

# Analyzing the Prevalence of Serum Electrolyte Disturbance in Children with Acute Diarrhea and Dehydration

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## ABSTRACT

**Objective:** To study serum electrolyte derangements among children with acute diarrhea presenting with dehydration.

**Study Design:** Cross-sectional and descriptive study.

**Place and Duration of Study:** This study was conducted at Poonch Medical College, Rawlakot and Shalamar Medical & Dental College, Lahore in the duration from January, 2022 to June, 2022.

**Methods:** There were 132 children with severe acute diarrhea and severe dehydration. The ages of the children ranged from one year to twelve. Children's comprehensive demographic information was gathered after written consent was obtained from parents. We took a blood sample of 5 ml and estimated the serum Sodium and potassium levels. All of the data was analyzed with SPSS 23.0.

**Results:** There were majority male children 82 (62.1%). The Mean age of the cases was  $2.2 \pm 3.11$  years. Frequency of severe dehydration was noted in 52 (38.6%) cases, mild dehydration was in 60 (45.5%) and moderate dehydration in 20 (15.2%) cases. Frequency of hyponatremia and hypokalemia was 85 (64.4%) and 53 (40.2%) children.

**Conclusion:** Our results show that children with acute diarrhea and dehydration have an increased risk of developing hyponatremia and hypokalemia. Significant correlations were found between hyponatremia, hypokalemia, and age, gender, and degrees of dehydration.

**Keywords:** Hypokalemia, Dehydration, Acute Diarrhea, Children

## INTRODUCTION

In nations across sub-Saharan Africa, acute watery diarrhea is a major contributor to child mortality and morbidity. According to the WHO and UNICEF, each year there are around 2 billion instances of diarrheal illnesses recorded globally, resulting in the deaths of over 1.9 (18%) million children under the age of 5 from underdeveloped countries. [1]

Diarrhea is a deviation from the typical bowel movement pattern in young children [2]. Young children, especially those living in impoverished nations, lose their lives in the millions every year due to complications from acute diarrheal illness [3]. As a result, it is a frequent reason for visits to primary care physicians and hospital emergency rooms in wealthy nations [4].

In children less than five years old, acute diarrhea accounts for an annual global prevalence estimate of 1.7 billion cases and over 700,000 fatalities [5]. More than 16% of all child fatalities in Nigeria occur in children under the age of five due to diarrhea [6].

Immediate and/or long-term complications of diarrhea can cause mortality [7]. In the short term, you'll notice symptoms including a shift in your body's acid-base balance and a depletion of fluids and electrolytes. Given that the osmolality and amount of extracellular fluid are both governed by the concentration of sodium, this ion plays a crucial role in the control of both water and electrolytes. Dehydration in children can cause hyponatremia, isonatremia, or hypernatremia, all of which are biochemical abnormalities [8]. We also note hypokalemia and metabolic acidosis as other biochemical abnormalities.

Dehydration is often categorized as mild, moderate, or severe in clinical settings based on estimated fluid loss and other clinical criteria [9]. When it comes to morbidity and mortality caused by acute diarrheal illness in children, dehydration is by far the most common and serious consequence. Similar results were seen for changed biochemical markers in relation to prognosis [10]. These biochemical indicators, when evaluated upon admission, can help guide more targeted and effective care for the patient.

Children with diarrhea who also suffer from electrolyte abnormalities have a far higher risk of dying.[11] The prevalence of illness and death due to electrolyte abnormalities may be underreported. Recognizing common electrolyte imbalances early,

maintaining a high index of suspicion, and having a solid grasp on their causes and treatments are all crucial. Studies have found varying prevalence rates of electrolyte abnormalities in children who are dehydrated. [12]

This study aimed to assess the prevalence of hyponatremia and hypokalemia among malnourished children coming to the emergency department of a university hospital with an episode of severe diarrhea. Clinicians' knowledge of the electrolyte condition of malnourished children with diarrhea will aid in early screening and appropriate therapy of the child, reducing the likelihood of morbidity and death.

## MATERIAL AND METHODS

This Descriptive/cross-sectional study was conducted at Poonch Medical College, Rawlakot and Shalamar Medical & Dental College, Lahore in the duration from January, 2022 to June, 2022 and comprised of 132 children with acute diarrhea. Children's comprehensive demographic information was gathered after written consent was obtained from parents. Chronic, bloody diarrhea, or acute renal failure, in children, were not included in this study.

Acute diarrhea/dehydration lasting less than 15 days, affecting children of both sexes aged 1 months years to 10 years. The sample size was determined using the formula  $n = z^2pq/d^2$ , with  $p = 39.3\%$  (the frequency of hypokalemia in acute diarrhoea with dehydration),  $q = 100 - p$ , and  $d = \%$ . They adopted a method of successive sampling that had nothing to do with probability. The serum Sodium and potassium levels were estimated from 5 cc of blood. SPSS-20 was used for all analyses. The average and standard deviation of the serum Na and K concentrations were determined using descriptive statistics. Categorical variables such as gender, age range, severity of dehydration, serum sodium concentration, and serum potassium concentration were analysed using frequency and percentage distributions. Statistical significance was assumed when the p value was less than .05.

