

Original Article

Serum Zinc Level in Pre-eclamptic Pregnancies: Association with Clinical Complication

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Abstract

Pre-eclampsia is one of the fatal complications in pregnancy. Zinc plays an important role in the course and eventual outcome of human pregnancy, and is essential for normal embryogenesis and fetal growth. Zinc deficiency in pregnancy is thought to be associated with pre-eclampsia. The aim of this study was, therefore, to investigate the serum zinc level in pre-eclampsia and to examine its association (if any) with pre-eclampsia. A case control study was done among 45 pre-eclamptic and 35 normotensive pregnant at their third trimester. Serum zinc concentration was determined by Atomic Absorption Flame Spectrophotometric method. Correlative analysis was made to find any correlation, of serum

zinc with blood Pressure. Results showed identical Maternal and gestational age, and different gravida distribution for the patients and controls, and significantly ($P < 0.005$) higher blood pressures (systolic and diastolic) for pre-eclampsia. Serum zinc concentration were estimated $0.65 \pm 0.09 \text{ mg/L}$ in pre-eclampsia and $0.60 \pm 0.08 \text{ mg/L}$ in pregnant controls, difference of which was insignificant ($p = 0.284$). Correlative analysis showed that there was a linear correlation between serum level and diastolic blood pressure, but it was found to be insignificant ($r = 0.158$, $p = 0.330$). It was suggested that changes in zinc status may not be an etiological or contributory factor in pre-eclampsia.

Key words: Serum zinc, pre-eclampsia, diastolic blood pressure

Introduction

Pre-eclampsia is one of the fatal complications in pregnancy.¹ It is a leading cause of maternal and perinatal morbidity and mortality in the world.^{2,3} The etiology and pathogenesis of pre-eclampsia is still unknown. It has been documented that pre-eclampsia is accompanied with oxidative stress that contributes to vascular dysfunction.^{4,5}

Zinc plays an important role in the course and eventual outcome of human pregnancy. Zinc is essential for normal embryogenesis and fetal growth, and has importance for the antibacterial activity of amniotic fluid, uterine contractility, and initiation of labour.⁶ It has been suggested that the placenta actively provides the fetus with zinc. In pre-eclampsia, there are conflicting reports on the changes in maternal serum/plasma zinc concentration. It is reported as low⁷, high⁸ and as normal.⁷ Zinc deficiency in pregnancy is thought to be associated with certain pregnancy

complication like pre-eclampsia⁹. The present study has, therefore, attempted to analyse serum zinc level in pre-eclampsia and to examine its relation with this complication.

Materials and Methods

Study population: This was a case control study. The study population consisted of 45 pre-eclamptic pregnant and 35 normotensive pregnant of singleton gestations in their third trimester. The subjects were prospectively recruited under defined criteria from the Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University, Dhaka. Pre-eclampsia patients were 28 to 42 weeks of singleton gestation, one measurement of diastolic pressure of 110 mmHg or more, or two measurements of 90 mmHg or more on two consecutive occasions 6 hours or more apart, urinary protein 2+ or more (100mg/dl; dipstick reagent strip, Boehringer Mannheim, Germany). Patients with history of hypertension and proteinuria before conception or before 20 weeks of gestation, any associated medical disorders were excluded from the study. Age and socioeconomic-matched healthy normotensives of same age and singleton gestation with nil urinary protein were recruited by convenience. Ethical clearance was taken from the head of the Institute.

Serum analysis: A venous blood sample (5ml) was collected from antecubital vein of each of the case and

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control subjects. Blood sample was kept undisturbed for at least 60 min and was then centrifuged at 3000rpm for 10 min. Serum thus extracted was stored at -20°C for analysis of minerals.

Concentrations of zinc in the sera were determined by Atomic Absorption Flame Spectrophotometry as described by Hossain et al¹⁰. Standard zinc (Sigma Chemicals Co, USA) was used for calibration of standard graph. Absorbances for zinc was read at 213.9nm in an Atomic Absorption Flame Spectrophotometer (AA-6200 Series, Shimadzu Corporation, Kyoto, Japan). To verify the assay accuracy and validation, the standard preparation was run for every ten test samples. A software package (AA-6200, ver 1.1, Shimadzu Corporation, Kyoto, Japan) was used to calculate the zinc concentration. In order to avoid the trace element contamination, adequate precaution was taken collection of blood and subsequent handling of sera.

