

Serum Electrolyte Profile of Children less than Five Years Old with Dehydration due to Acute Diarrhoea

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Abstract

Background: Dehydration due to acute diarrhea remains a significant cause of morbidity and mortality in children under five years old, particularly in developing countries. Electrolyte imbalances play a critical role in the severity and management of this condition. This study aimed to assess the serum electrolyte profile at the time of admission of children less than five years old with dehydration caused by acute diarrhea.

Materials and Methods: A total of 100 children aged less than five years presenting with dehydration due to acute diarrhea were included in this one-year study conducted at Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda. Serum electrolyte levels including sodium (Na⁺), potassium (K⁺), chloride (Cl⁻) and bicarbonate (HCO₃⁻) were measured at the time of admission using standard laboratory methods. The severity of dehydration was assessed clinically, and data were analyzed using descriptive statistics.

Results: The study revealed the following serum electrolyte values in children with dehydration due to acute diarrhea: mean serum sodium level was 133.5 ± 3.8 mEq/L, mean serum potassium level was 3.8 ± 0.5 mEq/L, mean serum chloride level was 95.2 ± 4.2 mEq/L, and mean serum bicarbonate level was 17.3 ± 2.1 mEq/L. Additionally, 40% of the children exhibited hyponatremia, 32% had hypokalemia and 28% showed hypochloremia at the time of admission.

Conclusion: This study underscores the significance of assessing serum electrolyte levels at the time of admission in children less than five years with dehydration due to acute diarrhea. The prevalence of electrolyte imbalances, particularly hyponatremia, hypokalemia, and hypochloremia was notable in this population. Timely recognition and appropriate management of electrolyte disturbances are crucial in improving the clinical outcomes of these children.

Keywords: Dehydration, acute diarrhea, serum electrolytes, children, hyponatremia, hypokalemia, hypochloremia.

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Introduction

Dehydration due to acute diarrhea remains a pressing global health concern, particularly among children under five years old. It is a leading cause of morbidity and mortality, especially in resource-limited settings [1]. Acute diarrhea is responsible for approximately 0.5 million child deaths annually, with a significant portion attributed to dehydration [2]. Inadequate management of dehydration can lead to electrolyte imbalances, which can further exacerbate the severity of the condition [3].

Electrolytes, including sodium (Na⁺), potassium (K⁺), chloride (Cl⁻) and bicarbonate (HCO₃⁻), play crucial roles in maintaining normal physiological processes. Alterations in these electrolyte levels can have profound effects on a child's health, ranging from neuromuscular abnormalities to cardiac arrhythmias [4]. In the context of acute diarrhea

and dehydration, electrolyte disturbances can be life-threatening if not promptly recognized and managed [5].

Despite the importance of electrolyte assessment, there is a paucity of data regarding the point-of-admission serum electrolyte profile of children under five years old with dehydration due to acute diarrhea in the specific geographic region of Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda. Therefore, this study aims to fill this knowledge gap by characterizing the serum electrolyte status of such children at the time of admission and evaluating the prevalence of electrolyte imbalances in this population. Understanding the serum electrolyte profile in children with dehydration at the time of admission due to acute diarrhea is vital for healthcare providers to tailor ap-

appropriate management strategies and improve clinical outcomes. This study's findings may guide clinicians in the timely correction of electrolyte imbalances and enhance the overall care of these vulnerable pediatric patients.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted over duration of one year (from Jan 22 to Dec 22) in the department of pediatrics at Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda. The hospital is a tertiary care center serving a diverse pediatric population in the region.

Study Participants

A total of 100 children under five years of age, who presented with dehydration due to acute diarrhea, were enrolled in the study. Informed consent was obtained from the parents or legal guardians of each participant before inclusion in the study.

Data Collection

Clinical Assessment: All enrolled children underwent a thorough clinical assessment at the point of admission. Dehydration status was evaluated using standard clinical signs, including reduced skin turgor, sunken eyes, dry mucous membranes, and de-

creased urine output. The severity of dehydration was categorized as mild, moderate or severe based on clinical findings [6].

Serum Electrolyte Measurement: Blood samples were collected from each participant at the time of admission. Serum electrolytes, including sodium (Na^+), potassium (K^+), chloride (Cl^-) and bicarbonate (HCO_3^-), were measured using automated clinical chemistry analyzers following standard laboratory protocols. The reference ranges for electrolyte levels were based on age-specific norms [7].

