

**INFLUENCE OF SOCIO-ECONOMIC FACTORS
AND NUTRITIONAL STATUS OF THE LACTATING WOMEN
ON SOME MINERALS CONTENT OF BREAST MILK**

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ABSTRACT

To assess some mineral contents of breast milk such as Calcium , Selenium and Zinc , a sample of 30 lactating mothers was selected randomly from Helwan General Hospital , Cairo , Egypt .

Dietary, healthy and anthropometric assessments were done in addition to socio-economic assessment .

Results showed that there was a clear deficiency in the daily intakes from calories , carbohydrates, fat, calcium and phosphorous in both rural and urban areas compared with the RDA (1989) .

The obtained data revealed that exactly 50% of the mothers either in the village or in the city have normal BMI (21.1 – 26.1) which indicates a sign of good health .

The results revealed a highly significant relationship between calcium and baby rank and the intake of some special food . Significant relationship with mother's age and number of deliveries was found . While there was a highly significant relationship between Zinc intake and mother's educational status. Moreover, it was significantly related to healthy condition. Concerning selenium intake, it was highly significantly related with mothers rank, weaning type and BMI of the mother. Meanwhile significant relationship between healthy condition and intake of some special food was observed .

No clear effect was observed for some socio-economic factors, *i.e.*, sucking period, occurrence of pregnancy during lactating and place of living on minerals content of the milk.

The study concluded that the nutritional status, health and demographic conditions are important indicators for the essential nutrients in breast milk.

Key words: *breast milk, minerals content, nutritional status.*

1.INTRODUCTION

Human milk is considered as the optimum source of nutrition for the infant. Previous studies were directed towards the constituents of the human milk (lipids, proteins, carbohydrates & minerals). These studies indicated that the lipids constitute about 50% of the total caloric value of human milk (Hambraeus, 1978). American Academy of Pediatrics, Committee on Nutrition, (1976) indicated that breast milk lipid provides high percentages of calories for developing infants. Casey *et al.*, (1985) reported that the minerals are important constituents in the breast milk. Adequate calcium intake during the first 2 to 3 decades of life is a critical factor in attaining peak bone mass (Wosje *et al.*, 2000).

Lee *et al.* (1993) reported that Hong Kong children 4th habitually low calcium intakes had a lower bone mineral content than Hong Kong Children with habitually higher calcium intakes.

Levander, (1989) reported that several surveys have documented the variation in the selenium content of human breast milk collected in several different countries around the world. In general, the amount of selenium in breast milk appears to reflect the amount of selenium consumed in the maternal diet. Breast milk selenium values reported from Scandinavia and New Zealand are only about 32 to 66% of the values reported from the United States (18µg/L).

Hassan *et al.*, (2002) determined the selenium content of a wide variety of food in Egypt. Selenium content of the investigated samples varied from 0.2 to 36.4 µg/kg.

Traditional balance studies have indicated that a zinc intake of 0.82 mg/kg /d is adequate to achieve positive balance in infants (Ziegler *et al.*, 1987). The proposed upper limit (per 100 Kcal) is 1.5 mg of zinc (Hambidge and Krebs, 1989).

The place of living and food habits had a clear effect on the milk constituent of minerals . No clear effect was observed for the socio – economic factors on the minerals content of breast milk (Al- Othman *et al.*, 1997) .

Several previous studies were carried out in different countries concerning food habits, mother status, breast milk and its constituents and their relationships (Vouri *et al.*, 1982 and Soliman *et al.*, 1983) .

Lonnerdal, (2000) explained the existing mechanisms that regulate milk concentration of trace elements such as iron and zinc. The transfer of elements like selenium appeared to be unregulated and may be explained by passive diffusion. Little is known about the mechanisms involved in the uptake of calcium and magnesium into milk and factors affecting these mechanisms. Increased knowledge of these mechanisms could help not only to understand the transfer of minerals into milk under normal conditions but also to investigate the lesions behind abnormal transfer of such components. Beside, it helps to understand defects in mammary gland function induced by suboptimal nutrition .

Therefore, the aim of the present investigation was to perform such necessary studies on the lactating women and assessment studies of socio-economic factors and nutritional status of them on some minerals content of breast milk .

2. MATERIAL AND METHODS

The study included 30 lactating mothers aged from 23- > 30 years, visiting at intervals Helwan General Hospital in Cairo Governorate . Selection of lactating mothers was done randomly . Mothers were interviewed during attending Health Units seeking immunization services for their babies .

