

Study of Clinical Profile of Electrolyte Disturbances and Dehydration amongst Children (6 Month - 15 Years) Admitted with Acute DiarrhoeaMegha Khandelwal¹, Priyanka Singh², Dipal Zanzrukiya³¹3rd Year Pg Resident, Department Of Paediatrics, JNUIMSRC, Jaipur²Associate Professor, Department Of Paediatrics, JNUIMSRC, Jaipur³Assistant Professor, Department Of Paediatrics, JNUIMSRC, Jaipur

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Abstract:**Background:** Acute diarrheal diseases are a leading cause of pediatric morbidity and mortality globally, particularly in settings with limited resources. This study aimed to delineate the patterns of electrolyte disturbances in children with acute diarrhea and assess their impact on clinical outcomes.**Methods:** In this cross-sectional, hospital-based study, 100 children aged 6 months to 15 years presenting with diarrhea and dehydration were assessed. Electrolyte levels, renal function, and clinical symptoms were evaluated and analyzed using SPSS.**Results:** The study found mild hyponatremia in the majority of patients, with normal potassium and chloride levels. Renal function was largely unaffected. Vomiting was present in 65% of cases, and a small percentage showed mucus or blood in stools, indicating potential severe infections. Diarrheal severity was high, with frequent episodes underscoring the need for effective rehydration strategies.**Conclusion:** Effective management of electrolyte disturbances in pediatric diarrheal diseases can significantly influence clinical outcomes. Tailored rehydration solutions and rapid treatment interventions are critical to addressing the complications associated with electrolyte imbalances.**Keywords:** Pediatric Diarrhea, Electrolyte Disturbances, Dehydration, Clinical Management, Rehydration Therapy.

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Introduction

Acute diarrheal diseases pose a persistent challenge to global child health, especially in regions burdened by economic constraints and limited healthcare infrastructure. Despite global health efforts, acute diarrhea remains a prevalent emergency among children aged 6 months to 15 years, leading to significant rates of hospital admission. This condition not only disrupts the normal physiological function of young patients but also precipitates severe complications such as electrolyte imbalances and dehydration, which can be life-threatening if not managed promptly and effectively. [1,2,3]

The clinical repercussions of acute diarrhea extend beyond simple fluid loss; they involve complex interactions between the child's nutritional status, the body's electrolyte homeostasis, and the immune response to infectious agents. The study of electrolyte disturbances—specifically sodium and potassium imbalances—in the context of pediatric acute diarrhea is crucial.

These imbalances can inform the severity of the condition and guide targeted therapeutic strategies,

which may include tailored rehydration solutions and adjustments in clinical management practices. [4,5,6] Our research focuses on a comprehensive analysis of the incidence, patterns, and severity of electrolyte disturbances among hospitalized children presenting with acute diarrhea.

By correlating clinical outcomes with laboratory findings, this study aims to enhance the understanding of the pathophysiological impacts of dehydration and electrolyte shifts. This knowledge could lead to improved diagnostic precision and therapeutic outcomes, ultimately reducing the morbidity and mortality associated with this condition. [7,8,9] This paper seeks to delineate the patterns of sodium and potassium disturbances across different degrees of dehydration, correlate these electrolyte profiles with clinical manifestations, and evaluate the efficacy of intervention strategies tailored to specific electrolyte derangements. [10]

The overarching goal is to refine the management protocols for dehydration in pediatric acute diarrhea, thereby contributing to better health

outcomes and resilience against potential complications.

Materials and Methods

Study Design: This cross-sectional, hospital-based study was conducted to evaluate the prevalence and types of electrolyte disturbances—specifically hyponatremia, hypernatremia, hypocalcemia, and hyperkalemia—among children admitted with diarrhea-induced dehydration. Additionally, clinical features were analyzed in correlation with electrolyte imbalances and varying degrees of dehydration.

Sample Size: The study sample comprised approximately 100 pediatric patients.

Study Period: Research activities spanned from July 2022 to December 2023.

Study Population: The cohort included children aged 6 months to 15 years admitted to the pediatric department of JNUIMSRC, presenting with diarrhea and dehydration.

Inclusion Criteria:

1. Children aged between 6 months and 15 years.
2. Presentation with three or more episodes of loose stools per day.
3. Cases classified as having some or severe dehydration, according to WHO guidelines.

Exclusion Criteria:

1. Children younger than 6 months or older than 15 years.
2. Cases where diarrhea (loose stools) persisted for more than 14 days.
3. Presence of mucus or blood in the stools.
4. Children diagnosed with grade 4 malnutrition according to the Indian Academy of Pediatrics (IAP) classification.

Methodology: Sample sizes were calculated using the WHO sample size calculator. Written informed consent was obtained from the parent or caretaker of each participant before inclusion in the study. Blood samples were collected for serum electrolyte determination (sodium and potassium) using a standard serum separator tube and aseptic technique, prior to initiating any rehydration measures.

Statistical Analysis: Data were analyzed using SPSS software. The proportion of patients with various types of electrolyte disturbances was calculated. A detailed patient history and physical examination were conducted to assess dehydration levels. Patients classified with some or severe dehydration, per WHO criteria, were included in the analysis. Correlations between clinical features and electrolyte levels in patients with moderate to severe dehydration were explored.

