RESEARCH BRIEF

Zinc and Copper Concentrations in Breastmilk at the Second Month of Lactation

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We aimed to investigate zinc and copper concentrations in breast milk at two months postpartum and the relationship between these concentrations and the characteristics of mother infant dyads. A total of 142 mothers were enrolled. The median concentrations of breast milk Zinc and Copper were 625 µg/L and 239 µg/L, respectively. These concentrations were not related to maternal age, parity, smoking habits, iron and vitamin/mineral supplementation, birthweight, gestational age, or feeding type. The concentrations had no effect on anthropometric measurements of infants at two months of age.

Key words: *Breastmilk, Copper, Micronutrients, Zinc.*

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Human milk is the only source of nutrition for exclusive breastfed infants during the first six months of life. Copper (Cu) body stores are sufficient at birth to protect infant from deficiency until 4-6 months, but zinc (Zn) body storages are not extensive, and it should be taken in adequate quantities for optimal growth and development [1]. Both Zn and Cu have critical roles in infant growth [2,3]. There is some controversy about other clinical determinants of breast milk Zn and Cu concentrations [4-8]. We aimed to analyze Zn and Cu content in breast milk in Turkish mothers at the second month of lactation, and to study the association of some maternal and infant characteristics with breast milk Zn and Cu concentrations.

METHODS

This study was conducted between August 2006 and January 2007. Participitants were recruited from lactating mothers attending Hacettepe University Ihsan Dogramaci Children Hospital in Ankara, Turkey for routine well-baby visit at the second month (52-60 days postpartum). A total of 142 apparently well-nourished, consenting mothers and their infants participated in the study. Mothers whose nipples were cracked, and those having mastitis or using cream on nipple were not taken into study. The study was approved by the Ethical Committee of The Faculty of Medicine, Hacettepe University.

A questionnaire including maternal age, parity, monthly family income, maternal smoking habits, and iron or vitamin/mineral supplement intake during pregnancy and postpartum, birthweight, gestational age, and delivery type was completed with all mothers. Based on their smoking status, mothers were divided into two groups as active tobacco use and/or passive exposure to smoke, and no exposure to smoke. Postpartum maternal hemoglobin values, analysed at the postpartum 1st day, were noted from hospital record file. The infants' weight, length, and head circumference were recorded. The Z scores of weight-for-age, length-for-age, head circumference for age, and body mass index for age were calculated on the basis of recent WHO growth references.

Breastmilk samples were collected by manual expression after about 2 hours from the last feeding session in the morning. Concentrations of Cu and Zn were determined by Inductively Coupled Plasma Mass Spectrometry (using an Agilent 7500a instru-ment). The Limit of Quantitation (LOQ) for Zn and Cu were 0.8 µg/L. Data were analyzed using the SPSS-Windows 10.0. Mann Whitney U test was applied to compare the level of trace elements between sub-groups, as defined by various maternal and infant characteristics. Statistical

WHAT THIS STUDY ADDS?

- Breast milk concentrations of zinc and copper in Turkish mothers at two months lactation had no correlation with maternal and infant characteristics.

significance was accepted at $P<0.05$.

RESULTS

The mean age of mothers was 24.7 (± 5) years (range 17-41). Seventeen infants were preterm (gestational age <37 weeks) and only nine infants had low birth weight (<2500g). The median (25-75 percentiles) concentrations of Zn and Cu were 625 (475-889)µg/L and 239 (200-296) µg/L, respectively. Milk Zn concentrations were not correlated with milk Cu concentrations (r=0.09, P=0.310).

Maternal age, family income, parity, postpartum Hb values, smoking habits at pregnancy and postpartum period, iron and vitamin/mineral supplement intake at pregnancy and postpartum period affected neither milk Zn nor Cu concentrations (***Web Table* I**). Further, birthweight, gestational age, and delivery type were not associated with breastmilk Zn or Cu concentrations. 116 (86%) infants were exclusively breastfed. The milk concentrations of Zn and Cu were not different with regard to feeding types. There was no correlation between breastfeeding practices (frequency of day and night time suckling, and duration of breastfeeding) and milk Zn and Cu concentrations.

Breastmilk zinc and copper concentrations of infants having anthropometric measurements less than -2 z scores were not different than those of z score ≥-2. Breast milk Zn and Cu concentrations were also not correlated with the anthropometric measurements.

DISCUSSION

In the present study, the median concentration of Cu in breast milk fell within the range of concentrations found in other populations and only 13% were <180 µg/L, which is the WHO standard concentration [1]. However, 56% of Zn concentrations were <700 µg/L which is the WHO standard concentrations. There is a wide variation in concentrations of breast milk Zn and Cu reported from different countries [4-7]. The analysis method (ICP-MS, AAS, etc), sampling time (foremilk-hindmilk or morning-afternoon-night), sampling method (pump, manual suckling), between-breast (right, left) differences, the stage of lactation, and inter-individual variability might be plausible reasons for different results in previous studies [8-10].

The factors that affect breast milk Cu and Zn concentrations are still controversial [4-10]. Pre-vious studies reported that maternal age, parity, smoking, delivery type, gestational age, place of residence, and maternal body mass index might affect the breast milk Cu and Zinc contents [5,6]. Our results were consistent with previous studies with neither maternal factors nor infant factors being associated with breast milk Cu and Zn concentrations [4,7]. However, Mahdavi, *et al*. [11] reported that the weight for age z scores of infants whose mothers' milk zinc was more than 2 mg/L were significantly higher than for others. Limitations of the present study include; maternal diets were not evaluated, maternal serum Zn and Cu concentrations were not analyzed, and the concentrations of Zn and Cu were measured only one time during lactation.

In conclusion, it was found that our population had lower breast milk zinc concentrations at two month of lactation whereas breast milk copper concentrations were within references range. Breast milk concentrations of Zn and Cu had no correlation with the examined maternal and infant features.

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