Original Research Article

Electrolyte abnormalities and type of feeding in acute diarrhoea in children upto five years

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ABSTRACT

Background: Children in infancy are protected against diarrhoea by breastfeeding as suggested by many studies. Failure to exclusively breastfeed and early introduction of complementary feeds in children predispose to several diseases especially diarrhoea. This study was mainly aimed at analysing electrolyte abnormalities in children with diarrhoea in relation to their type of feeding.

Methods: Around 100 children under five years of age with acute diarrhoea presenting to paediatrics department were enrolled in the study after meeting the inclusion criteria. The electrolyte abnormalities, glucose level, renal parameters, severity of dehydration and type of feeding of the children were recorded. The incidence of electrolyte abnormalities in diarrhoea in the children and their type of feeding were analysed.

Results: Participants had hyperkalaemia which was 30%, followed by 19% had hyponatremia, 13% had hypokalaemia, 12% had hypernatremia and 1% had hyperchloremia. 38% had no dehydration, 8% had severe dehydration and 54% had some dehydration. 49% of the children followed breast feeding, 16% followed formula feeding, 14% were taken cow's milk and 21% were followed mixed feeding. There was no statistically significant relationship between electrolyte abnormalities and type of feeding except for hypokalemia.

Conclusions: Except with hypokalaemia, our study did not find a statistically significant relationship between electrolyte abnormalities in diarrhoea in children with type of feeding. But still, need for exclusive breastfeeding, continuation breast feeding more than two years remains protective against acute diarrhoea in children.

Keywords: Electrolyte abnormalities, Acute diarrhoea, Type of feeding

INTRODUCTION

Diarrheal diseases remain a leading cause of preventable death especially among children under five in developing countries.[1] Diarrheal diseases account for 1 in 9 child deaths worldwide, making diarrhea the second leading cause of death among children under the age of five.[2] Early formula feeding and failure to breast feed during first 6 months increases the risk of childhood diarrhea.[3] Breast milk contains all anti-infective and essential nutrients necessary for children's growth and development. Evidence suggests that infants and young children who were primarily breastfed were less likely to experience diarrhea. The type of feeding and hygiene practices followed also reduced incidence and severity of diarrhea as suggested by some studies.[4] Human milk contains high concentrations of fucosylated glycans which are oligosaccharides that prevent pathogens from adhering to target receptors on the mucosal surface of gastrointestinal tract, thereby preventing many cases of moderate to severe diarrhea. Cow's milk feeding and improper dilution of formula feeds also causes frequent diarrheal diseases in infants. Most of the diarrheal-related deaths may be attributable to a lack of potable water, poor hygiene and

sanitation, and low immunization coverage, as well as inappropriate child rearing and behaviours.[5] The main aim of our study is to relate the electrolyte disturbances in children with diarrhea with breast feeding, formula feeding, cow's milk feeding and mixed feeding among the children.

METHODS

This cross-sectional observational study was conducted in Government Cuddalore medical college and hospital, Chidambaram over a period of 2 years. Total of 100 children presenting to pediatric unit with acute diarrhoea under five years of age were selected. The study was approved by the institutional ethical committee and was conducted for 2 years from December 2020 to December 2022. All the collected data were analysed using Statistical software SPSS version 21.0.

Inclusion criteria

Inclusion criterion for current study was; children from one month to five years of age with history of loose stools.

Exclusive criteria

Exclusion criteria for current study were; pneumonia and other systemic illness, history of loose stools more than 14 days and newborn with history of diarrhoea.

After taking the detailed history and examination, type of feeding and an evaluation of degree of dehydration was done. The blood samples were taken for estimation of electrolyte levels, blood glucose and renal function analysis. Detailed history regarding type of feeding like breast feeding, formula feeding, cow's milk feeding was taken. Depending on the type of feeding the children with diarrhea were divided into two groups, breast feeding group who were given only breastfeeding and other feeding group who were given formula feeds, cow's milk and mixed feeding. History of exclusive breast feeding was asked if child was more than six months. History regarding duration of breast feeding till two years of age was also asked if child was more than two years. The electrolyte abnormalities, degree of dehydration and renal parameters among the children were analyzed and compared with their type of feeding. The data collected was studied between breastfeeding and other feeding groups.

