

Evaluation of the Frequency of Obesity and Associated Factors in Children of Obese and Overweight Mothers

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ABSTRACT

Aim: The mother is an important determinant of the nutrition of her children. The aim of this study is to evaluate the relationship between obese or overweight mothers, their sociodemographic status and appetite on the anthropometric measurements of their children, and evaluate the relationship between breastfeeding duration, initiation time of a complementary diet and children's BMI classification.

Materials and Methods: Children whose ages were between 2 and 5 years old, with no additional chronic disease, were included. The sociodemographic data anthropometric measurements and appetites of the children and their mothers were determined. Obese or overweight mothers and mothers with normal body mass index (BMI) were studied as two separate groups. The duration of breastfeeding and initiation time of a complementary diet for the children was classified as <4 months, 4–6 months and > 6 months.

Results: A total of 182 children (109 with obese and overweight mothers and 73 with mothers with normal BMI) were included. The distribution of overweight and obese children among the group of obese and overweight mother was higher. When the weight, weight percentile and weight SDS values of the obese or overweight mothers were compared with their children, a moderately statistically significant positive correlation was found. The distribution of overweight and obese children among the group of employed mothers, and the distribution of underweight children among the group of unemployed mothers, was high. A significant relationship was found between maternal appetite and the BMI classification of the children. No statistically significant difference was found between breastfeeding duration, initiation time of a complementary diet and children's BMI classification.

Conclusion: It was determined that mother's characteristics of having a BMI classification of overweight or obese, excessive appetite and being employed may be risk factors for developing overweight and obese children.

Keywords: Obesity, mother, child, overweight

Introduction

The increase in obese and overweight children is an important health problem all over the world. In Turkey, especially in recent years, the prevalence of obesity has increased in children and adolescents. It is reported that 14.2–16.1% of children are overweight, and 8.3–10% are obese in Turkey (1,2). Parental obesity is thought to be a risk factor for childhood obesity (3). Sharing the same genetic burden

and environmental conditions are impressive factors for parents and children (4).

Parental weight change is an independent predictor of child weight change (5). However, positive weight change in the mother had a more dominant influence than did the father's positive weight change (5). The mother is generally the principle responsible parent for the care of the child, and her knowledge and practices surrounding nutrition can be an influential factor in her child's development, as

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well as her own body composition (5,6). The sociocultural status of the mother, her level of knowledge and practices around nutrition, her employment status and how she acts as a model for her child regarding nutrition can shape the nutritional characteristics of the child and, ultimately, the child's body composition (7). In a systematic review, it is reported that breastfeeding has a small but consistent protective effect against obesity in children (8). However, some studies have reported an inverse relationship between breastfeeding and obesity (8). Additionally, it has been reported that complementary feeding, when initiated earlier than 4 months, increased the risk of being overweight and obese during childhood (9). For these reasons, the aim of this study is to evaluate the effect of having an obese or overweight mother, sociodemographic status and the appetite of the mother, on the anthropometric measurements of the child. Secondly aim is evaluating the relationship between breastfeeding duration, initiation time of a complementary diet and children's BMI classification.

Materials and Methods

Children who were admitted to the pediatric gastroenterology and general pediatric outpatient clinic between August and November 2018 who were between the ages of 2 and 5 years and had no additional chronic disease were included in the study. The sociodemographic data of the children and their mothers were determined. The mothers' education level, employment status, appetite, level of knowledge about child nutrition, breastfeeding duration, initiation time of complementary feeding and family income were evaluated. The monthly income level was grouped as ≤1600 Turkish Lira (TL), 1600-2500 TL, 2500-5000 TL and >5000 TL, based on the minimum wage. Appetite was classified and recorded as: very bad (0 points), bad (1 point), normal (3 points), good (4 points), very good (5 points). The appetite of the mother and the child were determined according to the score given by the mother.

