# MATERNAL SERUM ZINC CONCENTRATION IN GRAVIDAE SUFFERING FROM PRE-ECLAMPSIA

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## ABSTRACT

Zinc is one of the most intensively investigated mineral during pregnancy. **OBJECTIVE:** To find out the relationship of maternal serum zinc with pre-eclampsia PERIOD 1989 to 1991. **SETTING** Lady Willington Hospital. Lahore, King Edward Medical College, Lahore, Metallurgy Department PCSIR, Lahore. **MATERIALS AND METHODS**: In this prospective study 218 pregnant women were randomly registered during their 1st trimester and followed up till delivery. A group of 46 women remained normal throughout pregnancy and they delivered normal babies by spontaneous vaginal deliveries. Ten women suffered from pre-eclampsia. They were considered as study subjects. Three blood samples were drawn from all subjects each by the end of 1st, 2nd and 3rd trimesters. Serum zinc was analyzed by atomic absorption spectrophotometer. **RESULTS:** Serum zinc levels (Mean ± SD µg/dl ) in normal gravidae by the end of 1st, 2nd and 3rd trimester were 76.57 ± 10.76, 61.98 ± 7.97 and 51.17 ± 8.61 while in pre-eclamptic gravidae, 64.60 ± 7.71, 50.30 ± 6.50 and 25.30 ± 8.97 µg/dl respectively. The pre-eclamptic women had significantly lower ($P<0.001$) levels of serum zinc throughout gestation as compared to normal gravidae. **CONCLUSION**: Low maternal serum zinc levels may have some association with pre-eclampsia.

**KEYWORDS:** Pre-eclampsia, Maternal Serum zinc

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## INTRODUCTION

It is known that maternal serum zinc decreases with the advancement of human pregnancy[1,2,3]. Zinc is required for DNA replication, transcription and cellular replication as it is the metallic component of various related enzymes i.e. DNA polymerase, RNA polymerase and thymidine Kinase[4]. Essentiality of zinc during pregnancy is evident. In zinc deficient animals and women poor outcome of pregnancy is observed[5,6,7] Pre-eclampsia is a multi system disorder involving placenta, liver, kidney, blood, neurological and cardiovascular systems. It is characterized by hypertension associated with

proteinuria in pregnant women which were normal prior to gestation[8] The Incidence of pre-eclampsia is about 05% of the total pregnancies and is higher in primigravidae. Pre-eclampsia is established when diastolic blood pressure >90 mmHg or the increase is >15 mmHg over that of pre-pregnancy level or systolic blood pressure 140 mmHg or the increase is >30 mmHg over pre-pregnancy level and proteinuria >0.3 gm/24 hours . Both maternal and fetal morbidity and mortality are more likely to occur with early onset of the disease. Cerebral haemorrhage and adult respiratory distress are common causes of death in pre-eclampsia[9]. The dietary requirement of zinc is increased during pregnancy[10] and various feto-maternal complications are observed in zinc deficient pregnant animals. This study was therefore designed to find out possible association of maternal serum zinc levels with the toxemia of pregnancy i.e. pregnancy induced hypertension and pre-eclampsia.

## MATERIALS AND METHODS

A total of 218 pregnant women during their 1st trimester were registered at Lady Willington Hospital, Lahore. Among these, 46 subjects remained normal throughout the course of pregnancy and they delivered normal babies by spontaneous vaginal deliveries. These 46 subjects were considered as control. Among the registered subjects 10 women developed pre-eclampsia and these were considered as study subjects. From ante-cubitel vein 05 ml blood was drawn by the end of each trimester. Serum was separated and analysed immediately for total serum proteins[12] and serum albumin[13]. Serum for analysis of zinc were stored at –20°C in metal free plastic tubes. Zinc was analysed by atomic absorption spectrophotometer[14] . Statistical analysis of the two groups was done by "t" test using the standard error of the difference[15].

## RESULTS

The level of maternal serum zinc, total proteins and albumin in normal gravidae and pre-eclamptic subjects along with their comparison is shown in the Tables I, II and III.

