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ORIGINAL ARTICLE

Determination of serum zinc concentration in SGA neonates as compared to AGA neonates

Jaswir Singh, Manish Gupta, Maninder Kaur

Department of Pediatrics & Biochemistry,
Government Medical College, Patiala, Punjab, India

ABSTRACT

Background: Birth weight is the single most important determinant of infant survival in developing countries. Zinc is required to maintain the normal structure and function of multiple enzymes including those that are involved in transcription and translation of genetic material and cell division and growth and development.

Methods: The objective of the study was to compare serum zinc levels in small for gestational age (SGA) babies with respect to appropriate for gestational age (AGA) babies in a tertiary hospital whether term or preterm. 100 term and preterm newborns who are small for gestational age will comprise the study group and 100 newborns who are appropriate for gestational age will comprise control group. Venous blood sample will be collected immediately after birth and zinc levels will be determined by colorimetric method.

Results: The mean (±SD) serum zinc levels of the study and the control groups were 56.8 ± 40.6 µg/dl and 107.4 ± 72 µg/dl respectively. Statistically highly significant difference was found in the mean serum zinc levels between the two groups. The serum zinc level was lower in the study group as compared to control group. The mean serum zinc levels of the preterm SGA group and term SGA group were 46.26 ±22.54 µg/dl and 63.35± 47.47 µg/dl respectively. Statistically significant difference was found in the mean serum zinc levels between the two groups.

Conclusions: Maternal zinc level affects the weight of the baby but not the length or head circumference of the baby. So, zinc supplementation during pregnancy leads to normal birth weight.

Key words: Pre-term, Birth weight, Zinc level

Abbreviations: **SGA -** Small for gestational age; **AGA -** Appropraite for gestational age

Introduction

Birth weight is the single most important determinant of infant survival in developing countries. It is estimated to be responsible for >70% Perinatal deaths, 90% of neonatal deaths and 50% of infant deaths [1]. Low birth weight is associated with poor subsequent growth in infancy and childhood with increased morbidity from infectious diseases and compromised cognitive and behavioural development [2].

Zinc is required to maintain the normal structure and function of multiple enzymes including those that are involved in transcription and translation of genetic material and cell divison [3]. SGA born babies have small liver and inadequate stores of zinc, limited capacity to absorb and retain micronutrients and increased requirement for catch up growth, thus making them vulnerable for zinc deficiency [4]. This contributes to substantial neuro-cognitive, pulmonary and ophthalmologic morbidity.

Due to effect on DNA and RNA synthesis, Zinc helps in cell replication and differentiation of chondrocytes, osteoblasts, fibroblasts. In cell transcription and synthesis of somatomedin C, osteocalcin, alkaline phosphatise and

Address for correspondence
Prof. Jaswir Singh, 5084 Urban State -1, 26 acre, Patiala City, Distt. Patiala, Punjab -147002, India

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metabolism of carbohydrates, proteins and fats. Zinc helps in hormonal mediation by growth hormone synthesis, secretion and action on somatomedin C in liver cells and activation of somatomedin C in bone cartilage. It helps in synthesis of Insulin, thyroid hormone and Vitamin D, all of which are required for growth [5].

MATERIALS AND METHODS

The study was conducted on 100 newborns with birth weight small for gestational age as study group delivered in Deptt. of Obstetrics and Gynaecology, Govt. Medical College, Patiala and admitted to neonatal section of Deptt. of Paediatrics, Govt. Medical College Patiala. 100 newborn term AGA and preterm AGA babies are taken as control group. Approval of ethics committee was taken along with written consent from the parents.

A detailed antenatal and clinical history of the mother covering personal history, past history of any medical illness like pregnancy induced hypertension, diabetes mellitus etc., previous obstetrical history like previous number of childbirths, abortions, perinatal loss, mode of delivery, family history of tuberculosis/diabetes mellitus/ hypertension etc., socio-economic status and present complaints were taken to rule out other causes that can affect zinc levels in babies.

Inclusion criteria

All SGA babies whether term (37-41 weeks) or preterm (<37 weeks) were included as test and AGA babies both term and preterm were taken as controls.

Exclusion criteria

All newborns whose mothers were having intrauterine infections, toxaemia of pregnancy, Diabetes mellitus, hepatitis, smokers and all birth- asphyxiated babies.

Serum Zinc level were estimated by 56.8 ± 40.6 µg/dl and 107.4 ± 72 µg/dl respectively in the hospital laboratory.

RESULTS

The male and female percentage of babies in the study group were 55% and 45% and in the control group were 56% and 44% respectively. The mean gestational age in the study group was 37.13± 2.33 weeks and 36.82 ± 2.50 weeks in the control group. The maximum number of cases in both the groups were in the 39th week period of gestation.

