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To Study the Role of Zinc Supplementation on Growth of Low Birth Weight Infants

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Abstract

This was a randomized controlled trial undertaken to study the role of zinc supplementation on growth of low birth weight infants (b.wt≤2500 gm). Out of 120 LBW infants, 23 were excluded due to loss of follow up. The remaining 97 LBW eligible neonates were randomized in to 2 group (zinc & control group), zinc group were given zinc supplementation at a dose of 2 mg/kg/day for 8 weeks from enrollment. They were then followed up every 4 weeks up to 8 weeks. At each visit, detail anthropometry including e weight, length, and head circumference were recorded at each visit. The infants in the zinc group had significantly higher weight gain ($p<0.000$), length gain ($p<0.000$), linear growth velocity and head circumference at 8 weeks. We concluded that zinc supplementation at 2 mg/kg/day for 8 weeks in LBW infants improves their growth during infancy.

Keywords: LBW (Low Birth Weight Babies), Zinc, Supplements to Infants, Growth of Infants.

1. Introduction

Zinc is one of the most important trace elements for the body. Zinc plays a major role in various aspects of physiology, immunity and skeletal growth. Its many roles include participation in basic metabolic functions such as cellular respiration, synthesis of many proteins and enzymes, DNA and RNA replication, carbohydrate metabolism, cell division and growth[1].

Normal R.D.A of zinc is 3.5–5 mg/day in normal infants. Zinc deficiency is one of the most prevalent deficiencies in LBW infants due to decreased stores (poor maternal fetal transfer and small liver size), decreased absorption due to immature gut and increased requirement due to catch up growth with the resultant decline in zinc in body stores & serum during the early period of life [1,2].

No serious adverse effect was noted related to supplementation therapy [5].

Zinc deficiency in infants has been shown to have an adverse impact on growth and immunity in many studies[2]. Several studies have demonstrated the benefit of zinc supplementation in low birth infants with regard to growth and prevention of infections[2–7] However, some studies have shown marginal or no effect[8], It is with this view that the present study is undertaking to evaluate the effectiveness of zinc supplementation in LBW infants in our set up.

2. Method

This study was a randomized control trial, conducted in the Neonatal Division, Department of Pediatrics of Dr. Vasantrao Pawar Medical College Nashik, The study was approved by the ethical committee of the institution.

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Neonates with birth weight <2500 gm admitted in PNC ward or attending OPD underwent screening for eligibility. Neonates with gross congenital malformations, on top feed were excluded. On obtaining informed written consent from parents, the subjects were randomized in to two group (zinc & control group), LBW infants in zinc group were given zinc supplementation in a dose of 2 mg/kg/d for 8 weeks. The drug was available as a white powder in white opaque plastic container. At baseline, the data on maternal and infant characteristics were recorded. They were then followed up every 4 weeks up to 8 weeks. At each visit, the detailed anthropoemetry including weight, length, head circumference were recorded at each visit. All data were recorded on a master chart and subjected to statistical analysis.

3. Result

A total of 120 LBW infants fulfilled the eligibility criteria for the study, out of which 23 were excluded due to loss at follow-up, 50 were randomly selected as the zinc supplemental group and 47 were randomly selected to be in the control group. At enrollment, the neonates randomized to the zinc and control groups were comparable in terms of gestational age at birth, age at enrollment, gender, and the difference between the two groups was not statistically significant. In both groups the majority of the babies were in the weight range of 2000 gm to 2500 gm while babies in the weight range of 1000–1499 gms, accounted for less than 5% of the total no in either group (Table 1).

Out of 50 eligible LBW infants enrolled in the zinc group, 12(24%) were preterm (AGA) and 38(76%) were term small for gestation infants (SGA) whereas out of 47 eligible LBW infants in control group, 11(23%) were preterm (AGA) and 36(77%) were term small for gestation infants (SGA), there was no significant difference between the gestational age of babies between the two groups. Out of 50 eligible LBW infants enrolled in the zinc group, 20(40%) were male and 30(60%) were female while among the control group, 26(55%) were male and 21(45%) were female.

At the first follow up after 4 weeks, the mean weight in the zinc group (2841.1 ± 255.7) was more than in the control group (2755.2 ± 237.5) but the difference was not statistically significant (p=0.09). However at second follow up the difference in the mean weight between the zinc (3693.7 ± 332.9) and control group (3429.4 ± 291.1) was highly significant (p=0.000). (Table 2, Figure 1)

3.1 Effect of Zinc Supplementation on Length

In contrast to weight, the significant effect of zinc administration on length was apparent even at the first follow up after 4 weeks. The difference between the mean lengths of the two groups [(48.8 ± 2.0), (52.8 ± 2.0) vs (47.5 ± 1.5), (50.2 ± 1.7)] remained highly significant both at first (p=0.001) and second follow-up (p=0.000) (Table 3, Figure 2).

