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ZINC TASTE TEST IN PREGNANT WOMEN AND ITS CORRELATION WITH SERUM ZINC LEVEL

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Abstract. Pregnant women in different trimesters of pregancy were divided into control (n = 58) and study (n = 104) groups. Study group subjects were given 45 mg zinc/p.o./ day as 200 mg 'zinc sulphate tablets from the day of reporting till term. Body zinc status was clinically assessed by 'zinc taste test'. Blood samples were drawn at the same time and serum zinc levels measured. Zinc taste test scores decreased with advancement of pregancy ($P < 0.05$) and increased significantly following zinc administration ($P<0.05$). Serum zinc level declined significantly with advancement of preganancy ($P<0.001$). Following zinc administration, serum zinc level increased significantly ($P<0.001$). Accuracy of zinc taste test in individual cases ranged between 70 and 100 percent. On the whole, zinc taste test was well correlated with serum zinc level, and provides a fair idea of zinc deficiency.

Key words : oral zinc serum zinc zinc taste test pregnancy

INTRODUCTION

Women whose diets are marginally adequate in zinc, might develop deficiency due to known increased demands during pregnancy. However clinical manifestations of mild zinc deficiency are ill defined, although an association between anaemia and zinc deficiency have been reported (1). Several studies have reported associations between prenatal serum zinc concentrations and fetal congenital malformations, low birth weight and other complications at birth (2, 3).

Alteration in taste associated with zinc deficiency has commonly been used as a measure of the extent of deficiency. Metallic taste of zinc is perceived during its deficiency. On this basis a zinc taste test (ZTT) has been devised to detect zinc deficiency which has been claimed to reflect the body zinc status (4). The present investigation was designed to investigate how well does Zinc Taste Test correlate with the serum levels of zinc for which pregnant women were selected as these are likely to present wide spectrum of zinc deficiency.

METHODS

Pregnant women were recruited on voluntary basis from Gynaecology & Obstetrics outpatients and antenatal clinic of J.N. Medical College, A.M.U., Aligarh. Pregnancy was established by history, obstetrical checkup and presence of human chorionic gonadotrophin in urine. Period of gestation was determined and women were placed in subgroup I, II & III, according to the trimester of pregnancy. Subjects with associated cardiac, renal or hepatic disease and those habitual of tobacco or betel chewing were excluded from study.

Subjects were clinically tested for zinc deficiency by means of 'zinc taste test' (ZTT)4. This simple test is based on the observation that zinc deficiency leads to failure of perception of metallic taste of zinc. The

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kit for this test was supplied by M/s Yash Pharma Laboratories Pvt. Ltd., Bombay. It consists of a colourless 1% solution of zinc sulphate in distilled water. 2 ml of this solution were instilled into the oral cavity of subjects who were asked to retain it for 10 seconds without swallowing. Clinical grading was done on the basis of the score (ZTTS) they received. Scoring was done in the following manner.

	Zinc taste test score	*Zinc status of subject*
No particular taste sensation within 10 seconds	1	Zinc deficient
Perception of a peculiar taste after a few seconds	2	Zinc deficient
Distinctive taste is perceived immediately but is not a nasty one	3	No zinc deficiency
Perception of a very nasty, distinctive taste straightaway	4	No zinc deficiency

Collection of blood and estimation of serum zinc: 5 ml of nonfasting venous blood was collected with aseptic precautions in sterilized plastic vials. The vials were kept at room temperature till serum separated, which was then transferred to fresh vials. Serum samples were stored at 4°C and serum zinc level was estimated within 72 hours of collection by G.B.C. 902 Double Beam Atomic Absorption Spectrophotometer.

Subjects were then randomly assigned to untreated (control) and zinc treated (study) groups. Number of subjects finally selected for study was 58 in the control group, and 104 in the study group. The study group subjects were asked to take one 200 mg zinc tablet (containing 45 mg elemental zinc) per day from the day of reporting till term. Subjects were instructed to take zinc tablets after lunch to avoid gastric irritation, and also to avoid interference with absorption of the morning and evening doses of haematinics and calcium. Control group was given identical tablets of vitamin B complex.

Zinc taste test scoring and collection and analysis of blood samples were done on the same day in each trimester of pregnancy, and also at term. Statistical analysis of data was done by Student's 't' test and 'Z' test for proportion.

RESULTS

I Trimester: On recruitment of subjects to the study during I trimester of pregnancy, none had ZTTS as 1, while 34, 20 and 2 had score 2, 3 and 4. This was also reflected in their serum zinc level (Table II).

TABLE I: Relationship between Zinc Taste Test score and number of pregnant subjects having normal and below normal serum zinc levels (μg/dl). (Data are before zinc supplementations)

Zinc taste test score	*Number of pregnant subject*								
	Normal serum zinc (90-110 μg/dl)			*Below normal serum zinc (<90 μg/dl)*			*Accuracy of zinc taste test %*		
	Trimester of pregnancy			*Trimester of pregnancy*			*Trimester of pregnancy*		
	I	II	III	I	II	III	I	II	III
1	—	6	5	—	32	40	—	84.21	88.88
2	8	14	4	26	49	17	76.47	77.77	80.95
3	15	7	4	5	3	—	75.0	70.0	100.0
4	2	—	—	—	—	—	100.0	—	—

TABLE II: Relationship between zinc taste test score and serum zinc level (μg/dl) of pregnant women, before and after treatment with oral zinc. (Mean±SEM)

