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Zinc status of lactating Egyptian mothers and their infants: effect of maternal zinc supplementation

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Abstract

In this study, assessment of serum, breast milk, and hair and nail zinc (Zn) was done in 60 primiparous women and their neonates to evaluate the effect of maternal Zn supplementation on maternal and infant Zn stores and on the infants' physical growth. Thirty mothers were given a multivitamin preparation (lacking Zn) and the other 30 were additionally supplied with Zn for 2 months, then reassessment of Zn levels was done. The results revealed diurnal variation in colostral Zn concentrations. Lactation depleted the maternal Zn stores whereas infant stores were replenished regardless of maternal supplementation. Zn supplementation caused significantly higher maternal hair, nail, and breast milk Zn levels but did not affect the infants' levels or their growth. In conclusion, Zn supplementation for lactating women positively influenced breast milk Zn concentrations and maternal body stores although it had no significant influence on the infants' physical growth. Women who plan to nourish their infants by breast milk alone should ask for dietary consultation to obtain this nutrient from a varied balanced diet rather than from supplementation. In addition, the evident diurnal variation in breast milk Zn emphasizes that working mothers should be advised to express their morning milk, which is richer in Zn, for the maximum benefit of their infants.

Keywords: Breast milk; Lactation; Supplementation; Zinc

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1. Introduction

Zinc (Zn) is essential for the activity of many vital enzymes in the body [1]. It is greatly linked to the metabolism of proteins, carbohydrates, energy, nucleic acids, and lipids as well as heme synthesis, turnover of connective tissue, gene expression, and embryogenesis [2].

Milk production is a complex process where nutritional factors interact with structural, hormonal, and behavioral influences [3]. Understanding the role of the nutritional status of lactating women in the outcome of breast-feeding is thus crucial to be clarified [4].

Zn intakes of breast-fed infants are likely to be adequate during the first 5 months but are subsequently marginal without the introduction of weaning foods [5]. Reported Zn intake in breast-fed infants is 1.9 mg/d at 1 month and 2.7 mg/d at 6 months compared with 3.6 and 4.6 mg, respectively, in bottle-fed infants [6]. However, bioavailability is higher for breast milk Zn [7].

Karra et al [8] reported the average Zn intake of Egyptian pregnant and lactating mothers to be 12.9 mg/d. Although this figure is far less than the American recommended daily allowance (US RDA) for lactating women in the first 6 months of lactation, it is still slightly higher than the recommended needs stated by Sandstead and Smith [9], which are 10.7 mg/d during the third trimester and 11.3 mg/d at 2 months.

Based on the above data, this work was designed to assess the Egyptian maternofetal Zn axis as well as the Zn status of lactating mothers and their infants 2 months after delivery, delineating the effect of maternal Zn supplementation and exploring whether it would increase maternal and infant Zn stores with eventual improvement in the infants' physical growth.

2. Methods and materials

This follow-up clinical trial included all the clinically healthy primiparous women who gave birth at the Ain Shams University Maternity Hospital and their healthy, singleton full-term, exclusively breast-fed neonates. They were selected in their last month of pregnancy during follow-up visits to the outpatient clinic of the maternity hospital after the exclusion of any mother who had a history of medical or obstetric illness. Later on, we also excluded mothers whose neonates suffered any stressful condition that needed neonatal intensive care admission.

After obtaining the approval of the ethical committees of the children's hospital and the maternity hospital of the Ain Shams University, a written consent was taken from the mothers before they participated in the study. The enrolled mothers were divided randomly into 2 groups. Mothers of the first group were given a routine multivitamin preparation, which supplied them with their required daily needs, but it did not contain Zn. Mothers of the second group (the Zn-supplemented group) were given, in addition, 10 mg/d of Zn sulfate capsules that were to be taken 2 hours after dinner for 2 months, which is the same dose used in a similar clinical trial by Chierici et al [10] and provides their average daily Zn needs according to Sandstead and Smith [9]. The control mothers were given placebo capsules instead. During these 2 months, the mothers were followed up every week to ensure their compliance. There were many dropouts and only 60 mothers completed the trial according to the protocol.