International Journal of Contemporary Pediatrics
Gubbari KTN. Int J Contemp Pediatr. 2019 Sep;6(5):2077-2080
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20193728

Original Research Article

Electrolyte disturbance in rotaviral diarrhea and other acute diarrheal diseases in children under 5 years

Keerthana T. N. Gubbari*

Department of Pediatrics, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India

Received: 24 May 2019
Revised: 30 June 2019
Accepted: 29 July 2019

***Correspondence:**
Dr. Keerthana T. N. Gubbari,
E-mail: keerthana4tn@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Acute diarrheal disease is one of the most common cause of mortality and morbidity in under 5 children. Rotavirus is one of the important cause of diarrhea in under 5. This study was done to know the electrolyte disturbance in under 5 children with diarrhea.
Methods: A prospective observational study was conducted in Masonic Medical Centre for Children, Coimbatore on children aged less than 5 years with acute diarrhea with moderate and severe dehydration.
Results: Total 220 children are included in study, among them 66(58.9%) had rotavirus infection. Among 220 cases of diarrhea 14.09% (31/220) had hypernatremia, 2.72% (6/220) had hyponatremia, 4.54% (10/220) had hyperkalemia and 9.09% (20/220) had hypokalemia. Among 66 cases of rotavirus diarrhea, 27.27% (18/66) had hypernatremia, 4.5% (3/66) had hyponatremia and 25.75% (17/66) had hypokalemia.
Conclusions: Hypernatremia is the most common electrolyte disturbance in acute diarrheal diseases and most frequently seen in rotavirus diarrhea. In most of the situation, there is unavailability of laboratory or time lag in obtaining reports. Hence prediction of electrolyte disturbance and management is more important in diarrheal disease.

Keywords: Acute diarrheal disease, Electrolytes, Hypernatremia, Hyponatremia, Hyperkalemia, Hypokalemia, Rotavirus

INTRODUCTION

Diarrheal diseases are a major cause of hospitalization worldwide. Diarrheal disorder in childhood account for a large proportion of childhood deaths, estimated to be 1.5 million deaths per year globally, making it second most common cause of deaths worldwide.[1] In India more than 0.3 million annual deaths among children attributable to diarrhea.[2]

Pneumonia and diarrhea together account for 29% of all deaths of children under 5 years, among which diarrhea itself contributes for 11% of deaths.[3] In India, 1 in 82 children are dying from diarrhea before the age of 5 years.[2]

Rotavirus diarrhea is the most common cause of severe diarrhea in children below 5 years.[1,2,4,5] It accounts for 2.5% of all hospitalization of children.[5] 29% of deaths due to diarrhea in below 5 years is due to rotavirus. 23% of deaths due to rotavirus occurs in India.[1]

Serum electrolyte disturbance is one of the most common complication of acute diarrhea in children.[6,7,8] If not treated these electrolyte disturbances are associated with increased mortality.[6,7]

In present study, an attempt has been made to outline the spectrum of electrolyte disturbances in children suffering with acute diarrheal disease with moderate and severe dehydration, especially in rotavirus diarrhea.

METHODS

A prospective observational study was conducted in Masonic medical Centre for Children, Coimbatore. Study was conducted over a period of 12 months extending from January 2015 to December 2015.

Inclusion criteria

- Age group under 5 years.
- 3 or more episodes of loose stools per day.
- Satisfying criteria of moderate and severe dehydration.[9,10]

Exclusion criteria

- Duration of loose stools more than 14 days
- Children with grade 4 malnutrition according to IAP classification and severe acute malnutrition according to WHO classification
- Children with pre-existing renal disease, CNS infection and on drugs like diuretics.

Detailed history, examination and investigations were recorded by specially designed proforma. Clinical features suggestive of dehydration done. A detailed examination done to assess the degree of dehydration, presence or absence of features suggestive of dyselectrolytemia.

Before starting any rehydration measures, 5 ml of blood was drawn to estimate the levels of serum electrolytes, particularly sodium and potassium. Based on values obtained from laboratory, hyponatremia is considered when serum sodium is <130 mEq/L, hypernatremia when sodium >150 mEq/L. Hypokalemia when potassium is <3.5 mEq/L and hyperkalemia when potassium >5.5mEq/L.

Diagnosis of rotavirus diarrhea was made by detection of rotavirus antigen in stool sample using immune chromatographic test. Obtained data was analysed using descriptive and inferential statistical techniques. The results were cross checked with Epi Info Software.

RESULTS

Total 220 children with acute diarrheal disease with some and severe dehydration were included in the study. Out of which 66 had rotavirus diarrhea.

Severe dehydration was noticed in 8.1% of children with acute diarrheal disease. Severe dehydration was more common (13.6%) in children with rotavirus diarrhea.

Table 1: Details about degree of dehydration.

