ORIGINAL ARTICLE

EVALUATION OF ENERGY AND NUTRIENT INTAKE FROM FOOD OF LACTATING MOTHERS IN A ROMANIAN SAMPLE

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Abstract

Maternal diet has a great impact on breast milk composition and therefore on infant nutrition as many nutrients that are essential for growth and development are secreted in breast milk. Moreover, it represents one of the most important factors for successful milk production and mother's health and well-being. The aim of the present study was to comprehensively evaluate the energy and nutrient intake from food of lactating mothers during a self-selected diet in a Romanian sample population. The results highlighted that energy intake was significantly lower compared with the level of energy intake recommended for lactating women and the distribution of macronutrients was misbalanced in the study group.

Rezumat

Dieta mamei, în perioada de lactație, influențează major compoziția laptelui matern și implicit alimentația sugarului, având în vedere că numeroși nutrienți, importanți pentru creștere și dezvoltare, sunt secretați în lapte. În plus, aceasta reprezintă un factor important pentru producția de lapte și pentru menținerea unei stări optime de sănătate. Scopul acestui studiu a fost să evalueze aportul dietetic, energetic și nutritiv, al mamelor în perioada de lactație, raportat la dietele lor obișnuite. Pentru eșantionul luat în studiu, rezultatele au arătat că aportul energetic a fost semnificativ mai mic comparativ cu aportul energetic recomandat femeilor în perioada de lactație, iar distribuția macronutrienților a fost dezechilibrată.

Keywords: energy intake, nutrient intake, lactation diet

Introduction

Dietary habits and intake during lactation period represent one of the most important factors for successful milk production and mother's health and well-being. Having a healthy and balanced diet during lactation is essential not only to achieve mother's nutritional needs, which are greater during this period, but also to promote adequate milk bio-synthesis and composition [17]. Maternal diet has a great impact on breast milk composition and therefore on infant nutrition [6, 11]. Baby's early health depends most on milk quality as many nutrients that are important for growth and development (e.g. fatty acids, vitamin E) are secreted in breast milk [3, 14]. Particular attention should be given to essential fatty acids as they are responsible for the development of the infant's brain, retina and skin [8, 10, 13].

Energy requirements for lactating women are also higher compared to non-lactating women, mostly because of milk production. It is stated that in order to produce 700 - 800 mL of milk daily, the maternal diet should be supplemented with at least 500 kcal every day or maternal energy stores may be mobilized [4]. However, well-nourished mothers might have sufficient nutrient and energy reserves that can be used during milk synthesis, when their dietary intake does not meet proper requirements [1].

Research evaluating food intake during the lactation period reported that lactating mothers consume insufficient energy and essential nutrients and rarely meet dietary recommendations, which may lead to a risk of poor nutritional outcome for both mother and infant [7, 9, 12]. To our knowledge, there is no

available information regarding the dietary patterns of lactating mothers in Romania. Therefore, the aim of the present study was to comprehensively evaluate the energy and nutrient intake from food, in a Romanian sample of lactating mothers during a self-selected diet.

Materials and Methods

According to the Helsinki Declaration, the Amsterdam Protocol, and EU Directive 86/609/EEC, we obtained the approval of the Ethical Commission of the "Iuliu Haţieganu" University of Medicine and Pharmacy of Cluj-Napoca, Romania, for this study.

Subjects

Participants were recruited online, through social network advertisement. All women were healthy volunteers, over 18 years old. Women suffering from metabolic disorders and with complications during pregnancy were excluded from the study. Before completing the survey, all the participants received written information about the study aim and design and signed an informed consent regarding the use of personal data. Participants did not receive previously any counselling on healthy eating during the lactation period.

Study design and data collection

Data was collected between November 2014 and March 2015 from a cohort of lactating women in Cluj-Napoca, Romania. Lactating women were on a self-selected diet and instructed not to change their dietary habits during the study. The women in the study group were selected according to the period of lactation (G1: 0 - 6 months, G2: 6 - 12 months, G3: 12 - 24 months and G4: over 24 months). For data collection, every participant received *via* e-mail a 7-day prospective food diary template and a general characteristic questionnaire, both designed by the research team. An experienced member of the research team met and trained every woman on measuring food portions.

