Original Article

Frequency of Hypokalemia in Malnurished Children with Acute Diarrhea

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ABSTRACT

Objective: This study aimed to determine the frequency of hypokalemia in malnourished children with acute diarrhea.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at the pediatrics department of Ayub Teaching Hospital Abbottabad for six months from June 2017 to November 2017.

Materials and Methods: After approval from hospital ethical committee, sample size of 96 was calculated using WHO software for sample size determination in health studies by keeping confidence level of 95%, anticipated prevalence of hypokalemia in malnourished patients of 55% and absolute precision of 10%. Children of either gender aged six months to five years admitted in ward fulfilling the inclusion criteria of malnutrition with acute diarrhea were included in this study in a consecutive manner.

Results: Out of 96 patients, 44(45.8%) were male and 52(54.2%) were female. Mean age was 20.65±11.961 months. Hypokalemia was observed in 46 (47.9%) children whereas 50 (52.1%) children had no electrolytes imbalance. The frequency of hypokalemia was analyzed with respected to gender and age groups of the children and the p-values were 0.973 and 0.176 respectively.

Conclusion: In conclusion hypokalemia is a common electrolyte abnormality in children with malnutrition especially during acute diarrheal episodes. Therefore, the treating physician should be very vigilant for this common electrolyte abnormality and serial monitoring of serum potassium level and potassium supplementation should be done in children with malnutrition during acute diarrhea illnesses to avoid life threatening consequences of severe hypokalemia.

Key Words: Malnutrition, hypokalemia, Acute Diarrhea, frequency

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INTRODUCTION

Malnutrition is a major health problem throughout the world especially in developing countries. It interacts with diarrhea in a vicious cycle[1]. Electrolyte imbalance is a common problem in malnourished children [2]. The increase loss of electrolytes especially potassium and sodium in acute diarrhea increases the morbidity and mortality associated with malnutrition. Therefore, serum electrolytes should be keenly monitored in these patients [3].

Potassium plays a very important role in the stabilization and maintenance of electric potential in cardiac muscle cells. Their imbalance may have a detrimental effect on the normal electric activity of heart [4]. Therefore, it is highly essential to maintain normal level of potassium in malnourished children.

Malnutrition is the leading contributor to the global burden of diseases in children. It is responsible for more than half of all childhood deaths throughout the world[5]. In a survey conducted jointly by the Government of Pakistan and United Nations Children's Fund (UNICEF) showed that 41.5% of Pakistani children were underweight, 31% were stunted, 11.6% were wasted and 10% were anemic. In this survey, In Pakistan 44% of school going children were found to be malnourished[6]. Malnutrition also impairs children's physical and mental development and it results in poor academic performance[7]. In Pakistan the rate of childhood malnutrition is comparatively much higher than in other less developed countries in the world and its achievement in childhood nutrition and health is much slower as compared to other countries in this region [8].

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The association of malnutrition and diarrhea is an established fact [9]. Severe acute malnutrition account for about two million deaths annually with diarrhea being the most common cause[10]. Both the frequency and duration of diarrhea and the resulting mortality due to diarrhea are much higher in malnourished children as compared to well-nourished children. Acute malnutrition and diarrheal illnesses are also the major contributor to childhood morbidity[11]. Diarrhea is a common problem in our country and the prevalence of diarrhea in Pakistan is 51% reported by Syed M. Shah et al. in a study [12].

In children with acute malnutrition electrolyte imbalance is very common along with other complications. Acute diarrheal illnesses aggravate this electrolyte imbalance. Diarrheal episodes result in loss of sodium, potassium, bicarbonate and chloride ions form the body [13]. Among these electrolytes imbalances hypokalemia and hyponatremia can have a fatal outcome [14]. This loss of electrolytes especially severe hypokalemia has importance in immediate therapy to avoid life threatening situations. Malnourished children have poor ability to maintain normal electrolyte concentration and acute diarrhea exacerbates this problem. This results in overall decrease in electrolytes especially Sodium and Potassium. The concomitant electrolytes and water losses results in compensatory mechanism for water retention which may lead to edema in malnourished children [15].

Management of acute diarrheal illnesses and dehydration in children with severe malnutrition is often controversial. Diarrhea has been shown to have a poor outcome in these children in some studies while other studies have shown to have a little prognostic value upon successful management [16]. In patients with severe complicated acute malnutrition bacterial causes of diarrhea is more common and it is suggested to be caused due to the immunosuppressive effects of acute malnutrition and due to damage to the protective mucosal barrier in gastrointestinal tract [17].

Children with severe acute malnutrition are usually managed with antibiotic and oral rehydration fluids like well-nourished children without considering this electrolyte imbalance which can be highly dangerous and increases morbidity and mortality in these children. Therefore, it is highly recommended to detect and manage this electrolyte imbalance in malnourished children according to World Health Organization (WHO) protocols to reduce the associated life threatening consequences.

This current study was aimed to determine the frequency of hypokalemia in malnourished children with acute diarrhea so that this serious complication can be diagnosed and managed immediately to reduce the associated morbidity and mortality.

