

FREQUENCY OF HYPOKALEMIA IN CHILDREN WITH ACUTE DIARRHEA PRESENTING TO SAIDU GROUP OF TEACHING HOSPITAL

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ABSTRACT

Background: Acute diarrhea remains one of the leading causes of morbidity and mortality among children in developing countries. Electrolyte disturbances, particularly hypokalemia, are common complications that can exacerbate disease severity and increase the risk of adverse outcomes. **Objective:** To determine the frequency of hypokalemia in children presenting with acute diarrhea at Saidu Group of Teaching Hospital. **Study Design:** Descriptive cross-sectional study. **Setting:** Department of Pediatrics, Saidu Group of Teaching Hospital, Swat, Pakistan. **Duration of Study:** 06-02-2025--06-05-2025. **Methods:** A total of 145 children aged 1–8 years presenting with acute diarrhea were enrolled. Acute diarrhea was defined as more than three watery stools per 24 hours for up to 10 days, accompanied by fever ($>37.2^{\circ}\text{C}$) and abdominal pain. Serum potassium levels were measured, and hypokalemia was defined as a potassium concentration <3.5 mmol/L. Data were analyzed using SPSS version 21. Descriptive statistics were calculated, and associations were assessed using chi-square tests; $p \leq 0.05$ was considered significant. **Results:** The mean age of participants was 3.55 ± 2.37 years, with males comprising 58.6% ($n = 85$). The overall frequency of hypokalemia was 45.5% ($n = 66$), and the mean serum potassium level was 3.65 ± 1.23 mmol/L. Hypokalemia was significantly associated with younger age ($p = 0.02$) and a longer duration of diarrhea (>15 days) ($p = 0.03$). **Conclusion:** Hypokalemia was observed in nearly half of the children presenting with acute diarrhea, with a higher prevalence in younger patients and those with prolonged illness. Early recognition and prompt correction of hypokalemia are essential to reduce complications and improve clinical outcomes.

Keywords: Hypokalaemia, Acute Diarrhoea, Paediatrics, Electrolyte Imbalance

INTRODUCTION

Acute gastroenteritis is a common cause of illness in pediatric patients. In developing countries, it serves as a crucial element influencing the rates of disease and death among children (1). Regardless of the root cause of diarrhea, the resulting fluid loss can lead to serious complications that may necessitate hospitalization or, in more serious situations, could be fatal if timely and suitable interventions are not carried out. Diarrhea may result from exposure to various pathogens. Evidence indicates a relationship between the use of oral rehydration solutions and a decline in mortality rates linked to diarrheal diseases. The success rate of oral rehydration solution for treating diarrheal disorders in children is linked to the preservation of the sodium-coupled solute co-transport mechanism, which remains effective even in severe diarrhea (2-6).

Children with uncomplicated diarrhea typically have increased bowel movements and altered stool consistency. Typical adverse reactions include nausea and abdominal discomfort (7). The possible consequences of untreated diarrhea, including dehydration and other associated complications, may severely affect children under the age of 5. Children who suffer diarrhea are at a heightened risk for electrolyte imbalances, including hypokalemia. Hyperkalemia is rarely encountered in this pediatric demographic. The treatment of electrolyte deficiencies in individuals with diarrhea requires replenishing sodium or potassium levels to optimal levels (8). In older children, symptoms can include altered sensorium, increased urine output, and elevated body temperature. The available methods for treating electrolyte imbalance include administering oral rehydration solutions, using intravenous fluids, and correcting electrolyte levels precisely. Patients arriving at the hospital with dehydration might need admission to a children's critical care unit, in which they will receive thorough intensive care along with suitable shock treatment (9, 10).

