

Retinol concentration in breast milk of lactating Turkish mothers under various socioeconomic conditions

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INTRODUCTION

Breast milk is the ideal first food for the infant in terms of nutrition and immunologic and emotional benefits. The sufficient and healthy growing and development of breast fed infants depend upon the overall quality and quantity of human milk. Maternal diet variations affect the quality of breast milk. Good nourishment of the mothers can provide balanced composition of fat soluble vitamins such as retinol (vitamin A) in breast milk. Low-dietary intake of fat soluble vitamins, especially vitamin A deficiency is a public health concern in developing countries world wide.

An adequate supply of retinol is crucial both to sustain the intense proliferative growth observed during fetal and neonatal development and to protect against infectious diseases in infancy. In case of insufficient Vitamin A intake the resistance to infectious diseases decreases, growing slows down, and anemia may develop.

OBJECTIVES

Relations between retinol levels in breast milk and plasma in lactating women have been reported before. Total lipid of breast milk is not strongly affected by the diet, but is related to maternal body composition. However, no data is present between the retinol levels in breast milk and plasma, and the socioeconomic conditions of lactating mothers in Turkey. One of the objectives of this study was to determine the retinol levels in breast milk and plasma of lactating Turkish women. We also aimed to evaluate the relation between levels of this substance and socioeconomic characteristics of the mothers such as body mass index (BMI), and dietary intake.

MATERIAL AND METHODS

Breast milk samples were collected from two Mother and Infant Health Planning Centers in Izmir and Manisa. Adult (20-40 years old) mothers attending these public day-care clinics with their babies were recruited for the study during appointment with the pediatrician. Lactating mothers (n=92) were enrolled in the research according to the following eligibility criteria: mothers of healthy full-term (37-42 weeks) single infants without any severe congenital abnormality; self-reported absence of chronic diseases such as diabetes or a process of acute illness; no use of supplements containing Vitamin A. Lactating period of the mothers were between the 60th and the 90th day. Socioeconomic, anthropometric, and dietary data were collected by means of a questionnaire. Body mass index was used to determine the nutritional status. Vitamin A level was determined with high performance liquid chromatographic method.

The collected data was analyzed statistically by Statistical Package for Social Sciences (SPSS 11.0, Chicago, IL, USA) for Windows (Microsoft). The information about mothers' diet was evaluated according to the frequency of each type of food consumed. Since information about food consumed in three days was not collected quantitative analysis was not performed. Descriptive data obtained from mothers and babies living in two different cities were compared by using chi-square test, Student's t test, and Mann-Whitney U test. Breast milk concentrations of Vitamin A in mothers living in two cities were compared by using Student's t test and Mann-Whitney U test.

RESULTS

Ninety-two couples of mother and infant, 43 from Izmir and 49 from Manisa were included in the study. The majority of the mothers were from socioeconomically lower or lower-middle groups.

Similarly, educational status of the mothers was low, but that of the mothers from Izmir was statistically higher than the educational level of the mothers from Manisa (Table 1).

Table 1. Descriptive parameters of the study group.

Parameters	Group		P
	Manisa	Izmir	
Age of the mother	26,8±4,6	27,3±4,8	,606
BMI of the mother	25,2±4,2	25,1±4,1	,961
Mother's educational status			
Middle school or lower	34	31	
High school	14	5	<0.01
College-University	1	7	
Current smoking status			
Yes	11	7	0,337
No	38	35	
Gestation period (months)	39,7±1,1	40,0±1,5	,241
Age of the infant (days)	67,2±7,0	65,0±8,1	,084
Body weight of the infant (kg)	56130±870	5975±1284	,719
Length of the infant (cm)	58,5±3,1	58,0±4,1	,056
Gender of the infant			
Male	23	25	0,139
Female	26	18	
Family type			
Nuclear family	40	39	0,251
Extended family	9	3	
Economic status of the family			
Lower	26	16	
Middle	23	23	0.052
Upper	0	4	

BMI=Body mass index

There was statistically significant difference in consumption of fish, eggs, olive oil, and margarine between the mothers from Izmir and Manisa ($P<0.05$) (Table 2).

Mean Vitamin A level in samples of mothers' milk obtained between the 60th and the 90th days of lactation was 81.24±17.92 µg/100 ml. Mean Vitamin A level in mothers' milk was 81.14±19.84 µg/100 ml for the mothers from Manisa whereas it was 81.35±15.67 µg/100 ml for the mothers from Izmir. There was not any significant difference in Vitamin A levels between the milk samples obtained from mothers from the two cities.