The height and weight of the children and their mothers were measured by the same team and the same equipment. The weight, weight percentile, weight standard deviation score (SDS), body mass index (BMI) of the children and their mothers were determined. The BMI of mothers and children was calculated by weight (kg)/height (m²). The BMI of the children was rated as follows; >95 percentile=obese, 85-95 percentile=overweight, 5-85 percentile=normal, <5 percentile=underweight (10,11). The BMI of the mothers classified as follows: > 30=obese, 25-29.99=overweight, 18.5-24.99=normal and <18.5=underweight (<http://www.who.int/mediacentre/factsheets/fs311/en>). Children whose mothers were underweight were not included in

the study. Children whose mothers was considered obese or overweight and children whose mothers' BMI was within the normal range were studied as two separate groups. The duration of breastfeeding and initiation time of complementary diet for the children was classified as <4 months, 4-6 months and > 6 months. The anthropometric measurements, parents' sociodemographic data, duration of breastfeeding and initiation time of complementary diet and appetite were compared between mother's children in the two groups. The relationship between anthropometric measurements of mothers and their children was evaluated, too. Informed consent was obtained from all mothers who participating in the study. Ethics committee approval was obtained from the Ethics Committee of Tepecik Training and Research Hospital.

Statistical Analysis

All statistical analyses were performed using the IBM SPSS Statistics 25 package program (IBM Corp., Armonk, New York, USA). Data are presented as count (n), percent (%), mean, standard deviation ($\bar{x} \pm sd$) and median 25 %-75 % quartiles (M (Q1-Q3)). Shapiro-Wilk's test was used and a histogram and Q-Q plot were examined to assess the data normality. Mann Whitney U test was used to compare the differences between two groups for children age and body mass index (percentile). The relationship between variables was evaluated by Spearman correlation analysis. The relationship between categorical variables that have two categories and more than two categories were used Pearson Chi-Square test and Continuity Correction test. Boxplot graph was used to show the shape of the distribution of breastfeeding duration (months) according to groups of children's body mass index classification. Bar graph was used to visually compare breastfeeding duration (3 categories), mother appetite (5 categories) and initiation time of complementary diet (3 categories) data among categories.

Results

A total of 182 children with 109 obese or overweight mothers and 73 mothers who had normal BMI were included in the study. Sociodemographic and anthropometric findings of the children and mothers are shown in Table I. There were statistically significant differences, in terms of the BMI percentiles of the children, between the group of children with obese or overweight mothers and the group with mothers with normal BMI ($p=0.011$) (Table I). According to the children's BMI classifications, there is no significant relationship between the children of obese or overweight mothers and the children of mothers with normal BMI ($p=0.170$). However, the distribution of overweight and obese children among the group of obese and overweight mothers was higher than among the group with normal BMI mothers

(Table II). A statistically significant difference was found between the BMI classification of the children with employed versus unemployed mothers ($p=0.015$). The distribution of overweight and obese children among the group of employed mothers and the distribution of underweight children among the group of unemployed mothers was high (Table II). When the weight, weight percentile and weight SDS values of the obese or overweight mothers were compared with their children, a moderately statistically significant positive correlation was found ($rs=0.215$, $p=0.025$; $rs=0.319$, $p=0.001$; $rs=0.319$, $p=0.001$). A significant relationship was found

between maternal appetite and the BMI classification of the child ($p=0.005$). Among the children of mothers with very good appetites, 18.5% were overweight and 20.4% were obese (Table II).