The mean (±SD) serum zinc levels of the study and the control groups were 56.8 ± 40.6 µg/dl and 107.4 ± 72 µg/dl respectively. Statistically highly significant difference was found in the mean serum zinc levels between the two groups. (Normal zinc levels- 60-120 µg/dl).

Table 1: Serrm zinc levels in study and control grow

Group	No.	Mean ±SD (µg/dl)	't' value	'p' value	Sig.
Study	100	56.8 ±40.6	-6.1	<0.001	HS
Control	100	107.4± 72			

Table 2: Serrm zinc levels in preterm SGA and Term group babies

Group	No.	Mean±SD (µg/dl)	't' value	'p' value	Sig.
Preterm SGA	38	46.26± 22.54	2.07	<0.05	Sig.
Term SGA	62	63.35± 47.47			

The mean serum zinc levels of the preterm SGA group and term SGA group were 46.26 ±22.54 µg/dl and 63.35± 47.47 µg/dl respectively. Statistically significant difference was found in the mean serum zinc levels between the two groups.

Table 3: Serrm zinc levels in term and preterm babies

Group	No.	Mean±SD (µg/dl)	't' value	'p' value	Sig.
Term	120	81.13 ± 52.25	-0. 277	> 0.05	NS
Preterm	80	83.68 ± 77.88			

The mean (SD) serum zinc levels of the term and preterm group whether they are SGA born or AGA born babies are 81.13 ± 52.25 µg/dl and 83.68 ± 77.88 µg/dl respectively. A statistically non significant difference was found in the mean serum zinc levels between the two groups (p> 0.05, as computed from the SEDM and the t-test).

DISCUSSION

In the present study, the mean (±SD) serum zinc levels of the study and control groups were 56.8 ± 40.6 µg/dl and 107.4 ± 72 µg/dl, respectively. Statistically, highly significant difference was found in the mean serum zinc levels between the two groups. A similar study done by Elizabeth et al (2007) showed the same observation in SGA babies taken in study group and term normal weight babies taken in control. Serum zinc levels were 70.25 ± 24.5, 78.09 ± 18.39 and 92.24 ± 19.4 in µg/dl respectively. The difference between study and control group was statistically significant.[6] Another study by Akram et al

(2011) compared serum zinc levels in babies born SGA with the babies born large for gestational age(LGA). Zinc levels were 78 µg/dl in the SGA group and 92 µg/dl in the LGA group. The difference was statistically significant in the two groups [7]. A study was done by Ozdemir et al (2007) on the estimation of zinc levels from cord blood in SGA, AGA and LGA babies. Zinc levels were below 100 µg/dl in the SGA group and 150 µg/dl in the AGA group. It showed significantly lower zinc levels in the SGA group. The method used for estimation was atomic absorption spectrophotometery [8].

CONCLUSION

The present study demonstrates that maternal zinc level affects the weight of the baby but not the length or head circumference of the baby. As prognosis of the baby in neonatal period and infancy regarding morbidity and mortality depends on the birth weight, various factors affecting the weight in utero should be duly considered. However more studies are required.

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REFERENCES

1) Smith Vincent C. The High Risk Newborn: Anticipation, Evaluation, Management and Outcome. Manual of Neonatal Care, edition 7;chapter 7:74-90

2) Osrin David, Costello Anthony M.de L. Maternal nutrition and fetal growth: practical issues in international health. Semin Neonatol 2000;5:209-219

3) Bernstein Ira M, Horbar Jeffrey D, Badger Gary J, Ohlsson Arne, Golan Agneta. Morbidity and mortality among low-birth-weight neonates with intrauterine growth restriction. Am J Obstet Gynecol 2000;182:198-206

4) Bhatnagar Shinjini, Natchu Uma Chandra Mouli. Zinc in Child Health and Disease. Indian J Pediatr 2004;71(11):991-995

5) Merialdi Mario, Caufield Laura E, Zavaleta Nelly, Figueroa Alberto, Dominici Francesca. Randomized controlled trial of prenatal zinc supplementation and development of fetal heart rate. American Journal of Obstetrics and Gynecology 2004;190:1106-12

6) Elizabeth K.E, Krishnan Viji. Umbilical cord blood nutrients in low birth weight babies in relation to birth weight and gestational age. Indian J Med Res 2008;128:128-133

7) Akram Shahzad K. Placental IGF-1, IGFBP-1, zinc and iron and maternal and infant anthropometry at birth. Acta Paediatrica 2011;100:1504-1509

8) Ozdemir U. Correlation between birth weight , leptin and copper levels in maternal and cord blood. J Physiol Biochem2007;63(2):121-128