**TABLE-I: Levels (mean ± S.D.) of serum zinc, total protein and albumin in normal gravidae.**

| Serum level | Ist Term *n=46* | 2nd Term *n=46* | 3rd Term *n=46* |
|---|---|---|---|
| Zinc ug/d | 76.57±10.76 | 61.98±7.97 | 51.17±8.61 |
| Total protein g/dl | 06.05± 0.24 | 05.84±0.22 | 05.76 ± .25 |
| Albumin g/dl | 03.94± 0.24 | 03.70±0.16 | 03.60± .19 |

**TABLE-II: Levels (mean ± S.D.) of serum zinc, total protein and albumin in pre-eclamptic gravidae.**

| Serum level | Ist Term *n=10* | 2nd Term *n=10* | 3rd Term *n=10* |
|---|---|---|---|
| Zinc ug/d | 64.6 ± 7.71 | 50.3 ± 6.50 | 25.3±8.97 |
| Total protein g/dl | 6.02 ± 0.19 | 5.77 ± 0.10 | 4.52 ± 0.31 |
| Albumin g/dl | 3.93 ± 0.15 | 3.60 ± 0.15 | 2.18 ± 0.23 |

**TABLE-III: Comparison of serum zinc in normal and pre-eclamptic gravidae.**

| Terms | XI-X2 | S.E.of diff. | t. value | p.value | Significance |
|---|---|---|---|---|---|
| 1st | 11.97 | 3.60 | 3.33 | p<0.01 | S |
| 2nd | 11.68 | 2.71 | 4.31 | p<0.001 | H.S. |
| 3rd | 25.87 | 3.03 | 8.54 | p<0.001 | H.S. |

***Abbreviations:***

*Trim:Trimester, XI: mean of normal gravidae. X2: mean of pre-eclamptic gravidae. SE.diff: standard error of difference. S.D: Standard deviation. S: significant. H: highly, µg: microgram, g: gram, n: number of subjects, >: equal to or greater. >: greater than.*

The decrease in maternal serum zinc levels in pre-eclamptic gravidae is highly significant during 2nd and 3rd trimesters as compared to the normal gravidae.

## DISCUSSION

There is progressive decline in the level of serum zinc from 1st trimester to the 3rd trimester both in normal and the pre-eclamptic gravidae. The progressive hypozincemia of pregnancy is due to plasma expansion[16] , enhanced endogenous steroid production[17] and fetal uptake of zinc from maternal plasma[18] . The levels of serum zinc in each trimester among pre-eclamptic gravidae is significantly lower than the normal gravidae. The more rapid decline of serum zinc in pre-eclamptic women may be due to hypoalbuminemia resulting from albuminuria. About 65% serum zinc is bound to albumin[07]. The loss of albumin bound zinc is a major cause of gross hypozincemia in pre-eclamptic gravidae. Secondly fetal uptake of zinc is one of the causes of maternal hypozincemia. In this study significantly higher birth weight babies were delivered by pre-eclamptic mothers than the normal gravidae. So the relatively increased uptake of zinc by high birth weight babies belonging to pre-eclamptic mothers may be a cause of more rapid hypozincemia. Such type of findings are also reported in other studies[19].

The effects of hypozincemia on pre-eclampsia has not yet established. Some investigators have hypothesized a relationship between zinc and prostaglandin utilization in the development of pregnancy induced hypertension[20] . However others have suggested that marginal zinc deficiency state and low dietary protein might confer an increased sensitivity to cadmium toxicity, sodium retention, altered catecholamine metabolism, increased rennin activity and resultant hypertension[21]. Most of the subjects in this study belong to low socioeconomic class. Their dietary intake of protein was inadequate than the Recommended Dietary Allowance. Low protein intake alongwith hypozincemia may aggravate the toxic effects of cadmium resulting in hypertension. Zinc is metallic component of the enzyme superoxide dismutase[7]. which causes protection from damage by the free radicals. Recent studies show beneficial effects of supplementing antioxidants to pre-eclamptic gravidae[22]. So hypozinemia suppressing the activity of superoxide dismutase may be a precipitating factor of pre-celampsia. However further studies are required to find out the effects of hypozincemia on pre-eclampsia.

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