No statistically significant difference was found between breastfeeding duration and the children's BMI classification ($p=0.687$) (Figure 1, Table II). However, the distribution of overweight and obese children among the group of children breastfed for less than 4 months was higher than the group of children breastfed for more than 6 months (Table II). When the children were evaluated

Table I. Socio-demographic and anthropometric findings of the children in the groups

	Groups		
	Obese or overweight mother (n=109)	Mother with normal BMI (n=73)	
Children			
	$\bar{x} \pm sd$ $M(Q_1-Q_3)$	$\bar{x} \pm sd$ $M(Q_1-Q_3)$	p value
Age	3.53±1.02 3.50 (2.83-4.50)	3.59±1.05 3.50 (2.75-4.50)	0.679+
BMI percentile	50.63±36.63 56.36 (13.00-89.03)	37.25±33.90 28.10 (4.36-69.89)	0.011*
	(n, %)	(n, %)	
Gender			
Girls	60 (55.0)	34 (46.6)	
Boys	49 (45.0)	39 (53.4)	0.262†
Mother			
	$\bar{x} \pm sd$ $M(Q_1-Q_3)$	$\bar{x} \pm sd$ $M(Q_1-Q_3)$	
Age	31.81±5.40 31.00 (28.00-34.00)	31.53±5.54 32.00 (27.00-36.00)	0.997+
	(n, %)	(n, %)	
Education level			
Uneducated	9 (8.3)	8 (11.0)	
Primary school	64 (58.7)	37 (50.7)	
High school	17 (15.6)	9 (12.3)	
University	19 (17.4)	19 (26.0)	
Employment status			
Employment	29 (26.6)	20 (27.4)	
Unemployment	80 (73.4)	53 (72.6)	1.000*
Family Income level			
1600 TL	37 (33.9)	25 (34.2)	
1601-2500 TL	37 (33.9)	25 (34.2)	
2501-5000 TL	15 (13.8)	9 (12.3)	
>5000 TL	20 (18.3)	14 (19.2)	

*Mann Whitney U test, †Pearson Chi-Square test, *Continuity correction test

according to the initiation time of a complementary diet, no significant difference was found ($p=0.375$) (Table II).

Discussion

In this study, obese and overweight mothers who were employed and had high appetite were found to have more

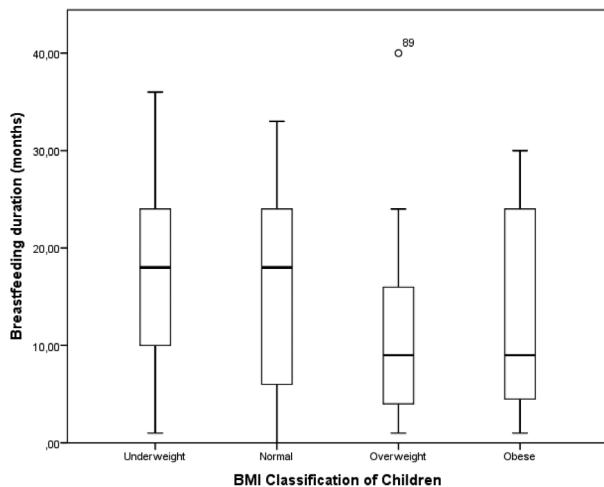


Figure 1. oxplot of Breastfeeding duration (months) and Children's BMI classification

obese and overweight children. Additionally, the children who were breastfed for less than 4 months were more likely to be obese and overweight than children who were breastfed for more than 6 months.

Parents are important as a role model in the physical appearance and health of their children (12). Parental obesity has been shown to increase the risk of developing obesity in children (13,14). The mother is especially the determinant of nutrition in her child, as she is the principal caregiver and the person shaping nutrition (6). Stunkard et al. showed a weak relationship between the weight of mothers and the weight of their children in the first 2 years (15). The first years are a transitional period in which the prenatal environmental impact decreases and the genetic and shared common environment and parental characteristics become more pronounced (4). Therefore, the study did not include children less than 2 years of age.

In a study in which children under 5 years of age were followed for about 14 years, it was shown that mothers' positive weight gain increased the likelihood of positive weight gain in pre-school and school children. However, no similar relationship was found between fathers and their children (5). In our study, we found that a positive correlation between the weight, weight percentile and weight SDS values of the obese or overweight mothers and their children.