Data Analysis

Data obtained from clinical assessments and laboratory measurements were recorded in a structured case report form.

Descriptive statistics, including means and standard deviations, were used to summarize continuous variables, such as serum electrolyte levels. Categorical variables, including the prevalence of electrolyte imbalances, were expressed as percentages.

Results

Clinical Characteristics of Study Participants

Table 1 summarizes the clinical characteristics of the 100 children under five years old with dehydration due to acute diarrhea at the time of admission.

Table 1: Clinical Characteristics of Study Participants

Variable	Number (%)
Gender	
Male	52 (52.0%)
Female	48 (48.0%)
Dehydration Severity	
Mild	30 (30.0%)
Moderate	50 (50.0%)
Severe	20 (20.0%)
Mean Age (years)	2.3 \pm 1.1
Clinical Signs of Dehydration	
Reduced Skin Turgor	65 (65.0%)
Sunken Eyes	60 (60.0%)
Dry Mucous Membranes	50 (50.0%)
Decreased Urine Output	30 (30.0%)

Serum Electrolyte Profile

Table 2 presents the serum electrolyte values at the time of admission of the study participants with dehydration due to acute diarrhea.

Table 2: Serum Electrolyte Profile

Electrolyte Parameter	Mean Value \pm SD	Abnormal Value (n, %)
Serum Sodium (mEq/L)	133.5 \pm 3.8	Hyponatremia (40, 40.0%)
Serum Potassium (mEq/L)	3.8 \pm 0.5	Hypokalemia (32, 32.0%)
Serum Chloride (mEq/L)	95.2 \pm 4.2	Hypochloremia (28, 28.0%)
Serum Bicarbonate (mEq/L)	17.3 \pm 2.1	Normal Range

The mean serum sodium level at admission was 133.5 \pm 3.8 mEq/L with 40% of children presenting with hyponatremia. The mean serum potassium

level was 3.8 \pm 0.5 mEq/L and 32% of children had hypokalemia. The mean serum chloride level was 95.2 \pm 4.2 mEq/L and 28% of children showed

hypochloremia. Serum bicarbonate levels were within the normal range.

Discussion

The findings of this study provide valuable insights into the point-of-admission serum electrolyte profiles of children under five years old with dehydration due to acute diarrhea. Dehydration remains a significant concern in pediatric healthcare, and understanding the electrolyte imbalances associated with it is crucial for appropriate management and improved clinical outcomes.

The prevalence of electrolyte disturbances in our study population is notable. Hyponatremia was the most common electrolyte abnormality, affecting 40% of the children at the time of admission. This finding is consistent with previous research highlighting the association between acute diarrhea and hyponatremia [1]. Hyponatremia can lead to neurological symptoms such as confusion, seizures, and coma, emphasizing the need for early detection and intervention [2]. Hyponatraemic dehydration was observed in 56% of cases by Shah et al. among Nepalese children [9].

Hypokalemia was observed in 32% of the children, emphasizing the importance of monitoring potassium levels in pediatric patients with acute diarrhea. Hypokalemia can lead to muscle weakness, cardiac arrhythmias, and metabolic alkalosis [3]. Timely correction of potassium imbalances is crucial to prevent these complications. Hypokalemia was reported in 46% of cases by Shah et al. [9] and 37.1% by Majeed et al. in Hyderabad, Pakistan [10]

Hypochloremia was also prevalent in our study, affecting 28% of the participants. Chloride plays a vital role in maintaining acid-base balance, and hypochloremia can contribute to metabolic alkalosis [4-8]. Proper management of chloride imbalances is essential to prevent further acid-base disturbances. The clinical assessment of dehydration severity showed that a substantial proportion of children in our study presented with moderate to severe dehydration. This underscores the importance of prompt evaluation and management of dehydration, including the correction of electrolyte imbalances. It is worth noting that our study has certain limitations. The sample size was relatively small, and the study was conducted in a specific geographic region, which may limit the generalizability of the findings. Additionally, this study focused on serum electrolyte values at the time of

admission and did not assess changes over time during treatment.

Conclusion

In conclusion, this study highlights the high prevalence of electrolyte imbalances, particularly hyponatremia, hypokalemia, and hypochloremia, in children under five years old with dehydration due to acute diarrhea. These findings underscore the importance of early assessment and management of electrolyte disturbances in pediatric patients with acute diarrhea to prevent potentially life-threatening complications.

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