

## COPPER AND ZINC LEVELS IN MATERNAL AND FETAL CORD BLOOD

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### SUMMARY

Serum Copper and Zinc were estimated in 44 mothers and their new borns cord blood at term. The results were compared with 40 age-matched non-pregnant females and 67 males. None of the subjects had any systemic or hepatic disease. The mean serum copper in non-pregnant female group and in males was 114.6 (S.D. 30.43) and 111.3 (S.D. 30.79) micrograms/dl, while in mothers immediately after delivery was 135.3 ( $\pm$  26.26). This was significantly higher than control female group ( $P < 0.01$ ). In fetal cord blood, it was 35 percent as compared to maternal blood. Serum Zinc in control females and males was 112.8 ( $\pm$  11.94) and 109.9 ( $\pm$  15.69) micrograms/dl respectively. In mothers it was 102.9 ( $\pm$  17.04) which was significantly lower than the control females. In fetal cord blood, it was 98.6 ( $\pm$  12.10) micrograms/dl. No significant difference could be obtained between maternal serum zinc and cord blood levels.

### Introduction

The importance of Cat ions particularly of Copper and Zinc in human reproduction has been recognised during the last three decades. Of the various trace elements, serum copper levels in women fluctuate the most, increasing significantly during pregnancy and during oestrogen administration (Bhar et al, 1975). A linear increase of serum copper from the third to the 9th month has been reported. Dokuman (1968) has shown that serum copper rises throughout the pregnancy with a steep rise at the beginning of the second trimester.

There have been conflicting reports regarding serum zinc during pregnancy and at term. henkin et al (1971) and Halsted et al (1968) found a decrease in serum zinc during pregnancy, whereas O'heary and Spellacy (1969) could not find any change.

In our geographical surroundings, ingestion of copper is more as copper utensils are widely used for cooking purposes. Various compounds of copper are being used by quacks and practitioners of Ayurvedic, Homeopathic and Unani Systems of Medicine. Copper levels have been found to be increased in alcoholic cirrhosis (Narang and Datta, 1982) in alcohol samples consumed by patients (Singh et al, 1986). Indian childhood cirrhosis (Datta

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et al, 1979 & 1981); G.I.T. malignancies (Narang et al, 1987) and in Leprosy (Narang et al, 1988).

Copper and Zinc are closely inter-related at the site of absorption and conversely zinc absorption is greatly increased in copper deficiency states. The present study reports the serum copper and zinc levels in maternal and fetal cord blood.

#### Material and Methods

Forty-four pregnant females aged 20 - 35 years were studied. A thorough general physical examination and relevant investigations were done to exclude any systemic or liver disease. Forty normal healthy non-pregnant females and sixty-seven healthy male volunteers were taken as controls.

5 ml of venous blood was drawn from each subject which includes control females and males, mothers and fetal cord. The blood samples were collected in clean plastic containers free of any copper or zinc content. Serum was separated by centrifugation. 2 ml of serum and equal volume of trichloro-acetic acid (25% to w/v) were mixed and kept for 30 minutes in ice. It was centrifuged and the supernatant was separated. The supernatant was either stored at -20°C until assay or was

directly aspirated into the atomic absorption. Spectrophotometer (Pye Unicam 2900 using slit width 0.4 mm at 324.7 nm for copper and 213.8 nm for zinc). Calibration was done using the standards copper sulphate for copper and zinc oxide for zinc.

#### Results

The mean serum copper in normal healthy males was 111.3 (S.D. 30.79) micrograms/dl (Table I) with the range of 64 - 156 micrograms/dl, whereas in the non-pregnant normal females, it was in the range of 57 - 166 with the mean of 114.6 (S.D. 30.43). The difference was not significant. At term, serum copper in mothers was 135.3 (S.D. 26.26); it ranged between 85 - 170 micrograms/dl and was significantly higher than males as well as non-pregnant females ( $P < 0.01$ ). Copper in fetal cord blood was 35 percent as compared to mother's blood. It was in the range of 31-65 with the mean 47.4 (SD. 10.60).

Serum zinc in males was 109.9 (S.D. 15.69) micrograms/dl ranged between 81-140 and in pregnant females it was 112.8 (S.D. 11.94) micrograms/dl in the range of 81-141. Serum zinc in mothers group was 102.9 (S.D. 17.04) with the range of 78-132 micrograms/dl. It was signifi-

TABLE - I  
SERUM COPPER AND ZINC LEVELS OF MOTHER AND CORD BLOOD AND CONTROLS

Group	Copper (Microgramme/dl)	Zinc
Mother (44)	135.3 ± 26.26*	102.9 ± 17.04
Cord (44)	47.4 ± 10.60	98.6 ± 12.10
Non-pregnant Females (40)	114.6 ± 30.43	112.8 ± 11.94
Males (67)	111.3 ± 30.79	109.9 ± 15.69

\* Means + S.D.

cantly lower than the normal female group ( $P < 0.05$ ). Levels of zinc in the fetal cord blood was in the range of 80-122 with the mean of 98.6 (S.d. 12.10) microgramms/dl.

### Discussion

The present study reports high serum copper levels and low serum zinc levels in mothers immediately after delivery as compared to non-pregnant females. Serum copper was 1/3rd in fetal cord blood as compared to mothers whereas serum zinc was within the normal range. Bhar et al (1975) reported that serum copper level increased progressively throughout the pregnancy. With the onset of labour the level dropped sharply. Thereafter, it remained slightly higher till 4-6 postpartum days. Copper levels of the fetal cord blood was 5.5 times lower than that of maternal blood during labour. On the contrary in the present study fetal cord blood was just three times lower (1/3rd) than the maternal blood.

Prema et al (1980) observed a significant increase of copper and decrease of zinc levels during pregnancy. In the fetal cord blood, copper was five times lower and zinc was two times higher, whereas in our study zinc level remained unchanged in fetal cord blood.

High levels of serum copper in the maternal blood may be due to mobilization of copper from maternal tissues especially from liver. The endogenous estrogen rises during pregnancy, which may be associated with a rise in ceruloplasmin, an enzyme to which the copper is tightly bound. During pregnancy there is considerable increase of serum enzymes. The increase in level of ceruloplasmin may

give rise to increase in copper levels.

Lower serum copper levels of fetal cord blood is due to the fact that copper does not easily diffuse across the placenta but accumulates in the layers of the placenta and from there it is transferred to the fetus by an active process of diffusion according to the needs of the fetus.

As compared to serum copper levels, not much appreciable change could be found in serum zinc levels. It could easily diffuse across the placenta and in fetal cord blood. Zinc levels remained within normal limits.

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