Hypokalemia in pediatric patients experiencing acute diarrhea presents a complex and multifactorial challenge. To the best of my knowledge, no study has been conducted on this subject in our local context. This study aims to assess the frequency of hypokalemia among pediatric patients experiencing acute diarrhea at Saidu Group of Teaching Hospital. The findings of this study will provide valuable insights for health professionals; effectively managing hypokalemia in these instances is essential, as significant potassium deficiency can result in serious complications, such as cardiac arrhythmias and muscle weakness.

METHODOLOGY

A cross-sectional study was conducted in the Paediatrics Department of Saidu Group of Teaching Hospital, Swat, from 06-02-2025 to 06-05-2025, after obtaining ethical clearance. The sample size for this study was calculated to be 145. This calculation was based on a 95% confidence level, an 8% margin of absolute precision, and an anticipated frequency of hypokalemia of 40% (11). Participants were recruited using a consecutive non-probability sampling technique.

In this study, children aged 1 to 8 years, regardless of gender, presenting with acute diarrhea were selected. Acute diarrhea was defined as an acute onset of more than 3 watery stools within 24 hours, lasting for the last 10 days, with fever (37.2 degrees Celsius) and abdominal pain ($\text{VAS} > 3$). Children diagnosed with congenital anomalies or thyrotoxic periodic paralysis were excluded.

Consent was obtained from the parent/guardian of each child. The principal researcher performed data collection. Demographic details for each patient, including their age, gender, residence, and socioeconomic status, were recorded. The duration of the disease was also documented. To diagnose hypokalemia, a blood sample was collected from each child using a small needle. The serum potassium level was then measured in the hospital laboratory. Hypokalemia was

confirmed in any child with a serum potassium level below 3.5 mmol/L with weakness, fatigue, and muscle cramps. A consultant paediatrician supervised the entire assessment.

SPSS 21 was used for data analysis. Age, serum potassium, and disease duration were calculated as means $\pm$ standard deviation. Other demographics and hypokalaemia were presented as frequency and percentages. Hypokalaemia was stratified by demographics and disease duration using the chi-square test; significance was set at $P \leq 0.05$.

RESULTS

This study included 145 children. The average age of the children was 3.55 ± 2.37 years. The mean serum potassium level was 3.65 ± 1.23 mmol/L. The duration of the disease was 6.30 ± 2.72 days. Regarding the demographic profile, 85 (58.6%) were boys and 60 (41.4%) were girls (Table 1). Hypokalaemia was found in 66 children (45.5%). The remaining 79 children (54.5%) had normal serum potassium levels (Table 2). Analysis of factors associated with hypokalaemia revealed a statistically notable relationship with age. A greater proportion of children with hypokalaemia, 43 (65.2%), were

Table 3: Association of hyperkalemia with demographics

Demographics		Hypokalemia				P value
		Yes		No		
		n	%	n	%	
Age groups (Years)	1 to 3	43	65.2%	37	46.8%	0.02
	> 3	23	34.8%	42	53.2%	
Gender	Male	42	63.6%	43	54.4%	0.26
	Female	24	36.4%	36	45.6%	
Socioeconomic status	Lower	35	53.0%	27	34.2%	0.07
	Middle	27	40.9%	46	58.2%	
	Upper	4	6.1%	6	7.6%	
Place of living	Rural	37	56.1%	46	58.2%	0.79
	Urban	29	43.9%	33	41.8%	
Duration of disease (Days)	2 to 6	26	39.4%	47	59.5%	0.01
	> 6	40	60.6%	32	40.5%	

