

# Frequency of Clinical Presentations of Hypokalemia in Diarrhoea

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## ABSTRACT

**Background:** Hypokalemia is a common electrolyte imbalance in diarrhea especially in malnourished children.

**Aim:** To determine the various clinical presentations of the hypokalemia in diarrhea in patients below age of 5 years and relationship of severity of hypokalemia with nutritional assessment.

**Methods:** It was a descriptive, cross-sectional study conducted at Pediatric Medicine department, The Children's hospital and Institute of Child Health, Lahore from January 2018 to August 2018. All patients below 5 years, presented with diarrhea along with hypokalemia were enrolled in the study. If level of serum potassium was <3.5mEq/l labelled as hypokalemia. The clinical presentations and nutritional status of the patients were noted.

**Results:** Out of 42 patients presented with diarrhea along with hypokalemia, females were 26(61.9%). The mean age at presentation was 16.86 months (SD±1.067) and commonest age range was 1-2 year which constitutes 20(47.6%) patients. The various presentations with hypokalemia were abdominal distension in 28(66.7%), sluggish bowel sounds in 26(61.9%), neck lag and weakness of truncal muscles in 21(50%) and paralytic ileus in 19(45.2%) children. Weakness of limbs in 19(45.2%) and muscles of respiration was found in 8(19%) children. Severe hypokalemia (K<2.0mEq/l) was seen in 16(38.1%) children. Out of these 16, severe malnutrition was found in 10 (P-value <0.003).

**Conclusion:** The abdominal distension, decreased bowel sounds, neck lag and truncal weakness are the commonest clinical presentation of hypokalemia. Malnourished children are more prone to hypokalemia because they have already low potassium stores.

**Key words:** Malnutrition, Hypokalemia, Muscle weakness.

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## INTRODUCTION

Diarrhea is a common infectious disease in less than three years of age worldwide. In developing countries, it is a major cause of mortality and morbidity in children<sup>1,2</sup>. Annually one billion cases and 3-5 million deaths due to acute diarrhea have been reported<sup>3</sup>. Children with diarrhea have various electrolyte abnormalities<sup>4</sup>. Severe diarrhea is seen commonly in children with poor nutritional status and usually it is of prolonged duration. In malnourished children, the diarrheal prevalence is about 6 times more common than normal children and it is of greater severity<sup>5</sup>. Most common electrolyte disturbances include sodium, potassium and bicarbonate. In malnutrition, there is fluid retention along with retention of sodium which is mainly extra-cellular. Although level of sodium is usually low in malnourished children concealing the overload of sodium. The sodium level could be decreased due to diarrhea. In malnourished children, total potassium in body is low up to 25%, because of low consumption and decrease mass of muscle. To maintain homeostasis, potassium is the main ion found intracellularly which is required for normal functioning of cells. Extra cellular fluid is only 2% of body content so serum potassium doesn't indicate total potassium in body. Determining the level of potassium is very important for acute management of hypokalemia which may be deadly. The potassium is usually

deficient sub-clinically in malnutrition with no clinical signs and symptoms but still there is a threat of hypokalemia during diarrhea<sup>6,7</sup>. Simultaneous presence of malnutrition and electrolyte imbalance are risk factors for mortality in children having acute diarrhea<sup>8,9</sup>. Hypokalemia is one of the common electrolyte imbalances in diarrhea. Other causes are losses due to vomiting, diabetic ketoacidosis, diuretic use and dialysis<sup>10</sup>. Potassium (K<sup>+</sup>) level in body is kept at a level by maintaining a balance in intake, its distribution in body and excretion. So, potassium level is maintained between 3.5-5.0mEq/l. If serum potassium level is <3.5 mEq/l, it is labelled as hypokalemia. The hypokalemia is mild when K<sup>+</sup> level is between 3.0-3.5mEq/l and it is mostly not symptomatic. When hypokalemia is severe, K<sup>+</sup><2.0mEq/l, the patients are usually symptomatic. Rarely hypokalemia leads to a fatal outcome, yet various features causing morbidity are frequently found. These include ileus or intestinal hypo-motility, cramping, muscle weakness and cardiac dysrhythmia<sup>11,12,13</sup>.

