

Zinc Deficiency in Pregnancy: A Dietary Health Problem

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Zinc is an important micro-nutrient in pregnancy. The maternal serum zinc levels were used as an index of zinc status in 55 pregnant women and was compared with the incidence of complications during the antenatal period. The mean value of plasma zinc in 15 non-pregnant, age matched controls (mean 54 ± 5.2 SD) was used as a cut off point to subdivide the patient population into 'low' and 'high' groups. An association of complications like mild toxemia ($P < 0.05$) vaginitis ($P < 0.05$) and post dates ($P < 0.05$) in the antenatal period was recorded with low levels of maternal serum zinc. It was concluded that a low serum zinc level is a valid predictor of pregnancy complications. The results suggest that serum zinc screening, as part of the patient's antenatal evaluation should be evaluated.

Key words: Pregnancy, Micronutrient.

The essential role of zinc in the maintenance of structure of biomembranes, DNA and RNA synthesis and metabolism of essential fatty acids makes it an extremely important micronutrient in pregnancy¹. A close association has been reported between zinc status and normal foetal growth. An abnormal zinc nutriture has also been associated with an increased rate of malformations and premature rupture of membranes². The relationship between low maternal serum zinc levels and intrauterine growth retardation created special forms of interest amongst research workers in 1992³. Although some studies have failed to show a clear association between zinc status and IUGR; others have found low maternal zinc levels to be the strongest predictor for low birth weight⁴. Certain studies have also indicated that women experiencing hypertension and/or toxemia during pregnancy had significantly lower serum zinc levels⁵.

The present and past antenatal health care system somehow has been focussed on conventional iron deficiency therapy but the latest and recent emphasis for the development of anemia in pregnancy needs more emphasis for a better health care provision not only to the mother but also for the foetus. The reported incidence of zinc deficiency in pregnancy is 1 in every 10th pregnancies in the developing countries⁶.

This study was designed to evaluate not only the effects of usual dietary intake of zinc during pregnancy on serum zinc concentrations but also to evaluate the zinc dietary deficiency problem which could be a helpful parameter for antenatal health care of pregnant women.

Subjects and methods

The subjects ($n=55$) women, were studied during their third trimester at Lady Aitchison Hospital, Lahore while 15 age matched non pregnant females were included as control cases. All women were enrolled after explanation of the purpose of study. Antepartum risk factors were recorded on clinical proforma. The patient inclusion criterion for mild toxemia of pregnancy was based on blood pressure or generalized edema and/or proteinuria

were used as additional diagnostic criteria.

Obstetric estimates of gestational age were based on the patient's menstrual history, the first audible foetal heart tones, quickening, and progression of fundal height.

In order to assess the patient's zinc status, 5 ml of venous blood was obtained from the pregnant women with disposable syringes. Samples were allowed to clot and then serum was obtained by centrifugation. Serum was stored in plastic tubes which were first made zinc free by washing with nitric acid. Zinc was analysed by flame atomic absorption spectrometer at PCSIR Laboratories, Lahore through the courtesy of Director.

Data Analysis:

The median values for serum zinc level were compared with the control group values. Student's 'T' test was applied. Results were considered significant if $P < 0.05$.

Results

Maternal age ranged from 16 to 39 years with a mean age of $23.3 \pm SD 4.2$ years. Parity ranged from 0 – 7. Significant differences for either age or parity were observed between the subdivided groups for serum zinc. Significant differences in serum zinc level were observed in patients with parity >3 . (six of the multiparous women had low serum zinc levels). The relationship between patient's age and serum zinc levels were striking. Almost two thirds of patients older than 27 years were in the low group (Table I).

The mean values observed in the control group were used as the cut off point to subdivide the patient groups ($54 \pm 5.2 \mu\text{g}/\text{dl}$). The means, SDs and ranges for serum zinc level is shown in the table (Table II).

A low level of maternal serum zinc was associated with more complications in the antenatal period. The significant findings for serum zinc levels in antenatal period is shown in the next table (Table-III). Plasma zinc levels less than the mean control value were more commonly associated with mild toxemia, vaginitis and post dates (>12 weeks).

Table I Ranges and mean values of serum zinc levels in low and high groups (microgram/decilitre values).

Serum Zinc Level.	No. of subjects	Mean \pm SD Micro gm/dl	Ranges Micro gm/dl
Controls	15	54 \pm 5.2	29 - 58
Low group	35	47.4 \pm 6.1	29 - 54
High group	20	60.3 \pm 6.8	> 54 - 100

Table II Distribution of age and parity in low and high groups on the basis of serum zinc level.

Serum Zinc Level	No. of subjects	Age In years		Parity	
		Mean \pm SD	Range	Mean \pm SD	Range
Low	35	25.3 \pm 4.6	16-42	1.3 \pm 1.3*	0-5
High	20	29.9 \pm 5.8	16-44	1.9 \pm 1.4*	0-7

* Significant difference between low and high sub groups $P < 0.05$.

