

A Prospective Hospital-Based Assessment of the Clinical Features of Hyponatremic Dehydration in Acute Gastroenteritis

Shaantanu Kumar¹, Satyendra Paswan², Satish Kumar³

¹Senior Resident, Department of Pediatrics, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

²Senior Resident, Department of Pediatrics, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

³Assistant Professor, Department of Pediatrics, Jawahar Lal Nehru Medical College and hospital, Bhagalpur, Bihar, India

Received: 04-10-2022 / Revised: 15-11-2022 / Accepted: 10-12-2022

Corresponding author: Dr. Satyendra Paswan

Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to estimate the incidence of hyponatraemic dehydration in neonates and children aged till 12 years and to evaluate clinical features associated with acute gastroenteritis associated dehydration.

Methods: The prospective study was conducted in the Department of Pediatrics, Jawahar Lal Nehru medical College and hospital, Bhagalpur, Bihar, India for the period of six months and Study population consisted from Infants to children aged till 12 years attending the pediatric Department both OPD and IPD care for acute gastroenteritis are enroll in the study who was satisfying the criteria for Moderate to severe dehydration. A total of 100 Children including neonates were enrolled in the study.

Results: It was found that 60% of the males were having acute gastroenteritis while it was 40% in female subjects. The data also reveals that higher incidence of acute gastroenteritis was noted between 6 to 24 months of age while the lower incidence was found in the subjects above 36 months of age. Hyponatremia was occurred in 37 subjects with high incidence in lower age group in both the genders. Males were more affected than females. Lowest sodium level was 127mmol. Among 100 individuals, 28 were severely dehydrated and rest of them was moderately dehydrated (59). The number of episodes of loose stools was correlating with the extent of dehydration. Higher the episodes the severe were the dehydration.

Conclusion: The study suggested that routine estimation of serum electrolytes is not necessary however it is necessary whenever electrolyte imbalance is suspected on clinical grounds and in cases which do not respond satisfactorily with routine fluid electrolyte therapy.

Keywords: Hyponatremia, Gastroenteritis, Dehydration, Vomiting, Diarrhea

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Diarrhea is a leading cause of illness and death in children of developing countries, where an estimated 1300 million episodes and 3.2 million deaths occur in under-5

children. About 80% of deaths due to diarrhea occur in the first 2 years of life. [1] WHO estimated that worldwide, 1 child dies of diarrhea every 6 seconds. [2]

In India, at least 1.5 million under-5 children die every year due to acute diarrhea. [3]

The occurrence of hyponatremia has been exhibited to be an autonomous hazard factor for expanded mortality in medical clinic inpatients. As hyponatremia is the most well-known electrolyte unsettling influence experienced in clinical drug, it is fundamental that specialists and medical attendants realize how to properly deal with this condition. Extreme hyponatremia has for quite some time been perceived to be related with antagonistic results. [4] Babies and children with gentle lack of hydration regularly have negligible or no clinical changes other than a lessening in pee yield. Alongside diminished pee yield in kids with moderate drying out regularly have dried mucous layers, diminished skin turgor, crabbiness, tachycardia with diminished hairlike refill, and profound breath. A methodical audit of the exactness of clinically foreseeing at any rate 5% lack of hydration in kids found abnormal skin surface, and decreased respiratory example to be the best indicators. [5]

No ongoing investigations exist with respect to the electrolyte unsettling influences happening in a youngster experiencing AGE. Likewise, there are no particular examinations portraying the clinical highlights related with Hyponatremic drying out, and the pieces of information to separating it from Isonatremic drying out. [6] Despite the fact that drugs are a typical reason for hyponatraemia, different causes ought to likewise be considered. Surveying the patient's liquid status and plasma osmolality can help in finding the reason. As hyponatraemia is regularly connected with liquid maintenance the osmolality is generally diminished, anyway different causes might be related with typical or expanded osmolality. [7] In neonate, hypernatremic dehydration might be associated as a weight reduction with over 10% of birth weight toward the finish of

first seven day stretch of life or if there is clinical discoveries of lack of hydration with hypernatremia. Hypernatremic dehydration is a possibly deadly condition in neonate which unfavorably influences focal sensory system, prompting destroying outcomes like intracranial discharge, thrombosis, and even demise. [8]

