Original Research Article

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Efficacy of zinc therapy in acute diarrhea in children

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ABSTRACT

Background: Diarrhoea is a major public health problem in developing countries. An estimate of 1.5 billion episodes of diarrhoea occurs each year and 3 million children under the age of 5 years die due to diarrhoea. Its effect is particularly devastating on children below 2 years of age, with eighty percent (80%) of deaths due to diarrhoea occurring during the first 2 years of life. Diarrhoeal diseases constitute 18% of under five deaths in Asia-Pacific countries.

Methods: The present study was carried out in Anil Neerukonda hospital, Visakhapatnam from July'2015 to July'2017 over a period of 2 years. A detailed clinical study of 100 children between the age group of 6 months to 5 years with acute diorrhea was done. Zinc was given to 50% of cases and was not given to the rest of 50%. Duration of hospital stay (in days) and duration of diarrhoeal episodes (in days) were compared in both the groups.

Results: Incidence of acute gastroenteritis was maximum below 2 years of age (77%). Patients administered with Zinc had significantly less duration of hospital stay 3.35 days vs. 5.34 days (in patients who were not administered zinc) with t=8.170 and a strongly significant p<0.001.

Conclusions: Incidence of acute gastroenteritis is maximum below 2 years of age. Patients in zinc group had significantly less duration of hospital stay and less proportion diarrhoeal episodes on follow up compared to the non-zinc group.

Keywords: Acute gastroenteritis, Diarrhea, Zinc

INTRODUCTION

Diarrhoea is a major public health problem in developing countries. An estimate of 1.5 billion episodes of diarrhoea occur each year and 3 million children under the age of 5 years die due to diarrhoea.¹ Its effect is particularly devastating on children below 2 years of age, with eighty percent (80%) of deaths due to diarrhea occuring during the first 2 years of life.² Diarrhoeal diseases constitute 18% of under five deaths in Asia-Pacific countries.³ Accurate data on the global extent of the problem of diarrhoeal diseases are difficult to obtain, but an analysis of the findings of 27 active surveillance studies

conducted for one year or more done in 1983 suggests that around 750 million children below 5 years of age in Asia, Africa and Latin America suffer from acute diarrhoea each year.² From the same study, it is estimated that between 3 and 6 million in this age group die annually from acute diarrhoea; 80% of these deaths occur in the first 2 year of life. Such repeated attacks of diarrhoea lead to malnutrition and growth retardation because of associated food restriction by mothers, anorexia and malabsorption.² Two recent studies presented global estimates of child deaths due to diarrhoea that were equal to 2.5 million and 2.1 million.^{4,5} A third review has estimated that 22% of all deaths

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among under-5s in sub-Saharan Africa and 23% in south Asia were caused by diarrhoeal diseases in the year 2000.⁶ Diarrhoea is a particularly deadly illness for young children, with acute diarrhoea liable to cause death within a day or less if left untreated.⁷ In India the situation is no different. Diarrhoeal diseases remain a serious threat to child survival, with an estimated 9% of children suffering from this condition in India. India also has the highest rate of severely underweight children of any country in the Asia-Pacific region. Diarrhoeal diseases account for 15.4% of under 6 population in India which includes 16.5% of rural and 12.4% of urban population.⁷ In India, diarrhoeal diseases account for 1.7 episodes per child per year in under 5 population.⁸

METHODS

The present study was carried out in Anil Neerukonda hospital, Visakhapatnam from July'2015 to July'2017 over a period of 2 years. A detailed clinical study of 100 children between the age group of 6 months to 5 years with acute gastroenteritis was done.

Inclusion criteria

- Passage of liquid or watery stools with increased frequency and volume.
- Duration of illness of less than 2 weeks at the time of admission.
- Age group of between 6 months to 5 years.

Exclusion criteria

- Children with non-infectious causes of diarrhea
- Children suffering from dysentery.
- Children with congenital lactose intolerance and those on lactose free diets.
- Intolerance to cows' milk.
- Deaths due to gastroenteritis.

