

## ROLE OF MATERNAL AND FOETAL PLASMA ZINC CONCENTRATION IN CONGENITAL MALFORMATIONS

K. SRIVASTAVA ● J. KAR ● U. GUPTA ● S.P.SAXENA ● MITA VERMA ● O.N. PANDEY

### SUMMARY

The aim of obstetric practice is achieved only when a pregnant women is blessed with a normal healthy child, congenital malformation is the unequivocal manifestation of abnormal prenatal development. Zinc deficiency during the antenatal period leads to diverse adverse effects on the new born including fetal mortality, fetal malformations, teratogenecity and intra uterine growth retardation.

Zinc deficiency leads to various congenital malformations of which many affected the CNS and included hydrocephalus and anencephaly and other multi system defects. No significant relationship was found between the age of mother & congenitally malformed child.

In our study serum zinc level of the child was always affected by the serum zinc level of the mother and low levels were associated with greater number of congenital malformations.

### INTRODUCTION

Medically speaking, the most fascinating and eventful period of the child's life is the part spent in-utero. Zinc has been considered important for normal embryogenesis, uterine contractility

and initiation of labour.

Various studies have exhibited that zinc deficiency during the antenatal period leads to fetal mortality, fetal malformation, teratogenecity and intrauterine growth retardation.

Hurley (1981) postulated that zinc deficiency might be a factor in congenital

*Dept. of Biochemistry, Obstet. & Gynec., & Social prev.  
Med. B.R.D. Medical College Gorakhpur  
Accepted for Publication 5.7.95*

abnormalities in human.

Soltan, M.H. and Jenkins, D.M. (1982) reported mean maternal plasma zinc levels to be significantly lower in women who gave birth to congenitally malformed infants than in controls i.e.  $4.032 \pm 2.16$  as compared to  $10.36 \pm 2.04$  micromoles/litre respectively.

Buamah (1984) showed that serum zinc concentrations were lower in the anencephalic pregnancy than in normal control subjects of similar gestational age suggesting that low zinc levels may be an associated factor in the pathogenesis of CNS malformation.

The AIM of this study was to establish a relationship between plasma zinc levels of mother and congenital malformations.

#### **MATERIAL AND METHOD**

This study was conducted in the Deptt. of Obstetrics & Gynecology B.R.D. Medical College, Gorakhpur, in co-operation with the Deptt. of Biochemistry.

Total 110 cases were studied and divided into two groups. 50 normal pregnant females & their normal children formed the control group, while the study group consisted of 60 congenitally malformed babies and their mothers.

A detailed interrogation, full history, routine clinical examination and routine investigations were carried out in all cases.

Serum zinc levels were measured by Double beam atomic absorption spectrophotometer on GBC - 902 model.

Blood was collected in zinc free pyrex glass vials with glass string and stainless steel needle. Samples were collected during or within 24 hours of labour.

Serum was separated after 12 hours by

centrifugation at 3600 g for 10 min. and refrigerated prior to analysis.

Since ordinary glass contains zinc, pyrex glassware were used, which were rinsed with double distilled water after cleaning them with tap water.

#### **OBSERVATIONS & DISCUSSION**

In our study no significant correlation was found between maternal age and congenital malformations.

The incidence of central nervous system anomalies (60%) was more than anomalies pertaining to other systems and included anencephaly, hydrocephalus, meningocele and meningomyelocele.

In our study maximum (28.33%) babies had hydrocephalus and 20% babies were anencephalic.

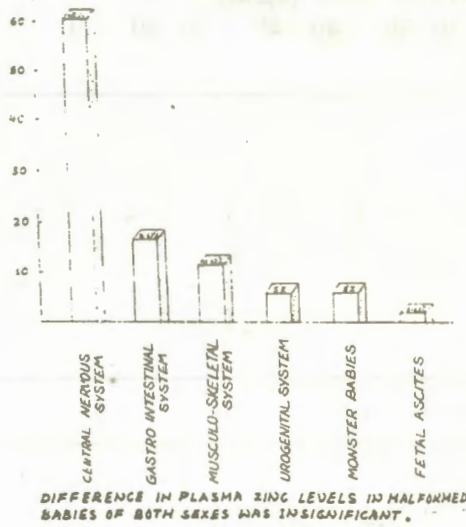
Defects pertaining to the GIT were found in 16.67% cases, there included cleft lip, exomphalos, imperforate anus.