Intense hyponatremia is characterized by beginning of side effects <48hrs. Patients with intense hyponatremia create neurologic manifestations coming about because of cerebral edema incited by water development into the mind. These may incorporate seizures, debilitated mental status or trance like state and death. While chronic hyponatremia creating over >48hrs should be considered "chronic." Most patients have chronic hyponatremia. The serum sodium focus is more often than not above 120meq/L. [9]

The aim of the present study was to estimate the incidence of hyponatraemic dehydration in neonates and children aged till 12 years and to evaluate clinical features associated with acute gastroenteritis associated dehydration.

Materials and Methods

The prospective study was conducted in the Department of Pediatrics, Jawahar Lal Nehru medical College and hospital, Bhagalpur, Bihar, India for the period of six months and Study population consisted from Infants to children aged till 12 years attending the pediatric Department both OPD and IPD care for acute gastroenteritis are enroll in the study who was satisfying the criteria for Moderate to severe dehydration. A total of 100 Children including neonates were enrolled in the study.

Inclusion criteria

1. Watery diarrhoea of 4 or more episodes per day.
2. Age group less than 12 years

3. Signs and symptoms suggestive of mild dehydration.
4. Without any other severe complications.

Exclusion criteria

1. Diarrhoea of 12 or more episodes per day.
2. Haematological disorders, chronic illness.
3. Signs suggestive of mild or no dehydration

Methodology

After obtaining informed consent from the parents of cases, they are subjected to

detailed history and clinical examination and the findings are entered in the Performa. Blood samples are collected and measures of serum electrolytes & Serum Calcium are measured and compared with that of the clinical aspects of the patient, i.e., diarrhea, vomiting, thirst, fever, abdominal distention and convulsions followed by urine analysis.

Statistical analysis

SPSS (version 20) was used to analyze the data collected. The value of $p < 0.05$ was considered to be statistically significant.

Results

Table 1: Age and Gender Distribution

Age distribution	Male		Female		Total	
	N	%	N	%	N	%
6m – 24m	52	52	35	35	87	87
25m-36m	5	5	2	2	7	7
Above 36m	3	3	3	3	6	6
Total	60	60	40	40	100	100

100 cases were studied and analyzed to detect Gastroenteritis associated dehydration and its clinical features as a possible risk factor for hyponatremia. It was found that 60% of the males were having acute gastroenteritis while it was

40% in female subjects. The data also reveals that higher incidence of acute gastroenteritis was noted between 6 to 24 months of age while the lower incidence was found in the subjects above 36 months of age.

Table 2: Incidence of Hyponatremia with respect to age and Gender

Age	Male			Females		
	Hyponatremic	Normal	Total	Hyponatremic	Normal	Total
6m – 24m	20	32	52	12	23	35
25m-36m	2	3	5	2	0	2
Above 36m	1	2	3	0	3	3
Total	23	37	60	14	26	40

Hyponatremia was occurred in 37 subjects with high incidence in lower age group in both the genders. Males were more affected than females. Lowest sodium level was 127mmol.

Table 3: Incidence of severity of dehydration with Respect to age and gender

Age	Male			Females		
	Severe	Moderate	Total	Severe	Moderate	Total
6m – 24m	18	34	52	10	25	35
25m-36m	0	5	5	2	0	2
Above 36m	0	3	3	0	3	3
Total	18	42	60	12	28	40

Among 100 individuals, 28 were severely dehydrated and rest of them was moderately dehydrated (59). The number of episodes of loose stools was correlating with the extent of dehydration. Higher the episodes the severe were the dehydration.