Dietary assessment

The dietary assessment was based on data from all 7-day prospective food diaries. The food intake was analysed using EDIM software, previously described by Miere and Grecu [12]. The daily intake of energy and nutrients for every lactating woman was considered as the average value of the seven days. Mean daily energy and nutrient intakes were compared to the Dietary Reference Intakes (DRIs) for the lactating woman as developed by the Food and Nutrition Board, Institute of Medicine, U.S. National Academy of Science (IOM) [1].

Statistical analysis

Obtained data was statistically tested using Real Statistics Resource Pack add-in for Microsoft Excel. Testing for Normality was performed by employing Shapiro-Wilk statistical test. For normally distributed data, the t-test for one sample was applied to test the null hypothesis; otherwise, Wilcoxon Signed-Ranks Test for a Single Sample was performed.

Results and Discussion

Participant characteristics

In this study participated 33 lactating women, living in urban areas, with a response rate of 66%. General characteristics and some pregnancy-related features of the study group are presented in Table I.

Table I

General characteristics of the study group

Parameter	Value	Number of participants	Percentage of study group (%)
Age (years)	25 - 30	20	60.61
	30 - 35	10	30.30
	35 - 40	3	9.09
Median	29.00 [29.00 - 33.00]		
Height (cm)	165.87 ± 5.79	-	-
Weight before pregnancy (kg)	59.21 ± 9.55	-	-
Body Mass Index (BMI) before pregnancy (kg/m^2)			
Underweight	< 18.5	4	12.12
Normal Weight	18.5 - 24.9	25	75.76
Overweight	25 - 29.9	3	9.09
Obese	> 30	1	3.03
Median	20.58 [19.36 - 22.53]		
First Child	Yes	27	81.82
	No	6	18.18
Type of delivery	Natural	17	51.52
	Vaginal with epidural	7	21.21
	C-section	9	27.27
Smoking	Yes	2	6.06
	No	31	93.94
Regular exercise	Yes	11	33.33
	No	22	66.67

The median pre-pregnancy body mass index (BMI) of the lactating women studied was within the normal range 20.58 [19.36 - 22.53] and according to it, the majority were normal weight (76%), while 12% were underweight and 12% were overweight or obese.

Energy and macronutrients intake

This study evaluated energy and dietary intake of lactating women and showed that the majority of the subjects in the study group fail to meet IOM recommendations for energy and macronutrients during a self-selected diet. Mean or median energy intake from food and the intake of macronutrients among lactating women in the whole sample are shown in Table II. Also, Tables III and IV present data from every sample group.

Table II

Evaluation of energy, macronutrient intake in the study group

Nutrient		DRI	Value	*SMR %*	p value
Dietary Intake (kcal)	< 6 months	2744.00	1879.05 ± 315.37	***68.48***	p < 0.001
	> 6 months	2803.00	1770.08 [1540.11 - 2036.76]	***63.15***	p < 0.001
Macronutrients intake in lactating women					
Protein (g)		71.00	68.78 ± 15.82	***96.87***	0.427
Fat (g)	< 6 months	59 - 103.2	78.78 ± 26.34		0.776
	> 6 months	56 - 105.4	74.35 [66.83 - 89.06]		0.374
Saturated FA(g)		NA	26.60 [22.08 - 33.39]		-
Monounsaturated FA(g)		NA	23.08 [18.11 - 28.94]		-
Polyunsaturated FA(g)		NA	11.92 [9.28 - 13.87]		-
n-3 FA (g)		1.30	1.32 [1.1 - 1.68]	***101.54***	0.331
n-6 FA (g)		13.00	9.66 [7.23 - 12.03]	***74.31***	0.001
Trans FA (g)		NA	0.95 [0.81 - 1.07]		-
Cholesterol (mg)		NA	225.19 [176.12 - 459.44]		-
Carbohydrate (g)		210.00	215.04 ± 56.67	***102.38***	0.613
Fibre (g)		29.00	15.92 [12.88 - 20.43]	***54.90***	p < 0.001

