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The Association Between Maternal and Child Nutritional Status: Evidence From a Social Pediatrics Outpatient Clinic

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ABSTRACT

Objective: This study aimed to investigate the relationship between maternal and child nutritional status, considering the importance of children's nutrition at an early age.

Material and Methods: Mother-child pairs who attended a social pediatrics outpatient clinic participated in the study. A survey form was used to collect data, including questions regarding general information, breastfeeding, complementary feeding, and dietary records. The 24-hour dietary recall method was used as a dietary assessment method. Height and body weight were taken using measurement techniques by researchers. Data of pairs were collected from mothers, and they assisted in taking anthropometric measurements of the children. The recorded data were used to calculate the percentage of daily energy and nutrient requirements met by each participant. Pearson correlation analysis was performed to detect the coefficients of the relationship in SPSS statistic package program.

Results: The study included 104 mother-child pairs. The mean age of the mother and children was 30.7±5.7 years and 41.7±17.3 months, respectively. While 13.5% of the mothers were obese, 16.3% of the children were obese. A significant relationship was found between mothers' and children's daily main and snack numbers. The percentage of meeting their energy and protein requirements did not vary according to breastfeeding and complementary feeding parameters. Statistical analysis results showed significant relationships between percentages of meeting their macro and micronutrient requirements of mother-child pairs, except for energy and magnesium.

Conclusion: The study's results indicate that there is a relationship between the nutritional status of mothers and their children. There is a need for further research investigating the nutritional status of both mothers and children and emphasizing the interdependency of nutrition within the family.

Keywords: Mother-child pairs, Nutritional intakes, Parent diet

INTRODUCTION

The change in food preferences is a process that starts with pregnancy and continues throughout life. This development occurs with complex biological tendencies, and social and environmental factors (1). Various taste and flavor experiences in early stages of life play a role in promoting healthy eating later in life (2). Human milk is the first food consumed in infancy and accepted as the gold standard which has positive health effects for children (3). A systematic review found that optimal breastfeeding practices reduce morbidity and mortality from infectious diseases (gastrointestinal diseases, lower respiratory tract infections, allergic diseases) in the short term, and current evidence shows that they are effective in the long term against the emergence of non-communicable diseases, especially in high-income countries

Conflict of Interest : On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethics Committee Approval : This study was conducted in accordance with the Helsinki Declaration Principles. This study was approved by the Ethics Committee of Ankara City Hospital and then Ankara University Rectorate (12.05.2020-No. 07/112).

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(4). Beyond these health effects, there is also evidence showing that breastfeeding can affect future food choices (5,6). Additionally, some factors such as the time when complementary feeding began, and the consumption of formula have also some effects on children's later food preferences (6).

At this point, parents, especially mothers who give primary care to children become active. Parents provide their children with food, feeding environments and experiences. Moreover, they prepare the social and physical environment by encouraging, setting, or preventing their children from consuming certain foods (7). Children can take their parents as role models in terms of their eating behavior, lifestyles, attitudes related to eating, and satisfaction with body image (2). As a result of these factors, it is thought that the nutritional habits of the parents affect the food choice, food intake, and other issues related to children's diet (8,9). In addition, children of obese parents are at higher risk of becoming obese (10). It is reported that cases in which children's diet are controlled by parents and imposing their own attitudes of dietary intake on the children are also effective on the child's eating attitude (11). Besides, it is thought that healthy nutritional intake of parents will encourage their children to do so (12).

This study hypothesizes that the nutritional status of mothers, who are responsible for the primary care of children has close relationships with children, and it also influences the nutritional status of the children. The nutritional status of mothers is remarkably crucial because the eating habits acquired in childhood continue throughout adulthood (13). This study aimed to determine the relationship between mother-child pairs' nutritional status.

