

ORIGINAL RESEARCH

## Assessment Of Sodium Disturbances In Children Suffering From Diarrhoea With Dehydration

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### ABSTRACT

**Background:** Diarrhoeal disorders are considered to be a major cause of morbidity and mortality among children all around the globe. The present study was conducted to assess pattern of sodium disturbances in children suffering from diarrhoea with dehydration.

**Materials & Methods:** 58 children age ranged 6 months- 5 years suffering from diarrhoea of both genders were included. Clinical examination was done. 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:** Out of 58 patients, boys were 38 and girls were 20. The mean duration of diarrhoea was 3.5 days, number of loose stools per day was 11.2, duration of vomiting episodes was 2.7 days, number of vomiting episodes/day was 3.5 and duration of hospital stay was 3.2 days and mean serum sodium level at admission was 139.5mEq/L. Maximum cases of hyponatremia was seen in age group 1-5 years (10), maximum cases of hypernatremia (6) in age group 1-5 years and isonatremia (20) in age group 1-5 years. The difference was significant ( $P < 0.05$ ).

**Conclusion:** The incidence of hyponatremia and hypernatremia in children was quite high (nearly 40%). Cases of hyponatremia, hypernatremia and isonatremia was high in age group 1-5 years.

**Key words:** Children, hyponatremia, electrolytes

### INTRODUCTION

Diarrhoeal disorders are considered to be a major cause of morbidity and mortality among children all around the globe.<sup>1</sup> Annually, 3 to 5 billion cases of diarrhoeal disorders are reported from all over the world while diarrhoeal disorders is estimated to be responsible for 2 million deaths among children below 5 years of age. Between 10-20% of cases are due to bacterial infections while around 70% of cases are thought to be because of viral etiology whereas rotavirus is known to be the most commonly found virus causing diarrhoeal disorders.<sup>2</sup>

WHO defines diarrhoeal disease as the passage of three or more loose or liquid stools per day. 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.<sup>3</sup> The clinical manifestations of acute diarrhoea are

reflective of the underlying water deficit severity as well as pattern of electrolyte disturbances. The commonest cause of mortality in acute diarrhoea is hypovolemia due to dehydration resulting from the loss of fluid and electrolytes in diarrheal stools. Other important causes of mortality are dyselectrolytemia, malnutrition, dysentery, associated serious infections such as pneumonia.<sup>4</sup> Clinical recognition and prompt management of water and electrolyte disturbances is therefore of utmost importance, particularly hyponatremic and hypernatremic dehydration given their serious neurological consequences.<sup>5</sup> The present study was conducted to assess pattern of sodium disturbances in children suffering from diarrhoea with dehydration.

## MATERIALS & METHODS

The present study comprised of 58 children age ranged 6 months- 5 years suffering from diarrhoea of both genders. All parents gave their written consent for the participation of their children in the study.

Data such as name, age, gender etc. was recorded. Clinical examination was done. Consumption of ORS, correctness of preparation and volume administered was recorded. 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 Distribution of patients**

Total- 58		
Gender	Males	Females
Number	38	20

Table I shows that out of 58 patients, boys were 38 and girls were 20.

**Table II Assessment of parameters**

Parameters	Mean
Duration of diarrhoea (days)	3.5
Number of loose stools per day	11.2
Duration of vomiting episodes (Days)	2.7
Number of vomiting episodes/day	3.5
Duration of hospital stay (Days)	3.2
Serum Sodium level at admission (mEq/L)	139.5

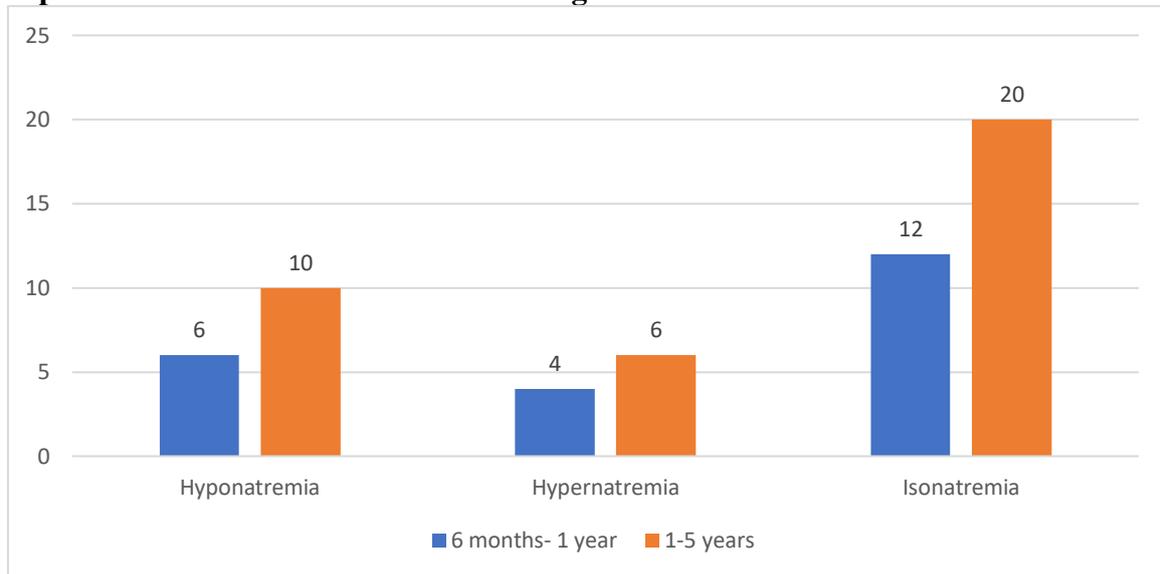
Table II shows that mean duration of diarrhoea was 3.5 days, number of loose stools per day was 11.2, duration of vomiting episodes was 2.7 days, number of vomiting episodes/day was 3.5 and duration of hospital stay was 3.2 days and mean serum sodium level at admission was 139.5mEq/L.