The objective of the study was to determine the various clinical presentations of hypokalemia in diarrhea in patients below 5 year of age and their relationship with nutritional assessment of the patients.

## PATIENTS AND METHODS

It was a descriptive cross sectional study, at Pediatric Medicine department, The Children's Hospital and Institute of Child Health, Lahore, from January 2018 to August 2018. All those children with diarrhea along with

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hypokalemia, below 5 year of age were enrolled. Children with persistent and chronic diarrhea (14 days or more duration) and patients having hypokalemia from other diseases such as renal causes, Bartter syndrome, septic ileus and periodic paralysis were not included in this study. If serum potassium level is  $<3.5\text{mEq/l}$ , it is labelled as hypokalemia<sup>14</sup>. Hypokalemia was categorised into mild, when  $\text{K}^+$  level is between  $3-3.5\text{mEq/l}$ , moderate,  $2-2.9\text{mEq/l}$  and severe,  $<2\text{mEq/l}$ <sup>15</sup>. The presentations of hypokalemia were noted, such as abdominal distension, sluggish bowel sounds, neck lag, limbs weakness, aphonia, weakness of respiratory muscles and dysrhythmias. Electrocardiography (ECG) was done and checked for flattening of T-wave, U wave, depression of ST segment, prolonged QT interval or dysrhythmias. Labs such as stool examination, abdominal X-ray, abdominal USG were done if needed. National Center for Health Statistics (NCHS) charts were used to plot weight for age and patients were categorized as well-nourished if on 50<sup>th</sup> centile, mildly malnourished if  $<50^{\text{th}}$  and  $>25^{\text{th}}$  centile, moderately malnourished if  $<25^{\text{th}}$  and  $>5^{\text{th}}$  centile and severely malnourished if  $<5^{\text{th}}$  centile. The degree of relationship between malnutrition and hypokalemia severity was noted and analyzed statistically. The data was analyzed by chi-square test and student t-test and P-value was determined.

**RESULTS**

Forty two patients having diarrhea and hypokalemia were enrolled in this study. Out of these, male constituted 38% while females were 62%. Among all, 20 patients (47.6%) belonged to 1-2 year of age, while 11 patients (26.2%) were

less than 1 year and 11 patients (26.2%) fall in 2-3 years. No patient had age more than 3 years.

Severity of hypokalemia was assessed and in 13 patients (31%) it was mild, in 13 patients (31%) it was moderate, and in 16 patients (38.1%) it was severe (Fig. 1). The various presentations noted were abdominal distension in 28 patients (66.7%), sluggish bowel sounds in 26 patients (61.9%), while neck lag and weakness of truncal muscles in 21 patients (50.0%) diarrhea patients. 19 patients (45.2%) were having limbs weakness and 8 patients (19%) had weakness of muscles of respiration. About three patients (7.1%) having hypokalemia demonstrate no findings on clinical examination (Table 1). Electrocardiography was performed in all enrolled patients, which revealed T-waves flattening in 34 patients (81%), depression of ST-segment in 22 patients (52.4%) and appearance of U-waves in 10 patients (23.8%).

Table 1: Clinical presentation of hypokalemia in children. (n=42).