Table 1. Distribution of weight at enrolment between zinc and control group

Groups		Zinc group		Control group		P value	Interpretation
Parameters		N	%	N	%		
Weight at enrolment (gms)	1000–1500	2	4%	2	4.25%	0.596	N.S
	1501–2000	15	30%	14	29.78%		
	2001–2500	33	66%	31	65.95%		

Table 2. Descriptive statistics and unpaired 't' test for for weight in both groups

					95% C I for Mean							
Parameters	Groups	N	Mean	Std. Dev.	Lower Bound	Upper Bound	Min. range	Max. range	Mean difference	t test value	p value	Interpretation
Weight at enrolment	Zinc	50	2040.5	384.8	1931.2	2149.9	1805	2400	-27.63	-0.532	0.60	NS
	Control	47	2104.2	260.1	2027.9	2180.6	1340	2390				
Weight at 1st follow up	Zinc	50	2841.1	255.7	2768.4	2913.8	2060	3470	85.95	1.712	0.09	S
	Control	47	2755.2	237.5	2685.4	2824.9	2050	3100				
Weight at 2nd follow up	Zinc	50	3693.7	332.9	3599.1	3788.3	2550	4360	264.27	4.151	0.000	S
	Control	47	3429.4	291.1	3343.9	3514.9	2605	4005				

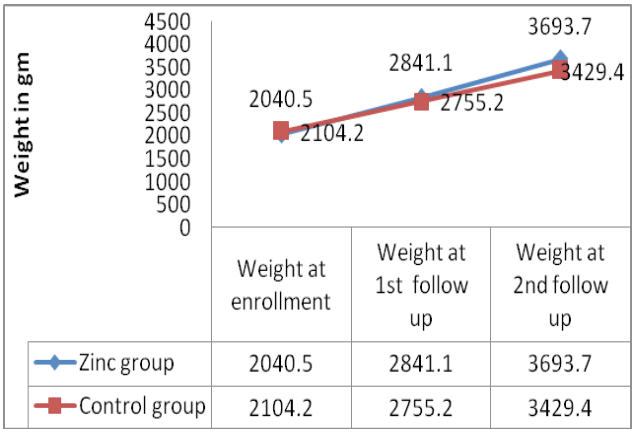

Figure 1. Showing mean difference in weight gain in zinc and control group.

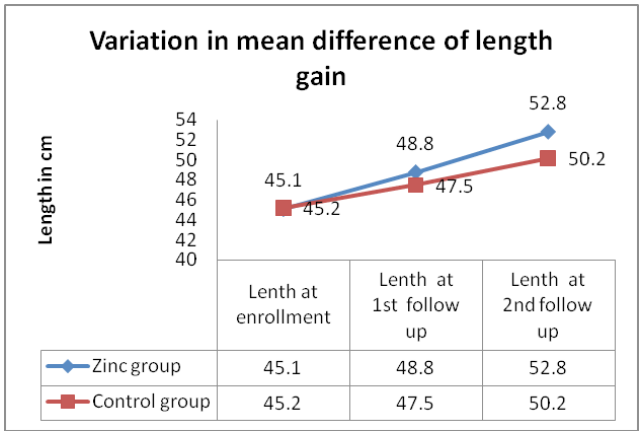

Figure 2. Showing mean difference in length gain in zinc and control group.

Table 3. Descriptive statistics and Unpaired 't' test for length in both groups

Parameters	Groups	N	Mean	Std. Dev.	95% C I for Mean: Lower Bound	95% C I for Mean: Upper Bound	Min. range	Max. range	Mean Difference	t-test value	p value	Interpretation
Length at enrolment	Zinc	50	45.1	1.8	44.6	45.6	40	49	−0.103	−0.321	0.749	NS
	Control	47	45.2	1.3	44.8	45.6	40	48				
Length at 1st follow up	Zinc	50	48.8	2.0	48.2	49.3	46	56	1.266	3.54	0.001	S
	Control	47	47.5	1.5	47.1	47.9	42	50				
Length at 2ndfollow up	Zinc	50	52.8	2.0	52.2	53.4	50	59	2.6	6.885	0.000	S
	Control	47	50.2	1.7	49.7	50.7	45	53				

3.2 Effect of Zinc Supplementation on Linear Growth Velocity

LBW infants who received zinc supplementation had a significantly higher mean linear growth velocity (0.96 cm/wk) as compared to placebo group (0.63 cm/wk) with a mean difference of 0.34 cm/wk. (Table 4, Figure 3)

3.3 Effect of Zinc Supplementation on Head Circumference

At the first follow up after 4 weeks, the increase in the head circumference of the newborn in zinc group (34.4±0.9) was not significantly different (p=0.09) from that of control group (34.2±1.7).