## RESULTS

There were majority male children 82 (62.1%). The Mean age of the cases was  $2.2 \pm 3.11$  years. Mean weight was  $5.7 \pm 6.4$  kg. 77

(58.3%) cases had rural residency and 55 (41.7%) cases had urban residency.(table 1)

Table-1: Children with baseline information

Variables	Frequency	Percentage
Gender		
Male	82	62.1
Female	50	37.9
Mean age (years)	2.2±3.11	
Mean Weight (kg)	5.7±6.4	
Place of Residence		
Urban	77	58.3
Rural	55	41.7

Frequency of severe dehydration was noted in 52 (38.6%) cases, mild dehydration was in 60 (45.5%) and moderate dehydration in 20 (15.2%) cases.(figure 1)

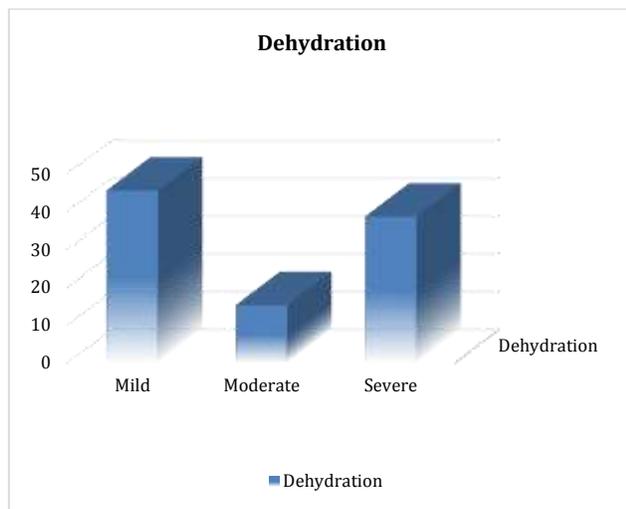


Figure-1: Dehydration among presented cases

Frequency of hyponatremia and hypokalemia was 85 (64.4%) and 53 (40.2%) children.(figure 2)

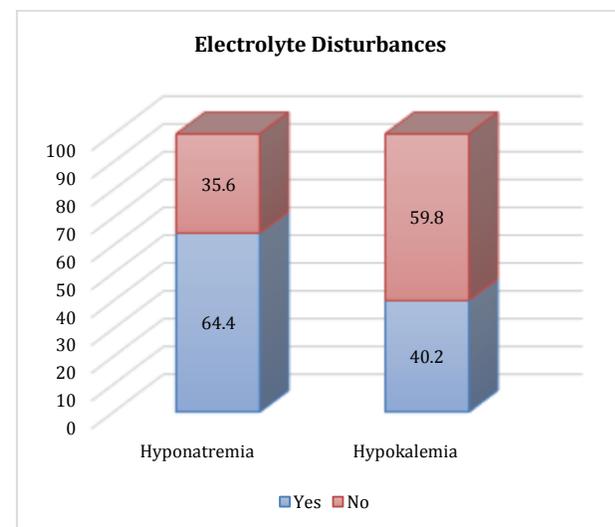


Figure-2: Association of hyponatremia and hypokalemia

## DISCUSSION

Diarrhea and malnutrition go hand in hand in children living in poverty, and both are widespread problems in these regions. If

malnutrition doesn't cause diarrhea, it certainly makes it last longer if it does. About 1.5 million of the more than 10 million annual deaths of children are attributable to diarrhea, making it one of the leading causes of death in children. [13] In underdeveloped nations, malnutrition has a direct impact on the infant mortality rate and contributes significantly to the overall disease burden.

In our study 132 children with diarrhea were presented. There were majority male children 82 (62.1%). The Mean age of the cases was 2.2±3.11 years. Mean weight was 5.7±6.4 kg. 77 (58.3%) cases had rural residency and 55 (41.7%) cases had urban residency. These were comparable to previous findings.[15,16] Our research found that hypokalaemia (40.2%) and hyponatraemia (64.4%) were the most common electrolyte disturbances. Both hyponatraemia (56%) and hypokalaemia (46%), the latter of which was more common, were found in previous study.[17] Another study conducted in Bangladesh found that hyponatraemia and hypokalaemia occurred in 27.8% and 47.5% of participants, respectively. [18] In a study of extremely malnourished patients, diarrhoea was shown to be the most prevalent illness (50.8%), while hyponatraemia was found to be the most common electrolyte imbalance (22.6%). [19]

Cases of hypokalemia-induced paralysis due to severe diarrhoea were documented by Ortuno et al. [20] Although subclinical hypokalaemia is possible in impoverished children, it becomes clinically apparent in the form of hypotonia, paralytic ileus, cardiac arrhythmia, and respiratory distress in children with diarrhoeal disease.

Magnesium, potassium, and salt deficits are commonly seen in extremely malnourished children and may take a few weeks or more to remedy. Low levels of intracellular potassium influence sodium and water retention, cardiac contractility, and ion transport across cell membranes. [21]

There is a high mortality risk from anomalies including hyponatremia, hypokalemia, and metabolic acidosis in severe malnutrition with diarrhoea. [22] Serum electrolyte concentrations do not accurately represent body content in malnourished children; instead, they simply reveal circulating concentrations. So, high serum potassium levels may conceal an intracellular potassium deficit, whereas low serum sodium levels may conceal a salt excess. But it's crucial to get treatment right away to avoid a tragic conclusion. [23]

## CONCLUSION

Our results show that children with acute diarrhea and dehydration have an increased risk of developing hyponatremia and hypokalemia. Significant correlations were found between hyponatremia, hypokalemia, and age, gender, and degrees of dehydration.

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