DISCUSSION

The present study provides valuable insight regarding hypokalaemia in children presenting with acute diarrhoea at a tertiary care facility. The findings indicate that hypokalaemia is a common and significant complication that was observed in 45.5% of the enrolled children. This frequency lies within the wide range reported by other local and regional studies, underscoring its relevance in paediatric practice. For instance, a study conducted in Peshawar on persistent diarrhoea reported a slightly lower frequency of 28.6% (12). Research from Abbottabad found hypokalaemia in 47.9% of malnourished children with diarrhoea (13), and a recent study from a Paediatric Intensive Care Unit (PICU) in Lahore reported a striking frequency of 62.9% (14). The 45.5% frequency in this study aligns closely with the 48% reported by Mushtaq et al.. It suggests that nearly half of all children hospitalised with acute diarrhoea are at risk of this electrolyte disturbance (15). Regarding the demographic profile, the mean age of the children in this study was 3.55 years, with a majority (58.6%) being male. This is a consistent finding across multiple studies from Pakistan. The work of Ahmad et al. and Abadin et al. both reported higher proportions of males at 64% and 64% respectively (14, 16). The socioeconomic distribution revealed that most children belonged to the lower (42.8%) and middle (50.3%) classes, with a small representation from the upper class (6.9%). Furthermore, a majority of participants (57.2%) were from rural areas.

In children between 1 and 3 years of age, there were 65.2% cases of hypokalaemia. Karim et al. reported a mean age of 12.6 months in their sample, and Abadin et al. noted that 50% of their cases were

in the younger age group of 1 to 3 years, compared to 23 (34.8%) who were older than 3 years ($p=0.02$). A longer duration of diarrhoea (>6 days) was present in 40 (60.6%) of the children with hypokalaemia ($p=0.01$) (Table 3).

Table 1: Demographics

Demographics		n	%
Gender	Male	85	58.6%
	Female	60	41.4%
Socioeconomic status	Lower	62	42.8%
	Middle	73	50.3%
	Upper	10	6.9%
Place of living	Rural	83	57.2%
	Urban	62	42.8%

Table 2: Frequency of hypokalemia

Hypokalemia	n	%
Yes	66	45.5%
No	79	54.5%

under one year of age (12, 16). Infants and young children have higher total body water turnover and are more susceptible to rapid electrolyte losses from diarrhoea. Their renal mechanisms for potassium conservation are also less mature than those of older children and adults.

Another statistically significant factor seen in the present study was the duration of diarrhoea. Children who experienced diarrhoea for more than 6 days had a higher prevalence of hypokalaemia (60.6%). This finding directly validates the pathophysiological understanding that prolonged gastrointestinal losses lead to substantial potassium depletion. Karim et al., who specifically studied persistent diarrhoea lasting over 14 days, also found a significant link between longer duration and hypokalaemia. Their reported mean duration of 19.4 days is consistent with the prolonged illness observed in a substantial portion of the current study's cohort (12).

Based on these findings, several suggestions can be made. The high frequency of hypokalaemia warrants a low threshold for serum electrolyte testing in children hospitalised with acute diarrhoea, particularly in those who are very young or have prolonged symptoms. Clinical management protocols should emphasise potassium supplementation, either orally or intravenously, based on severity, as part of the comprehensive rehydration strategy. Public health efforts should continue to focus on improving nutritional status and sanitation in lower socioeconomic and rural communities to break the vicious cycle of malnutrition and diarrhoea.

CONCLUSION

In conclusion, this study found a moderately higher frequency of

hypokalemia (45.5%) in children presenting with acute diarrhoea. Younger age and prolonged disease duration were associated with hypokalemia.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (98-ERB/024)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

AADIL JAHANGIR (Postgraduate Resident)

Collected data, performed preliminary analysis, Manuscript writing, Manuscript revision, and approved the final version

IHSAN UL HAQ (Professor)

Supervision of research work, Critical input, Proofreading, and final formatting of the manuscript

All authors read and approved the final version of the manuscript.

