Zinc Levels in Women and Newborns

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Abstract: Zinc is an important trace element having a definitive role in the metabolism, growth and development and reproduction. During pregnancy the requirements for zinc increase. This study was designed to evaluate the zinc status of normal women, normal pregnant women and their newborn babies.

Forty normal adult females, 40 normal pregnant women and their newborn babies were randomly selected and their serum and hair zinc levels were analysed using atomic absorption spectrophotometer.

The mean serum and hair zinc levels in normal women were 69.47 ± 1.4 µg/dl and 147.45 ± 6.12 µg/g respectively. The mean serum and hair zinc levels in normal pregnant women were 69.0 ± 3.22 µg/dl and 142.83 ± 4.39 µg/g respectively while the mean serum (cord blood) and hair levels in normal new born babies were 72.77 ± 5.14 µg/dl and 188.36 ± 4.12 µg/g respectively. There was a significant (p < 0.001) decrease in hair zinc levels during pregnancy. There was a significant (p < 0.05) decrease in zinc levels in new born babies when the time interval between the previous delivery and the present delivery was less than 3.4 years.

The results of the present study reinforce the need for zinc supplementation during pregnancy especially if the interval between pregnancies is short. (Indian J Pediatr 1999; 66: 681-684)

Key words: Zinc status; Pregnancy; Newborn.

Zinc is an essential trace element. It is a co-factor for many enzymes in many metabolic pathways including nucleic acid metabolism. Zinc is involved in neurotransmitter function, immune activity, growth and development, some hormone actions, sensory functions of taste and smell and wound healing. The richest sources of zinc are high protein containing foods such as shellfish, meat and liver. Sources like poultry, dairy products, beans and peanuts also have adequate zinc. However, foods that have high fibre and phytate content e.g. cereals inhibit zinc absorption. The recommended daily zinc requirement for adults is 15-19 mg/day and 5-10 mg/day for children. Deficiency of zinc has profound effects on rapidly proliferating tissues such as embryo, gonads, skin and bone marrow. Severe congenital malformations and intrauterine growth retardation have been reported in the progeny of maternal zinc deficient animals. Lower zinc levels have been reported in mothers delivering small for gestational age babies. Zinc deficient animals were reported to have reduced uptake of thymidine in DNA synthesis and defective DNA synthesis has...
been suggested to be responsible for con-
genital malformations⁸,¹⁰. Female rats, fed on a zinc-deficient diet gave birth to offspring reduced in weight and had high incidence of congenital malformations⁹. In humans, zinc deficiency has been shown to be associated with growth retardation⁷. The nutritional requirements increase during pregnancy and if these are not met, there is a potential of converting marginal deficiency states into severe deficiency.

This study was designed to evaluate the zinc status in normal women and their new born babies in India.

METHODS AND MATERIALS

Forty normal women, 40 normal pregnant women and their new born babies were included in this study. Mothers who had pre-eclampsia, eclampsia and other pregnancy related diseases were excluded. Subjects who had taken zinc supplements were not included in this study. New born babies with congenital malformations, asphyxia and congenital infections were also excluded.

All the samples were coded and these were decoded after the analysis. Blood was collected from a peripheral vein in women and from umbilical cord in babies in zinc free containers and stored at 20°C. The zinc free containers were prepared by dipping in 3% solution of nitric acid for 18 hours followed by three times washing with demineralized water and subsequent sterilization. Hair was collected from the nape of the neck. In pregnant women, at the time of delivery, hair was collected from two sites: hair₁ was collected 10 cms away from the scalp and hair₂ was collected close to the scalp. Hair samples were digested by microwave digestion instrument (MLS 1200, Milestone Laboratory Systems) after addition of appropriate amount of hydrogen peroxide and nitric acid. Digested samples were then stored in zinc free containers. Atomic absorption spectrophotometer (Phillips, Cambridge, UK) at 213 nm was used to analyse zinc levels.

RESULTS

In normal women (mean age 26.5 ± 3.2 yrs), the mean serum and hair zinc levels

<table>
<thead>
<tr>
<th>Diet</th>
<th>Serum zinc (μg/dl)</th>
<th>Hair zinc (μg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarians</td>
<td>68.5 ± 2</td>
<td>146.2 ± 6.4</td>
</tr>
<tr>
<td>Nonvegetarians</td>
<td>70.5 ± 4.4</td>
<td>147.9 ± 6.0</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Time interval between last delivery and present pregnancy</th>
<th>Serum zinc (μg/dl)</th>
<th>Hair zinc (μg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3.4 y</td>
<td>75.6 ± 5</td>
<td>190.2 ± 4.1</td>
</tr>
<tr>
<td>&lt; 3.4 y</td>
<td>72.3 ± 4</td>
<td>180.6 ± 4.3</td>
</tr>
</tbody>
</table>

* p < 0.05

TABLE 1. Zinc Levels in Normal Women

TABLE 2. Zinc Levels in Normal Newborn Babies