MATERIALS AND METHODS

This Descriptive cross sectional study was conducted in the pediatrics department, Ayub Teaching Hospital Abbottabad. Duration of study was six months from June 2017 to November 2017. After approval from hospital ethical committee, sample size of 96 was calculated using WHO software for sample size determination in health studies by keeping confidence level of 95%, anticipated prevalence of hypokalemia in malnourished patients of 55% and absolute precision of 10%. Children of either gender aged six months to five years admitted in ward fulfilling the inclusion criteria of malnutrition with acute diarrhea were included in this study in a consecutive manner. Hypokalemia was defined as potassium level less than 3.5mmol/L. children having weight for age less than 80% of the expected weight were considered malnourished. Acute diarrhea was defined as having more than three watery stools per day of less 14 days duration. Those patients fulfilling the above mentioned criteria were subjected to blood tests like serum potassium. The above mentioned information including name, age, gender, address, weight, and hypokalemia were recorded on a predesigned proforma. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 16. Quantitative variables like age and potassium level were described in terms of means ± standard deviation (SD). Categorical data like gender and hypokalemia was described in the terms of frequency and percentages. All results were presented as tables and diagrams. Data was stratified by age and gender with respect to outcome variable i.e. hypokalemia. Post stratified chi square test at 5% level of significance by age and gender was used.

RESULTS

A total of 96 patients were included in this study. Of these, 44(45.8%) were male and 52(54.2%) were female. Children were divided in three age groups six to twelve months, 13-36 months, and 37-60 months. A total of 24 (25%) children were aged below 12 months, 66 (60.8%) were between 13-36 months, and 6 (6.2%) were between 37-60 months. Mean age was 20.65±11.96 months. Hypokalemia was observed in 46 (47.9%) children whereas 50 (52.1%) children had no electrolytes imbalance.

The frequency of hypokalemia was analyzed with respect to gender of the patients in which 47.7% (21/44) male patient had hypokalemia while, among female patients 48.1% (25/52) patients had hypokalemia. Frequency of hypokalemia was observed in 50% (12/24) of patients under 12 months of age, 43.9% (66/29) among patients in 13-36 months age group, and 83.3% (five out of six) of children with age between 37-60 months. Frequency of hypokalemia by sex and age group of patients is presented in Table 1.

Table No.1: Frequency of hypokalemia by sex and age group of patients

	Hypokalemia		P-value
	Yes	No	
Total	46	50	-
Sex of child			
Male	45.7% (21)	46% (23)	0.973
Female	54.3% (25)	54% (27)	
Age Groups			
6-12 months	26.1% (12)	24% (12)	0.176
13-36 months	63% (29)	74% (37)	
37-60 months	10.9% (5)	2% (1)	

DISCUSSION

Children with severe malnutrition are at increased risk to various infections and these infections either further compromised their nutritional status or causes malnutrition [18]. In developing countries about 165 million children are malnourished and malnutrition is the leading cause of childhood mortality throughout the world [19]. Diarrhea contribute significantly to childhood mortality and it causes more than 1.5 million deaths annually and predisposes children to malnutrition.

In our study the frequency of hypokalemia was 47.9%. Our finding was very similarly to study conducted by Yasmeen Memon in which the frequency of hypokalemia in malnourished children with diarrhea was 48% [20]. In his study 57 children were male and 43 were females and 12 children were with grade one malnutrition, 27 were in grade two malnutrition while 61 were in grade three malnutrition. While in our study 44(45.8%) were male and 52(54.2%) were female.

In another study from Pakistan conducted by Arif Zulqarnain and colleagues, the frequency of Hypokalemia in malnourished children with diarrhea was 61.1% and the electrolytes abnormalities were more common in children with grade three malnutrition[21].

Similar findings were observed in a study by Asma Bilal in Rawalpindi, Pakistan in which the frequency of hypokalemia in malnourished children with diarrhea was 55% while the frequency of hyponatremia was 32.5% and none of the patients have hypernatremia or hyperkalemia. In her study, of the 80 patients, 61.3% were boys and 38.7% were girls with a mean age of 1.9±1.4 years [22]. Rehana Majeed in a study reported the prevalence of hypokalemia in children with acute diarrhea was to be 37%, [23] while in an Indian study, the frequency of hypokalemia was 8.33% while that of hyponatremia was 13.33% and these were the most common electrolyte abnormalities in children with severe acute malnutrition [24].

In a Nigerian study the frequency of Hypokalemia was 23.4% in malnourished children presented with diarrhea and it was second to metabolic acidosis which the most common abnormality in these children. The frequency of hyponatremia was 13%, hypochloraemia 4.2% and hypernatremia was 3.1% [7]. Malnutrition has significant graded association with diarrhea and malnourished children has an increased incidence of diarrhea while similarly diarrhea leads to worsening of already compromised nutritional status. In malnourished children the duration of diarrhea also significantly prolonged as compared to normal weight children [25]. In a study conducted in Bangladesh founded a positive relationship between diarrhea and malnutrition as diarrhea leads to malnutrion while malnourished children have an increased incidence and duration of diarrheal illnesses [26].

CONCLUSION

In conclusion hypokalemia is a common electrolyte abnormality in children with acute malnutrition especially during acute diarrheal episode. Therefore, the treating physician should be very vigilant for this common electrolyte abnormality and serial monitoring of serum Potassium level and potassium supplementation should be done in children with malnutrition during acute diarrhea illnesses.

Author's Contribution:

Concept & Design of Study:	Mujeeb ur Rehman
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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