

ORIGINAL RESEARCH

Assessment of clinical profile and pattern of water and sodium disturbances in children suffering from diarrhoea with dehydration**Dr. Gunjan Jain¹, Dr. Sharad Kumar Singh², Dr. Kuwar vishal³**^{1,3}Assistant Professor, ²Associate Professor Department of Pediatrics, Prasad Institute of Medical Sciences, Lucknow, Uttar Pradesh, India**Corresponding author**

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Received: 15 December, 2022

Accepted: 21 January, 2023

ABSTRACT**Background:** Acute gastroenteritis is one of the common causes for which pediatric patients are admitted. The present study was conducted to assess clinical profile and pattern of water and sodium disturbances in children suffering from diarrhoea with dehydration.**Materials & Methods:** 110 children of age 6 months to 5 years admitted in Pediatric ward with diarrhoea with dehydration of both genders were selected. Children were managed as per standard WHO protocol, adequately hydrated and serum electrolytes were repeated as and when required. Hyponatremia was defined as serum sodium 145 meq/L.**Results:** The mean serum sodium level at admission was 135.6mEq/L, duration of diarrhoea was 14.2days, number of loose stools per day was 11.5, duration of vomiting episodes was 2.9 days, number of vomiting episodes per day was 3.4 and duration of hospital stay was 3.8days. Hyponatremia was seen in 14 male and 16 females. Hypernatremia in 16 males and 9 females and isonatremia in 37 males and 18 females. Age group 6 months- 1 year had 10, 10 and 20 and 1 year- 5 years had 20, 15 and 35. Nutritional status was normal seen in 16, 12 and 22, grade I PEM in 6, 4 and 5, grade II PEM in 4, 5 and 4, grade III PEM in 3, 3 and 2 and grade IV PEM in 2, 1 and 2 having hyponatremia, hypernatremia and isonatremia respectively. The difference was significant ($P < 0.05$).**Conclusion:** The incidence of hyponatremia and hypernatremia in children is quite high (nearly 40%). Malnourished children and children taking improperly diluted WHO ORS were at a significantly higher risk of developing hyponatremia or hypernatremia.**Key words:** Acute gastroenteritis, children, diarrhoea**Introduction**

Acute gastroenteritis is one of the common causes for which pediatric patients are admitted. It is one of the important causes of morbidity and mortality amongst children particularly in developing world.¹ Irrespective of the etiology of the diarrhea it is the fluid loss which is responsible for complications that may need intensive care or even may prove fatal if appropriate intervention is not done in time. Various offending organisms including bacteria and viruses may be responsible for diarrhea and consequent dehydration.²

In children less than 5 years of age, diarrhoea is the 3rd most common cause of death which is responsible for 13% deaths in this age-group. It is estimated that diarrhoea still kills over 300,000 children in India each year. Due to such high burden, it is very important to monitor information on diarrheal diseases, its determinants as well as preventive and control strategies

to ensure better planning and organization of health services in a community.³ WHO defines diarrhoeal disease as the passage of three or more loose or liquid stools per day.⁴ The high incidence of diarrheal disorders in India can be explained by under-nutrition and increased vulnerability to infections resulting from poor infant and young child feeding practices: failing to exclusively breastfed for the first 6 months of life, using infant feeding bottles, storing cooked food at room temperature, using drinking-water contaminated with faecal bacteria, poor education, socioeconomic status, sanitary conditions and unfortunate trend of early breast milk substitutes.⁵The present study was conducted to assess clinical profile and pattern of water and sodium disturbances in children suffering from diarrhoea with dehydration.

Materials & Methods

The present study comprised of 110 children of age 6 months to 5 years admitted in Pediatric ward with diarrhoea with dehydration of both genders. All gave their written consent for the participation in the study.