Zinc was given to 50% of cases and was not given to the rest of 50%. The dose of zinc administered was 10mg OD for 14 days for children less than 1 year of age and 20mg OD for 14 days for children more than 1 year of age. Duration of hospital stay (in days) and duration of diarrheal episodes (in days) were compared in both the groups.

Statistical methods⁹⁻¹¹

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean±SD (Min-Max) and results on categorical measurements are presented in Number (%).

Significance is assessed at 5 % level of significance. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups Inter group analysis) 95% Confidence Interval has been computed to find the

significant features. Confidence Interval with lower limit more than 50% is associated with statistical significance.

RESULTS

A total of 100 cases between the age group of 6 months to 5 years were enrolled in the study. All 100 cases selected were among the in patients of Anil Neerukonda hospital.

They were selected randomly, once they were fulfilling the criteria for inclusion in the study. The study period was from July 2015 to July 2018.

Table 1: Age distribution.

Age in years	Number	%
<1	45	45.0
1-2	32	32.0
2-3	10	10.0
3-5	13	13.0
Total	100	100.0

Age distribution

In table I, the Incidence of acute gastroenteritis was maximum below 2 years of age (77%), especially during second half of infancy (45%). The distribution of gastroenteritis in various age groups is shown in the table below.

Table 2: Gender distribution.

Gender	Number	%
Male	51	51.0
Female	49	49.0
Total	100	100.0

Gender distribution

In Table 2, there was a male preponderance. Out of 100 cases, 51% were males and 49% were females. Hindus accounted for 72% of all cases followed by Muslims (26%) and Christians (2%).

Table 3: Duration of illness at the time of presentation.

Duration of illness in days	Number (n = 100)	%
1-2	56	56.0
3-4	28	28.0
>4	16	16.0

Duration of Illness at the time of presentation

In Table 3, Fifty six percent of children presented with 1-2 days of illness and >2 days in 44% of children at the time of admission as shown in the table below.

Table 4: Efficacy of zinc administration based on duration of hospital stay in days.

		Total		
Not given	Given			
1 (2.0)	13 (26.0)	14(14.0)		
6 (12.0)	31 (62.0)	37(37.0)		
42 (84.0)	5 (10.0)	47(47.0)		
1(2.0)	1 (2.0)	2(2.0)		
0 (100.0)	50(100.0)	100 (100.0)		
.34±1.00	3.35±1.37	4.36±1.55		
Patients administered with Zinc had				
significantly less duration of hospital stay				
(3.35 days vs 5.34 days) with t=8.170;				
< 0.001				
	1 (2.0) 6 (12.0) 42 (84.0) 1(2.0) 0 (100.0) .34±1.00 atients admini	1 (2.0) 13 (26.0) 6 (12.0) 31 (62.0) 42 (84.0) 5 (10.0) 1(2.0) 1 (2.0) 0 (100.0) 50(100.0) .34±1.00 3.35±1.37 atients administered with Zi gnificantly less duration of 13.35 days vs 5.34 days) with		

Efficacy of Zinc administration based on duration of hospital stay in days

In Table IV, Zinc was given to 50% of children (for 14 days) and not given to the rest 50%. Efficacy of zinc in the treatment of diarrhoea was compared in terms of duration of hospital stay in these two groups. Patients administered with Zinc had significantly less duration of hospital stay 3.35 days vs. 5.34 days (in patients who were not administered zinc) with t=8.170 and a strongly significant p<0.001

Table 5: Impact of zinc supplementation on duration of diarrheal episodes during follow up.