Results

Our study evaluated electrolyte disturbances and dehydration in children aged 6 months to 15 years admitted with acute diarrhea. A total of 100 patients were analyzed, providing a comprehensive dataset on serum electrolyte levels, renal function, and clinical symptoms associated with their condition.

Electrolyte Levels: The serum analysis revealed an average sodium level of 132.70 ± 3.72 mEq/L, suggesting that most children experienced mild hyponatremia relative to normal serum sodium levels. Potassium levels averaged 4.20 ± 0.41 mEq/L, within normal limits for children but indicative of the potential for disturbances following rehydration therapy. Chloride levels were found to be 101.67 ± 3.30 mEq/L, which is within the normal range, indicating stable chloride homeostasis in the majority of the study cohort.

Renal Function: Markers of renal function demonstrated an average urea level of 25.97 ± 6.74 mg/dL and a creatinine level of 0.92 ± 0.27 mg/dL, indicating normal renal function across the study group. These findings suggest that acute kidney injury was not a common complication in our cohort, despite the potential risks associated with severe dehydration.

Clinical Symptoms: Vomiting was present in 65% of the cases, underscoring its prevalence as a complicating factor in managing hydration and electrolyte balance. The frequent association of vomiting with diarrhea necessitates careful monitoring and management to prevent exacerbation of dehydration and electrolyte imbalances.

Gastrointestinal Symptoms: The presence of mucus or blood in stools was noted in 12% of cases, which could suggest a more severe infection or a different etiology such as amoebic dysentery or bacterial colitis, requiring differential management strategies from typical viral gastroenteritis.

Diarrheal Severity: The frequency of loose motions ranged from a minimum of 5.03 ± 1.43 to a maximum of 6.34 ± 1.54 episodes per day, reflecting the acute nature of the gastrointestinal disturbance and the burden of disease on these young patients.

This high frequency underscores the critical need for effective rehydration and electrolyte management strategies to prevent severe complications.

Overall, our study highlights the commonality and severity of electrolyte disturbances and the associated clinical presentations in children with acute diarrhea. The data point towards the need for vigilant monitoring and tailored therapeutic

approaches to manage the electrolyte imbalances and support renal function in this vulnerable population.

Table 1: Serum Electrolytes Levels among Study Cases

Parameter	Mean \pm SD
Sodium (Na ⁺)	132.6998 \pm 3.71948
Potassium (K ⁺)	4.1980 \pm 0.40634
Chloride (Cl ⁻)	101.665 \pm 3.2993

Table 2: Renal Function Markers among Study Cases

Parameter	Mean \pm SD
Urea	25.9717 \pm 6.73756
Creatinine	0.9173 \pm 0.2709

Table 3: Frequency of Vomiting among Study Cases

Vomiting Status	Frequency	Percent
Absent	35	35.0%
Present	65	65.0%

Table 4: Presence of Mucus or Blood in Stool

Mucus/Blood in Stool	Frequency	Percent
Absent	88	88.0%
Present	12	12.0%

Table 5: Frequency of Loose Motion Episodes per Day

Episode Frequency	Mean \pm SD
Minimum	5.030 \pm 1.4316
Maximum	6.340 \pm 1.5389

Discussion

The study of electrolyte disturbances in pediatric patients with acute diarrhea offers significant insights into clinical management and therapeutic approaches that could significantly alter the course of treatment and improve patient outcomes. Our analysis indicated mild hyponatremia and normal potassium levels among most patients, aligning with existing literature that highlights the prevalence of these disturbances in diarrheal diseases due to excessive fluid loss and inadequate intake. [11,12] Hyponatremia, often seen in acute diarrhea cases, can be dangerous if not promptly corrected, as it may lead to cerebral edema and neurological impairment. The commonality of this condition in our cohort necessitates an emphasis on balanced electrolyte rehydration solutions, which cater to the specific needs dictated by the underlying sodium disturbances. [13]

Furthermore, the presence of mucus or blood in stools in a small subset of our population flags the potential for more severe infections or other gastrointestinal conditions like amoebiasis or bacterial colitis. This finding underscores the importance of comprehensive diagnostic evaluations to differentiate among potential causative agents, thereby allowing for targeted therapy. [14] The data from our study did not show significant renal dysfunction, which is a crucial

indicator of favourable prognosis in dehydration cases if managed timely. Renal function markers such as urea and creatinine levels were found to be within normal ranges, suggesting that acute kidney injury is not prevalent among patients under effective rehydration treatment. [15] The study also highlighted the high incidence of vomiting as a compounding factor in dehydration management, pointing to the need for interventions that address both vomiting and diarrhea to prevent severe dehydration and the cascade of complications associated with it. Given the severity and frequency of diarrheal episodes reported, our findings emphasize the importance of early and adequate rehydration therapy, which remains the cornerstone of management for children presenting with acute diarrhea. Adjusting fluid and electrolyte management based on the severity of electrolyte imbalances can lead to better outcomes and prevent the complications associated with acute diarrheal diseases in children.

Conclusion

This study successfully mapped the electrolyte disturbances in children presenting with acute diarrhea, finding prevalent mild hyponatremia and stable potassium and chloride levels. These findings reinforce the need for tailored rehydration solutions that consider underlying electrolyte imbalances to improve treatment outcomes.

Additionally, our research supports ongoing education and training for healthcare providers on the importance of early diagnosis and appropriate fluid management in pediatric diarrheal illnesses to minimize morbidity and mortality associated with this globally prevalent condition.

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