Discussion

Diarrhea is a major cause of illness and death among children in developing countries, where around 1.3 billion episodes and 3.2 million deaths occur in children under 5 years of age. About 80% of deaths from diarrhea occur in the first two years of life. [10] Malnourished children are at increased risk of complications. In some countries, the rate of income increases due to gastroenteritis, malnutrition, comorbidity and electrolyte imbalances (especially hyponatremia and hypokalaemia). Worldwide, most cases of gastroenteritis are caused by viral infections, with rotaviruses being the most common. Viral infections damage the enterocytes of the small intestine and cause mild fever and watery diarrhea. Rotavirus infection is seasonal in temperate climates and peaks in late winter, but occurs throughout the year in the tropics. Rotavirus strains vary depending on the season and geographically within the countries. [11]

Disorder of sodium in dehydration associated with diarrhea can be a medical emergency that requires quick and appropriate diagnosis and treatment. [12] Different studies have shown a different prevalence of hyponatremia and hypernatremia in children with dehydration. A study by Samadi et al. including the children admitted for diarrhea, it was found that hyponatraemia and hypernatraemia were present in 20.8% and 6.4% of cases, respectively. [13] The study by Shah et al. showed that 56% of the cases with diarrhea and dehydration had hyponatremia, whereas hypernatremia only occurred in 10% of the cases. [14] Many studies have been conducted in the

past to determine the prevalence of various electrolyte disorders in children with gastroenteritis. These studies show that sodium disorders are more common in children with severe dehydration. Studies in South Asia show that hyponatremia is more common in pediatric age groups than hypernatremia. This study shows that hypernatremia is more common than hyponatremia in children with severe dehydration. [15]

In our study the most effected age population was 6 to 24 months and more effected were males In a study by SV Prasad et al found that 29.8% of the sick children is suffering from hyponatremia who require emergency care and must hospitalize while compared to the reported data in adult population, it also states that frequency of hyponatremia is much higher in hospitalized sick children. [16] Diarrhoea is the most concerning cause of dehydration in children as most of the fluids during gastroenteritis are lost. Our study reveals that prolong patient stay in the hospital is due to increase in the frequency of diarrhoea and so the risk of hyponatremia. Furthermore, emesis is also an important factor contributing to the fluid loss from the body resulting in electrolyte imbalance. As shown in our study, emesis and diarrhea leads to hypokalemia as well in few subjects. [17]

In our study the included population was only affected with gastroenteritis, hence there should be a broad category of diseases to be included in further research to know exactly the rare causes of hyponatremia in children. Jagdishet.al in Turkish province found that 5.6% neonates experience serum sodium concentrations of more than 145 mmol/L in hypernatremia dehydration [17] while our study shows that 29.8% of the infants have serum sodium levels lower than 135 mmol/L in hyponatremic dehydration. As stated by Jacob in his study that incidence of diarrhoea is high in children particularly in developing countries, but very low

proportion of the effected children visits to the clinic. Our study also supports this results that children effected with diarrhoea is less frequently hospitalized than gastroenteritis.⁶

Clinical management of hyponatremia depends on treating the fundamental causes however precise assurance of etiology of hyponatremia is not known, additionally, a clinical history might be hard to get because of pediatric population. Hence proper history from the parents and pediatrician clinical judgment is the most broadly acknowledged methods for acquiring precise conclusion of hyponatremia and its treatment in pediatric population. [18]

Conclusion

The clinical impression of the type of dehydration and electrolyte disturbances was fairly consistent with serum electrolytes values. This suggested that routine estimation of serum electrolytes is not necessary however it is necessary whenever electrolyte imbalance is suspected on clinical grounds and in cases which do not respond satisfactorily with routine fluid electrolyte therapy. In summary, it can be said that electrolyte disturbances are very common in children with acute diarrhea. The degree of dehydration and the age of less than 12 months seem to be good prognostic factors for electrolyte imbalance. Early diagnosis and treatment are very important to prevent complications. Promotion of health awareness, breastfeeding, weaning with hygienically prepared foods, demonstration of how to prepare appropriate ORS solution, better female literacy and health education will go a long way in reducing the morbidity and mortality associated with AGE.