However at second follow up the difference in HC gain between the two groups (36.7±0.9 Vs 35.9±1.2) was highly significant as can be seen from (Table 5, Figure 4).

4. Discussion

In the present study, infants who received zinc supplementation at a dose of 2 mg/kg/d had significantly better growth in term of increase in weight, length, linear growth velocity and head circumference as compared

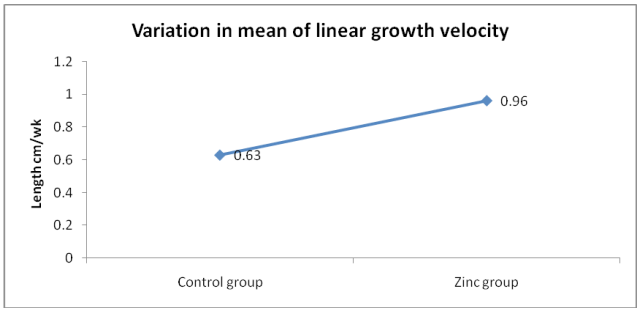

Figure 3. Linear growth velocity of length in cm/wk.

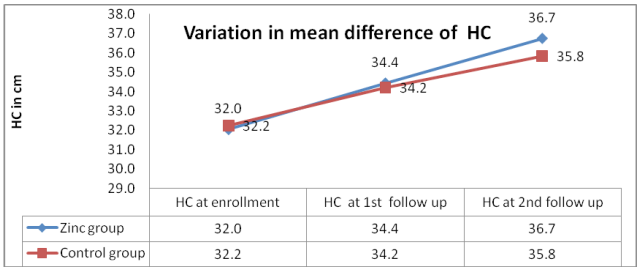

Figure 4. Showing mean difference in HC in zinc and control group.

Table 4. Linear growth velocity of length in cm/wk

t-test for Equality of Means (Equal variances assumed)					95% CI of the Difference		Unpaired t test	
Groups	N	Mean	Std. Deviation	Mean Difference	Lower	Upper	t test value	p value
Zinc group	50	0.96	0.26	0.34	0.26	0.42	8.187	0.000
Control group	47	0.63	0.10					

Table 5. Descriptive statistics and Unpaired 't' test for Head Circumference in both groups

		95% C I for Mean									
Parameters	Groups	N	Mean	Std. Dev.	Lower Bound	Upper Bound	Min. range	Max. range	Mean Difference	p value	Interpretation
HC at enrolment	Zinc	50	32.0	1.0	31.7	32.3	29	34	-0.21	0.252	NS
	Control	47	32.2	0.8	32.0	32.5	30	33			
HC at 1st follow up	Zinc	50	34.4	0.9	34.2	34.7	32	36	0.211	0.437	NS
	Control	47	34.2	1.7	33.7	34.7	32	44			
HC at 2nd follow up	Zinc	50	36.7	0.9	36.5	37.0	35	39	0.893	0.000	S
	Control	47	35.9	1.2	35.5	36.2	33	38			

NS- Non Significant, S- Significant.

to control group .The difference was obvious even at the first follow up at 4 weeks although it was significant only for length.

However, at the second follow up at 8 weeks, the effect of Zn supplementation was clearly obvious and significant on all parameters of growth viz weight, length, linear growth velocity and HC. The effect on length was not only seen earlier but it was more pronounced as compared to that on weight and HC.

Similar observations have also been made by several other workers in the field.

TV Ram Kumar et al.[9] in their study of 134 VLBW infants (zinc supplementation at a dose of 10 mg/day for 8 weeks) also found significant effect of zinc supplementation on weight, length and head circumference. Like in our study, they also found the earliest effect of zinc on length. However they used a higher dose of Zn in their study.

Castillo-Duran et al.[10] in their study of Zn supplementation on 68 term small for gestation age (SGA) infants (starting at 3 days of life and continuing till 6 months post natal age) also found significant effect of zinc supplementation on weight, length, and linear growth

velocity. However, this change in weight was influenced by sex and mode of feeding since a proportion of infants in placebo group had to receive supplementation prior to 4 months age. Therefore the effect on weight increment was an additive effect of zinc, exclusive breast-feeding and female gender. In our study all infants were breastfed and there was no confounding effect of formula feeding or sex. In a birth cohort of 100 LBW infants. Sur et al.[7] found significant effect of zinc supplementation on weight, length and linear growth velocity at the end of 1 year only.

