ORIGINAL ARTICLE

Serum Electrolyte Disturbances in Acute Diarrhoea among Children Less Than 5 Years of Age

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ABSTRACT

Aim: To determine the frequency of serum electrolytes disturbances in acute diarrhea among children less than five years of age.

Methods: This Cross-sectional study was carried out at Pediatrics Department of Bolan Medical Complex Hospital Quetta from 1st February to 31st July. One hundred and seventy four cases of acute diarrhea among children less than five years of age in both genders.

Results: There were 112 males and 62 females. Majority patients were less than 24 months of age 65.5%. Abnormal laboratory finding were found in 116 patients among total of 174 patients, 43.7% had only hypokalemia, and 8.6% patients had hyponatremia plus hypokalemia. Hyponatremia had found in 5.7% patients. Normal serum sodium and serum potassium were found in 33.3% while hyponatremia plus hyperkalemia were found in 1.2% patients. hyperkalemia were found in 4.6% only. Hypernatremia in 2.9% patients had found. Arterial blood analysis done in all patients for serum bicarbonate. Metabolic acidosis in 27.6% while metabolic alkalosis in 1.1% patients had found.

Conclusion: The most common abnormality was hypokalemia followed by combined hyponatremia with hypokalemia <5 years of children

Keywords: Serum electrolyte, disturbance, Acute diarrhea

INTRODUCTION

Acute diarrhoea is sudden onset of excessively loose stools of >10mL/kg/day in infants and >200g/24 hr in older children which lasts <14 days[1]. According to World Health Organization the definition of diarrhoea is three or more loose stools per day, or as having extra stools than is normal for that person[2]. Diarrhoea is a common cause of deaths in all children and is the second most common cause in those aged over 1 month[3]. The daily Express Tribune on 12th March 2011, that 'one child dies every minute in Pakistan', quoting the recently published annual health report of Pakistan Medical Association for the year 2011 that every year about 400,000 infants die in the first year of their life[4].

Diarrhoea is turnaround the normal net absorptive status of water and electrolyte absorption to secretion. In Nicaragua; Kling[5] reported that green tea and pomegranate extract combined as an oral solution to help children with diarrhoea to improve. Common electrolytes are sodium, potassium, chloride and bicarbonate. These molecules which are either positive or negative ionic charge conduct an electric current and help to balance pH acid-base levels in the body. Electrolytes also facilitate the passage of fluid between and within cells and play a part in regulating the function of the neuromuscular, endocrine and excretory systems. Abnormal electrolyte with acute diarrhoea are common, it may unrecognize and results in morbidity and mortality.

Effective replacement of electrolyte is necessary in diarrheal patients based on exact knowledge of changes in composition of body fluids. Timely recognition and common electrolyte abnormalities is necessary to ensure correction. The aim of my study will be to determine the frequency of common electrolyte abnormalities in acute diarrhoea and then those high prevalent electrolyte abnormalities will be addressed thus preventing and treating early to reduce risk of death and morbidity.

PATIENTS AND METHODS

This cross sectional study was carried out at Paediatrics Unit-II Bolan Medical College Hospital Quetta and comprised 174 children. Children <5 years with acute diarrhoea were included. Those children who have diarrhoea lasting more than 14 days and child having associated other diseases such as protein energy malnutrition measured clinically and doing weight were excluded. Children below five years of age who came with acute diarrhoea were recruited into study after their parent's consent. Those patients who having history of loose motion at least three episodes in 24 hours of less than 14 days were included. Each child with acute diarrhoea was then assessed by taking history from mother/caregiver, performing physical and systemic examination. Anthropometric measurements such as

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weight and height were done. After admission of child, 2ml of whole blood was collected after aseptic methods at the time of insertion of intravenous cannulation before giving intravenous fluids and electrolyte analyzer using ion selective electrodes were used to measure serum levels of Na and K while arterial blood was also taken for analysis of serum bicarbonate. The data was analyzed statistically through SPSS version 16.0.

RESULTS

Majority of patients admitted were below 24 months of age i.e., 114(65.5%). Among 174 patient male were 112(64.4%) and females were 62(35.6%) (Table 1).