The predesigned questionnaire used to collect data included age, educational level , meals , nutritional practices of the mother as well as health information such as taking drugs , contraceptive pills and infection with diseases .

Food pattern information such as frequency of food consumption, daily meals 24 hrs recall for three days , at the beginning and the middle of the week and at the week end .

The daily intake of calories, protein, carbohydrates, fat, calcium, phosphorous, iron, vitamin A and vitamin C were calculated and compared with those of the RDA (1989) and for B1 & B2 vitamins DRI (1997-1998) was used.

Anthropometric measurements for the lactating women (weight and height) were assessed to calculate Body Mass Index (BMI) proposed and classified to categories according to Garrow (1981) as follows:

BMI = EMBED Equation.3

Slimming level : > 21.1 Normal level : 21.1-26.1

Obesity level : < 26.1

Laboratory Analysis :

Thirty samples of human milk were obtained from healthy mothers at 6 months of lactation. All milk samples were collected during mid day time of lactation. Milk samples (15 – 25 ml) were collected in sterilized bottles using a manual breast pump and transported in an ice box from the hospital to the laboratory. Samples were frozen at -20 °C immediately on arrival and kept frozen until analysis.

Minerals content of breast milk including calcium, Zinc and selenium were determined using Atomic Absorption Spectrophotometer according to the method described in the A.O.A.C. (1995).

The obtained data were statistically analyzed using the Statistical Analysis System (SAS) program for calculating average, percentages, frequencies and Chi-square (Barr *et al.*, 1988).

3.RESULTS AND DISCUSSION

Demographic characteristics for lactating mothers under study as shown in Table (1) revealed that most of the mothers living in the city have better chance for education and occupation than those living in the village. It could be also noticed that more than one-third of the samples (35.7%) have better monthly income in the village than in the city (18.7%). On the other hand, 25% have monthly income higher than 250 Egyptian pound in the city. The period of marriage also in about half of the women in both the city and the village varies from 1-5 years and reaches to < 5-10 in 21.4% and 25.0% in the rural and

Table (1): Demographic factors for lactating mothers.

Factor	Village		City		Total	
	No.	%	No.	%	No.	%
<i>Age :</i>						
> 25	10	71.4	5	31.2	15	50.0
25-29	2	14.3	11	68.8	13	43.3
30 and more	2	14.3	0	0.0	2	6.7
<i>Educational status:</i>						
Illiterate	12	85.8	3	18.7	15	50.0
Read & write	1	7.1	2	12.5	3	10.0
Educated	1	7.1	11	68.8	12	40.0
<i>Occupation:</i>						
Working	0	0	5	31.2	5	16.7
House wife	14	100	11	68.8	25	83.3
<i>Monthly Income (Egyptian Pound):</i>						
100>200	6	42.9	9	56.3	15	50.0
200-250	5	35.7	3	18.7	8	26.7
<250	3	21.4	4	25.0	7	23.3
<i>Period of marriage:</i>						
>1-5	7	50.0	9	56.3	16	53.4
< 5-10	3	21.4	4	25.0	7	23.3
< 10	4	28.6	3	18.7	7	23.3
<i>Mothers Rank:</i>						
First	3	21.4	6	37.4	9	30.0
second	2	14.3	4	25	6	20.0
Third	2	14.3	1	6.3	3	10.0
Fourth	4	28.6	1	6.3	5	16.7
Fifth	1	7.1	0	0.0	1	3.3
< Fifth	2	14.3	4	25.0	6	20.0
<i>Baby Rank:</i>						
First	5	35.71	6	37.5	11	34.7
Second	3	21.43	5	31.2	8	26.7
Third	2	14.29	2	12.5	4	13.3
Fourth	1	7.14	0	0	1	3.3
Fifth	2	14.29	1	6.3	3	10.0
> Fifth	1	7.14	2	12.5	3	10.0

Table (2): Information about healthy conditions of lactating mothers.