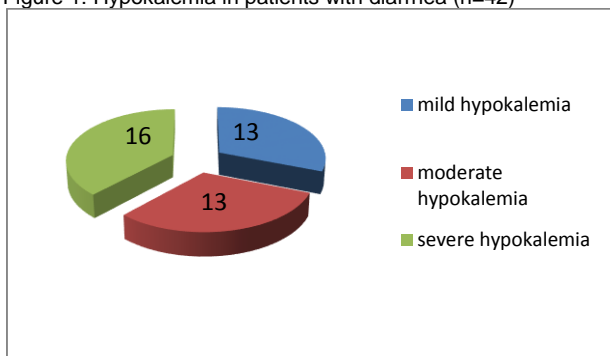
Clinical presentation	n	%age
Abdominal distension	28	66.7
sluggish bowel sounds	26	61.9
Neck lag	21	50.0
Inability to sit	21	50.0
Paralytic ileus	19	45.2
Aphonia	11	26.2
Weakness of upper limbs	19	45.2
Weakness of lower limbs	19	45.2
Respiratory muscles weakness	8	19.0
No clinical manifestations	3	7.1

Table 2: Relationship of severity of hypokalemia with nutritional status of the patients. (n=42).

Weight of the patients	Serum potassium level			Total
	Mild hypokalemia	Moderate hypokalemia	Severe hypokalemia	
Normal	6(100%)	0	0	6 (100%)
< - 1 SD	2(50%)	0	2(50%)	4 (100%)
< - 2 SD	2(16.7%)	6(50%)	4(33.3%)	12 (100%)
< - 3 SD	3(15%)	7(35%)	10(50%)	20 (100%)
Total	13 (31%)	13(31%)	16(38.1%)	42 (100%)

P value 0.003

Figure 1: Hypokalemia in patients with diarrhea (n=42)



The nutritional status of patients revealed that most of the patients were having malnutrition. About 6 patients (14.3%) had no malnutrition, 4 patients (9.5%) had mild malnutrition, 12 patients (28.6%) had moderate malnutrition and 20 patients (47.6%) had severe

malnutrition. The relationship of severity of malnutrition with potassium level was determined and statistically analyzed. It was noted that among 16 patients (38.1%) were having severe hypokalemia, 10 children had severe malnutrition. So, a significant correlation was found between severity of malnutrition and severity of hypokalemia (Table 2).

**DISCUSSION**

Electrolyte losses along with potassium are common in diarrhea<sup>16,17</sup>. The potassium disturbances cause a broad spectrum of presentations such as hypotonia, decrease power and hyporeflexia<sup>18,19</sup>. Hypokalemia impairs the ability of muscles to depolarize, that is essential for contraction of muscles. It may decrease skeletal muscle's blood flow. All such effects can cause weakness of muscles. The acute complications such as paralytic ileus is seen when potassium level is below  $2.6\text{mEq/l}$ . Hypokalemia is found in 24% of cases in diarrheal diseases<sup>20</sup>. Subba Rao et al<sup>21</sup> mentioned that diarrhea with dehydration is a cause of hypokalemia in four out of five cases.

In this study, observed presentations in hypokalemia were distension of abdomen, sluggish bowel sounds, truncal weakness, neck lag, limb weakness and aphonia. The limb weakness varied from difficulty in movement to flaccid paralysis. Respiratory muscles were involved in 8 cases and 3 of them who had hypokalemia were asymptomatic. Chhabra A et al<sup>22</sup> reported that neck lag is the most common (100%) presentation, then sluggish bowel sounds (82.6%), lethargy (43%) and paralysis of limbs in two patients. In our study, ileus was seen in 19 (45.2%) patients while Murtaza A et al, found in 35% children with diarrheal diseases associated hypokalemia<sup>23</sup>. Limb weakness was found in 19 (45.2%) patients with diarrheal diseases associated hypokalemia in our study. Hamnay NR et al<sup>24</sup>, found hypokalemia related paralysis due to diarrhea in 76.6% patients. In our study, most of the patients were having severe malnutrition along with severe hypokalemia. A significant correlation was seen between severity of malnutrition and the level of potassium as reported in other studies<sup>25</sup>.

## CONCLUSION

Hypokalemia has various clinical presentations such as abdominal distension, decreased bowel sounds, neck lag and truncal weakness which results in grave complications such as involvement of muscles of respiration, dysrhythmias and cardiac arrest. There is significant correlation among severity of malnutrition and decreased potassium level in acute diarrhea. So, it stresses the importance of timely diagnosis and management.

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