

A Clinico-epidemiological Profile of Hyponatremic Dehydration in Acute Gastroenteritis Patients: Prospective Observational Study

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Abstract

Aim: The aim of this study to evaluate the clinical Features of Hyponatremic Dehydration in Acute Gastroenteritis.

Methods: The Prospective, Observational study was conducted in the Dept of pediatrics, Vardhman institute of medical sciences, Pawapuri, Nalanda, Bihar, India, for 2 years. A total of 100 Children including neonates are enrolled in the study. Patients with watery diarrhoea of 4 or more episodes per day, age group less than 12 years, signs and symptoms suggestive of mild dehydration and without any other severe complications were included in this study.

Results: 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 64% of the males were having acute gastroenteritis while it was 36% in female subjects. Hyponatremia was occurred in 35 subjects with high incidence in lower age group in both the genders. Males (35.94%) were more effected than females (33.33%). Among 100 individuals, 34% were severely dehydrated and rest of them were moderately dehydrated (66%). The number of episodes of loose stools were correlating with the extent of dehydration. Vomiting were associated with diarrhea in 64 subjects whereas 36 subjects were only complained of diarrhea. The subjects who were severely dehydrated showed both the manifestations of diarrhea and vomiting except 15

individuals. Only 8 individuals showed hypokalemia without hyponatremia. About 5 subjects showed hypokalemia with hyponatremia.

Conclusions: The Incidence of diarrhea peaks in children less than 1 year of age and then decreases as age increases. The analysis of clinical presentation revealed that vomiting and fever were frequent accompanied with hyponatremic dehydration.

Keywords: diarrhea, hyponatremia, gastroenteritis

Introduction

Diarrhea remains a major cause of child morbidity and mortality worldwide.¹ 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.² 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). The length of hospital stay is also longer than that of her non-native colleagues. The costs for the gastroenteritis community are enormous, but are often underestimated. In addition, family costs, including lost work, are often not taken into account.³ 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.⁴ Bacterial pathogens such as *Campylobacter jejuni* and *Salmonella* spp. penetrate the lining of the small and large intestine and cause inflammation. Children with bacterial gastroenteritis are more likely to have a high fever and may have blood and white blood cells in their stools. Bacterial pathogens sometimes spread systemically, especially in young children. Infection with *Escherichia coli* or *Shigella dysenteriae*, which produce Shiga toxin, can cause hemorrhagic colitis (with severe bloody diarrhea), which can be complicated by hemolytic uremic syndrome.⁵ The clinical manifestations of acute diarrhea are related to the severity of the lack of water and the type of electrolyte imbalance. As a result, the clinical detection of water and electrolyte disorders, especially hyponatremic dehydration, becomes important due to their serious neurological consequences.⁶ Because the osmolality and volume of extracellular fluid are determined by their sodium content, this ion plays a key role in the regulation of water and electrolytes. In this sense, the biochemical change in children suffering from dehydration can be hyponatremic, isonatremic or hypernatremic. Other observed biochemical changes are hypokalaemia and metabolic acidosis.⁷ The clinical impression of the type of dehydration and electrolyte changes was fairly in agreement with the values of the serum electrolytes. Bloating and abdominal distention correlated positively with hyponatraemia and hypokalaemia. Routine monitoring of serum electrolytes is not required. However, it is important if an electrolyte imbalance is suspected for clinical reasons and if they do not respond satisfactorily with routine fluid and electrolyte therapy.⁸ Disorders of sodium and potassium levels in diarrhea-related dehydration cases can be a medical emergency that requires quick and appropriate diagnosis and treatment.⁹

Material and Methods

The Prospective, Observational study was conducted in the Dept of pediatrics, Vardhman institute of medical sciences, Pawapuri, Nalanda, Bihar, India, for 2 year. after taking the approval of the protocol review committee and institutional ethics committee. Study population consisted from Infants to children aged till 12 years attending the pediatric Department for acute gastroenteritis were included in this study. A total of 100 Children including neonates are enrolled in the study. Patients with watery diarrhoea of 4 or more episodes per day, age group less than 12 years, signs and symptoms suggestive of mild dehydration and without any other severe complications were included in this study. Patients with diarrhoea of 12 or more episodes per day, Haematological disorders, chronic illness, Signs suggestive of mild or no dehydration were excluded from this study.