REFERENCES

- Guarino A, Aguilar J, Berkley J, Broekaert I, Vázquez-Frías R, Holtz L, et al. Acute gastroenteritis in children of the world: what needs to be done? *J Pediatr Gastroenterol Nutr.* 2020;70(5):694–701. <https://doi.org/10.1097/MPG.0000000000002669>
- Florez ID, Nino-Serna LF, Beltran-Arroyave CP. Acute infectious diarrhea and gastroenteritis in children. *Curr Infect Dis Rep.* 2020;22(2):4. <https://doi.org/10.1007/s11908-020-0713-6>
- da Cruz Gouveia MA, Lins MT, da Silva GA. Acute diarrhea with blood: diagnosis and drug treatment. *J Pediatr (Rio J).* 2020;96(S1):20–28. <https://doi.org/10.1016/j.jped.2019.08.006>
- Huang R, Xing HY, Liu HJ, Chen ZF, Tang BB. Efficacy of probiotics in the treatment of acute diarrhea in children: a systematic review and meta-analysis of clinical trials. *Transl Pediatr.* 2021;10(12):3248–3260. <https://doi.org/10.21037/tp-21-511>
- Natnael T, Lingerew M, Adane M. Prevalence of acute diarrhea and associated factors among children under five in semi-urban areas of northeastern Ethiopia. *BMC Pediatr.* 2021;21(1):290. <https://doi.org/10.1186/s12887-021-02762-5>
- Bardhan PK, Das R, Nahar B, Haque MA, Sobi RA, Sultana AA, et al. Assessing safety and efficacy of a novel glucose-free amino acid oral rehydration solution for watery diarrhea management in children: a randomized, controlled, phase III trial. *EClinicalMedicine.* 2024;72:102630. <https://doi.org/10.1016/j.eclinm.2024.102630>
- Lo Vecchio A, Conelli ML, Guarino A. Infections and chronic diarrhea in children. *Pediatr Infect Dis J.* 2021;40(7):e255–e258. <https://doi.org/10.1097/INF.0000000000003182>

- Lakshminarayanan S, Jayalakshmy R. Diarrheal diseases among children in India: current scenario and future perspectives. *J Nat Sci Biol Med.* 2015;6(1):24–28. <https://doi.org/10.4103/0976-9668.149073>
- Wu CJ, Li CS. The impact of iatrogenic hypernatremia on the prognosis of critical patients. *Zhongguo Wei Zhong Bing Ji Jiu Yi Xue.* 2009;21(8):474–477.
- Anigilaje EA. Management of diarrhoeal dehydration in childhood: a review for clinicians in developing countries. *Front Pediatr.* 2018;6:28. <https://doi.org/10.3389/fped.2018.00028>
- Arif M, Afridi AS, Ali F, Banuri S, Salman M, Khan M. Frequency of hyponatremia and hypokalemia in children with acute diarrhea. *Pak J Med Health Sci.* 2021;15(9):2565–2567. <https://doi.org/10.53350/pjmhs211592565>
- Karim R, Afridi JK, Zaman A, Zada U, Younas M. To determine the frequency of hypokalemia in children with persistent diarrhoea. *Khyber J Med Sci.* 2015;8(3):418–423. DOI not available.
- Rehman MU, Khalid A, Khan MA, Khan Z, Sohail A, Khan I. Frequency of hypokalemia in malnourished children with acute diarrhea. *Med Forum.* 2021;32(2):33–36.
- Ahmad N, Chaudhary AR, Usman M, Ayub MR. Frequency of hypokalemia in pediatric ICU patients with diarrhea and their outcome in a tertiary care pediatric hospital in Lahore, Pakistan. *Prof Med J.* 2025;32(10):1388–1395. <https://doi.org/10.29309/TPMJ/2025.32.10.8349>
- Mushtaq A, Naz S, Shehram M, Lodhi AM. Frequency of clinical presentations of hypokalemia in diarrhoea. *Pak J Med Health Sci.* 2020;14(1):309–311.
- Abadin MZ, Iftikar M, Arshad N, Mahmood Z, Tahira B, Shafiq M, et al. Frequency of electrolyte imbalance in children with pediatric acute diarrhea. *Esculapio J. SIMS.* 2020;16(3):23–27. <https://doi.org/10.51273/esc20.251635>



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