Statistical analysis: SPSS software package (version 10.0, SPSS Inc. Chicago, USA) was used to analyse the data. Descriptive statistics were calculated for all variables. Values were expressed as percentage and mean \pm SD. Comparison of serum zinc concentrations between subjects and controls were performed by cross table variables and independent sample t-test. A correlation analysis was made to find any association between blood pressure and serum zinc concentration.

Results

Table-I shows the clinical parameters of the pre-eclampsia patients and normotensive pregnant controls. The mean maternal and gestational age of the patients and controls were found to be same. The gravida distribution was found different, but had nearly same proteinurea. As predicted by definition, the systolic and diastolic pressures of pre-eclampsia patients were significantly ($P < 0.005$) higher than those of the pregnant controls.

Serum zinc levels of pre-eclampsia and pregnant controls are presented in table-II. Spreading of the patients and controls in low, middle and upper range of zinc was nearly equal. Serum zinc concentration in pre-eclampsia was 0.65 ± 0.09 mg/L, and it was 0.60 ± 0.08 mg/L in pregnant controls. The difference in serum zinc concentration between pre-eclampsia and pregnant control was found insignificant ($p = 0.284$). Comparison of zinc level of pregnant control (0.60 ± 0.08 mg/L) with that of pre-eclampsia having diastole > 110 mmHg ($n = 18$) was found increase (0.65 ± 0.14 mg/L) but it was insignificant ($p = 0.724$).

Correlative analysis showed that there was a linear correlation between pre-eclamptic serum zinc level and diastolic blood pressure, but it was found to be insignificant ($r = 0.158$, $p = 0.330$). No correlation was observed between maternal characteristics and serum zinc concentration.

Table I
Maternal characteristics of pre-eclampsia and normotensive pregnant

Maternal Characteristics	Pre-eclampsia	Pregnant	P-value
Maternal age (year)	23.91 \pm 5.41	24.11 \pm 4.93	Not significant
Gestational age (wk) at sampling	35.60 \pm 3.85	37.23 \pm 2.64	
Gravida in no (%)			
primi	19(41)	12(34)	
multi	26(59)	23(66)	
Proteinurea	2+(26)	nil	
	3+ (18)		
Systolic blood pressure (mmHg)	160.68 \pm 22.61	109.86 \pm 9.27	P-0.001
Diastolic blood pressure (mmHg)	109.16 \pm 15.21	72.29 \pm 7.81	

Values were expressed in mean \pm SD.

Descriptive Statistics: frequencies, descriptive, crosstabs
Compare Means: Independent-samples t-test

Table II
Serum zinc concentrations in pre-eclampsia and normotensive pregnant

Zinc ($\mu\text{mol/L}$)	Pre-eclampsia (n=45)		Pregnant control (n=35)		P value
	n (%)	mean \pm SD	n (%)	mean \pm SD	
<0.350	15(33.3)		12(34.3)		
0.351-0.575	16(35.6)	0.65 \pm 0.14	11(31.4)	0.60 \pm 0.08	P=0.284
>0.575	14(31.1)		12(34.3)		

Values were expressed in mean \pm SD.

Descriptive Statistics: frequencies, descriptive, crosstabs

Compare Means: Independent-samples t-test

Discussion

The etiology of pre-eclampsia is inconclusive. The role of zinc and oxidative stress in pre-eclampsia is also yet not clear. Oxidative stress is thought to be associated with preeclampsia.^{3,4,11} Serum antioxidant activity has been reported to be increasing progressively throughout pregnancy.¹¹⁻¹³ Furthermore, it is reported that zinc deficiency implicates in hypertension during pregnancy¹⁴, and its supplementation reduces the incidence of pre-eclampsia, even though the serum zinc level remained within normal range's. This study has, therefore, attempted to analyse serum zinc level in pre-eclampsia and also to examine its relation with this complication.

It was shown that serum zinc concentration was not altered significantly in pre-eclampsia; it was nearly same as of the pregnant control. This outcome is consistent as reported by Lao et al.^{7,9} However, there are some conflicting reports on the changes in maternal serum zinc level in pre-eclampsia.^{7,16,17} In this study, although there was a linear correlation between pre-eclamptic serum zinc level and diastolic blood pressure, but the correlation between maternal serum zinc concentration, and diastolic blood pressure and maternal characteristics was insignificant. This outcome is consistent to some extent to the report of Hubel et al.⁴

Our results suggest that changes in zinc status may not be an etiological or contributory factor in pre-eclampsia; plasma/serum zinc level may not be a useful indice of pre-eclampsia. However, further studies with a larger sample size may contribute to Find out the possibility of potential role of zinc in pre-eclampsia.

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