Items	Village		City		Total	
	No.	%	No.	%	No.	%
<i>Number of Deliveries :</i>						
1-2	8	57.2	11	68.8	19	63.3
3-5	5	35.7	3	18.7	8	26.7
> 5	1	7.1	2	12.5	3	10.0
<i>Type of Delivery:</i>						
Normal	14	100	14	87.5	28	93.3
Cesarean	0	0	2	12.5	2	6.7
<i>Occurrence of pregnancy</i>						
during lactation: yes existed	4	28.5	4	25.0	8	26.7
Not existed	10	71.5	12	75.0	22	73.3
<i>Health condition and drug use:</i>						
Taking contraceptive pills	1	7.1	2	12.5	3	10.0
Do not take pills	13	92.9	14	87.5	27	90.0
Taking iron	5	35.7	3	18.7	8	26.7
not taking	9	64.3	13	81.3	22	73.3
Taking multivitamins	7	50.0	6	37.5	13	43.3
not taking	7	50.0	10	62.5	17	56.7
Taking vitamin C	2	14.3	0	0.0	2	6.7
not taking	12	85.7	16	100	28	93.3
Taking antibiotics	2	14.3	3	18.7	5	16.7
not taking	12	85.7	13	81.3	25	83.3
Taking Aspirin	7	50.0	5	31.2	12	40.0
not taking	7	50.0	11	68.8	18	60.0
Taking Ataractic	2	14.3	2	12.5	4	13.3
not taking	12	85.7	14	87.5	26	86.7
Suffering from certain disease	8	57.2	6	37.5	14	46.7
not suffering	6	42.8	10	62.5	16	53.3
<i>Kind of disease :</i>						
Anemia	5	62.5	4	66.7	9	64.3
Other diseases	3	37.5	2	33.3	5	35.7

urban areas respectively . However 28.6% and 18.7% of the cases were < 10years in both the city and the village , respectively .

In respect of birth rank of mothers, data in the same Table reveal that the second , the third and < the fifth rank have the same percentages (14.3%) in the rural areas. On the other hand, 28.6% and 21.4% of these mothers in the village are in the fourth and the first arrangement respectively. However, more than one-third of the surveyed mothers (37.4%) are in the first arrangement in the city , while the second and < the fifth arrangement are equal (25%) .

Concerning the infant rank, the percentages of babies having the first rank were; 35.71% and 37.5% in the rural and urban areas, respectively.

Table (2) shows that the number of deliveries in most cases in both the village and the city varies from 1-2 and reaches to > 5 in few cases being, 7.1% and 12.5% in the urban and rural areas, respectively. While the rest of the cases being under study was 35.7% in the village and 18.7% in the city varies from 3-5. The same table indicates that 100% and 87.5% of the mothers living in the village and in the city respectively having a normal delivery .

Data in the same Table (2) reveals that the majority of the mothers , both in the village (92.9%) and in the city (87.5%) do not use contraceptive pills for birth control . Also , the same table indicates that the majority of the mothers either in the village or in the city do not take iron or multivitamins . All the cases in the city and the majority of the cases in the village (85.70%) do not take vitamin C. Also most of the mothers tended to avoid using antibiotics during lactation. Half of the cases in the village are taking aspirin, meanwhile 68.8% of the lactating women in the city do not take aspirin. The majority of the mothers under study do not take tranquilizers regardless their location in the village (85.7%) and in the city (87.5%). More than half of the mothers (57.2%) in the village are suffering from certain diseases, but the majority of the mothers (62.5%) living in the city do not suffer from diseases . However, the majority of these cases in both the village and the city are suffering from anemia .

Concerning the information about type of feeding the baby, the results tabulated in Table (3) indicate that the used type of weaning is suddenly in most cases for the lactating women, 64.3% and 56.3% in the village and the city, respectively. Concerning the type of feeding,

Table (3): Information about the type of feeding the baby.

Factors	Village		City		Total	
	No.	%	No.	%	No.	%
Type of weaning:						
Suddenly	9	64.3	9	56.3	18	60.0
Gradually	5	35.7	7	43.7	12	40.0
Type of feeding:-						
Breast feeding	5	35.7	9	56.3	14	46.7
Breast and bottle feeding	4	28.6	2	12.5	6	20.0
Breast feeding + food	5	35.7	5	31.2	10	33.3

Table (4): The relationship between place of living on some minerals content in breast milk.

Items	Village		City		Total	
	No.	%	No.	%	No.	%
Calcium concentration ⁽¹⁾						
Less than 280 mg	4	82.6	5	31.3	9	30.0
280 mg and more	10	71.4	11	68.7	21	70.0
Zinc concentration: ⁽²⁾						
Less than 1.2 mg	12	85.7	9	56.3	21	70.0
1.2 mg and more	2	14.3	7	43.7	9	30.0
Selenium concentration: ⁽³⁾						
Less than 20 µg	2	14.3	5	31.3	7	23.3
20 µg and more	12	85.7	11	68.7	23	76.7

(1) $\chi^2 = 0.5025$

(2) $\chi^2 = 3.5867$

(3) $\chi^2 = 1.7642$

Yates corection were done.

