

ORIGINAL ARTICLE

Electrolyte Abnormalities in Children Presenting with Acute Gastroenteritis

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ABSTRACT

Objective: To find out the frequency of electrolyte abnormalities among children with acute gastroenteritis.

Study Design: A cross-sectional study.

Place and Duration of the Study: The Department of Pediatrics, Sheikh Khalifa Bin Zayed Al Nahyan Hospital, Rawalakot from July 2020 to December 2020.

Material and Methods: A total of 159 children of both genders aged between 1 month to 5 years and presenting with acute gastroenteritis at outpatient or emergency department were included. At the time of enrolment, clinical and physical examinations were performed while medical history and presenting complaints were recorded. Frequency of electrolyte abnormalities like hyponatremia, hypernatremia, hypokalemia and hyperkalemia were noted on a predesigned proforma.

Results: In a total of 159 children, 86 (54.1%) were male. Mean age was noted to be 2.1±1.7 years while 69 (43.4%) children were aged between 1 to 3 years. Majority of the children, 104 (65.4%) belonged to rural areas of residence. Abdominal pain, vomiting and lethargy were the other most frequently observed presenting complaints noted among 91 (57.2%), 60 (37.7%) and 51 (32.1%) children respectively. Among all children, mean serum sodium was noted to be 140±11.3 meq/L. Hyponatremia was found to be among 45 (28.3%) children while hypernatremia was present in 28 (17.6%) children with AGE. Mean serum potassium was calculated to be 4.2±3.7 mmol/L. Hypokalemia was found to be present among 28 (17.6%) children while hyperkalemia was noted to be among 10 (6.3%) children.

Conclusion: Frequency of electrolyte abnormalities was found to be high among children with acute gastroenteritis. Timely identification and treatment of children presenting with acute gastroenteritis coupled with electrolyte abnormalities needs to be done to reduce the morbidity and mortality associated with these diseases.

Keywords: Acute gastroenteritis, hypokalemia, hyperkalemia, hypernatremia, hyponatremia.

INTRODUCTION

Acute Gastroenteritis (AGE) is considered to be a major cause of morbidity and mortality among children all around the globe.^{1,2} Annually, 3 to 5 billion cases of AGE are reported from all over the world while AGE is estimated to be responsible for 2 million deaths among children below 5 years of age.³ In Pakistan, epidemiological data in children revealed younger age and male gender to have increased prevalence gastroenteritis.⁴ Between 10-20% of AGE cases are due to bacterial infections while around 70% of AGE cases are thought to be because of viral etiology whereas rotavirus is known to be the most commonly found virus causing AGE.^{5,6}

Since the introduction of oral rehydration therapy (ORT) program by "World Health Organization (WHO)", mortality among children associated with AGE decreased significantly.⁷ Dehydration, electrolyte abnormalities and renal impairment are some of the major complications of AGE. Some pediatricians believe that blood chemical analysis is not essential among children with AGE while evaluation of electrolyte disturbances is important to identify the extent of dehydration and severity of the disease. Timely identification and management of dehydration can result in resolution of dehydration linked with AGE.⁸ Late identification of dehydration and under-treatment can result in increase in mortality while over-estimation of dehydration can be a cause of increased economic burden. A study from Iran analyzing electrolyte abnormalities among children with AGE observed 41.6% children to have some kinds of sodium abnormality while 13% children were noted to have hypokalaemia and 3.7% hyperkalaemia.⁹ A local study found hyponatremia to be the most common electrolyte abnormality affecting 28% of children with AGE while hypernatremia and hypokalemia were the other most commonly identified abnormalities among 19% and 12% children with AGE respectively.¹⁰ The present study was planned to find out frequency of electrolyte abnormalities among children with AGE. The frequency of electrolyte abnormalities among children with AGE are expected to be high but not much local evidence exists. Findings of this study were thought to provide the extent of

electrolyte abnormalities in children with AGE so that strategies can be devised for the timely identification and management of children presenting with AGE.

MATERIAL AND METHODS

This cross-sectional study was conducted at The Department of Pediatrics, Sheikh Khalifa Bin Zayed Al Nahyan Hospital, Rawalakot from July 2020 to December 2020. Approval from "Institutional Ethical Committee" was taken and informed consent was sought from parents/guardians of all study participants.

The sample size was calculated to be 159 considering 95% confidence level, 7% margin of error and proportion of hyponatremia among children with AGE as 28%.¹⁰ A total of 159 children of both genders aged between 1 month to 5 years and presenting with AGE at outpatient or emergency department were included. AGE was labeled as 3 or more loose/watery stools in the past 24 hours.¹¹ Children having AGE for duration more than 14 days were excluded. Children with the history of steroid intake due to any reasons in the past 1 month. Children whose parents/guardians refused to be part of this study were also not included.

At the time of enrolment, clinical and physical examinations were performed while medical history and presenting complaints were recorded. A 5-ml venous blood sample was taken from all study cases and sent to the institutional laboratory for electrolyte analysis. Normal sodium was defined as serum sodium between 135-150 meq/L, hyponatremia < 135 meq/L and hypernatremia > 150 meq/L.¹² Normal potassium level was defined as serum potassium between 3.5-5.5 mmol/L, hypokalemia < 3.5 mmol/L and hyperkalemia > 5.5 mmol/L.¹² A special proforma was designed to record study data. Data was analyzed using SPSS version 26.0. Qualitative data was expressed as frequencies and percentages while mean and standard deviation (SD) were calculated for quantitative data.

