

# Study of effect of zinc on the Diarrhea among breast feeding babies of Maharashtra

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## Abstract

**Background:** Deficiency of zinc may result in profound effects on overall immune function with susceptibility to diarrhea causing pathogens including parasites bacteria and viruses. **Method:** 90 breast feeding babies aged between 6 months to 2 years suffering with diarrhea were studied and compared with 90 controlled breast-feeding babies of same age. The babies are administrated with zinc supplement in the form of oral syrup 10mg/day (2.5 ml once daily) and controlled group was administrated with placebo. A total three follow ups (at 6, 9 and 12 months) were performed and out comes at different follow up was compared in both groups. **Results:** The total episodes between 6 to 9 months mean value of interventional group was 88 ( $\pm$  3.8) and controlled group was 65 ( $\pm$  4.8) t test was 36.7 and p value was highly significant, similarly comparison between 9-12 months between 2 groups. Mean value of intervention group was 86 ( $\pm$  3.4), controlled group was 61 ( $\pm$  4.5) t test was 42.05 and p<0.000 **Conclusion:** This pragmatic study has proved that zinc also plays a key role in maintenance of gut mucosal cells. Zinc blocks baso-lateral potassium ( $K^+$ ) channels and thus inhibits CAMP, induced chloride dependent fluid secretion and maintains the normalcy of mineral in the body hence zinc supplementation significantly reduces the morbidity associated with diarrhea in breast feeding babies.

**Keywords:** Zinc gluconate, anthropometry, breast feeding, diarrhea, mal-nutrition

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## INTRODUCTION

Diarrhea is the passage of three or more loose or watery stools during at 24 hours period at least two days where there is change in consistency of stools. An episode of diarrhea was defined as least day of diarrhea, with the final day of the episode being the last day by meeting the diarrhea definition followed by at least 48 hours without diarrhea.<sup>1</sup> It is estimated that diarrhea disease cause 2 million deaths annually in children under the age of 5 years and contribute substantially to malnutrition in the

surviving children.<sup>2</sup> Zinc is the second most abundant trace mineral in the human body. Its function in a multitude of biochemical processes as a co-factor for hundred of enzymes, modulates activity of peptide hormones and neuro-transmitters and has a fundamental roles in gene regulation and normal development of immune system. In secretion of zinc in human milk produces immunity in infants.<sup>3</sup> An association between diarrhea associated morbidity and zinc intake was first noted in early observational studies that documented increased fecal zinc loss, negative zinc balance, and low tissue zinc concentrations among the children with diarrhea conservative estimate suggest that at least 25% of the world population is the risk of zinc deficiency.<sup>4</sup> Zinc deficiency is highly prevalent in developing countries because of inadequate dietary intake, lack of intake of animal foods and/or reduced bio availability of zinc because of high phylate; zinc ratio in the diet.<sup>5</sup> The adverse effects of zinc deficiency on the immune response are likely to increase the susceptibility of children to infections diarrhea, and chronic or persistent diarrhea further compromise the zinc status because of increased fecal

losses of zinc during diarrhea episodes. Hence attempt is made to study the breast-feeding babies from 6 months to 2 years to evaluate the reduction of episodes.

## MATERIAL AND METHOD

90 breast feeding babies aged between 6 months to 2 years regularly visiting paediatric OPD of Prakash Medical Institute and research centre hospital Islampur-415409 Maharashtra were studied.

**Inclusive Criteria:** The babies clinically diagnosed as diarrhea due to lack zinc were selected for study.

**Exclusive Criteria:** Babies aged more than two years and not fed by breast feeding were excluded from the study.

**Method:** 90 breast feeding babies suffering with diarrhea and 90 breast feeding babies of same age group without any disease i.e. controlled group were also selected for study. The study intervention was initiated at six months of age after recording base line anthropometry (weight, length and head circumference). The infants in the interventional group received zinc supplement (zinc gluconate) in the form of oral syrup in the dosage of 10 mg/day (2-5 ml once daily) and controlled group received 2-5 ml/day of placebo. The placebo was sugar syrup prepared by reputed pharmaceutical company which was similar to the zinc supplement with respect to appearance, colour and taste. Mothers were instructed to administer the dose by measuring cup every day morning one hour before feeding. To know the compliance of the drug, mothers were provided with a calendar to mark each day that drug was administrated. These calendars were reviewed during the monthly visits and the number of days that drug

