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A Study of Serum Zinc Levels in Cord Blood of Neonates and their Mothers

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Serum zinc was estimated in the cord blood of 60 neonates of different gestational age and birth weight, and their mothers.

Mean serum zinc levels in neonates FTGA, PTAGA and term SGA were 128.88 ± 14.37, 94.32 ± 17.79 and 111.8 ± 9.2 ug/dl respectively. The maternal serum zinc levels in corresponding groups was 96.28 ± 19.48, 115.44 ± 15.41 and 93.8 ± 7.62 ug/dl.

Thus mean serum zinc level in cord blood of FT AGA newborns was significantly higher than that in PT AGA and FT SGA. Mean serum zinc level in mothers of FT AGA was significantly lower than that in mothers of PT AGA. However, there was no significant difference between the maternal serum zinc levels of FT AGA and FT SGAs. There was positive correlation between gestational age and serum zinc level in cord blood of AGAs while correlation was negative in case of their mothers. There was positive correlation between weight (keeping gestational age constant) and serum zinc level in case of neonates while corresponding maternal zinc levels did not vary. (FT AGA and FT SGA).

Key Words : *Zinc; Neonates; Appropriate for gestational age; Small for gestational age.*

Zinc is one of the essential trace metals required for optimal growth and development.[1] Its importance in fetal nutrition and neonates has been increasingly recognised.

Zinc influences all the major metabolic pathways[2,3] and is important for new tissue synthesis and thereby has influence over foetal growth.[1,4] Zinc deficiency affects growth adversely.[4,5] Since 70% of the body zinc stores of the fetus are accumulated during the third trimester of pregnancy, prematurely born infants have high postnatal requirements and with gastrointestinal tract immaturity, these newborns are at in-

Abbreviations
FTAGA = Full-term appropriate for gestational age
FTSGA = Full-term small-for-gestational age
PTAGA = Pre-term appropriate for gestational age

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creased risk for developing zinc deficient state.[1,6,7]

Maternal zinc deficiency has been studied in recent years and correlated to the occurrence of fetal growth retardation.[4] Present work has been carried out to study and correlate the levels of serum zinc in neonates and their mothers in relation to gestational age and birth weight.

MATERIAL AND METHODS

Sixty live healthy new borns delivered at Civil Hospital Ahmedabad, and their healthy mothers were studied. Only neonates of known gestational age (based on last menstrual period of mothers and Dubowitz scoring) ranging between 28-40 weeks were taken and classified according to the intrauterine growth curves.[8] They comprised of 25 term AGA and 10 term SGA.

Cord blood samples were collected from the placental end of the cord and maternal blood samples were collected from the peripheral vein immediately after delivery. Serum zinc was estimated by A.A.S. (Atomic absorption spectrophotometer) at National Institute of Occupational Health (N.I.O.H.) Ahmedabad. Data collected were statistically evaluated and 't' test was applied to find the 'p' value. Correlation coefficients were calculated in order to assess the impact of different variables upon the serum zinc in cord blood as well as maternal blood.

RESULTS

Mean serum zinc levels in different groups of neonates is shown in Table 1. Mean serum zinc level in term AGA neonates was significantly higher than both preterm AGA and term SGA. ($p<.01$). Mean serum zinc level in mothers of term AGA neonates was significantly lower compared to that in mothers of preterm neonates ($p<.01$). There was no significant difference between serum zinc level in mothers of term AGA and SGA neonates ($p>.05$) [Table 1].

There was definite positive correlation between gestational age and serum zinc level in cord blood ($r=0.865$) while negative correlation in case of their mothers ($r=-0.39$). Likewise there was positive correlation between the neonatal weight and the serum zinc levels at any gestational age ($r=0.617$) but no correlation among the maternal levels, FT AGA and FT SGA ($r=0.134$).

TABLE 1. Serum Zinc (μg %) in Different Groups of Neonates and their Mothers

Study group	No. of cases	Mean weight ± SD (kg)	Serum zinz (μg/dl) (Cord blood)	Serum zinc (μg/dl) (Maternal)
FT AGA	25	2.8 ± .2	128.88 ± 14.37	96.28 ± 19.48
PT AGA	25	1.79 ± .38	94.32* ± 17.79	115.44** ± 15.41
FT SGA	10	1.88 ± .15	111.8* ± 9.22	93.8 ± 7.62

* $p < .01$ Cord blood zinc FT AGA vs. FT SGA and FT AGA vs. PT AGA.
** $p < .01$ Maternal level in term AGA vs. PT AGA.

DISCUSSION

Zinc is passively transferred from the mother to the fetus across the placenta to play its role in the development of organs and growth of tissues.[10] The serum zinc levels in cord blood of term AGA in present study compares well with the values observed by Goel and Mishra[9] and Prasad et al.[3] Similar to present study, Dreosti[11] observed positive correlation between gestational age and cord blood zinc levels while negative correlation in case of mothers. This is explained by increasing utero zinc accumulation rate from 240 μg/day to 675 μg/day from 26 weeks to 30 weeks of gestation[4,6] and the corresponding lower maternal zinc levels with increasing gestational age.[14] Additionally, declining circulating zinc levels in mothers with increasing gestational age might reflect the change in maternal serum albumin concentration as about 75% of the zinc is bound to albumin.[14,15]

While serum zinc levels in term AGA neonates obtained in our study are much higher than those obtained by Marshall.[12] Lower levels in the cord and maternal zinc levels in the later study may be because of the several factors affecting zinc level such as dietary intake, nutritional status, racial and geographic differences. Individual contribution of such variables need to be explored further.

Pattern of cord zinc levels in term AGA and term SGAs were similar to those reported by Kapoor and Mishra.[13] Mean serum zinc levels in mother of these two groups (term AGA term SGA) are comparable to the study done by Meadows & Smith.[14] Prasad suggested that plasma zinc concentrations of mothers at term giving birth to SGA babies were not different from those who gave birth to FT AGAs.[3] The same has been documented in our study. Accumulation of zinc by foetal tissues accelerates during last trimester of pregnancy.[1,4,3] Seventy percent of the body zinc stores of the fetus are accumulated during the 3rd trimester of pregnancy.[1]

Although the plasma zinc concentration were similar in mothers of term AGA and term SGA neonates, body zinc stores may not be optimal. Zinc concentration in leucocytes, are reported to be lower in those mothers who produced small babies (SGA) compared to those with normal weight babies (AGA).[14] Whether the lowered zinc in leucocytes is casually related to the growth retardation or is merely a marker of fetal growth abnormality needs further elucidation.[2,14]

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