MATERIALS and METHODS

Mother-child pairs who attended the Social Pediatrics Outpatient Clinic of the Ankara City Hospital were included in the study. The inclusion criteria for mothers were that being volunteer and not having communication problems to participate in the study. The exclusion criteria were not to be a volunteer for herself and/or her child. Consent forms were obtained from the volunteers participating in the research. For their children, the criteria were to have permission from their family to participate in this study. They needed to be between 9-72 months, not to have any diagnosed chronic or metabolic diseases, and to be cared for and fed by their mothers. The maximum number of samples reached that met the inclusion criteria within the data collection time (3 months) was included in the study. Adequacy of the sample size and power of the study was calculated using freely available open-source software, OpenEpi web tool (14), with a 95% confidence interval (CI) and 80% power, and it was determined that at least 53 mother-child pairs (106 in total) were adequate. This study was conducted with 104 pairs (208 children and their mothers in total).

The questionnaire form included general information about the children and mothers, questions about breastfeeding, nutritional habits of children, their mothers, and their families. Anthropometric measurements (body weight, height/length) of the children and their mothers were taken and evaluated according to WHO reference values by the researchers. For children up to 24 months, the height was measured by two people, ensuring that the child's heel and head touched the infantometer, with the knees tense. When the scale needle was fixed, body weight was measured with a digital baby scale. Both measurements were made lying down and with minimal clothing. For children above 24 months and mothers, the height was measured with a stadiometer, and body weight was taken with a digital scale, in Frankfurt plane and standing. When evaluating the measurements, WHO Anthro (version 3.2.2) percentile values were used for children. The percentiles of children's Body mass index (BMI) were classified as < 3 (severely underweight), 3-15 (underweight), 15-85 (normal), 85-97 (overweight), and >97 (obese). Body mass index (BMI) (body weight, kg)/(body height, m^2) values were calculated and assessed according to WHO – 2008 criteria: BMI of < 18.5 kg/m^2 (underweight), 18.5-24.9 kg/m^2 (normal weight), 25 – 29.9 kg/m^2 (overweight), and 30 – 39.9 kg/m^2 (obese) (14). Mothers' and children's 24-hour dietary recalls, describing and quantifying the intake of foods and beverages consumed in the 24 hours, the day before the interview, from the first intake in the morning until the last foods or drinks consumed at night, were recorded. All information was obtained from mothers in detail. The Nutrition Information System Program (BeBiS, Version 8.2) analyzed for energy and nutrient composition (16). Nutritional assessment was examined in reference to Dietary Guidelines for Türkiye (17). The percentages of meeting the daily requirement of each mother and child were calculated by following the requirements recommendation according to sex and age.

Participants were informed before starting the data collection and written consent was signed by volunteers both for them and their children. This study complied with the Helsinki Declaration and was approved by Ankara City Hospital and then by the Ethics Committee of Ankara University Rectorate (12.05.2020-No. 07/112).

Statistical Analysis

Data analysis was performed via IBM Statistical Package for the Social Sciences, version 26.0 (SPSS Inc., Armonk, NY, IBM Corp., USA) for the Windows package program. Mean and standard deviation (SD) were calculated for the quantitative data. The distribution of data was given with tables of numbers (n) and percentages (%). The Pearson Chi-Square test was used to determine whether there was a significant difference between the frequencies. The regularity of the distribution for each parameter was evaluated using the Kolmogorov-Smirnov test. Data obtained from this study showed normal distribution (17). Independent sample t test and One Way ANOVA test were used to compare the means between two independent groups and more than two independent groups. Pearson correlation analysis was used to determine the relationship between two variables. The correlation coefficient was evaluated as follows: 0.00-0.10 (negligible), 0.10-0.39 (weak), 0.40-0.69 (moderate), 0.70-0.89 (strong), and 0.90-1.00 (perfect)

RESULTS

Total of 104 mother-child pairs were included in the study, and 58.7% of the children were girls. The mean age of mothers was