RESULTS

The mean age of the study participants was 24.04±19.17 months. The median age of the study participant was 18.17 (inter quartile range=9.0-36.5) months. The minimum age was 1.1 months and the maximum age was 60 months (Table 1). Majority of the children belongs to the age category of less than one year which is 47%. Out of 100 children, 58% were males and 42% were females (Table 2). Breast feeding as only type of feeding was observed in

49% of children. 16% followed formula feeding, 14% were taken cow's milk and 21% were followed mixed feeding.

Table 1: Age distribution among study participants.

Age category (years)	N	%
≤1	47	47.0
>1 to 2	18	18.0
>2 to 5	35	35.0
Mean age in months±SD	24.04±19.17	
Median age in months (IQR)	18.17 (IQR=9.0-36.5)	
Minimum age in months	1.1	
Maximum age in months	60	
Total	100	100

Table 2: Gender distribution among study participants.

Gender	N	%
Male	58	58
Female	42	42
Total	100	100.0

Among 100 children's, 38% had no dehydration, 8% had severe dehydration and 54% had some dehydration. In electrolyte imbalance, majority of the participants had hyperkalemia which is 30% followed by 19% had hyponatremia, 13% had hypokalemia, 12% had hypernatremia and 1% had chloride level more than 108 mmol/l (Table 3).

Table 3: Electrolyte imbalance observed among study participants.

Electrolyte imbalance	N	%
Sodium levels		
Hyponatremia (<135)	19	19
Normal	69	69
Hypernatremia (>145)	12	12
Potassium levels		
Hypokalemia (< 3.5)	13	13
Normal (3.5 to 4.5)	57	57
Hyperkalemia (> 4.5)	30	30
Chloride level		
<89	0	0
89 to 108	99	99
>108	1	1
Total	100	100

Out of 49 children in Breast feeding group, 6 (12.2%) had hyponatremia, 38 (77.6%) had normal sodium levels and 5 (10.2%) had hypernatremia. Among 51 children in other feeding groups 13 (25.5%) had hyponatremia, 31 (60.8%) had normal sodium levels and 7 (13.7%) had hypernatremia. Sodium levels were equally distributed in both the groups with the p value of more than 0.05 (Figure 1). In breast feeding group, 2 (4.1%) had hypokalemia, 32 (65.3%) had normal potassium levels and 15 (30.6%) had

hyperkalemia. Among 51 children in other feeding groups 11 (21.6%) had hypokalemia, 25 (49.0%) had normal potassium levels and 15 (29.4%) had hyperkalemia.
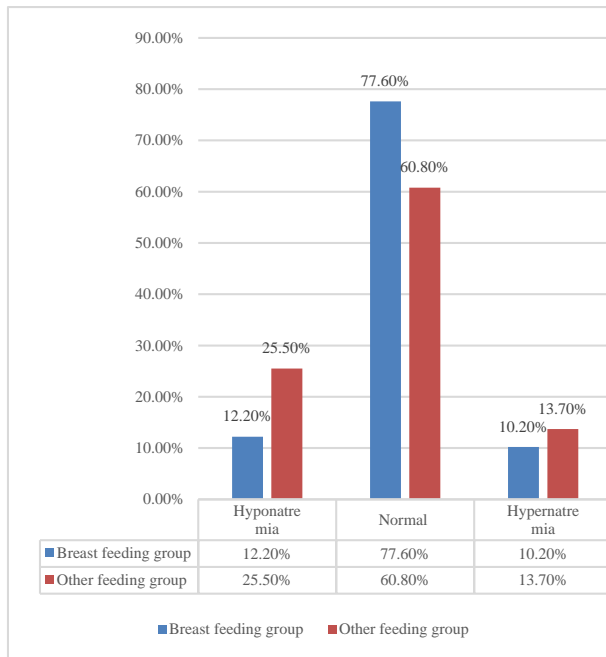

Figure 1: Bar diagram shows comparison between sodium levels with type of feeding.

