Original Research Article

A study of serum zinc of neonates and their mothers

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Abstract

Background: Zinc is one of the essential trace metals required for optimal growth and development. Its importance in fetal nutrition and growth has been increasingly recognized. Zinc is a trace element necessary for normal growth and development. It influences the synthesis of nucleic acids and thus is essential for cellular growth, division and differentiation and new tissue synthesis. Requirements for Zinc increase during period of rapid growth, such as pregnancy, infancy and puberty. **Aims and Objectives:** Estimation and comparison of cord blood Zinc levels of AGA and SGA of term and preterm neonates. Estimation and comparison of maternal serum Zinc levels in mothers of the above group. To test the hypothesis "Maternal Zinc levels affects the birth weight of the baby". **Materials and Method:** This study was carried out in St James hospital, chalakudy. A 600 bedded multispecialty referral hospital from April 2013 to February 2014. **Subjects:** Babies who were delivered in our labour room were included in our study. Study design: A prospective observational study and this study was conducted after obtaining Ethical clearance from Ethical Committee of medical college**. Sample size:** 100 babies and their mothers. Data Analysis: The data was analyzed using SPSS software version 17; the unpaired t-test was applied. **Conclusion:** Cord blood zinc levels of all babies who were term are higher than that of their mothers. There was no statistically real difference found in the maternal zinc levels of babies who were FT (AGA), FT (SGA) and PT. Thus birth weight is not affected by maternal zinc levels. There was significantly low level of cord blood zinc between FT (AGA) and FT (SGA) and PT
Key Words: Small for gestational age, appropriate for gestational age, serum zinc levels, full term/pre term.

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INTRODUCTION

Zinc is one of the essential trace metals required for optimal growth and development. Its importance in fetal nutrition and growth has been increasingly recognized. Zinc, as an important micro-nutrient was first suggested more than 150 years ago.[1] Prasad *et al* were the first to describe Zinc deficiency syndrome in adults characterized by dwarfism, anemia, hepatosplenomegaly, rough and dry skin, mental lethargy and geophagia[2]. Zinc comprises only about 0.0033% of the body's mass, making it the third most abundant trace element after iron and fluorine. Zinc is essential for the function of atleast 70 enzymes such as dehydrogenises, aldolases and peptidases and is involved in a variety of metabolic processes. This micronutrient is a cofactor for more than 200 metallo enzymes[3]. Zinc is a trace element necessary for normal growth and development. It influences the synthesis of nucleic acids and thus is essential for cellular growth, division and differentiation and new tissue synthesis[4]. Requirements for Zinc increase during period of rapid growth, such as pregnancy, infancy and puberty[5].Animal studies showed that deficiency of Zinc during pregnancy is associated with growth retardation fetus. Mothers of LBW infants have reported to have lower concentrations of serum Zinc than do mothers of normal birth weight babies[6].If there is a relationship between maternal Zinc nutrition and birth weight, such information would be useful because birth weight is an important factor that affects neonatal mortality and is a significant determinant

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of infant and childhood morbidity[5]. Keeping the above point in mind this study was undertaken.

MATERIALS AND METHODS

This study was carried out in St James hospital, chalakudy. A 600 bedded multispecialty referral hospital from April 2013 to February 2014.

Subjects: Babies who were delivered in our labour room were included in our study.

Inclusion Criteria

- Live born babies of mothers who had not taken Zinc supplementation antenatally.

Exclusion Criteria

1. Major congenital malformations.
2. Babies of mother who had received Zinc Supplementation antenatally.

All babies were divided according to their gestational age (MB Sclassification) into terms and preterms. Babies were divided as SGA and AGA according to AIIMS standards (Dr. M. B. Singh)

Study design: A prospective observational study and this study was conducted after obtaining ethical clearance from Ethical Committee of medical college

Sample size: 100 babies and their mothers. Weight for classifying into SGA and AGA was done on a standard detecto beam balance with minimum calibration of 20 gms. All babies were weighed on same scale.