Table I: Characteristics of Mother-Child Pairs

Characteristics	Mothers (n=104)	Children (n=104)
Age, mean (SD)*	30.7±5.7 years	41.7±17.3 months
Girl†	104 (100)	61 (58.7)
BMI, mean (SD)‡	25.3±4.6 kg/m^2	59.2±32.7
Overweight†	37 (35.6)	17 (16.3)
Obese†	14 (13.5)	17 (16.3)

: mean±standart deviation,†: n(%), ‡: Reported as percentile of BMI for age for children, **BMI: body mass index*

Table II: Dietary Habits of Mother-Child Pairs

Dietary habits	Mothers	Children	p
Main meal*			
1 or 2	45 (43.3)	9 (8.7)	<0.001‖
3	59 (56.7)	95 (91.3)	
Snack*			
No or 1	53 (51.0)	13 (12.6)	<0.001‖
2	38 (36.5)	46 (44.2)	
3 or above	13 (12.5)	45 (43.2)	
The duration of each main meal (minute)†	21.0±12.5	21.9±15.2	0.651¶
Most common preferred food in snacks (Fruit)*	(36, 34.6)	(65, 62.5)	-
Most common preferred drink in snacks*	(32, 30.8)‡	(36, 34.6)§	-

**: n(%), †: mean ±standart deviation, ‡: tea, §: milk, ‖: Pearson Chi-square test, ¶: Independent sample t test*

30.7±5.7 years and the mean age of children was 41.7±17.3 months. While 49.1% of mothers and 32.6% of children were overweight/obese, respectively (Table I).

In examining some dietary habits of participants, most of the mothers (56.7%) and children (91.3%) had consumed 3 main meals. There was a significant difference between frequencies of the number of both main meals and snacks for children and their mothers. The mean duration of each main meal was not statistically different between mothers and children (p>0.651). While the most common preferred food in snacks was fruit for both mothers and children, the drink was tea and milk for mothers and children, respectively (Table II).

The percentages of meeting energy and protein requirement of mothers and their children did not differ according to the duration of exclusive breastfeeding (p=0.678, p=0.479, p=0.917, p=0.990), first breastfeeding time (p=0.456, p=0.313, p=0.674, p=0.052), main food source in 6 months of life (p=0.982, p=0.259, p=0.991, p=0.564), and the day complementary nutrition started (p=0.642, p=0.201, p=0.923, p=0.326) (Table III).

There were positive correlations between mothers and children in terms of the mean percentages of meeting protein (r=0.313, p=0.001, weak), dietary fiber (0.359, p<0.001, weak), calcium (r=0.343, p<0.001, weak), phosphorus (0.364, p<0.001, weak), iron (r=0.298, p=0.002, weak), zinc (r=0.564, p<0.001, moderate), vitamin A (r=0.654, p<0.001, moderate), vitamin E (r=0.367, p<0.001, weak), vitamin K (r=0.539, p<0.001, moderate), vitamin C (r=0.509, p<0.001, moderate), thiamine (r=0.397, p<0.001, weak), riboflavin (r=0.487, p<0.001, moderate), niacin (r=0.426, p<0.001, moderate), pyridoxine (r=0.240, p=0.014, weak), folate (r=0.504, p<0.001, moderate), vitamin B12 (r=0.965, p<0.001, perfect) (Table IV) requirements.

Table III: The Percentages of Meeting Energy and Protein Requirements According to The Features of Children