The hypokalemia was significantly higher in other feeding groups when compared to breast feeding group with the p value of less than 0.05. Normal potassium level and hyperkalemia was equally distributed in both the groups with the p value of more than 0.05 (Figure 2).
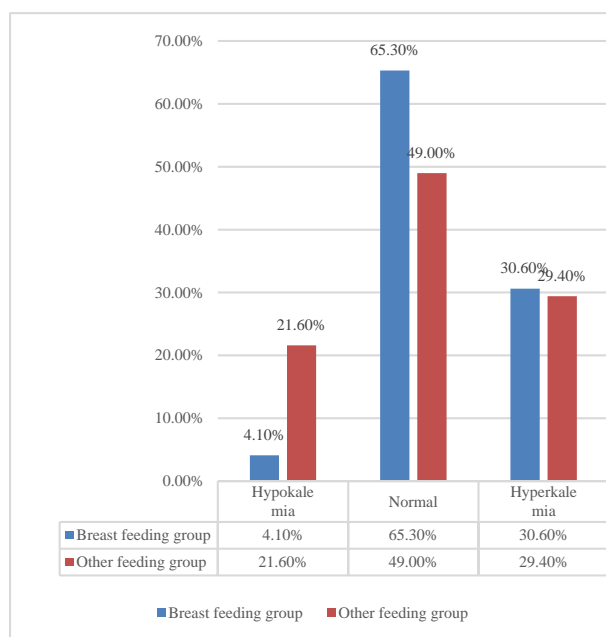

Figure 2: Bar diagram shows comparison between potassium levels with type of feeding.

48 children (98%) had the chloride level between 89 to 108 mmol/l and 1 (2.0%) had chloride levels more than 108 mmol/l in the breast-feeding group. All the 51 children in other feeding group had normal chloride levels between 89 to 108 mmol/l. Chloride levels were equally distributed in two groups with the p value of more than 0.05 (Figure 3).
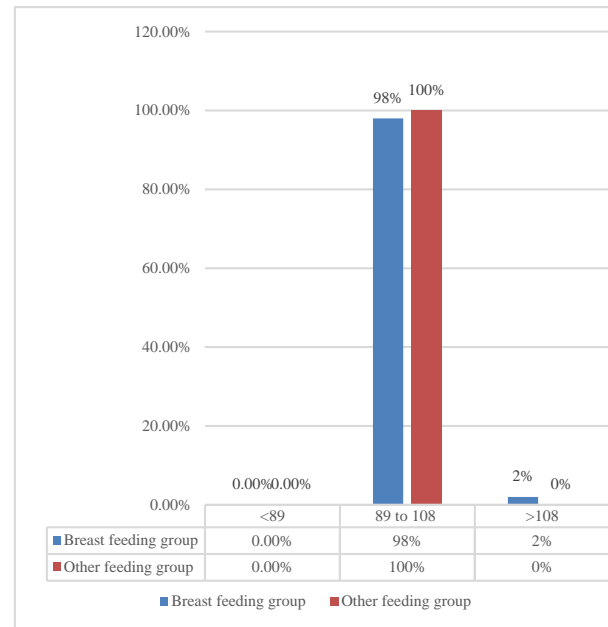

Figure 3: Bar diagram shows comparison between chloride levels with type of feeding.

DISCUSSION

Acute diarrhea is the third leading cause of childhood mortality in India and it also accounts for 13% of all deaths in a year among children of under 5 age groups.[6] The results of this study showed that the mean age of the study participants was 24.04±19.17 months. This explains that children' of this age group are more prone for diarrheal incidence as compared with older age group. This finding is consistent with studies reported by Edward et al and Degebasa et al.[7,8] This could be explained by the fact that children older than 24 months are less prone for diarrheal diseases than those younger to them as the younger age groups are usually undergoing complementary feeding during the time period of 6-23 months which paves way for the vulnerability of diarrheal disease causing infectious agents because of their under developed immunity.38% had no dehydration, 8% had severe dehydration and 54% had some dehydration. In our study, Sodium levels were equally distributed in both the groups with the p value of more than 0.05. This finding is contrast to the study by Banajeh et al where hyponatremia was significantly more prevalent in infants who were exclusively bottle-fed compared with exclusively breastfed and among bottle-fed weaning children compared with weaning children who continued to breastfeed.[9] The hypokalemia was significantly higher in other feeding groups (21.6%) when compared to breast feeding group (4.1%) with the p value of less than 0.05. As compared with the study by Banajeh

et al our study reported similar results.[9] There was no significant relationship of hyperkalaemia or other chloride abnormalities among breast feeding and other feeding groups.

Limitations

Limitations of the study were; small sample size and failure to include other factors like handwashing, method of preparation of formula feeds as these could also alter the results.

CONCLUSION

This study does not establish any significant relationship between electrolyte disturbances in diarrheoa with the type of feeding in children. Exclusive breast feeding and breast feeding till two years of age still protects children against many infectious diseases including diarrhoea. Untreated severe electrolyte imbalance is dangerous because it increases the risk of neurological problems including seizures. Consequently, these electrolyte imbalances must be corrected and should be diagnosed and treated early to prevent the development of severe dyselectrolytemia and its complications.

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