RESULTS

In a total of 159 children, 86 (54.1%) were male. Mean age was noted to be 2.1+1.7 years while 69 (43.4%) children were aged between 1 to 3 years. Majority of the children, 104 (65.4%) belonged to rural areas of residence. Table-I is showing characteristics of children with AGE in the present study.

Table-I: Characteristics of Children with Acute Gastroenteritis (n=159)

Characteristics	Number (%)
Gender	
Male	86 (54.1%)
Female	73 (45.9%)
Age	
1 month to 1 year	31 (19.5%)
>1 year to 3 years	69 (43.4%)
>3 years to 5 years	59 (37.1%)
Residential Area	
Rural	104 (65.4%)
Urban	55 (34.6%)

As presence of 3 or more loose/watery stool was one of the major inclusion criteria of this study so loose/watery stool was the presenting complaint in all (100%) children. Abdominal pain, vomiting and lethargy were the other most frequently observed presenting complaints noted among 91(57.2%), 60 (37.7%) and 51 (32.1%) children respectively. Table-II is showing frequency of most common complaints among children with AGE at the time of presentation.

Table-II: Frequency of Most Common Complaints among Children with Acute Gastroenteritis at the Time of Presentation (n=159)

Most Common Complaints	Number (%)
Loose/Watery Stool	159 (100%)
Abdominal Pain	91 (57.2%)
Vomiting	60 (37.7%)
Lethargy	51 (32.1%)
Refusal to Feed	39 (22.6%)
Irritability	35 (22.0%)
Fever	26 (16.4%)
Respiratory Distress	14 (8.8%)
Abdominal Distention	9 (5.7%)
Convulsions	7 (4.4%)

Among all children, mean serum sodium was noted to be 140+11.3 meq/L. Hyponatremia was found to be among 45 (28.3%) children while hypernatremia was present in 28 (17.6%) children with AGE. Mean serum potassium was calculated to be 4.2+3.7 mmol/L. Hypokalemia was found to be present among 28 (17.6%) children while hyperkalemia was noted to be among 10 (6.3%) children. Table-III is showing details of serum electrolyte analysis and frequency of serum electrolyte abnormalities among children with AGE.

Table-III: Frequency of Serum Electrolyte Analysis among Children with Acute Gastroenteritis

Electrolyte Analysis	Number (%)
Normal Sodium	86 (54.1%)
Hyponatremia	45 (28.3%)
Hypernatremia	28 (17.6%)
Normal potassium	121 (76.1%)
Hypokalemia	28 (17.6%)
Hyperkalemia	10 (6.3%)

DISCUSSION

Sodium and potassium abnormalities linked with diarrhea or dehydration can be a cause of serious medical concerns and needs immediate management. Irrespective of the cause of AGE, fluid loss is the most important cause of complications which can further require intensive care and appropriate intervention and if left untreated can cause serious outcomes.

In this study, we noted that 54.1% children with AGE were male. This is consistent with the findings of an Indian study where authors revealed 65% cases of acute diarrhea to be male.¹² Chakravarthi GK et al also note that 54.6% children with dehydration were male.¹³ We also found that mean age of the

children with AGE was 2.1+1.7 years while most of the children (43.4%) were aged between 1 to 3 years. Local data from Ullah I et al revealed mean age of the children to be 4+5.6 years which is different to what we noted in the present study.¹⁰ Data from Iran correlated with us well in terms of age where mean age of the children with AGE was found to be 20.5+25 months which is close to what we noted. Our findings were very similar to a study from India in terms of age where the authors calculated mean of the children with AGE to be 2.24+1.78 years.¹²

In the present research, abdominal pain, vomiting and lethargy were the other most frequently observed presenting complaints noted among 57.2%, 37.7% and 32.1% children respectively. Gopchade A from India revealed 65% of the children with acute diarrhea to have abdominal pain as the most frequency presenting complaint which is quite similar to what we noted.¹² Researchers in the past have postulated bloating and abdominal distention to correlate well with hyponatremia and hypokalemia.¹⁴

We noted frequency of hyponatremia to be 28.3% children while hypernatremia was observed in 17.6% children with AGE. Hypokalemia was found to be present among 17.6% children while hyperkalemia was found in 6.3% children with AGE. Pratima P et al analyzing children with AGE to be present in 62.5% children while no cases of hypernatremia were reported in that study. Hypokalemia was observed in 26.5% children.¹⁵ Ukarapol N et al evaluating children with digestive tract manifestations found hyponatremia to be present in 17% children while hypernatremia, hypokalemia and hyperkalemia was noted in 9.4%, 22.6% and 3.8% respectively.¹⁶ Ahmad MS et al in a local study on cases with diarrhea and severe dehydration found 26.9% cases to have hyperkalemia while hypernatremia was observed in 17.3% cases.¹⁷ The present study revealed high frequency of electrolyte imbalance among children with AGE. Gauchan E et al noted 8.9% children to have hypokalemia in acute diarrhea. Gangaraj S et al recorded frequency of hypernatremia as 15.7% children with severely acute malnourishment with diarrhea and vomiting.¹⁹

CONCLUSION

Frequency of electrolyte abnormalities was found to be high among children with acute gastroenteritis. Timely identification and treatment of children presenting with acute gastroenteritis coupled with electrolyte abnormalities needs to be done to reduce the morbidity and mortality associated with these diseases.

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