Musculoskeletal system defects were seen in 11.67% cases, there included CTEV, syndactyly. (fig.1)

Hydrocephalus was seen mainly in multigravidae and anencephaly was commoner in primigravidae. Only one patient had previous history of preterm still born anencephalic baby. She delivered a preterm stillborn anencephalic baby during her second labour too. Serum zinc levels of the mother and baby were 28.00 g/dl and 9.75 g/dl respectively.

In the control group (Table 1) the serum zinc level of the child was significantly correlated with the serum zinc level of mother as is evident from the highly significant levels of correlation between the two  $r = 1 + 0.66$ . In the study group (Table II) the serum zinc level of the child

DISTRIBUTION OF STUDY GROUP CASES ACCORDING TO VARIOUS SYSTEMS



DIFFERENCE IN PLASMA ZINC LEVELS IN MALFORMED BABIES OF BOTH SEXES WAS INSIGNIFICANT.

Fig. 1

DISTRIBUTION OF TOTAL CASES ACCORDING TO MEAN SERUM ZINC LEVEL

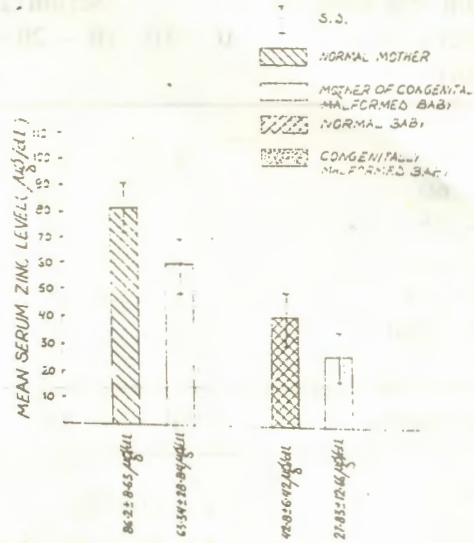


Fig. 2

TABLE I  
RELATIONSHIP OF MOTHER AND CHILD SERUM ZINC LEVEL IN CONTROL GROUP

Serum ZN level of mother (kg/dl)	Serum ZN level of child (kg/dl)				
	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
60 - 70	-	-	1	-	-
70 - 80	-	-	8	4	-
80 - 90	-	-	8	10	-
90 - 100	-	-	-	13	5
100 - 110	-	-	-	-	1
Total (50)	-	-	17	27	6

$r = 1 + 0.66$   
 $y = 6.11$  at 48 d.f.  
 $p < 0.01$

**TABLE II**  
**RELATIONSHIP OF SERUM ZINC LEVEL OF MOTHER AND CHILD**  
**IN STUDY GROUP**

Serum ZN level of mother (kg/dl)	Serum ZN level of child (kg/dl)					
	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
10 - 35	3	8	3	-	-	-
35 - 60	-	5	4	-	-	-
60 - 85	-	1	12	8	7	-
85 - 110	-	-	-	2	2	3
110 - 135	-	-	-	-	-	-
135 - 160	-	1	-	-	1	-
<b>Total (60)</b>	<b>3</b>	<b>15</b>	<b>19</b>	<b>10</b>	<b>10</b>	<b>3</b>

$$r = 0.6536$$

$$t = 6.56 \text{ at } 58 \text{ d.f.}$$

$$p < 0.01$$

was significantly correlated with the serum zinc level of the mother. The linear correlation coefficient between the two zinc levels was found to be  $r = + 0.6536$ s. Serum zinc levels of female and male congenitally malformed babies were not different statistically.

The mean plasma zinc levels as follows :- (fig 2)

Control mother  $86.2 \pm 8.63$  g/dl

Control babies  $42.8 \pm 6.42$  g/dl

Study group mother  $63.34 \pm 28.84$  g/dl

Study group babies  $27.03 \pm 12.66$  g/dl

From our study it is evident that there was a significant relationship between low plasma zinc level of mother and congenital malformation in her baby similar results were found by various authors

(Soltan and Jenkins 1982, Buamah 1984, Kumbhar et al 1985 and Manorama et al 1990)

In our study lowest plasma zinc levels were found in anencephaly 4.50 g/dL and highest in CTEV 52.25 g/dL. Buamah (1984) also showed that serum zinc concentration were lower in the anencephalic baby than in normal control subjects of similar gestational age. This suggests that low serum zinc levels may be an associated factor in the pathogenesis of fetal central nervous system malformation.

In nut-shell, zinc deficiency plays a dynamic role, as a cause of development of congenital malformation in new-borns, especially neural tube defects.

Dietary counselling must be advised