Sample collection: 5 ml of cord blood was taken from placental side directly into previously acid washed and deionized plan plastic bulbs .Glass and rubber tubing's were avoided. Serum was separated and stored in plastic vials at 8^0 c in the refrigerator. With similar precautions, 5 ml of blood was collected from peripheral vain of mother immediate post-partum. Serum was analyzed for Zinc levels by a qualified pathologist. The kit for analysis was procured form RANDOX laboratories Ltd, Ardmore, diamond Road, Coantrim, United Kingdom. Serum Zinc concentration was determined by the "Calorimetric method" using 2-(5-bromo pyraldizo)-5n(propyl-N-3-Sulfopropyl-amino)phenol, 5-BR-PAPS for short [7,8,9].This pyraldizo compound is well suited for determination as besides being water soluble, it has a high molar absorbidity. Resultsby the above method with 5-Br-DAPS compare well with those obtained by Atomic Absorption Spectrophotometry[8].

Data Analysis: The data was analyzed using SPSS software version 17, the unpaired t-test was applied and the probability worked out from corresponding 'p' value to find out whether the results were statistically significant or not.

RESULTS AND DISCUSSIONS

Table 1: Sex distribution of sample

	Male	Female	Total
A(n=30)	13(43.7 %)	17(56.6%)	30
B(n=31)	19(61.2%)	12(35.4%)	31
C(n=25)	14(56%)	11(44%)	25
Total	**46**	**40**	**86**

A=FT (AGA), B=FT (SGA), C=PT

The above table shows the sex wise distribution of our sample in FT (AGA), FT(SGA) and PT

Table 2: Mean Birth weight of babies

Group	Mean Birth Weight
FT(AGA)(n=30)	2740 gms±220gms
FT(SGA)(n=31)	1990 gms±240gms
PT(n=25)	1700 gms±380gms

The above table shows the average birth weights of babies who were FT (AGA)

Table 3: Mean Maternal age of mother

Group	Mat-age
FT(AGA)(n=30)	25.2yrs ±3.3yrs
FT(SGA)(n=31)	23.2yrs±4.6yrs
PT(n=25)	23.3yrs±2.8yrs

This table shows the mean maternal ages of FT (AGA), FT (SGA) and PT which did not show any significant difference

Table 4:

Group	ANC Taken	ANC not taken
FT(AGA)	27(90%)	3(10%)
FT(SGA)	24(77.4%)	7(22.5%)
PT	18(72%)	7(28%)
Total	**69**	**17**

The above table shows the number of mothers who had received antenatal care regularly and those who did not. The mothers of babies who were SGA, PT had a lower antenatal coverage as compared to those with FT (AGA).

Table 5: Distribution according to gestational age

	Gest age	Number
Term	>37 weeks	61
Preterm	33-37 weeks	21(85%)
	<33weeks	4(15%)

This table indicates the gestational age distribution of our preterm babies with 85% of babies between 33-37 weeks and very few gross preterm.

Table 6: Comparison of serum zinc levels of mothers of FT(AGA), FT(SGA)and PT

	Our study	Jeswani *et al*	Bahl *et al*
A(n=30)	90.37±22.47	96.28±19.4	67±19.2
B(n=31)	83.39±14.78	93.8±7.62	56.5±15
C(n=25)	94.31±20.27	115.44±15.4	62.7±21.2

All figures are in u g/dl

Table 7: Comparison of maternal zinc levels of FT(AGA) and (SGA)

Group	Mean levels
A(n=30)	90.3±22.5
B(n=31)	83.3±14.8
t=1.16 p=0.1	

The above table shows the mean serum levels of FT (AGA) and FT (SGA) .As indicated above there is no significance which is real between the serum zinc levels of both groups. The zinc levels obtained in our study of mothers of FT (AGA) is comparable to the study of Vani and Jeswani *et al*[10].However, the levels of zinc in mothers of FT(SGA) were slightly lower as compared to the study of Vani and Jeswani *et al*[10]. The zinc levels directly correlate with a calorie intake of an individual. Thus, a lower calorie intake in the aforesaid group could be reason for the observed lower levels. Goel *et al* also had lower levels in all groups compared to our study[11].