Sample collection and analysis

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 & Sr 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.

Results

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 64% of the males were having acute gastroenteritis while it was 36% in female subjects.

The data also reveals that higher incidence of acute gastroenteritis was noted between below 24 months of age while the lower incidence was found in the subjects above 36 months of age. (Table 1)

Table 1: Age and Gender Distribution of the Subjects in Study

Age distribution	(n)	Male		Female		Total	
		(n)	%	(n)	%	(n)	%
Below 24m	54	54	54	32	32	86	86
24 m-36m	6	6	6	1	1	7	7
Above 36m	4	4	4	3	3	7	7
Total	64	64	64	36	36	100	100

Table 2: Hyponatremia was occurred in 35 subjects with high incidence in lower age group in both the genders. Males (35.94%) were more affected than females (33.33%). Lowest sodium level was 128mmol.

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

Age	Male				Females			
	Hyponatremic	Normal	Total	%	Hyponatremic	Normal	Total	%
Below 24m	19	35	54	29.69	10	22	32	27.78
24m-36m	3	3	6	4.69	2	0	2	5.56
Above 36m	1	3	4	1.56	0	2	2	0
Total	23	41	64	35.94 %	12	24	36	33.33 %

Table 3: Among 100 individuals, 34 were severely dehydrated and rest of them was moderately dehydrated (66n). The number of episodes of loose stools was correlating with the extent of dehydration. Higher the episodes the severe were the dehydration.

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

Age	Male				Females			
	Severe	Moderate	Total	%	Severe	Moderate	Total	%
6 m – 24m	19	35	54	84.37	13	19	32	88.89
25 m-36m	0	6	6	9.37	2	0	2	5.56
Above 36 m	0	4	4	6.25	0	2	2	5.55
Total	19	45	64	100	15	21	36	100

Vomiting were associated with diarrhea in 64 subjects whereas 36 subjects were only complained of diarrhea. The subjects who were severely dehydrated showed both the manifestations of diarrhea and vomiting except 15 individuals. Only 8 individuals showed hypokalemia without hyponatremia. About 5 subjects showed hypokalemia with hyponatremia.

Discussion

Diarrhoea remains the second most common cause of hyponatremia in children.¹⁰ [1]. In our study the most effected age population was below 24 months. It was found that 64 % of the males were having acute gastroenteritis while it was 36% in female subjects.

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 oh hyponatremia is much higher in hospitalized sick children.¹⁰ [1].

Hyponatremia was occurred in 35 subjects with high incidence in lower age group in both the genders. Males (35.94%) were more effected than females (33.33%). Neurological complication and symptoms arising from severe hyponatremia can be treated with 3 % hypertonic saline¹¹ while in our study the paediatric population is treated with isotonic saline (0.90%) with a dose of 20ml/kg till the symptoms of the dehydration is resolved and gastroenteritis is corrected followed by oral rehydration salts, as there were no neurological manifestations in the subjects.

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 diarrhoea leads to hypokalemia as well in few subjects. To tackle this, we need to monitor potassium levels in conjunction with sodium levels. To treat dehydration in children, calculated amount of fluids need to be infused as warranted by a study which shows that the maintenance fluid need for ongoing losses and deficit needs have to be fulfilled by providing adequate fluids till normo-volemia is achieved.¹²

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.¹³

As mention in the book of Australian prescribers that approximately 5 % of the outpatients and 15 % of the inpatients are drug induced hyponatremia in adults¹⁴ but in children the incidence of drug induced hyponatremia is very rare.

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.

Jagdish et al. in Turkish province found that 5.6% neonates experience serum sodium concentrations of more than 145 mmol/L in hypernatremia dehydration¹⁵, while our study shows that 35 % of the infants have serum sodium levels lower than 136 mmol/L in hyponatremic dehydration

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.

Conclusions

The present study concluded that the Incidence of diarrhea peaks in children less than 1 year of age and then decreases as age increases. The analysis of clinical presentation revealed that vomiting and fever were frequent accompanied with hyponatremic dehydration.

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