Table (5): The Average daily nutrients intake of lactating women.

Nutrients	Average Daily Intake		RDA (1989)	Difference between Intake & the RDA		% From RDA(1989)	
	Village	City		Village	City	Village	City
	Calories (kcal)	1800.7	1630.4	2700	-899.3	-1069.6	66.7
Protein (gm)	73.6	82.9	65	+806	+17.9	113.2	127.5
Carbohydrates (gm)	230.6	259.6	357.5	-126.9	-97.9	64.5	72.6
Fat (gm)	67.1	62.3	101	-33.9	-38.7	66.4	61.7
Calcium (mg)	517.14	541.38	1200	-682.86	-658.62	43.1	45.1
Phosphorous (mg)	1171.64	903.37	1200	-28.36	-296.63	97.6	75.3
Iron (mg)	19.25	16.29	15	+4.25	+1.29	128.3	108.6
Vitamin A (I.U.)*	1922.6	2223.3	1300	+622.6	+923.3	147.9	171.02
Vitamin C (mg)	82.14	102.06	95	-1286	+7.06	86.5	107.4
Thiamin (mg)**	1.795	2.07	1.5	+0.995	+1.27	119.7	138.0
Riboflavin (mg)**	2.66	2.91	1.6	+0.16	+0.41	166.3	181.9

* : I.U. : International Unit.

** : % of DRI(1997-1998)

Table (6): Distribution of lactating women according to the BMI. *

BMI *	Village		City		Total	
	No.	%	No.	%	No.	%
< 21.1	4	28.6	1	6.2	5	16.7
21.1 -26.1	7	50	8	50.0	15	50.0
>26.1	3	21.4	7	43.8	10	33.3

Table (7): The relationship between minerals content in breast milk and some factors.

Factors	Minerals		
	Calcium (mg)	Zinc (mg)	Selenium(mg)
Mother's age:	5.1584*	NS	NS
Mother's educational status:	NS	13.6606**	NS
Mother's occupation:	NS	NS	NS
Monthly income :	NS	NS	NS
Rank of mothers:	NS	NS	9.4305**
Rank of baby	29.6642**	NS	Ns
Number of deliveries:	3.945*	NS	NS
Sucking period	NS	NS	NS
Weaning type:	NS	NS	11.3759**
Occurrence of pregnancy during lactating :	NS	NS	NS
Health condition:	NS	6.2843*	6.5841*
BMI of mother	NS	NS	9.2764**
Some special food***	4.4986**	NS	5.487*
Place of living	NS	NS	NS

NS : Not significant

*: Significant (at 0.05 level)

** : Highly significant (at 0.01level)

***: Intake of some foods enhancing breast milk secretion

the results in the same table show that more than half of the mothers living in the city (56.3%) used breast feeding only, while less than one – third of the cases 31.2% gave the infants some complementary foods beside their breast feeding. In the rural areas, the breast feeding and breast feeding plus food have the same percentages of the cases (35.7%). The rest of the cases under study (28.6%) in the village and (12.5%) in the city are depending on bottle feeding (processed milk) beside their breast feeding.

Concerning the effect of the living place on the minerals content of breast milk, results in Table (4) show that the concentrations of calcium, zinc and selenium in the collected milk samples of the mothers living in urban and rural areas were not- significantly different. Comparing the obtained results with those reported by the investigations in other countries, it was not in the same line with those reported by Murthy & Rehea, 1971, Feely *et al.*, 1983, Prentice *et al.*, 1986, Laskey *et al.*, 1990 and Al. Othman *et al.*, 1997. This may be attributed to the difference in food habits in rural and urban areas of Egypt and other countries which affect to a great extent the nutritional status of the mothers.

The data in Table (5) show a comparison between the average daily intakes of lactating mothers from some basic nutrients and those of the Recommended Dietary Allowances, (RDA, 1989). As the daily intakes from the basic nutrients were calculated from 3 days food recall for all the cases under study. It could be noticed from the results that there was a clear deficiency in the daily intake from calories, carbohydrates, fat, calcium and phosphorous in both rural and urban areas compared with the RDA (1989). On the other hand, there was a clear excess of the daily intake from protein, iron, vitamin A, thiamin and riboflavin in both the rural and the urban areas. However the average of vitamin C intake was higher in the city (107.4%) but lower in the village (86.5%) than the recommended amounts.

