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# Effect of Trace Element on First and Multiple Pregnancy

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**A study of 105 women (40non-pregnant women [control group] and 65pregnant women) attending the child and maternal health center in Mosul, included determination of trace element (zinc, copper, manganese, magnesium and iron)in pregnant women and their effect on the three trimesters of pregnancy and in multiple pregnancy. The results showed significantly lower concentration of serum zinc, manganese, magnesium and iron in pregnant women compared with non-pregnant women at P=0.0001, P=0.05, P=0.005, Pd ≤ 0.001 respectively, while concentration of serum copper clamp up through pregnancy, and the results showed significantly lower concentration of serum zinc in the 1st and 2nd trimesters of pregnancy women compared with non-pregnant women at P<0.05, P<0.005 respectively and significantly lower concentration of serum manganese and magnesium in the 2nd and 3rd trimesters of pregnancy women compared with non-pregnant women at P<0.005, P<0.001 respectively. On the other hand, showed significantly lower concentration of serum iron in the three trimesters of pregnancy women compared with non-pregnant women at P<0.05, P<0.005, P<0.001 respectively. Finally the results showed in pregnant women low concentration of serum zinc and iron in multiple pregnancy compared with first pregnancy and high concentration of copper in multiple pregnancy compared with first pregnancy, while concentration of manganese and magnesium stay equal in spite of multiple pregnancy.**

**Key words:** Multiple pregnancy, Non-pregnant women, Trace elements.

Trace element deficiencies have been documented to play an important role in determination of the fetal outcome. Pregnant women in developing countries have been reported to consume diets with low amount of minerals and vitamins. Deficiencies of trace elements like zinc (Zn), copper (Cu), manganese (Mn), magnesium (Mg), and iron (I) have been implicated in various reproductive events like infertility, pregnancy wastage, congenital anomalies, pregnancy induced hypertension, placental abruption, premature rupture of membranes, still births and low birth weight. The present review article highlights the important of role played by zinc, copper, manganese, magnesium and iron during pregnancy and its outcome. The role of individual trace elements has not been completely documented. There is a need to undertake further studies in this field. Trace elements needed in minute quantities, for normal development and body function[1,2]. Nutritional deficiencies are common during pregnancy. Pregnant women in developing countries have been reported to take diets with a low minerals and vitamins. An inadequate dietary intake before and during pregnancy might be a high risk not only for the mother but also for the fetus[3].

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In this study we evaluated the levels of Zn, Cu, Mn, Mg and I in the serum during pregnancy in an effort to evaluate these elements in such pregnant and to further clarify their role in this state.

## MATERIALS AND METHODS

All materials used for the measurement were obtained from Fluka, Sigma and BSH chemical companies, which are available in the department of chemistry.

Study of (105) women (40 non-pregnant women [control group] and 65 pregnant women) attending the Child and Maternal Health Care Center in Mosul, 65 healthy pregnant at various stages of pregnancy were studied. They were divided into three trimesters. These women had no adverse medical history, blood samples were taken, centrifuged and serum was collected and frozen for Zn, Cu, Mn, Mg and I analysis.

These trace elements are measured by atomic absorption[4]:

1. Zinc (Zn): Preparation of standard curve. Dissolve 0.01gm of zinc metal in 0.3ml of hydrochloric acid. Dilute to 100ml in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption at 213.9nm.
2. Copper (Cu): Preparation of standard curve: Dissolve 0.01gm of copper metal in 0.5ml of 5M nitric acid. Dilute to 100ml in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption at 324.8nm.
3. Manganese (Mn): Preparation of standard curve: Dissolve 0.01gm of Manganese metal in 0.5ml of 5M hydrochloric acid. Dilute to 100ml in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption at 279.5nm.
4. Magnesium (Mg): Preparation of standard curve: Dissolve 0.01gm of magnesium metal in 0.5ml of 5M hydrochloric acid. Dilute to 100ml in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption at 285.2nm.
5. Iron (I): Preparation of standard curve: Dissolve 0.01gm of iron metal in 0.2ml of 5M hydrochloric acid. Dilute to 100ml in a volumetric flask with deionized water, from it we prepare different samples and measured by atomic absorption at 248.3nm.