dosages were missed was recorded. Mothers were also asked to return the bottles each month so that any unused portion could be measured. The intervention was continued up to 12 (twelve months) in both groups. Mothers were asked to record on the calendar provided, the date when a new complimentary food was introduced and to keep a detailed every day diet record of the amounts (using standard house hold measures) of non-breakfast milk food and fluids consumed. A total three follow-ups (at six, nine and twelve months) were performed during the study period. The anthropometric measurements and data regarding morbidity with respect to number of diarrhea were recorded. Infants were also assessed for compliance of the drug in terms as any adverse number of missed doses retuned reason for same was noted. Any co-incidental administration of other supplements (multi vitamins, iron and calcium) by physician was also noted during these visits. Throughout the study mothers were asked to record on the calendar any symptoms of illness using standardize guidelines for description of symptoms and also diagnosis made by other physicians Data of number of episodes of diarrhea was used for analysis in both groups. The duration of study was July-2010 to June-2021

**Statistical analysis:** The incidences episodes of diarrhea in both groups from 6 to 9 months, 9 to 12 months were compared with z test statistically. The statistical analysis was carried out in SPSS software. The ratio of male and female baby was 2:1.

This research paper is approved by Ethical committee of Prakash Medical Institute and research centre Islampur-415409, Maharashtra

## OBSERVATION AND RESULTS

**Table 1:** Comparison of incidences of diarrhea episodes from 6 to 9 month interventional and controlled in groups. Mean value  $58 \pm 2.3$  in interventional,  $26 \pm 1.5$  in controlled group t test was 110 and  $p < 0.00$  ( $p$  value was highly significant). Once episodes has  $30 \pm 1.2$  mean values in interventional,  $35 \pm 2.1$  in controlled group, t test 19.6 and  $p$  value  $p < 0.00$  ( $p$  value was highly significant). In comparison  $88 \pm 3.5$  in interventional group,  $65 \pm 4.8$  in controlled group, t test was 36.7 and  $p$  value  $p < 0.00$  ( $p$  value was highly significant).

**Table 1:** Comparison of incidences of diarrhea in interventional and controlled groups from babies 6 to 9 months

No. of Episodes	Interventional group 90 babies Mean value ( $\pm SD$ )	Controlled group 90 babies Mean value ( $\pm SD$ )	t test	p value
Nil	58 ( $\pm 2.3$ )	26 ( $\pm 15$ )	110	$P < 0.00$
Once	30 ( $\pm 1.20$ )	35 ( $\pm 2.1$ )	19.6	$P < 0.00$
2 > episode	00	4 ( $\pm 1.2$ )	--	--
Total	88 ( $\pm 3.5$ )	65 ( $\pm 4.8$ )	36.7	$P < 0.00$

**Table 2:** Comparison of incidences of diarrhea from 9 + 12 months in interventional and controlled group mean value  $78 \pm 1.8$  in interventional group,  $50 \pm 2.3$  in controlled group t test was 90.9 and  $p$  value highly significant ( $p < 0.00$ ). Once

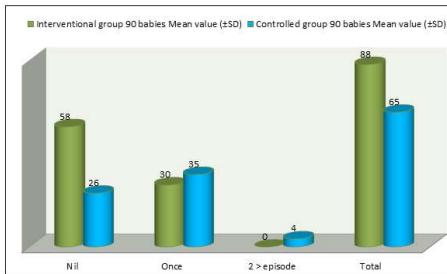
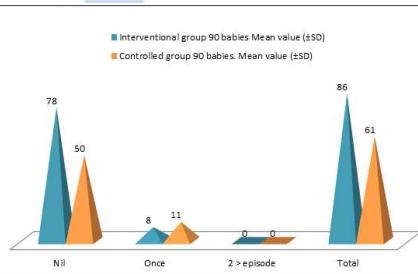
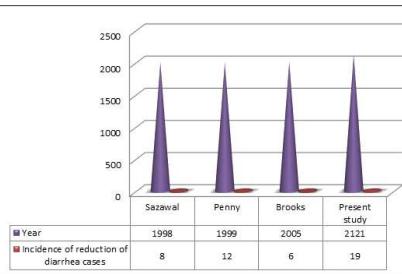
episode had  $8 \pm 1.6$  in interventional group,  $11 \pm 2.2$  in controlled group t test was 10.4 and p <0.00 p value was highly significant. In total result of comparison of interventional group mean value was  $86 \pm 3.4$  and in controlled group  $61 \pm 4.5$ , t test was 42.05 and p value was highly significant (p<0.00).