Table (6) reveals that exactly 50% of the mothers either in the village or in the city have normal BMI (21.1-26.1) which indicates a sign of good health. However, 28.6% and 6.2% of the mothers in the village and in the city were under weight (> 21.1), while 21.4% and 43.8% were over weight (< 26.1). The obtained results reveal that mothers under study consume less fat and carbohydrate than the

required amounts (Table 5) , consequently the intake of the daily calories is relatively less than usual which reflects that 16.7% of the cases understudy has BMI (> 21.1) .

On the other hand , the results showed that 33.3% in both of the city and the village together were suffering from overweight and obesity (BMI = < 26.1) according to Garrow classification . This figure is lower than that recorded by Gabr *et al.* , 2000 , El – Saied *et al.* , 1995 and Al- Othman *et al.*, 1997.

Associations between mineral contents in breast milk and some factors are shown in Table (7) . The relationships between rank of mothers, weaning type & BMI of mother and selenium in breast milk were highly significant (at 0.01 level). Meanwhile, the associations between health condition ,zinc and selenium concentrations in breast milk were significant (at 0.05 level). There was a significant association between eating foods important for excreting the breast milk and selenium and calcium concentrations. The association between mother's educational status and zinc was highly significant, but the relationships between mother's age and number of deliveries and calcium concentration were significant (at 0.05 level).

There was a highly significant relationship between mother's educational status and zinc concentration and between baby rank and calcium content .

These results are in agreement with the study conducted by Al – Othman *et al.*, (1997).

The above results revealed that food habits, socio – economic and health characteristics and anthropometric measurments had a clear effect on the mineral constituents of breast milk .

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تأثير العوامل الاجتماعية والاقتصادية والحالة الغذائية للمرأة المرضع على محتوى لبن الأم من بعض المعادن

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ملخص

تم اختيار ٣٠ سيدة مرضع عشوائيا من مستشفى حلوان العام وذلك لتحديد محتوى لبن الأم من بعض المعادن مثل الكالسيوم، السليسيوم، والزنك. وقد تم تحديد الحالة الغذائية، الصحية، المقاييس الأنثروبومترية وكذلك الحالة الاجتماعية والاقتصادية للأمهات.

أظهرت النتائج أن هناك نقص واضح فى السعرات اليومية، الكربوهيدرات، الدهون، الكالسيوم والفسفور فى كل من الريف والحضر بالمقارنة بالاحتياجات اليومية الموصى بها (RDA 1989).

وقد أوضحت النتائج أنه حسب مقياس مؤشر كتلة الجسم (BMI) أن ٥٠% من الأمهات فى كل من الريف والحضر ذات مستوى طبيعى (٢١,١-٢٦,١) وذلك علامة للصحة الجيدة.

أسفرت النتائج عن وجود علاقة معنوية مرتفعة عند مستوى (٠,٠١) بين المأخوذ من الكالسيوم وترتيب الطفل بين أخوته وتناول الأم لبعض الأغذية المدرة لل لبن، وكذلك وجود علاقة معنوية عند مستوى (٠,٠٥) مع عمر الأم وعدد الولادات.

بينما وجد أن المأخوذ من الزنك كانت له علاقة معنوية مرتفعة مع الحالة التعليمية للأم وكذلك علاقة معنوية مع الحالة الصحية للأم.

فى حين كان المأخوذ من السليسيوم له علاقة معنوية مرتفعة مع ترتيب الأم بين أخواتها وطريقة الفطام ومؤشر كتلة الجسم للأم BMI وكذلك وجدت علاقة معنوية مع الحالة الصحية وتناول بعض الأغذية المدرة لل لبن.

وكذلك أظهرت النتائج عدم وجود تأثير لبعض العوامل الاقتصادية والاجتماعية مثل مدة الرضاعة، حدوث الحمل أثناء الرضاعة، وكذلك مكان المعيشة (ريف -حضر) على محتوى لبن الأم من المعادن.

المجلة العلمية لكلية الزراعة - جامعة القاهرة - المجلد (٥٥) العدد الثانى
(ابريل ٢٠٠٤): ٢٨٥-٣٠٠.