Zinc taste test score	*Number of subjects*		*Serum zinc level (μg/dl, Mean±SEM)*	
	Pre treatment	*Post Treatment*	*Pre treatment*	*Post Treatment*
Subgroup I: >6-9 months treatment with zinc sulphate				
1	—	—	—	—
2	34	—	100.58±3.42	—
3	20	—	113.92±4.85	—
4	2	—	115.0±11.50	—
Subgroup II: >3-6 months treatment with zinc sulphate				
1	38	—	96.80±5.68	—
2	63	—	98.46±3.12	—
3	10	17	105.65±14.16	188.88±6.06*
4	—	30	—	207.10±7.51
Sub-group III: 1-3 months treatment with zinc sulphate				
1	45	—	80.11±1.17	—
2	21	—	85.52±3.15	—
3	4	45	104.66±7.65	198.63±5.11
4	—	57	—	212.73±3.80

*P<0.001 vs pretreatment

II Trimester: During II trimester the subjects had ZTTS as 1(38), 2(63) and 3(10). None had score 4. Following oral Zn thereapy for the entire duration of pregnancy their ZTTS increased to 3(17) and 4(30) and also their serum zinc levels increased significantly (P<0.001, Table II).

III Trimester: Subjects in III trimester of pregnancy had ZTTS as 1(45), 2(21), and 3(4). None had score 4. Following zinc administration, the ZTTS of all subjects increased to 3(45) and 4(57) (Table II).

Accuracy of Zinc Taste Test (ZTT)

I Trimester: Zinc deficiency was detected in 34 of the 56 women during I trimester of pregnancy on the basis of ZTTS. The test correlated well in 26 women whose serum Zn level was also below normal, while in remaining 8, it was normal, although at a lower range of the limit. The ZTT correlates well with serum zinc level in 76.47% of the subjects. Similar was the observation with 20 subjects having ZTTS 3. Of these, 5 subjects had lower than normal serum zinc level, showing a ZTT accuracy of 75%. Two subjects with ZTTS 4 had normal serum zinc, the accuracy of ZTT being 100% in these cases.

II Trimester: Zinc deficiency was detected in 38 subjects, by means of ZTT (ZTTS1). The ZTT correlated well in 32 of these subjects whose serum zinc level was below normal. 6 women tested positive for zinc deficiency by ZTT, although their serum zinc was normal. The ZTT is accurate in 84.21% of these 38 subjects.

Similarly 63 subjects were detected as zinc deficient by ZTT (ZTTS 2). ZTT correlated with serum zinc in 49 of them, their serum zinc being below normal. In remaining 14 subjects serum zinc was normal, while ZTT showed zinc deficiency. Thus the accuracy of ZTT is 77.77% in these. 10 subjects had ZTTS 3 and were not zinc dificient clinically. However, 3 of these subjects had below normal serum zinc, the accuracy of ZTT being 70% in these subjects.

III Trimester: 45 subjects showed zinc deficiency by ZTT (ZTTS 1), but 5 of them had normal serum zinc, the accuracy of ZTT being 88.88% in these cases. Similarly 21 subjects showed clinical zinc deficiency (ZTTS 2), but 4 of these had normal serum zinc. Thus, the accuracy of ZTT for these subjects was 80.95%. In 4 subjects, ZTT showed no zinc dificiency (ZTTS 3). Their serum zinc was normal. The accuracy of ZTT was 100%.

DISCUSSION

Several factors operate in determining the level of zinc in serum during pregnancy. Although the total zinc content of body may be with in normal limits, serum levels may still show a declining trend (5). Important contributory factor is gradual increase in glucocorticoid level which may attain levels 2-3 times as compared to those in nonpregnant women. This increase is maximum during third trimester, Serum zinc changes reciprocally with changes in glucocorticoid levels (6). Another contributing factor is decrease in serum albumin concentration secondary to hypovolemia combined with decreased affinity of albumin which cause further fall in serum zinc level (7, 8).

Zinc plays pivotal role in the perceptions of taste. Its deficiency has been reported to lead to dysgeusia i.e. altered taste sensation (9, 10). concentration of zinc in saliva and serum are same and do not vary with age (9). Although zinc has been found in saliva as well as in taste buds, the mechanism by which it plays a role in perception of taste is not clear (4). During deficiency the taste of metalic zinc is not perceived well. This is the basis on which ZTT has been designed (4). Taste perception may be affected by a number of factors other than zinc deficiency. These include neurological nutritional endocrinal and local factors, viral infections and a number of drugs (11). In the present study, all these factors, which could affect taste perception, were ruled out.

Zinc taste test may not accurately indicate body zinc status and due to the coexisting additional factors it may at times may not exactly correlate well with serum zinc level. One such situation is provided during pregnancy where physological changes associated may influence the link between zinc status of body and serum zinc level. Under such a situation the accuracy of ZTT may be compromised. Further, the deficiency although reflected in lowered serum zinc level may not indicate the deficiency in total zinc content of the body. Regular daily zinc supplementation to the subjects included in the study for months not only replinished the body stores but also raised serum zinc levels well above normal limits (Table II). The ZTTS in these subjects increased from 1, 2, or 3 to 4, (post treatment) accuracy being 100%.

The accuracy of ZTT has been shown to be 98% in a series of clinical trials in British subjects (12). However, such high accuracy of ZTT was found in non-pregnant females and male subjects identified as having considerable zinc deficiency. In the present study where the subjects of study were pregnant women the accuracy or ZTT in diagnosing zinc deficiency has ranged between 70-89%. This may be attrubuted to associated pregnancy wherein physiological changes like increase in cortisol level, reduction in plasma albumin and lower affinity of zinc to albumin may manifest as appparant zinc deficiency although the total body zinc content may still be within normal limits.

The decline and increase in serum zinc and ZTTS were fairly well correlated, ZTT is a sufficiently reliable guide to zinc deficiency. Because of the ease care in performance, it can be carried out in outpatients departments and in places where facilities for estimation of zinc are not available.

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