Table 1: Demographic information of the children

Variable	n	%age
Gender		
Male	112	64.4
Female	62	35.6
Age (months		
<24	114	65.5
At or >24	60	34.5

Table 2: Serum electrolyte parameters in patients

Variable	n	%age
Serum Sodium		
Isolated Hyponatremia (<135 mEq/L)	10	5.7
Isolated Hypernatremia (> 145 mEq/L)	5	2.9
Serum Potassium		
Isolated Hypokalemia (< 3.5 mEq/L)	76	43.7
Isolated Hyperkalemia (> 5.0 mEq/L)	8	4.6
Mixed electrolyte abnormality		
Hyponatremia plus Hypokalemia	15	8.6
Hyponatremia plus Hyperkalemia	2	1.2
Serum Bicarbonate		
Metabolic Acidosis (<mEq/L)	48	27.6
Normal (22–28 mEq/L)	124	71.3
Metabolic Alkalosis (>mEq/L)	2	1.1
Normal serum sodium & serum potassium	58	33.3

Table 3: Mean and standard deviations

Parameter	Mean±SD
Serum sodium (mEq/l)	135.0±10.3
Serum potassium (mEq/l)	3.7±1.01
Bicarbonate (mEq/l)	15.65±5.95

The serum electrolyte was done in 174 patients who recruited for study presenting with acute diarrhoea. Abnormal laboratory finding were found in 116 patients among total of 174 patients. In our study the normal reference range for serum sodium was 135–145mEq/L, above and below this reference range was considered abnormal. Reference range for serum potassium was 3.5–5.0mEq/L, above and below this reference range was considered abnormal. While Serum Bicarbonate reference range was 22–28mEq/L, above and below this reference range were considered significant (Table 2). The mean serum sodium was 135±10.3mEq/l (range of 117-178mEq/l). The potassium was 3.7±1.01mEq/l (range 1.8-7.4mEq/l). Among 174 patients 76(43.7%) had isolated hypokalemia. In 15(8.6%) patients had hyponatremia plus hypokalemia. Isolated hyponatremia had found in 10(5.7%) patients. Normal serum sodium and serum potassium were found in 58(33.3%) while hyponatremia plus hyperkalemia were found in 2(1.2%) patients. Isolated hyperkalemia were in 8(4.6%). Isolated hyper-natremia in 5(2.9%) patients had found. Arterial blood analysis done in all patients for serum bicarbonate. The mean serum bicarbonate levels were 15.65±5.95mEq/l. Metabolic acidosis in 48(27.6%) while metabolic Alkalosis in 2(1.1%) patients had found (Table 3).

DISCUSSION

We recruited 174 patients in our study for electrolyte disturbances who presented with acute diarrhea in less than five years of age. Most of patients were below 24 months of age. Incidence of diarrhea was high in this age group, while Jyotsna et al, found highest at age groups of 6–11 months in children.[7] We found mean serum sodium 135±10.3 mEq/l (range of 117-178mEq/l), while potassium was 3.7±1.01mEq/l (range 1.8-7.4mEq/l). In a study of Nowrouzi found in their study mean sodium 137±10.3mEq/l (range of 106-184mEq/l), while the mean serum potassium was 4.4±1.2mEq/l (range 1.4-7.7mEq/l)[8]. In our study among 174 patients we found electrolyte abnormality in 116(66.7%) while Rothrock et al[9], has shown in their study around 28% of electrolyte abnormality.

The common abnormality was isolated hypokalemia 43.7% in our study followed by mixed hyponatremia plus hypokalemia in 8.6% of patients. Shah et al[10], found hyponatremia in 56% followed by hypokalemia in 46% and also they found 37% mixed electrolyte disturbances. Another study in Bangladesh reported frequency of hyponatremia and hypokalemia at 27.8% and 47.5% respectfully.[11] This is due to loss of sodium in diarrhoea while potassium loss due to bicarbonate in diarrhoea. In the present study isolated hyponatremia was 5.7% while in a study of Pizzoti et al[12],found hyponatremia 34% of admitted patients. Isolated hypernatremia was 2.9%, in a study of Jenkins and Ansari[13] found it <1% of their cases. It is because of most fluid in diarrhoea lost with a lower sodium concentration.

The most common electrolyte abnormality in our study was hypokalemia in 43.7% of patients as compare to other study where its frequency was 14%[14]. It results in loss of potassium with bicarbonate. We also found in our study in 1.2% of patients mixed hyponatremia plus hyperkalemia. It could be due to ischemic changes in renal tissue due to hypovolemic dehydration affecting renal function.

The mean serum bicarbonate levels were 15.65±5.95mEq/l in our study. Metabolic acidosis in 48 (27.6%) while metabolic alkalosis in 2(1.1%) patients had found. Narchi[15] and Teree et al[16] reported that no significant difference in the serum bicarbonate concentration in relation to the degree of dehydration in diarrhoea patients. This study also showed0020that metabolic acidosis following acute diarrheal disease was more common than previously reported in children less than 12 months of age.[10]

CONCLUSION

We found significant changes of serum electrolytes in patients of diarrhoea. The most common abnormality was hypokalemia followed by combined hyponatremia with hypokalemia. Therefore serum sodium and serum potassium should be closely monitored in patients of acute diarrhoea in children especially below 24 months of age.

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