Plasma and erythrocyte zinc and birth weight in pre-eclamptic pregnancies

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Summary. Plasma and erythrocyte zinc concentrations in 45 proteinuric pre-eclamptic Chinese women were measured. There was no difference in either the plasma or erythrocyte zinc concentration between pre-eclamptic patients with and without intrauterine growth retardation. There was no correlation between either plasma or erythrocyte zinc concentration with the gestation at delivery, birth weight, mean arterial pressure and plasma albumin concentration. On the other hand, both plasma albumin concentration and mean arterial pressure were significantly correlated to birth weight, and the mean arterial pressure was also significantly higher in patients with intrauterine growth retardation. Plasma and erythrocyte zinc are not useful as indices of severity in pre-eclampsia.

Key words: Plasma zinc – Erythrocyte zinc – Pre-eclampsia

Introduction

In pre-eclamptic pregnancies, maternal serum/plasma zinc concentration has both been reported as low [3, 10] as well as normal [6, 11] when compared to pregnant controls, and the placental zinc content was found to be lower [2]. Erythrocyte carbonic anhydrase, a zinc metalloenzyme, was found to increase in pregnancy due to the effect of progesterone, and this increase was not observed in a hypertensive woman [15]. While fetal growth retardation has been reported in association with low blood [8] and tissue (leukocyte) [12] zinc concentrations, there is little information on maternal zinc status and growth retardation in pre-eclamptic pregnancies. The present study was performed to determine the concentrations of erythrocyte and plasma zinc in pre-eclamptic patients with and without fetal growth retardation and the relationship between these concentra-
tions and features that reflect the severity of pre-eclampsia such as gestational age at delivery, plasma albumin concentration [17], and mean arterial pressure.

Materials and methods

Forty-five Chinese women with singleton pregnancies and proteinuric pre-eclampsia were studied after obtaining informed consent. The diagnosis of pre-eclampsia was based on the criteria of the American College of Obstetricians and Gynecologists Committee on Terminology [5], with the modification that the blood pressure must reach or exceed both 140 mmHg systolic and 90 mmHg diastolic on at least two occasions six hours apart after resting in hospital. Proteinuria was defined as a reading of at least one-plus on the dipstix, (albustix, Ames, Miles Lab., Australia) on repeated testing of clean-catch mid-stream urine samples. Blood was taken for the estimation of renal function and plasma albumin concentration from the pre-eclamptic patients after the diagnosis was established in hospital and prior to delivery. Fetal growth retardation (small for gestational age, SGA) was defined as a birthweight below the tenth percentile after corrected for gestational age.

After the diagnosis was established, another blood sample was collected with a disposable plastic syringe and placed in a heparinized tube (Sarstedt, Numbercht, FRG) and sent to the laboratory where the plasma was separated and stored at −20°C. Plasma and erythrocyte zinc concentrations were measured by flame atomic absorption spectrophotometry as describe previously [11].

Pearson’s correlation coefficient (r) was calculated between plasma and erythrocyte zinc and the other variables and statistical analysis was performed by Student’s t-test.

Results

The mean age (SD) of the study group was 28.4 (4.4) years. There were 11 (24.4%) multiparous patients. The mean gestation at delivery was 37.3 (3.4) weeks. The plasma and erythrocyte zinc concentrations in the whole group were 10.2 (2.9) μmol/l and 237.0 (47.6) μmol/l RBC respectively. These values were similar to those of normal third trimester patients reported before [11].

Pre-eclamptic patients who delivered SGA babies had significantly higher mean arterial pressure (P < 0.02) than those who delivered appropriate for gestational age babies (AGA group), but there were no differences in the plasma or erythrocyte zinc concentration, or in the plasma albumin concentration (Table 1).

Table 1. Plasma and erythrocyte zinc concentrations in SGA and AGA groups. Results in mean ± SD

<table>
<thead>
<tr>
<th></th>
<th>SGA group (n = 15)</th>
<th>AGA group (n = 30)</th>
<th>Normal 3rd trimester values(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean arterial pressure (mmHg)</td>
<td>125.4 ± 8.6</td>
<td>118.1 ± 9.6(^a)</td>
<td></td>
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<tr>
<td>Plasma albumin (g/l)</td>
<td>31.7 ± 3.8</td>
<td>33.8 ± 4.2</td>
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<tr>
<td>Plasma zinc (μmol/l)</td>
<td>10.0 ± 2.9</td>
<td>10.2 ± 2.9</td>
<td>9.9 ± 1.7</td>
</tr>
<tr>
<td>Erythrocyte zinc (μmol/1 RBC)</td>
<td>226.5 ± 40.0</td>
<td>242.3 ± 49.5</td>
<td>224.5 ± 38.4</td>
</tr>
</tbody>
</table>

\(^a\) t-test P < 0.02; \(^b\) Data from our previous study [11]