Table 8: Comparison of maternal zinc levels of FT(AGA) and PT

Group	Mean levels
A(n=30)	90.3±22.4
C(n=25)	94.3±20.2
t=0.72 p = >0.1	

The above table shows a comparison of the serum zinc levels of mothers of FT (AGA) against PT. There was no statistically difference in the mean observed. The result do not compare with the studies of Jeswani *et al* where there was a statistically real difference between the maternal serum zinc levels of FT and preterms[10]. But the studies at Himachal Pradesh by Bahl *et al* have comparable results[12]. The reason why there was not a very significantly high level in the mothers of preterm babies could be most of the babies in our study were around 32-35 weeks gestation age and very few were grossly preterm. Studies of Goel *et al* show that there was statistically difference between mothers of FT and preterms which is not comparable to our result[11].

Table 9: Comparison of cord blood zinc levels of FT (AGA) and FT (SGA)

Group	Zinc Levels our study	Jeswani *et al*	Bahl *et al*
FT(AGA)	113.5±24.6	128±14.3	79.6±35.6
FT(SGA)	94.6±19.31	111.8±9.2	58.2±26.8
t=10.67 p = <0.001			

Figures shown in the above table the comparison of cord blood zinc levels of full term (AGA) and FT (SGA) show a statistically difference. Studies of Jeswani *et al*[10] had cord blood zinc levels higher than those of our babies, but the results of Goel *et al*[11] are comparable with ours. Jeswani *et al* had shown that there was no statistically difference between the FT (AGA) and FT (SGA)[10] and so have Goel *et al*[11] and Prasad *et al*[13].Bahl *et al* have shown a real difference between the cord blood zinc levels of the above group as ours has shown[12]. This low level would be explained on the basis of some placental barrier responsible for decreased maternofoetal transfer of zinc or reduced uptake by foetus and low levels in mother. In our study though the maternal levels of both groups were comparable the lower cord blood level of FT (SGA) is explained probably due to some placental barrier which decreases maternofoetal transfer or reduced uptake by foetus.

Table 10: Comparison of cord blood zinc levels of FT (AGA) andPT

Group	Zinc levels our body	Jeswani *et al*	Bahl *et al*
FT(AGA)	113.5±24.6	128±14.4	79.6±35.6
PT	84±20.7	94.3±17.3	81±50.4
t=15.05 p=<0.001			

The comparison of FT (AGA) and PT shows a statistically difference between the core blood zinc levels of the above two groups. The mean cord blood levels of our study are comparable to those of Goel *et al*[11] and Bahl *et al*[12]but slightly lower than that obtained by Jeswani *et al*[10] .Like our study, all our studies show a statistically real difference between the zinc levels of the FT (AGA) and PT. The reasons for the same are the accumulations of zinc by foetal tissues accumulation during last trimester of pregnancy. Seventy percentage of the body zinc stores of the fetus are accumulated during the third trimester of Pregnancy[2]. It is the free zinc which is transferred to the fetus from the mother and higher the level of free zinc, increased transfer occurs. As the gestational age increases, due to increased sex hormones there is an increase in levels of free zinc[13]. Thus there is maximum transfer of zinc passively to the foetus in the last trimester.

Table 11:

Group	Mother's zinc level	Cord blood zinc level
FT(AGA)	90.33±22.4	113.5±24.6
FT(SGA)	83.2±19.8	94.5±19.3
PT	94.3±20.3	84±20.7

Our study shows that cord blood zinc levels of all the term babies was higher than those of their mother's. This is explained because of high photosynthetic activity in fetus and active transportation of zinc by placenta regardless of maternal zinc status.

CONCLUSION

This prospective study was carried out in the neonatal unit of St. James hospital Chalakudy from A 600 bedded multispecialty referral hospital from April 2013 to February 2014 in 100 babies and their mothers where zinc levels were studied. Certain conclusions which were derived were: Cord blood zinc levels of all babies who were term are higher than that of their mothers. There was no statistically difference found in the maternal zinc levels of babies who were FT (AGA), FT (SGA) and PT. Thus birth weight is not affected by maternal zinc levels.

There was significantly low level of cord blood zinc between FT (AGA) and FT (SGA) and PT.

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