DRI = Dietary Reference Index; SMR = Subjects Meeting Recommendations; NA=Not Available, FA= Fatty Acids

Table III

Evaluation of energy intake in every group based on the lactation period

	Period of lactation (months)							
Nutrient	**G1: 0 - 6**		**G2: 6 - 12**		**G3: 12 - 24**		**G4: > 24**	
Dietary Intake (kcal)	**Value**	**p value**	**Value**	**p value**	**Value**	**p value**	**Value**	**p value**
	1879.05 ± 315.37	< 0.001	1832.99 [1760.35 - 2075.37]	0.019	1575.91 ± 451.31	< 0.001	1721.43 ± 509.20	0.003

Table IV

Evaluation of macronutrient intake in every group based on the lactation period

	Period of lactation (months)							
Nutrient	**G1: 0 - 6**		**G2: 6 - 12**		**G3: 12 - 24**		**G4: > 24**	
	Value	**p value**	**Value**	**p value**	**Value**	**p value**	**Value**	**p value**
Protein (g)	69.41 ± 14.29	0.719	72.63 ± 12.39	0.703	62.30 ± 22.25	0.340	69.45 ± 16.35	0.825
Fat (g)	78.78 ± 26.34	0.776	76.08 [69.28 - 95.19]	1.000	69.23 ± 15.52	0.098	74.73 ± 21.38	0.525
Saturated FA(g)	28.63 ± 6.38	-	26.60 [26.03 -37.89]	-	26.19 ± 8.32	-	25.65 ± 9.20	-
Mono-unsaturated FA(g)	25.35 ± 9.95	-	26.43 [21.87 - 31.46]	-	19.40 ± 6.14	-	22.03 ± 8.68	-
Poly-unsaturated FA(g)	11.02 [8.97 - 13.63]	-	12.72 [10.02 - 14.84]	-	10.17 ± 3.47	-	12.60 ± 4.07	-
n-3 FA (g)	1.26 ± 0.42	0.754	1.33 [1.28 - 1.86]	0.426	1.42 [1.13 - 1.55]	0.688	1.60 ± 1.03	0.502
n-6 FA (g)	8.87 [7.29 - 11.41]	0.123	9.18 [7.06 - 12.41]	0.129	8.05 ± 3.07	0.005	10.53 ± 3.43	0.138
Trans FA (g)	0.96 ± 0.49	-	0.91 [0.85 - 1.33]	-	1.09 ± 0.33	-	0.97 [0.90 - 0.98]	-
Cholesterol (mg)	272.20 ± 184.51	-	338.97 ± 197.73	-	233.82 ± 174.75	-	330.19 ± 155.10	-
Carbohydrate (g)	230.53 ± 39.06	< 0.001	234.5 ± 51.48	0.199	180.90 ± 69.05	3.08E-01	197.94 ± 66.19	0.674
Fibre (g)	18.77 ± 6.06	< 0.001	22.36 ± 12.90	0.161	12.99 ± 4.10	< 0.001	15.60 ± 5.60	0.002

Concerning energy intake, the results indicate that lactating mothers have an inadequate intake of energy (1879.00 kcal/day for mothers in G1 vs. 2744 kcal/day recommended and 1770.08 kcal/day for mothers in G2, G3, G4 *vs.* 2803 kcal/day recommended). These values are close to the lower limit for energy intake during lactation according to Ares *et al*. [3] who concluded that for an optimal outcome, women should not have a daily dietary intake below 1800 kcal. However, our analysis revealed that women in the third group G3 have a mean dietary intake of 1575.91 kcal/day, covering about half of their energy needs (Table III). We consider this finding of particular interest which deserves further investigation. Our overall results are comparable to similar recent studies regarding energy intake of lactating mothers in Croatia [9], Italy [7], China [5] or USA [14] but remain the lowest values. Although energy requirements during lactation are usually higher for covering needs of milk production, in 2005 a panel of experts agreed that these recommendations are set too high and mothers can reduce energy intake and still breast-feed successfully [2]. Also, 12% of the mothers in our study were overweight or obese prior conception; in this particular case, studies concluded that mothers could consume a slightly hypocaloric balanced diet for a moderate decrease in body fat and weight loss without adversely affecting nutrient intake [11].