References

1. WHO G. Readings on diarrhoea. Student manual.
2. Lal S. Surveillance of acute diarrhoeal diseases at village level for effective

- home management of diarrhoea. Indian Journal of Public Health. 1994 Apr 1;38(2):65-8.
3. Saxena SC, Gupta RK, Krishna G, Sharma SN, Srivastava JP, Gupta SC. Impact of health educational interventions on diarrhoeal morbidity in a slum area of Kanpur. Indian Journal of Community Health. 1994;8(4):16-7.
4. Dr. Peter Allan & Dr. Saibal Ganguly, ATOTW 314 – Hyponatraemia (2nd April 2015) Tutorial. 314:1-8.
5. Powers KS. Dehydration: isonatremic, hyponatremic, and hypernatremic recognition and management. Pediatrics in Review. 2015 Jul;36(7):274-85.
6. Jacob J, Joseph TK, Srinivasan R, et al. Direct and Indirect Costs of Pediatric Gastroenteritis in Vellore, India. Indian Pediatr. 2016 Jul 8;53(7):642-4.
7. Spiros Furlanos, Peter Greenberg. Managing druginduced hyponatraemia in adults. Australian Prescriber, 2003 Vol. 26 (5): 114-117.
8. Das Jagadish. Hypernatremic Dehydration in Newborn Infants: A Review. Ulutas Med J. 2015;1(2):22-25.
9. Sahay M, Sahay R. Hyponatremia: A practical approach. Indian J Endocrinol Metab. 2014 Nov;18(6): 760-71.
10. Dastidar RG, Konar N. A Study of Electrolyte Disturbances in a Child Presenting with Acute Gastroenteritis, with Special Emphasis on Hyponatremic Dehydration- A Hospital based Cross-Sectional Study. Pediatr Ther. 2017; 7:322-6.
11. Kirkwood CD, Cannan D, Bogdanovic-Sakran N, Bishop RF, Barnes GL. National rotavirus surveillance program annual report, 2005-06. Communicable Diseases Intelligence. 2006 Jan 1;30(4):434.
12. Petzold A. Disorders of plasma sodium. The New England journal of medicine. 2015 Mar 26;372(13):1267.

13. Samadi AR, Wahed MA, Islam MR, Ahmed SM. Consequences of hyponatraemia and hypernatraemia in children with acute diarrhoea in Bangladesh. *Br Med J (Clin Res Ed)*. 1983 Feb 26;286(6366):671-3.
14. Shah GS, Das BK, Kumar S, Singh MK, Bhandari GP. Acid base and electrolyte disturbance in diarrhoea. *Kathmandu University medical journal (KUMJ)*. 2007 Jan 1;5(1):60-2.
15. Ahmad MS, Wahid A, Ahmad M, Mahboob N, Mehmood R. Prevalence of electrolyte disorders among cases of diarrhea with severe dehydration and correlation of electrolyte levels with age of the patients. *J Coll Physicians Surg Pak*. 2016 May 1; 26:394-8.
16. Prasad SV, Singhi S, Chugh KS. Hyponatremia in sick children seeking pediatric emergency care. *Indian pediatrics*. 1994 Mar. 1; 31:287-.
17. Das J. Hypernatremic dehydration in newborn infants: a review. *The Ulutas Medical Journal*. 2015 Jul 30;1(2):22-5.
18. Khan A., Tidman D. M. M., Shakir D. S., & Darmal D. I. Breast Cancer in Afghanistan: Issues, Barriers, and Incidence. *Journal of Medical Research and Health Sciences*. 2022; 5(8): 2125–2134.