	No. of	Follow up days		
Zinc	patients	1-6 days	7-13 days	≥14 days
Given	48	43(89.6)	4(8.3)	1(2.1)
Not Given	49	35(71.4)	12(24.5)	2(4.1)
Total	97	78(80.4)	16(16.5)	3(3.1)
Inference	Duration of diarrhoeal episodes is significantly less in patients who received Zinc when compared to those who did not received with p=0.055+			

Impact of zinc supplementation on duration of diarrheal episodes during follow up

All cases were followed up till 14 days, out of which 3 cases were lost for follow up. In the Table V, the incidence of diarrhoea during follow up was lower in zinc supplemented as compared with those who did not receive zinc on follow up 86.6% of children in zinc group recovered within 6 days compared to 71.4% in the non-zinc group.

In one case who received zinc supplementation, diarrheal episodes lasted till 14 days. This case was bacterial culture positive for Vibrio Cholerae and had sugar

intolerance. Two cases who did not receive zinc had diarrheal episodes up to 2 weeks.

DISCUSSION

Diarrhoea is a major public health problem in developing countries. An estimate of 1.5 billion episodes of diarrhoea occur each year and 3 million children under the age of 5 years die due to diarrhoea. Carbohydrate intolerance has been shown to be common during and immediately following an episode of diarrhea, particularly in infancy and childhood. Latin America, particularly in infancy and childhood. Latin America, Africa, the Middle East and South Asia. Intestinal zinc losses during diarrhea aggravate pre-existing zinc deficiency. Convincing evidence for its clinical importance has come from recent randomized controlled trials of zinc during acute diarrhea.

General Incidence

Diarrhoeal diseases account for 15.4% of under 6 population in India which includes 16.5% of rural and 12.4% of urban population.⁸ The incidence of acute gastroenteritis has varied in different areas of India among hospitalised cases. The incidence of diarrhoea cases in this study was 17.41%. Srivatsava JR et al, Hazra et al, Khanduja PC et al and Behera SK et al reported this to be 24.6%, 18.64%, 5.5% and 11. 3%.¹⁵⁻¹⁸

Patients administered with zinc had significantly less duration of hospital stay (3.35 days vs. 5.34 days) with t=8.170; p<0.001. On follow up, 86.6% of children in zinc group recovered within 6 days compared to 71.4% in the non-zinc group. In Bhatnagar S et al study, proportion of diarrhoeal episodes lasting ≥5 days (odds ratio, 0.49; 95% CI -0.25, 0.97) or ≥ 7 days less (odds ratio, 0.09; 95% CI: 0.01, 0.73) in the zinc group. 19 Zinc deficiency is highly prevalent in children in developing countries and is one of the major risks factors for poor child health accounting for over 800 000 child deaths per year, including 10% of all diarrhea deaths.^{20,21} Dietary zinc insufficiency is exacerbated during a diarrhea episode by net zinc loss in the stool.72 Zinc supplementation during diarrhea reduces the duration and severity of the episode and the risk of subsequent diarrhea and ALRI morbidity.²²⁻²⁴ It is now recommended that all children under 5 receive 20 mg supplemental zinc for 10-14 days as part of clinical treatment of diarrhea.²⁵

Zinc treatment given for 10-14 days during and after the diarrheal episode is associated with reductions in severity and duration, all-cause less than 5-year mortality, and incidence of diarrheal cases in the months after zinc treatment. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) now recommend a 14-day course of zinc treatment in addition to oral rehydration salts (ORS) for the treatment of acute childhood diarrhea. Children's Fund (UNICEF) acute childhood diarrhea.

CONCLUSION

- Incidence of acute gastroenteritis is maximum below 2 years of age.
- Patients in zinc group had significantly less duration of hospital stay and less proportion diarrhoeal episodes on follow up compared to the non-zinc group.
- Zinc was given to 50% of children (for 14 days) and not given to the rest 50%. Patients administered with Zinc had significantly less duration of hospital stay 3.35 days vs 5.34 days (in patients who were not administered zinc) with t=8.170 and a strongly significant p<0.001
- On follow up 86.6% of children in zinc group recovered within 6 days compared to 71.4% in the non-zinc group.

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Institutional Ethics Committee

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