**Table 2:** Comparison of incidences of diarrhea from 9 to 12 months babies interventional and controlled group

No. of Episodes	Interventional group 90 babies Mean value ( $\pm SD$ )	Controlled group 90 babies. Mean value ( $\pm SD$ )	t test	p value
Nil	78 ( $\pm 1.8$ )	50 ( $\pm 2.3$ )	90.9	P<0.00
Once	8 ( $\pm 1.6$ )	11 ( $\pm 2.2$ )	10.4	P<0.00
2 > episode	00	00	--	--
Total	<b>86</b> ( $\pm 3.4$ )	<b>61</b> ( $\pm 4.5$ )	<b>42.05</b>	<b>P&lt;0.00</b>

**Table 3:** Comparison reduction of diarrhea cases with previous workers

Workers	Year	Incidence of reduction of diarrhea cases
Sazawal	1998	08
Penny	1999	12
Brooks	2005	06
Present study	2121	19

**Table 1****Table 2****Table 3**

**Table 1:** Comparison of incidences of diarrhea in interventional and controlled groups from babies 6 to 9 months; **Table 2:** Comparison of incidences of diarrhea from 9 to 12 months babies interventional and controlled group; **Table 3:** Comparison reduction of diarrhea cases with previous workers

## DISCUSSION

Present study of effects of zinc on the diarrhea among breast feeding babies of Maharashtra. In the comparison of incidences diarrhea episodes in interventional and controlled groups in 9-12 months babies mean value  $58 \pm 2.3$  in interventional group,  $26 \pm 1.5$  in controlled group, t test was 110 and p<0.00. Once follow up (episode) mean value of interventional group  $30 \pm 1.2$  and  $35 \pm 2.1$  in controlled group t test 19.6 and p<0.00. In total follow up in 6 to 9 months babies  $88 \pm 3.5$  in interventional group,  $65 \pm 4.8$  in controlled group t test was 36.7 and p<0.00 (Table-1) similarly in 9-12 month babies mean value of interventional group was  $78 \pm 1.8$ ,  $50 \pm 2.3$  in controlled group, t test 90.9 and p<0.00. Once (first follow up) mean value 8 to 1.6 in interventional group,  $11 \pm 2.2$  in controlled, t test was 10.4 and p<0.00. Total follow up in 9-12 months babies mean value  $86 \pm 3.4$  in interventional group,  $61 \pm 4.5$  in controlled group, t test was 42.05 and p<0.00 (Table-2). These findings are more or less in

agreement with previous studies.<sup>6,7,8</sup> Zinc deficiency is associated with growth retardation and increased rate of diarrhea and Pneumonia in children. Current recommendations for zinc intake during infancy are based on the assumption that breastfed babies usually meet their zinc requirement during first six months of life and zinc status is likely to become marginal beyond this age<sup>9</sup> zinc deficiency a prevalent condition of young children in developing countries is associated with decreased with immune-competence and increased rate of serious infectious diseases.<sup>10</sup> It is also reported that, the benefit of zinc treatment of diarrhea in older children but not significant young infants. The effects of zinc may differ by pathogens and relative importance different of pathogens varies by age. For example zinc has been shown to inhibit ion secretion induced by cholera toxin but not by Escherichia coli heat stable toxin.<sup>11</sup> The effect of zinc on recovery from diarrhea due to rotavirus or other pathogens that Predominate in the study age group is it unknown.

Another possible difference between young infants and older children is the mechanism of immune protection young infants derive substantial protection from immune factors in breast milk where as older children must rely on acquired immunity from diet and rapid response to infection at the onset of diarrhea. Plausibly then, the immune compromise that is associated with zinc deficiency may have greater consequences in an age group that relies on active rather than passive immune factors in recovery from illness.

## SUMMARY AND CONCLUSION

The present study of effects of zinc on diarrhea has confirm at that zinc supplementation has significantly reduced the episodes of diarrhea in breast feeding babies hence zinc supplementation increases immunity hence it must be administrated during pregnancy in every under developed countries. So that, the new born babies will be immune to any infections like diarrhea vomiting etc, but this study demand further nutritional, patho-physiological, genetic, Pharmacological studies because the mechanism (s) by which zinc may act as an entero-protective have not yet been determined.

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