Vitamin A levels were measured in the plasma of 46 mothers. Mean Vitamin A level in samples of plasma of the mothers was 36±10.28µg/100 ml. There was a positive correlation between plasma and milk levels of Vitamin A ($P=0.01$).

There was not any statistically significant relationship between Vitamin A levels in mothers' milk and frequency of consumption of any type of food, income, or BMI of the mothers ($P>0.05$).

Table 2. Eating habits of the mothers from the two cities

Type of food	Frequency of consumption*		P
	Manisa	Izmir	
Meat	6	6	,509
Fish	5	6	,005
Eggs	8	9	,017
Milk and dairy products	9	9	,051
Olive oil	9	7	,021
Sunflower seed oil	9	9	,220

Corn oil	1	1	,055
Soya oil	1	1	,898
Butter	3	3	,701
Margarine	8	5	,018
Nuts	5	5	,143
Grains	9	9	,217
Beans	5	5	,322
Vegetables	6	8	,382
Fruits	8	9	,350
Carbonated drinks	5	8	,293
Fast-food	1	1	,766
Candies	6	5	,132
Tea	9	8	,177
Coffee	5	3	,012

Frequency of consumption of foods: 1. Never, 2. A few times a year, 3. Once a month, 4. Twice or three times a month, 5. Once a week, 6. 2-4 days a week, 7. 5-6 days a week, 8. Once a day, 9. Everyday, several times.

DISCUSSION

During pregnancy, intake and hepatic reserves of maternal vitamin A are essential to guarantee the transference of this micronutrient to the fetus, and its first source of the nutrient. Adequate amounts of vitamin A cross the placenta to the fetus, especially in the last trimester; however, vitamin A stores in the newborn liver are relatively low compared with those of older infants and children. Mature human milk contains 1850 to 2650 IU /L of vitamin A, and colostrum contains more. Thus, human milk is an excellent source of vitamin A. Vitamin A content of human milk is more influenced by maternal dietary intake than by her vitamin A status.

Mean retinol level in samples of mothers' milk obtained between the 60th and the 90th days of lactation was 81.24±17.92 µg/100 ml. This value is compared with those found in previous studies. Dimenstein et al. retinol level in the colostrums as 93±51.1 µg/100 ml and showed that retinol levels in milk is related to socioeconomic status of the mothers in a study performed in Brasil. As these levels were measured in the colostrum and colostrum retinol levels are always higher than the milk levels it is apparent that milk retinol levels measured in our study is sufficient. Relation between milk retinol levels and total income of the family was shown in a study from Bangladesh. There was not any significant relation between economic status and retinol levels in mothers' milk in our study.

A retinol level in breast milk less than 30.09 µg/100 ml is considered to be consistent with Vitamin A deficiency in lactating women. Prevalance rates of < 10 %, ≥10 to < 25 %, and ≥ 25 % of breast milk retinol < 30.09 µg/100 ml are considered to indicate mild, moderate, and severe Vitamin A deficiency, respectively, as a public health problem. The lowest concentration of breast milk retinol was 32.85 µg/100 ml in our study, indicating that there is not Vitamin A deficiency in the two cities.

Plasma retinol levels were measured in 46 milk samples with a mean of 36±10.28µg/100 ml. If plasma retinol concentration is less than 20.05 µg/100 ml over 15 % of a specific population Vitamin A deficiency is defined to be of public health importance. None of the mothers that plasma Vitamin A concentrations were measured had a value less than 20.05 µg/100 ml in our study. There was not any relation between income and breast milk retinol levels.

There was not any relation between breast milk retinol concentration and other factors (age, BMI of the mother, and eating habits), either. Dancheck et al. in their study in Malawi found retinol concentrations of 59.89 µg/100 ml in breast milk and 26.65 µg/100 ml in plasma. They did find any relation between retinol concentrations and age, education level, parity, and BMI. There was not any mother with a BMI less than 15 in Dancheck's study and in the present study. It is therefore apparent that none of the samples were taken from malnourished mothers. Sufficient retinol levels in breast milk may be due to feeding habits in our region and mothers' having full retinol stores.

In conclusion breast milk of the lactating women in our region is sufficient to meet daily Vitamin A needs of the babies.