Other workers have found variable results of Zn on different parameters of growth.

Islam et al.[5] in a trial of Zn supplementation in 100 PT LBW infants for 6 weeks (2 mg/kg) found significant effect on weight as well as on length but the effect on HC was not significant in his study. Hoque et al.[11] in 2005 in a study of 200 LBW infants also found significant effect of Zn supplementation on weight gain. However, authors did not study the effect of Zn on other growth parameters.

Lira et al.[4] in their study on 205 LBW infants given zinc (5 mg/d) for 6 months, found significant effect on weight. They did not find any significant effect on length.

In contrast to this study, Friel et al.[2] in their study of zinc supplementation on 52 VLBW infants for 12 months found significant effect on length and linear growth velocity only but not on weight gain and head circumference. The lack of effect on weight in their study may have been due to factors like low sample size (N=52), formula feed and the fact that their study cohort comprised of VLBW infants. Similar findings were also noted by Gomez et al.[3] in his study of 36 preterm infants. The authors found significant effect of zinc supplementation on length but not on weight gain. In their study also the sample size was small (N=32).

In contrast to the above observations of positive role of Zn in the growth of LBW infants, Taneja et al.[12] in a large double-blind, randomized, placebo-controlled trial of Zn supplementation on 2052 term LBW infants did not find any significant effect of zinc supplementation (5 mg/d for those infants between ages 2 wk and 6 mo and 10 mg/d for those infants aged >6 mo from birth up to 1 year of age), on the growth of LBW infants in their study.

In conclusion, zinc supplementation (2 mg/kg/day) among LBW neonates lead to better weight gain, it is suggested that zinc should routinely be supplemented in LBW neonates during early infancy to improve their outcomes in growth.

5. References

1. Berger A. Science commentary: what does zinc do? Br Med J. 2002 Nov; 325:1062.
2. Friel JK, Andrews WL, Mathew JD Long DR, Cornel AM, Cox M et al. Zinc supplementation in very low birth weight infants. J ped gastro nutrition 1993; 17:97–104.
3. Díaz-Gomez NM, Domėnech E, Barroso F, Castells S, Cortabarria C, Jiménez A. The effect of zinc supplementation on linear growth, body consumption, and growth factors in preterm infants. Pediatrics. 2003; 111:1002–9.
4. Lira Pic, Ashworth A, Morris SS . Effect of zinc supplementation on the morbidity, immune function, and growth of low birth weight, full term infants in North East Brazil. Am J Clin Nutr. 1998 Aug; 68:418S–24S.
5. Islam MN, Chowdhury M, Siddika M, Qurishi SB, Bhuiyan MK, Hoque MM et al. Effect of oral zinc supplementation on the growth of preterm infants. Indian Pediatr.2010 Oct 17; 47(10):845–9.
6. Sazawal S, Black RE, Menon VP, Dinghra P, Caulfield LE, Dhingra U et al. Zinc supplementation in infants born small for gestational age reduces mortality. Pediatrics. 2001 Dec; 108:1280–6.
7. Sur D, Gupta DN, Mondal SK, Ghosh S, Manna B, Rajendran K et al. Impact of zinc supplementation on diarrheal morbidity and growth pattern of low birth weight infants in Kolkata. Indian Pediatr. 2003 Dec; 112(6 Pt 1):1327–32.
8. Sazawal S, Black RE. Effect of oral zinc supplementation on growth of preterm infants. Indian Pediatr. 2010 Oct 17; 47:841–2.
9. Ram Kumar TV, Ramji S. Effect of zinc supplementation on growth in very low birth weight infants. J Trop Pediatr. 2012; 58(1): 50–4.
10. Castiio-Duran C, Rodriguez A, Venegas G, Alvarez P, Icaza G. Zinc supplementation and growth of infants born small for gestational age. J Pediatr. 1995; 127:206–211.
11. Hoque A, Ali SMA. Role of zinc in lowbirth weight neonates. Bangladesh Med J. 2009 Jan; 38(1):24–30.
12. Taneja S, Bhandari N, Rongsen-Chandola T, Mahalanabis D, Fontaine O, Bhan MK. Effect of zinc supplementation on morbidity and growth in hospital-born, low-birth-weight infants. Am J Clin Nutr. 2009; 90:385–91.