Original Research Paper

Determination of Serum Zinc Concentration in SGA Neonates as Compared to AGA Neonates

Singh J* Kaur M Gupta M***, Kaur D******

* Professor & Head *** Junior Resident, Deptt of Pediatrics, Govt. Medical College, Patiala

** Professor Deptt of Biochemistry, Govt. Medical College, Patiala

******MBBS Student

Corresponding Author

Dr. Maninder Kaur, Professor Department of Biochemistry, Govt. Medical College, Patiala

H. No. 53, B/2, Model town, Patiala (Pb)

Phone: +91 98159-04935

E-mail: mkaur68@yahoo.com

Article History

Received Oct 25, 2018 (Received in revised form Nov 15, 2018)

Accepted on Nov 16 , 2018

Abstract: Birth weight is the single most important determinant of infant survival in developing countries. Low birth weight is associated with poor subsequent growth in infancy and childhood with increased morbidity from infectious diseases and compromised congnitive and behavioural development.

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. In our study Serum Zinc levels were compared in small for gestational age babies with respect to appropriate for gestational age babies. It was found that maternal Zinc levels affect the weight of the baby. So Zinc supplements during pregnancy lead to normal birth weight babies.

Keywords- Zinc, SGA Babies, Birth Weight, Enzymes, Growth and Development.

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] Due to effect on DNA and RNA synthesis, zinc helps in cell replication and differentiation of chondrocytes, osteoblasts, fibroblasts, and in cell transcription and synthesis of somatomedin C, osteocalcin, alkaline phosphatase and 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.[4]

There is evidence that maternal zinc deficiency leads to decreased foetal growth & development that can cause foetal distress leading to assisted or operative delivery which can lead to preterm delivery, neonatal sepsis, birth asphyxia & even stillbirth.[5] Small for gestational (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.[6] This contributes to substantial neuro-cognitive, pulmonary and ophthalmologic morbidity.

Aims and Objectives

To compare serum zinc levels in Small for Gestational Age babies with respect to Appropriate for Gestational Age babies in a tertiary care hospital whether term or preterm.

Materials and Methods

This study was conducted on 100 newborns

with birth weight small for gestational age as study group which were 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 were 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 in study group 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.

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 of gestation.

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			

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).

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

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 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. 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 group. Serum zinc levels were 70.25 ± 24.5, 78.09 ± 18.39 and 92.24 ± 19.4 µg/dl respectively. The difference between study and control group was statistically significant.[7] 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.[8] 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.[9]

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. Zinc deficiency in mothers during pregnancy has adverse outcome on foetus. Therefore preventing zinc deficiency in mother leads to improvement in prenatal growth which translates into improvement in postnatal growth, improvement in immune functions & decreased risk of morbidity in infancy. Prognosis of the baby in neonatal period and infancy regarding morbidity and mortality depends on the birth weight. Therefore zinc supplementation to pregnant mothers could prevent preterm and LBW babies.

Conflict of Interest: None

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. 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
5. Janet C. King. Effect of Zinc Supplementation on Pregnancy and Infant Outcomes: A Systematic Review. Paediatr Perinat Epidemiol. 2012 ; 26(1): 118–137
6.. Bhatnagar Shinjini, Natchu Uma Chandra Mouli. Zinc in Child Health and Disease. Indian J Pediatr 2004;71(11):991-995
7. 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
8. Akram Shahzad K. Placental IGF-1, IGFBP-1, zinc and iron and maternal and infant anthropometry at birth. Acta Paediatrica 2011;100:1504-1509
9. Ozdemir U. Correlation between birth weight , leptin and copper levels in maternal and cord blood. J Physiol Biochem2007;63(2):121-128