	Energy (kcal)				Protein (g)			
	Mothers*	p†	Children*	p†	Mothers*	p†	Children*	p†
The duration of exclusive breastfeeding								
0-3 months	67.3±23.0	0.678	77.5±24.2	0.479	106.8±30.2	0.917	250.4±87.1	0.990
4-6 months	70.8±23.8		86.5±31.7		108.9±39.0		253.5±111.8	
>6 months	62.6±10.1		86.6±40.5		115.0±14.4		257.0±105.6	
First breastfeeding								
0-30 min	70.3±23.1	0.456	86.6±33.1	0.313	110.5±36.2	0.674	266.6±114.2	0.052
31-60 min	63.9±20.2		82.4±22.3		102.5±37.0		219.1±59.0	
≥61 min	75.4±29.5		70.5±10.7		104.0±40.6		193.0±50.1	
The main food in the 6 months period of life‡								
Exclusive breastfeeding	69.4±23.7	0.982	88.5±29.0	0.259	109.7±39.3	0.991	263.3±113.0	0.564
Breastfeeding and formula	71.4±23.6		84.2±31.4		107.4±28.9		250.1±82.5	
Breastfeeding and complementary foods	68.7±22.6		72.1±33.6		107.2±39.3		223.1±114.0	
The day of starting complementary nutrition								
<180th	70.0±23.6	0.642	74.6±30.7	0.201	107.0±36.0	0.923	229.1±103.4	0.326
180th	67.0±21.8		89.4±33.8		107.6±41.0		271.5±117.9	
>180th	71.9±24.3		85.3±27.1		110.3±33.4		249.0±96.1	

**: mean±standart deviation, †: One Way ANOVA test ,‡: Excluded one child who fed only formula and his mother*

Table IV: Correlation of The Percentages of Meeting Energy and Nutrient Requirements of Mother-Child Pairs, Mean (SD)

Nutrients	Mothers*	Children*	Coefficient	p†
Energy	69.8±23.2	84.6±30.5	0.170	0.085
Protein[a]	108.7±36.5	253.0±105.9	0.313	0.001
Dietary fiber	68.3±37.1	58.4±26.2	0.359	<0.001
Ca	58.2±26.1	70.4±36.0	0.343	<0.001
P	114.9±39.0	155.3±60.9	0.364	<0.001
Fe	48.3±19.7	82.5±35.5	0.298	0.002
Zn	104.3±61.9	236.7±170.2	0.564	<0.001
Mg	69.1±28.3	165.9±70.7	0.159	0.108
Vitamin A	128.4±161.0	207.8±196.4	0.654	<0.001
Vitamin E	73.6±38.9	129.6±94.3	0.367	<0.001
Vitamin K	112.1±203.7	185.5±353.1	0.539	<0.001
Vitamin C	86.3±69.1	130.9±109.6	0.509	<0.001
Vitamin B_1	62.3±26.3	112.0±49.1	0.397	<0.001
Vitamin B_2	83.7±36.5	225.4±137.8	0.487	<0.001
Vitamin B_3	70.4±36.6	109.2±69.9	0.426	<0.001
Vitamin B_6	66.0±26.1	167.3±109.1	0.240	0.014
Folate	58.2±29.4	110.0±62.8	0.504	<0.001
Vitamin B_{12}	163.9±453.2	398.9±925.1	0.965	<0.001

***:** *mean ± standart deviation,* **†:** *Pearson correlation test,* ***Ca:** Calcium, **P:** Phosphorus, **Fe:** Iron, **Zn:** Zinc, **Mg:** Magnesium*

DISCUSSION

This study was carried out to examine the relationship between the nutritional status of children and their mothers. While the frequencies of the main meals and snacks of children differed from their mothers, the mean times of the main meals were similar. Mother-child pairs most frequently consumed fruit in snacks, however, as beverages children and mothers drank milk and tea, respectively.

In current study, positive correlations were found between the percentages of meeting daily calcium, iron, thiamine, and folate requirements of mothers and children. However, studies in the literature are generally based on the comparison of food preferences and percentages of energy and macronutrient intakes of parent(s)-child(ren) pairs (20,21). The number of studies comparing micronutrients is limited. In this respect, the results of this study are preliminary data for future studies.

In this study, the percentage of mothers meeting their daily energy requirements was 69.8%, and it was not found to be correlated to their children's. A study, conducted by Aksoy and Garipağaoğlu (20) demonstrated that daily energy requirements were met at 93.0% and 83.4% for children and their mothers, respectively. While Aksoy and Garipağaoğlu's (20) study was conducted in a private hospital, this study was conducted in a public hospital, and it was thought that the difference between the percentages was due to the economic status.

