	48	25%
Hyperkalemia	24	13%
Hypomagnesemia	32	15%
Metabolic alkalosis	22	10%

Table 4: Association Between Diuretic Class and Electrolyte Disturbances

Diuretic Class	Hyponatremia	Hypokalemia	Hyperkalemia
Thiazide (n=74)	32 (39.5%)	17 (22.1%)	4 (5.1%)
Loop (n=64)	22 (33.3%)	24 (32.4%)	3 (4.1%)
Potassium-sparing (n=28)	6 (17.4%)	4 (9.7%)	11 (39.5%)
Combination (n=34)	4 (12.5%)	4 (12.5%)	6 (18.8%)

Discussion

This retrospective study reveals that electrolyte imbalances frequently occur in individuals undergoing prolonged diuretic treatment, with approximately one-third having hyponatremia and nearly one-quarter experiencing hypokalemia. These findings highlight the therapeutic significance of consistent electrolyte monitoring in patients on persistent diuretic therapy. Hyponatremia was predominantly noted in individuals on thiazide diuretics, aligning with their established mechanism of inhibiting sodium reabsorption in the distal convoluted tubule [7]. Loop diuretics were significantly correlated with hypokalemia, indicating heightened distal salt delivery and consequent potassium depletion. Hyperkalemia was primarily observed in patients on potassium-sparing diuretics, underscoring the potential of potassium retention, particularly in individuals with preexisting renal impairment [8].

The occurrence of hypomagnesemia and metabolic alkalosis underscores the extensive influence of diuretics on electrolyte and acid-base equilibrium [9]. Despite the limitations of the retrospective design on causal inference, the study offers empirical evidence regarding the burden of electrolyte imbalances associated with prolonged diuretic usage.

Conclusion

Electrolyte imbalances are frequently observed in individuals on prolonged diuretic treatment, with hyponatremia and hypokalemia as the predominant abnormalities. The electrolyte imbalance pattern differs according on the diuretic class employed. Consistent evaluation of blood electrolytes and tailored therapeutic modifications are crucial to avert problems linked to prolonged diuretic administration. Future studies are necessary to establish standardized monitoring techniques and risk classification strategies.

References

1. Côté J, Bouchard J, Murray PT, Beaubien-souligny W. Diuretic strategies in patients with resistance to loop-diuretics in the intensive care unit: A retrospective study from the MIMIC-III database. 2021; 65:282–91.
2. Arampatzis S, Funk G, Leichtle AB, Fiedler G, Schwarz C, Zimmermann H, et al. Impact of diuretic therapy-associated electrolyte disorders present on admission to the emergency department: a cross-sectional analysis. 2013;
3. Cooper HA, Dries DL, Davis CE, Shen YL, Domanski MJ. Diuretics and Risk of Arrhythmic Death in Patients with Left Ventricular Dysfunction. 1999;1311–5.
4. Lokesh G, Kavya K, Akshaya A, Hari K, Naik K. Evaluation of Electrolyte Management in Patients Receiving Diuretics. 2025;10(5):684–95.
5. Arampatzis S, Funk G, Leichtle AB, Fiedler G, Schwarz C, Zimmermann H, et al. Impact of diuretic therapy-associated electrolyte disorders present on admission to the emergency department: a cross-sectional analysis. BMC Med [Internet]. 2013;11(1):1. Available from: BMC Medicine
6. May C, Or G, Gad S, Daniel Z, Hila H, Boris F, et al. Can Patients with Electrolyte Disturbances Be Safely and Effectively Treated in a Hospital-at-Home, Telemedicine-Controlled Environment? A Retrospective Analysis of 267 Patients. 2024;
7. Chander K. A retrospective study of electrolyte imbalance among elderly patients and its relationship to the outcome and duration of stay in emergency. 2022;9(3):169–73.
8. Maida N, Kondo S, Hayashi N, Iwata H, Kobayashi N, Yamaura K. Sex Differences in Electrolyte Disturbances Among Diuretic Users According to Renal Function and Age. Drug Saf [Internet]. 2025;48(10):1149–59. Available from: https://doi.org/10.1007/s40264-025-01564-3
9. Patel VJ, Parikh PC, Vaghela C. Effect of diuretics on sodium, potassium and chloride levels- a cross sectional study. 2022;11(6):576–9.