**Table III Sodium alteration in relation to age**

Age group	Hyponatremia	Hypernatremia	Isonatremia
6 months- 1 year	6	4	12
1-5 years	10	6	20
P value	0.05	0.82	0.02

Table III, graph I shows that maximum cases of hyponatremia was seen in age group 1-5 years (10), maximum cases of hypernatremia (6) in age group 1-5 years and isonatremia (20) in age group 1-5 years. The difference was significant ( $P < 0.05$ ).

**Graph I: Sodium alteration in relation to age**



## DISCUSSION

Since the introduction of oral rehydration therapy (ORT) program by “World Health Organization (WHO)”, mortality among children associated with diarrhoeal disorders decreased significantly.<sup>6</sup> Dehydration, electrolyte abnormalities and renal impairment are some of the major complications of diarrhoeal disorders.<sup>7</sup> Some pediatricians believe that blood chemical analysis is not essential among children with diarrhoeal disorders while evaluation of electrolyte disturbances is important to identify the extent of dehydration and severity of the disease.<sup>8</sup> Timely identification and management of dehydration can result in resolution of dehydration linked with diarrhoeal disorders. 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.<sup>9</sup> The present study was conducted to assess pattern of sodium disturbances in children suffering from diarrhoea with dehydration.

We found that out of 58 patients, boys were 38 and girls were 20. The mean duration of diarrhoea was 3.5 days, number of loose stools per day was 11.2, duration of vomiting episodes was 2.7 days, number of vomiting episodes/day was 3.5 and duration of hospital stay was 3.2 days and mean serum sodium level at admission was 139.5mEq/L. Iqbal et al<sup>10</sup> in their study frequency of electrolyte abnormalities among children with acute gastroenteritis in 159 children of both genders. 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.

We observed that maximum cases of hyponatremia was seen in age group 1-5 years (10), maximum cases of hypernatremia (6) in age group 1-5 years and isonatremia (20) in age group 1-5 years. Ram et al<sup>11</sup> enrolled 148 children. Of these, 90 were males and 58 were females. Mean age at presentation was  $2.04 \pm 0.97$  years and mean weight on admission was  $9.553 \pm 3.826$  Kg. The mean serum sodium level was  $138.6 \pm 8.25$  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  $3.67 \pm 1.39$  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. 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.

Eke et al<sup>12</sup> enrolled 158 children aged 2 weeks to 14 years with hypernatraemic dehydration (serum sodium 150 mmol/l or more), infants predominated (61.4%). The 158 children with hypernatraemia accounted for 13.7% of all children admitted with gastroenteritis over the same period, and significant aetiological factors included the use of artificial feeds, differences between the children with hypernatraemia and those with normo- or hyponatraemia, respectively; the use of breast milk, respectively; nutritional status, respectively; and clinical state of mild to moderate dehydration respectively; but not with patients considered severely dehydrated. There was also a significant difference between the presence of neurological features in hyper- and normonatraemic patients; in hyper- and hyponatraemic patients and in mortality rate between hyper- and normonatraemic patients but not between hyper- and hyponatraemic patients. A history of refusal to feed or vomiting was obtained in 41 children (25.9%). The mean serum sodium was 155.5 mmol/l (range 150-189 mmol/l); mean serum urea 7.7 mmol/l (range 1-18.9 mmol/l). Hypernatraemic dehydration remains an important and serious complication of childhood gastroenteritis in our area of study.

The limitation the study is small sample size.

## CONCLUSION

The incidence of hyponatremia and hypernatremia in children was quite high (nearly 40%). Cases of hyponatremia, hypernatremia and isonatremia was high in age group 1–5-years.

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