Robson et al. (21) provided some evidence that the daily energy intake of the parents explained 21% of the child's energy intake. In the study of Robinson et al. (22) it was reported that there were weak correlations between both the energy intake of children aged 8-12 and their mothers and the percentage of energy from proteins of the same groups. However, no relationship was found for other macronutrients. In addition, it was revealed that as the amount of dietary fat in the parent's diet increased, the amount of fat in the child's diet also increased (23). In a study, it was determined that there was no difference between the daily energy intake of mothers and their children and the percentage of energy coming from protein, but the percentage of energy coming from fat was different (24). In a study conducted in the United States, the energy intake of parents and children through diet, the percentage of energy coming from fat, saturated fat, cholesterol, sodium, calcium, and fiber were examined and it was reported that this relationship was weak (25).

In a meta-analysis study that included 15 studies, it was determined that the correlation value between the nutrient intakes of mothers and children varies depending on the dietary evaluation and the country where the research was conducted. It was found that the correlation coefficient was lower in studies based on children's self-reporting (9).

Since preschool children cannot prepare their own food, they are dependent on their parents in this regard. They also tend to consume the same foods as their parents. Therefore, the correlation between the percentages of meeting nutrient requirements of parents and children is an expected finding.

Similarities can be observed between the food preferences of parents (especially mothers) and children as well. In the study of Vivarini et al. (26) a positive relationship was detected between the amount of fruit consumption by mother-child pairs. Similarly, another study conducted in Australia showed that the amount of fruit consumption of mother-child pairs was correlated. (27). Walsh et al. reported that as fruit consumption by fathers increased, it also increased by their children similarly (28). In a meta-analysis, the consumption of sugar-sweetened beverages and fruit and vegetables by children was like the consumption by their parents (29). In addition, Vaughn et al. (30) reported that the diet quality of the children who had healthy eating patterns was higher. In a study conducted with girls, it was reported that having a healthy diet for children was highly correlated with the mothers' diet (31). These studies showed that the diet of parents, especially mothers, considerably influences the diet of the child. In this study, the relationship on the basis of foods was not examined. However, since nutrient intakes reflect food intake, it is thought that the nutritional consumption of the mother and child will have similar results to those of these studies. In this study, some nutritional intakes of mothers and children are similar. Another study unveiled that the diet of the children was more like the diet of the parents who responded to the food intake record (32). This made us think that the results of food consumption records of children might vary according to the responder. Possible mistakes on this issue are another limitation of this study. In future studies, it is thought that food consumption records should be obtained from both parents and primary caregivers separately and independently.

In this study, the percentage of dyads meeting their daily energy and protein requirements did not vary based on breastfeeding or complementary feeding parameters. Shim et al. (33), have shown that the duration of breastfeeding and the timing of introducing complementary foods influence children's food choices during the preschool years.

It is reported that as the duration of breastfeeding increases, children eat healthier in the future (34). In addition, the consumption of vegetables when they reached the age of 2-4 years was higher in children who were breastfed for the first 3-6 months in life compared to those who were breastfed for a shorter period (35). Another study found that children who were breastfed for at least 3 months consumed more fruit when they were 6 years old than those who had never been breastfed (36). However, the data of this study was cross-sectional, and the nutritional status of the children in the following years was not kept track. This situation could be thought of as a study limitation.

CONCLUSION

Not having the ability to meet their self-care and being dependent on at least one caregiver (generally their mothers) cause children to be more affected by environmental factors. Therefore, it is inevitable that the nutritional status of children is affected by parents, and they play a crucial role in having a healthy diet for children. It is supported by the results of this study that especially the nutritional status of the mothers affects their children. Thus, it is important to improve the nutritional status of parents. In addition, nutritional habits acquired in childhood become permanent, continue in later years, and affect children's health status. However, it would be useful to carry out studies including mothers, fathers, and other family members to clarify this situation.

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