Data such as name, age, gender etc. was recorded. Clinical examination was done. Nutritional status of the child was graded as per IAP classification of malnutrition. Blood sample was sent for estimation of serum electrolytes, random blood sugar, blood urea and serum creatinine at the time of admission. Children were managed as per standard WHO protocol, adequately hydrated and serum electrolytes were repeated as and when required. Hyponatremia was defined as serum sodium 145 meq/L. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Baseline characteristics

Parameter	Mean	SD
Serum Sodium level at admission (mEq/L)	135.6	17.2
Duration of diarrhoea (days)	14.2	2.7
Number of loose stools per day	11.5	3.2
Duration of vomiting episodes (days)	2.9	1.0
Number of vomiting episodes per day	3.4	0.9
Duration of hospital stay in days	3.8	1.1

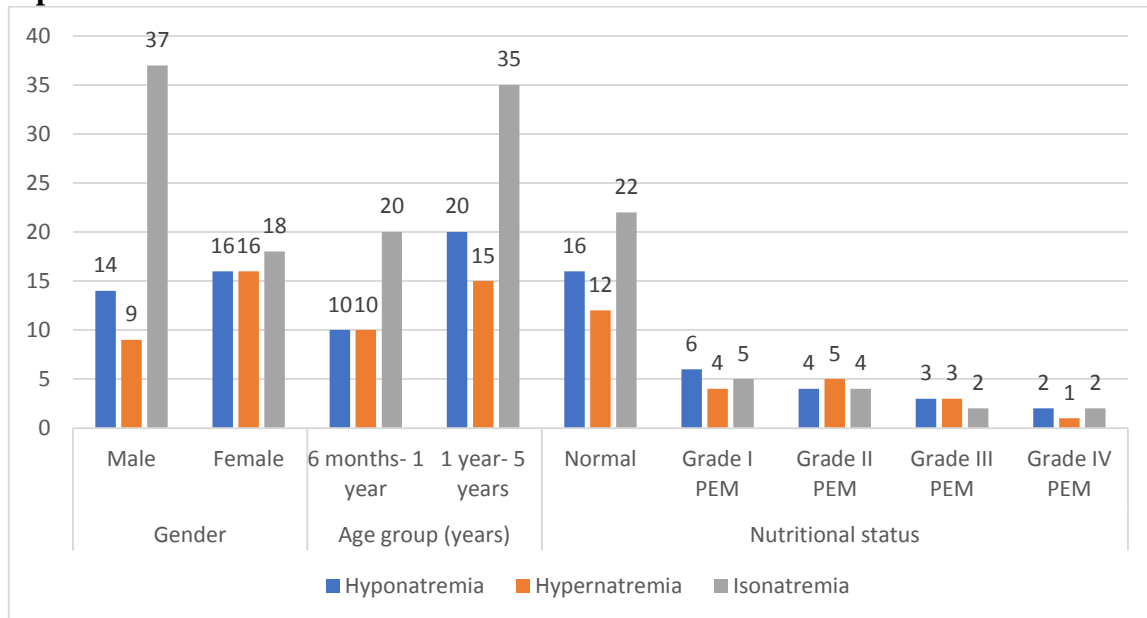
Table I shows that mean serum sodium level at admission was 135.6mEq/L, duration of diarrhoea was 14.2days, number of loose stools per day was 11.5, duration of vomiting episodes was 2.9 days, number of vomiting episodes per day was 3.4 and duration of hospital stay was 3.8days.

Table II: Assessment of sodium alteration

Parameters	Variables	Hyponatremia	Hypertnatremia	Isonatremia	P value
Gender	Male	14	9	37	0.06
	Female	16	16	18	
Age group (years)	6 months- 1 year	10	10	20	0.05
	1 year- 5 years	20	15	35	
Nutritional status	Normal	16	12	22	0.05
	Grade I PEM	6	4	5	
	Grade II PEM	4	5	4	
	Grade III PEM	3	3	2	
	Grade IV PEM	2	1	2	

Table II, graph I shows that hyponatremia was seen in 14 male and 16 females. Hypernatremia in 9 males and 16 females and isonatremia in 37 males and 18 females. Age group 6 months- 1 year had 10, 10 and 20 and 1 year- 5 years had 20, 15 and 35. Nutritional status was normal seen in 16, 12 and 22, grade I PEM in 6, 4 and 5, grade II PEM in 4, 5 and 4, grade III PEM in 3, 3 and 2 and grade IV PEM in 2, 1 and 2 having hyponatremia, hypernatremia and isonatremia respectively. The difference was significant ($P < 0.05$).