The statistical methods used to analyses the data include mean, standard deviation, minimum and maximum, while Z-test was used to compare between control and patients.

## RESULTS AND DISCUSSION

Zinc play an important role in body functions, as it is a co-factor for the synthesis of a number of enzymes, DNA and RNA[5]. Zinc deficiency has been associated with complications in pregnancy and delivery, as well as with growth retardation and congenital abnormalities in fetus[6,7]. During pregnancy, there is a decline in circulating zinc possibly due to decrease in zinc binding and increased transfer of zinc from the mother to the fetus[8,9,10].

Serum zinc concentration during pregnancy showed significantly lower value than non-pregnant women as seen in Table(1) and this agree with other studies[11,12], copper is involved in the function of several cuproenzymes that are essential for life[1], copper deficiency during embryonic and fetal development can results in numerous gross structural and biochemical abnormalities. It is estimated that more than 50% of human conceptions faille to implant, and of those implanting, approximately 30% faille to reach full term[13]. Various documents reveal increasing evidence of a significant number of development defects possibly due to inadequate nutrition, including copper, during embryonic and fetal development[14]. The fetus is fully dependent on the maternal copper supply. It has been documented that pregnancy is associated with increased copper retention, which may be partly due to decreased biliary copper excretion by hormonal changes, typical during pregnancy[15].

In addition to the physiological component, here is a physiological component to good parenting. It is the manganese for long time ago called “the mothering nutrient”, manganese levels provide telling biological clues about your feeling toward booth children and parents. Serum manganese concentration during pregnancy showed significantly lower than non-pregnant

women as seen in Table(1) and this agree with cybernation.com studies[16]. In humans a manganese deficiency causes defective ovulation and ovarian degeneration in females and increased infant mortality occurs when the mother lacks manganese during pregnancy.

Magnesium, an essential trace element for the human body, is needed for proper bone formation and in various intracellular enzymatic processes. Magnesium has established its role in obstetrics, it's an essential element to fetal wellbeing. Deficiency of magnesium may be associated with pre-eclampsia and pre-term delivery and possibly with low birth weight[1], magnesium is needed during pregnancy for the baby's and mother's tissue growth. Magnesium is also passed to the baby through breast milk, and as seen in Table(1) low Magnesium level in pregnant women compared with non-pregnant women and this agree with other study's whose found low Magnesium level linked to leg cramps, fluid retention and restless legs during pregnancy[7]

**Table 1.** Comparison of S.Zn, S.Cu, S.Mn, S.Mg and S.I between non-pregnant women and pregnant women.

| Parameters | Non-pregnant | pregnant women No.=40 | P-Value women No.=65 |
|---|---|---|---|
| S.Zn(µmol/l) | 14.79±2.24 | 11.73±5.13*** | 0.0001 |
| S.Cu(µmol/l) | 24.86±5.21 | 25.53±7.80 | 0.6 |
| S.Mn(nmol/l) | 0.102±0.02 | 0.090±0.01*** | 0.001 |
| S.Mg(nmol/l) | 1.02±0.20 | 0.093±0.07* | 0.05 |
| S.I(nmol/l) | 17.44±3.79 | 14.30±5.80** | 0.005 |

*Significant differences at P=0.05 ** Significant differences at P=0.005
*** Significant differences at P≤0.001

**Table 2.** Comparison of S.Zn, S.Cu, S.Mn, S.Mg and S.I between non-pregnant women and three trimesters of pregnant women

| Parameters | Non-pregnant women No.=40 | Pregnant women No.(65) | | |
|---|---|---|---|---|
| | | 1st trimester No.=15 | 2nd trimester No.=30 | 3rd trimester No.=20 |
| S.Zn(µmol/l) | 14.79±2.24 | 11.1±3.59* | 8.78±3.82*** | 10.47±3.22 |
| S.Cu(µmol/l) | 24.86±5.21 | 20.64±7.43 | 24.0±9.64 | 21.01±8.81 |
| S.Mn(nmol/l) | 0.102±0.02 | 0.096±0.023 | 0.088±0.004*** | 0.084±0.005*** |
| S.Mg(nmol/l) | 1.02±0.20 | 0.97±0.17 | 0.92±0.04** | 0.92±0.039** |
| S.I(nmol/l) | 17.44±3.79 | 15.71±1.87** | 12.50±1.003** | 11.05±1.47*** |