The recommended intake for dietary protein during lactation is greater due to important amino acids function such as growth and repair of body tissue, synthesis of hormones, enzymes, and antibodies and also for adequate levels of protein secreted into breast milk [17]. As shown in Table II and Table IV, lactating mothers in our study consumed 68.78 g protein/day, thus reaching the DRI during breastfeeding and also the recommended distribution of 15% protein of the total energy intake. Although the protein intake met the recommendations, the intake of fat was relatively high, covering about 40.7 % of the daily energy intake. Even if, the mean value in grams of dietary fat (Table II), fail between the recommended intake limits, if calculated as 30% of the mean daily dietary intake, it seems that lactating women in the study group exceeded recommendations by 18.16 g/day in G1 and by 17.25 g/day in G2, G3 and G4. Of particular interest are dietary fatty acids, as they are transferred to breast milk and represent key nutrients for both mother and infant [10]. On one hand, it is recommended to limit the intake of saturated fatty acids (SFA) due to the high risk of cardiovascular disease [16] and on the other hand, maternal intake of polyunsaturated fatty acids (n-3 and n-6) is highly important for the normal growth and development of infants [1]. As presented in Table II, the lactating women exceeded the maximum dietary intake for SFA (13.5% *vs.* 10% from the daily energy intake recommended) but managed to achieve the n-3:n-6 ratio of 1:10 recommended by IOM [1]. Also, we observed that the intake of total fat and the fatty acids distribution in the four groups were similar. Lactating mothers in the study reached the DRI of carbohydrate but had a moderate imbalance in the daily distribution of this macronutrients (44.3% *vs.* 50 - 55% recommended). The adequate intake of carbohydrates is utterly important during breastfeeding since lactose, which is the main carbohydrate in breast milk, is synthesized from dietary glucose [1]. Moreover, dietary fibres were significantly lower ($p < 0.05$) in three out of four groups than the recommended intake of 29 g/day for lactating women. Unlike our findings, other studies revealed a higher intake of protein in the lactating women population. Chen *et al*. reported between 111 - 130 grams of protein daily, depending on the period of lactation [5] and according to Pratt *et al*., the average intake was 79.7 grams of protein daily [14], exceeding daily protein recommendations mostly due to the high intake of meat and dairy products. In the present study, the results reporting high levels of SFA are similar to that in other countries (e.g. ~26.2 g/day in the USA or ~31 g/day in Croatia) [9, 14] and the low intake of dietary fibres is consistent with similar investigations (e.g. ~11 g/day in China or 17.3 g/day in USA) [5,15].

Results from the current study and from similar studies in different countries which reflect that lactating mothers have a poor energy and nutrient balance can be attributed to low intakes of nutritious food categories such as fruits, vegetables, legumes, low-fat dairy and oily-fish and high intakes of saturated fat rich foods. With such inadequate food intake, mothers might be at risk of depleting their energy and nutrient reserves, therefore affecting breast milk composition and having a negative health impact on both their babies and themselves.

Conclusions

In the present study, lactating mothers did not meet dietary recommendations regarding energy intake and macronutrient distribution, except for proteins. These results highlight the importance that women, during breastfeeding, should receive proper dietetic information from healthcare professionals in order to improve their overall diet and health outcomes of the infant. Sustained nutrition education and counselling are a top priority to improve dietary practices and achieve a balanced, diverse and adequate diet in this sensitive population group. Our findings are highly relevant for the understanding of dietary patterns and for identification of dietary risk factors and needs of lactating mothers. Even if further research is still needed on this matter, we are confident that the results presented can be used as the cornerstone for

developing national dietary recommendations and guidelines for women during breastfeeding.

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