Graph I: Assessment of sodium alteration



Discussion

Incidence of diarrhea worldwide has remained unchanged and diarrhea related illness and its complications results in millions of visits to pediatricians the mortality has been reduced to considerable levels.⁶ Use of oral rehydration solution is one of the most important factors responsible for reduction in mortality due to diarrheal diseases.⁷ This effectiveness of oral rehydration solution in management of diarrheal diseases in children is due to the fact that sodium coupled solute co-transport mechanism remains intact even in severe diarrhea.⁸ The presentation of uncomplicated diarrhea in children is usually by increased frequency and altered consistency of stools. In many cases this is also accompanied by vomiting and abdominal pain.⁹ If appropriate treatment is not instituted these children may develop complications secondary to dehydration such as hypovolemic shock and renal failure. In some children electrolyte imbalance may occur leading to neurological manifestations such as lethargy or irritability and convulsions.¹⁰ The present study was conducted to assess clinical profile and pattern of water and sodium disturbances in children suffering from diarrhoea with dehydration.

We found that mean serum sodium level at admission was 135.6mEq/L, duration of diarrhoea was 14.2days, number of loose stools per day was 11.5, duration of vomiting episodes was 2.9 days, number of vomiting episodes per day was 3.4 and duration of hospital stay was 3.8days. Ram et al¹¹ enrolled 148 children. Of these, 90 were males and 58 were females. Mean age at presentation was 2.04 ± 0.97 years and mean weight on admission was 9.553 ± 3.826 Kg. Mean serum sodium level was 138.6 ± 8.25 mEq/L. Majority of children suffered from isonatremic dehydration ($n= 89, 60.1\%$) followed by hyponatremic dehydration ($n= 45, 30.4\%$) and hypernatremic dehydration ($n= 14, 9.5\%$). Only 51 (34.5%) children had been administered ORS prior to admission, while the rest 97 (65.5%) were deprived of this life

saving remedy. Of these only 18 (35.3%) were given ORS in appropriate dilution and the rest 33 (64.7%) were given either over- or under concentrated ORS. Malnutrition was found in 51 (34.5%) children. 27 (52.9%) of such malnourished children had hyponatremia, 14 (27.4%) had Isonatremia and 10 (19.6%) had hypernatremia. Duration of hospital stay was 3.67 ± 1.39 days. Duration of hospital stay was maximum in children with hypernatremia, however no statistically significant trend was found between type of sodium disturbance and duration of hospital stay ($p=0.13$). Average duration of hospital stay in malnourished children was higher (4.75 days) as compared to non-malnourished children (3.0 days) which was statistically significant.

We found that hyponatremia was seen in 14 male and 16 females. Hypernatremia in 16 males and 9 females and isonatremia in 37 males and 18 females. Age group 6 months- 1 year had 10, 10 and 20 and 1 year- 5 years had 20, 15 and 35. Nutritional status was normal seen in 16, 12 and 22, grade I PEM in 6, 4 and 5, grade II PEM in 4, 5 and 4, grade III PEM in 3, 3 and 2 and grade IV PEM in 2, 1 and 2 having hyponatremia, hypernatremia and isonatremia respectively. Gopchade et al¹² assessed the incidence of electrolyte abnormalities in children under the age of 5 years who were admitted with acute diarrhea. This was a prospective cohort study in which 120 children below the age of 5 years and with acute diarrhea were included. Out of 120 children up to the age of 5 years there were 78 boys (65%) and 42 girls (35%) with a M:F ratio of 1:0.53. The mean age of the affected cases was found to be 2.24 ± 1.78 years. After loose motion the most common complaint was found to be Abdominal pain which was present in 78 (65%) cases. 78 (65%) children had serum sodium level less than s/o hyponatremia whereas in 41 patients (34.16%) serum sodium was found to be within normal range (135-145 meq/lit). Only 1 patient (0.83%) was found to be having hypernatremia. 21 (17.5%) children had serum potassium level less than 3.5 meq/lit s/o hypokalemia whereas in 99 patients (82.5%) serum potassium was found to be within normal range (3.5-5.5 meq/lit). There was no patient with hyperkalemia.

The limitation the study is small sample size.

Conclusion

Authors found that the incidence of hyponatremia and hypernatremia in children is quite high (nearly 40%). Malnourished children and children taking improperly diluted WHO ORS were at a significantly higher risk of developing hyponatremia or hypernatremia.

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