Table III Relationship between serum zinc levels and antenatal risk factors.

Factors	Serum Zinc n=55		P Values
	Low (%) (n=35)	High (%) (n=20)	
Mild toxemia	4.8	0.8	<0.05
Vaginitis	8.6	3.4	<0.05
Post term >42 weeks.	4.1	0	<0.05

• Statistically significant.

Discussion

Zinc is present and is indispensable to all forms of life, and is essential for the normal growth of human beings. Zinc deficiency has been incriminated in infertility, abortions, malformations, fetal intrauterine growth retardation, premature and postmature births, perinatal death and abnormal deliveries with dystocia and placental ablation.

Serum levels of zinc are known to decrease during pregnancy but predicting how much an individual patient's level will decrease is difficult. In our study we used the mean value of the control sample (54 \pm 5.2 μ g/dl) as the cut

off point. Other studies have shown similar results⁷. A minimum of 40 μ g/dl has been suggested as a tentative standard for the lower limit of serum zinc concentrations at term⁸. However in two studies in which 25% of women had values less than 40 μ g/dl, these women still had normal outcomes. In our study patients with values below the control values (mean 47.4 \pm 6.1 μ g/dl) were more likely to have antenatal complications than those with levels above the median (mean 60.3 \pm 6.8 μ g/dl)⁹.

Low serum zinc levels were associated with more antenatal complications in this study and in several other studies¹⁰. The development of mild toxemia in the low serum zinc level group may be related to hypoalbuminemia¹¹. However others have suggested that it might confer an increased sensitivity to cadmium toxicity, a condition that may in turn result in vasoconstriction, sodium retention, altered catecholamine metabolism, increased renin activity and resultant hypertension¹².

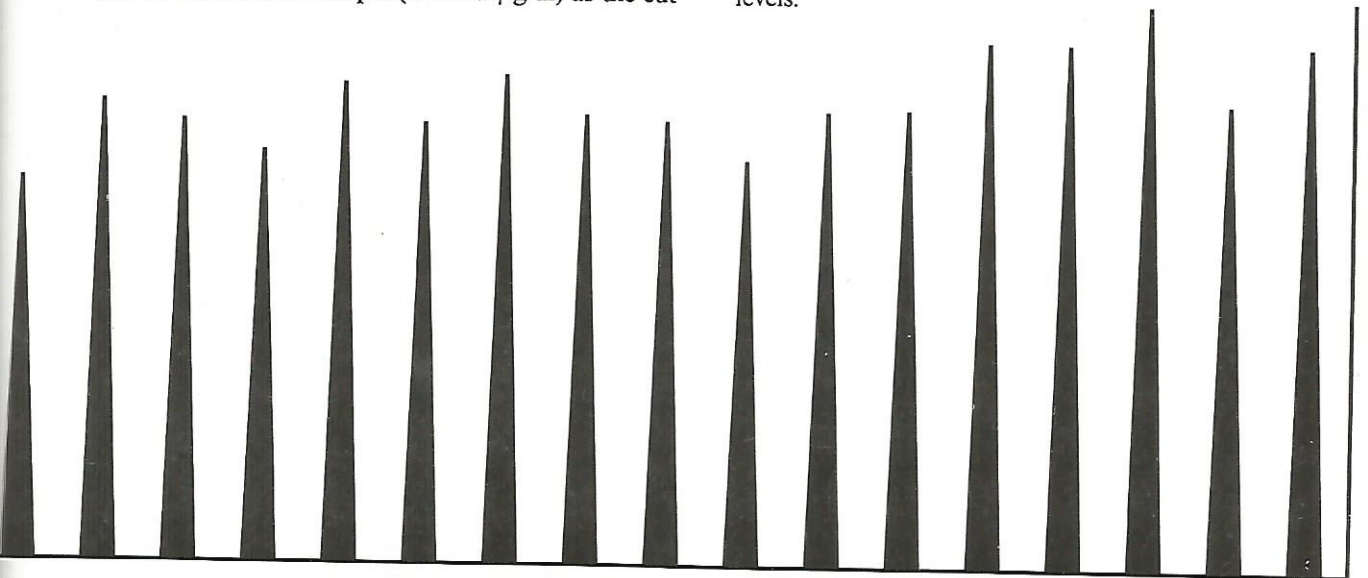
It is becoming increasingly clear that zinc deficiency has a broad effect on immune responses but the mechanism is not clearly understood. Nevertheless, the finding that patients with low serum zinc levels had a higher incidence of vaginitis is consistent with the role of zinc in immune responses. These findings are compatible with another study by Salvin and Rabin¹³.

Why lowered serum zinc level is related to prolonged gestation (42 weeks) is unclear but the findings of the study agree with studies by Tamura¹⁴. Apparently, zinc is related to some factor governing the length of gestation.

Additional studies of prophylactic zinc supplementation are needed.

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Fig. 1 Graphic record of serum zinc levels (μ gm/dl) in pregnant females

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