*Significant differences at P>0.05 ** Significant differences at P>0.005
*** Significant differences at P>0.001

**Table 3.** Comparison of S.Zn, S.Cu, S.Mn, S.Mg and S.I between first and multiple pregnancy pregnancy women

| Number of pregnancy | S.Zn (µmol/l) | S.Cu (µmol/l) | S.Mn (nmol/l) | S.Mg (nmol/l) | S.I (nmol/l) |
|---|---|---|---|---|---|
| 1 | 10.306±3.89 | 18.76±7.37 | 0.096±0.011 | 0.912±0.32 | 16.059±6.780 |
| 2-4 | 9.101±2.24 | 21.183±7.94 | 0.090±0.003 | 0.977±0.15 | 16.083±5.107* |
| 5≤ | 8.266±3.08 | 20.62±7.15 | 0.098±0.002 | 0.933±0.05 | 12.466±0.075* |

*Significant differences at P=0.05

and we found in the same Table low concentration of iron in pregnant women compared with non-pregnant women. The dramatic increase in blood volume during pregnancy greatly increase your iron needs. Iron is a primary component of hemoglobin, the part of the blood that supplies mother's cells and baby's cells with oxygen.

The values of zinc during pregnancy in Table (2) agree with other studies globally have documented relationships between lowered zinc concentrations during pregnancy and low birth weight, suggesting that there is a threshold for serum zinc concentration below which adverse pregnancy outcome increase significantly[1,17]. During pregnancy serum copper in the mother climbs up its normal level as seen in Table(2), developing babies depend on copper during and beyond pregnancy. Their bodies stock up on the mineral during the final trimester of pregnancy to ensure that copper is available after birth to carry out many metabolic functions. Copper is crucial for the optimal formation of a child's brain and nervous system, it is responsible for production and maintenance of myelin, the material that surrounds and protects nerve and brain cells. Copper also plays a role in making neurotransmitters, chemical messengers that foster communication between nerve cells[18]. Magnesium and manganese in the 2$^{nd}$ and 3$^{rd}$ trimesters of pregnant women are significantly lower than in non-pregnant women ($P > 0.005$, $P > 0.001$) respectively. While Magnesium and manganese in the 1$^{st}$ trimester showed no-significant differences in pregnant women with non-pregnant women as seen in Table(2), and no data available on deficiency of magnesium and manganese a amongst pregnant women and this agree with Pathak and Kapil and cybernation.com studies[1,16], also in Table(2) showed a significantly lower iron level ( $P > 0.005$, $P > 0.001$) respectively in the 1$^{st}$ , 2$^{nd}$ and 3$^{rd}$ trimesters in the pregnant women compared with non-pregnant women, this agree with the results of previous studies[19,20].

The results in Table(3) showed lower concentration of zinc in multiple pregnancy compared with the first pregnancy, but the statistical analysis showed no-significant difference this may be because of zinc is drained from the body and supplemental compensate of zinc deficiency but stay in the lower normal level[9]. On the other hand, the study showed high concentration of copper with multiple pregnancy to rise step by step may be due to it important in developing fetus brain[18]. Concentration of manganese and magnesium stay equal in spite of multiple pregnancy because manganese and magnesium can be easily provided with a normal or vegetarian diet, so that deficiency is rare[21,22].

Finally the results showed lower significant deference of iron concentration compared with first pregnant and multiple pregnancy because the pregnant susceptible to iron deficiency aneamia and multiple pregnancy due to drain iron stores in the body's by big amounts[19,23].

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