Degree of dehydration	Study population		Rotavirus diarrhea	
	N	%	N	%
Severe dehydration	18	8.1	9	13.6
Some dehydration	202	91.9	57	86.4
Total	220	100	66	100

Table 2: Comparison of serum sodium disturbance between study population and rotavirus diarrhea.

Serum sodium disturbance	Study population		Rotavirus diarrhea	
	N	%	N	%
Hypernatremia	31	14.09	18	27.27
Hyponatremia	6	2.72	3	4.5
Isonatremia	183	83.18	45	68.23
Total	220	100	66	100

Most common type of dehydration is Isonatremic dehydration, which constitutes around 83.18% of cases in all acute diarrheal disease and 68.23% of rotavirus diarrhea. Most common sodium disturbance is hypernatremia, which constitutes 14.09% of all acute diarrheal disease and 27.27% of rotavirus diarrhea.

Table 3: Comparison of serum potassium disturbance between study population and rotavirus diarrhea.

Serum potassium disturbance	Study population		Rotavirus diarrhea	
	N	%	N	%
Hyperkalemia	10	4.54	0	0
Hypokalemia	20	9.09	17	25.75
Normokalemia	190	86.37	49	74.25
Total	220	100	66	100

Most common potassium disturbance is hypokalemia, which constitutes 9.09% of all acute diarrheal disease and 25.75% of rotavirus diarrhea.

DISCUSSION

Acute gastroenteritis is still the common cause of mortality in infants and preschool children throughout the developing country.

In present study, among all the cases of acute gastroenteritis with some and severe dehydration, rotavirus infection constitutes around 30%. According to study conducted by MA Mathew, Nilesh Shyam Chavan and Nigel A. Cunliffe and et al, incidence of rotavirus diarrhea among admitted cases of gastroenteritis is 35.9%, 64% and 31% respectively.

In present study, among the study population with some and severe dehydration, hyperkalemia is seen in 4.54%,

which is almost nearer to the study done by Shah GS and et al. hyponatremia is seen in 9.09%, which is nearer to values obtained in other study group. Hypernatremia is seen in 14.09% of cases, which is slightly more than that of other studies; Hyponatremia is seen in 2.72%, much lesser than other studies.

Table 4: Incidence of rotavirus diarrhea.

Study	Incidence of rotavirus diarrhea among acute gastroenteritis
MA Mathew and et al[11]	35.9%
Nilesh Shyam Chavan and et al[12]	64%
Nigel A. Cunliffe and et al[13]	31%
Present study	30%

Table 5: Serum electrolyte disturbance in acute gastroenteritis with some and severe dehydration.

Serum sodium disturbance	Vishnu Murthy GS[8]	Shah GS and et al[6]	AN Onyiriuka and et al[14]	Present study
Hypernatremia	3.45%	10%	4.8%	14.09%
Hyponatremia	12.06%	26%	55.6%	2.72%
Hyperkalemia	0%	3%	0%	4.54%
Hypokalemia	13.79%	14%	14.3%	9.09%

Table 6: Serum electrolyte disturbance in rotavirus diarrhea.

Serum potassium disturbance	A Mathew and et al[15]	Zisu Mioara and et al[16]	Present study
Hypernatremia	26%	10%	27.27%
Hyponatremia	2.6%	21%	4.5%
Hyperkalemia	0%	22.3%	0%
Hypokalemia	19.7%	2.7%	25.75%

In present study, the children who had rotavirus diarrhea with some and severe dehydration, hypernatremia is seen in 27.27% of cases, which is very much comparable with the study done by A Mathew and et al.

Hyponatremia is seen in 4.5% of cases, which is much less than the study conducted by Zisu Mioara and et al, but comparable with the other study. Considering disturbance in serum potassium level, no cases were found to have hyperkalemia. Hypokalemia is seen 25.75% of cases, which is much higher compared to Zisu Mioara study. But can be compared with A Mathew study. No cases of hyperkalemia noted in present study and study conducted by A Mathew and et al, but hyperkalemia is as high as 22.3% in Zisu Mioara and et al study.

When compared to the present study and other studies, acute diarrheal diseases with some and severe dehydration presents with variable degree of significant electrolyte imbalance. Hence it is important to suspect the electrolyte disturbance by proper history taking and thorough clinical examination and prevent morbidity and mortality by early intervention.

All children in study group recovered and discharged. There were no mortality due to diarrhea during study period.

Limitation of study: Present study was based on small sample size. However, immunization status with respect to rotavirus vaccine , other biochemical parameters to support severity of dehydration status like serum creatinine, blood urea and arterial blood gas analysis, should be included to get better prospective of dehydration. Hence a study with larger study group with detailed biochemical analysis is recommended to come to a definitive conclusion.

CONCLUSION

Acute gastroenteritis is still a rampant problem in developing countries. Rotavirus diarrhea is one of common cause of diarrhea in both developed and developing countries. Rotavirus diarrhea accounts for one third of total cases of diarrhea.

Most common electrolyte disturbance in children with acute gastroenteritis and also particularly in rotavirus with some and severe dehydration is hypernatremia and

hypokalemia. Isonatremic dehydration is the common type of dehydration.

ACKNOWLEDGEMENTS

I thank Prof. Dr. M. Ramaswamy, Medical Advisor and Dr. Krishnaswami, Chief Medical officer, Masonic Medical Centre for Children, for their guidance and encouragement for this study.

I would like to thank Mr. Siva Kumar and Mr. Ranjith, Statistician, for their help in statistics.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Zulfiqar AB. Acute Gastroenteritis in Children. RM Kliegman, BF Stanton, JWS Geme III, NF Schor, editor. Nelson textbook of pediatrics, 19th ed. Elsevier publishers; 2012: 1323-1339.
2. Morris SK, Awasthi S, Khera A, Bassani DG, Kang G, Parashar UD, et al. Rotavirus mortality in India: estimates based on a nationally representative survey of diarrhoeal deaths. Bulletin of the World Health Organization. 2012;90:720-7.
3. Ending preventable child deaths from pneumonia and diarrhea by 2025, the integrated global action plan for Pneumonia and Diarrhea (GAPPD) [internet]. Geneva. World Health Organization /UNICEF 2013. Available at: http://www.who.int/maternal_child_adolescent/documents/global_action_plan_pneumonia_diarrhea/en/.
4. Thomas GC, LK Pickering. Acute gastroenteritis. S Krugman, SL Katz, AA Gershon, CM Wilfert, editors. Infectious diseases of children, 111th Ed, USA: Mosby-Year Book, Inc.; 1992:105-126.
5. LK Pickering, CJ Baker, SS long, JA McMillan. Rotavirus infections, Red book 2006 Reports of the committee on infectious diseases. 27th ed. New York, American Academy of Pediatrics; 2006:572-575.
6. Shah GS, Das BK, Kumar S, Singh MK, Bhandari GP. Acid base and electrolyte disturbance in diarrhoea. Kathmandu Univ Med J (KUMJ). 2007;5(1):60-2.
7. JA Begam, MM Hoque, M Hussain, MNA Hasan, MH Molla, Impact of electrolyte disturbance in outcome of acute diarrhea in children, DS(child) H J. 2010;26(1):36-40.
8. Vishnu Murthy GS, Hospital Based Clinical Study of Hyponatremic dehydration and serum electrolyte profile in acute gastroenteritis, AIMS, Bellur, Karnataka, 2006. Available from: http://drvishnumurthy.blogspot.com. Accessed on 13 May 2010.
9. Shinjini B, Mona KC, Meherban Singh. Acute Gastroenteritis, Emergencies in pediatrics. 5th ed. New Delhi, Sagar publications; 2012: 385-405.
10. World Health Organization; Centre for Disease Control and Prevention: Diagnosis and management of foodborne illness [internet]. Chicago: Centre for Disease control and prevention; 2004. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5304al.htm. Accessed on 16 April 2004.
11. Mathew MA, Paulose A, Chitralekha S, Nair MK, Kang G, Kilgore P. Prevalence of rotavirus diarrhea among hospitalized under-five children. Ind Pediatr. 2014 Jan 1;51(1):27-31.
12. NS Chavan, Nilima T. Detection of human rotavirus and bacterial enteropathogen in acute gastroenteritis in children below 5 years of age in Wardha. Int J Curr Microbiol App Sci. 2014;3(6):288-91.
13. Nigel A. Cunliffe, J. Angela Booth, Claire Elliot, Sharon J. Lowe, Will Sopwith, Nick Kitchinand et al. Healthcare associated viral gastroenteritis among children in a large pediatric hospital, United Kingdom. Emerg Infect Dis. 2010 Jan;16(1):55-62.
14. Onyiriuka AN, Iheagwara EC. Serum electrolyte profiles of under-five Nigerian children admitted for severe dehydration due to acute diarrhea. Niger J Health Sci. 2015 Jan 1;15(1):14.
15. Mathew A, Rao PS, Sowmyanarayanan TV, Kang G. Severity of rotavirus gastroenteritis in an Indian population: report from a 3 year surveillance study. Vaccine. 2014 Aug 11;32:A45-8.
16. Zisu M, Camelia B, Carmen T, Maria SC, Roxana C, Laura FR, et al. Prevalence of Rotavirus infection among children in Galati, Romania. Analele Universitatii "Durarea de Jos" Din Galati. 2014;17(2):71-5.

Cite this article as: Gubbari KTN. Electrolyte disturbance in rotaviral diarrhea and other acute diarrheal diseases in children under 5 years. Int J Contemp Pediatr 2019;6:2077-80.