Table II. The relationship between breastfeeding duration, initiation time of complementary diet, maternal appetite, mother's BMI classification, mother's working status and BMI classification of children

	BMI Classification of Children									
	Obese		Overweight		Normal		Underweight			
	n	%	n	%	n	%	n	%	p value	
Breastfeeding duration	< 4 months	4	15.4	4	15.4	15	57.7	3	11.5	0.687†
	4-6 months	2	13.3	3	20	8	53.4	2	13.3	
	> 6 months	13	9.5	14	10.2	79	57.7	31	22.6	
Initiation time of complementary diet	< 4 months	2	40	0	0.0	3	60	0	0.0	0.375†
	4-6 months	5	12.5	5	12.5	22	55	8	20	
	> 6 months	12	8.8	17	12.4	79	57.6	29	21.2	
Maternal appetite	Very bad	0	0.0	0	0.0	0	0.0	1	100	0.005†
	Bad	2	20	0	0.0	3	30	5	50	
	Normal	1	2.4	6	14.3	27	64.3	8	19	
	Good	5	6.6	6	8	46	61.4	18	24	
	Very good	11	20.4	10	18.5	28	51.9	5	9.2	
BMI classification of mothers	Obese or overweight	14	12.8	16	14.7	61	56.0	18	16.5	0.170†
	Normal	5	6.8	6	8.2	43	58.9	19	26.0	
Mother's working status	Employed mother	7	14.3	11	22.4	26	53.1	5	10.2	0.015†
	Unemployed mother	12	9.0	11	8.3	78	58.6	32	24.1	

†Pearson Chi-Square test

Also, BMI percentiles were higher in the children of obese or overweight mothers.

It has been shown that young mothers with low education levels are not aware of their weight status and do not worry that their children are overweight (16). In a study from Sweden, it was reported that the children of obese and low-educated parents were at risk for the development of obesity (17). In a study from United States, the relationship between the length of mother's working hours (for mothers with higher education level) and child BMI was associated with the child's duration of television viewing (18). In this study, the number of obese and overweight children was higher for the employed mothers, and the number of underweight children was higher for the unemployed mothers. In children 2-5 years of age, have been reported to be more important in the prevention of obesity, rather than longer working hours, more standard working hours for parents and reduced access of children to sugary drinks (19).

It has been reported that exclusive breastfeeding has a positive effect on the weight of children, as well as their weight in adolescence and adulthood (20). There is also a positive relationship between the mother's >30 BMI and the duration of less than 4 months breastfeeding (21). In a study that evaluated 5-year-old children, it was reported that there was a weak relationship between the duration of breastfeeding less than 4 months and obesity, but there was no statistical significance, and exclusive breastfeeding was not protective for obesity (21). In this study, we did not find a relationship between breastfeeding duration and obesity. However, it was seen that children who were breastfed for less than 4 months were more likely to be obese and overweight than children who were breastfed for more than 6 months.

A complementary feeding period provides the opportunity to protect children from becoming obese and overweight (22). Complementary nutrition that is applied between 6 and 24 months becomes an important period affecting long-term health. (23). The European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) states that complementary nutrition should not be initiated before 17th week or after 26th week and that exclusive breastfeeding or predominantly breastfeeding in the diet for 6 months is preferential (24). This study did not find a relationship between the initiation time of a complementary diet and obesity. Therefore, it is important to provide appropriate nutritional support in this period, considering the positive effects of complementary nutrition on a child's development and on long-term health (25).

The limitation of the study was evaluating the mothers' and children's appetite according to the mothers' declaration. Furthermore, larger sample size studies on this issue will be useful.

Obesity is a preventable public health problem. In this respect, it is important to identify impressive factors and take necessary measures to prevent obese and overweight children. This study determined that the mothers' characteristics of having a BMI classification of overweight or obese, having excessive appetite and being employed may be risk factors for developing overweight and obese children. Increasing the awareness of mothers about their excess weight and their children's excess weight and providing appropriate training for mothers about the healthy feeding of their children can help prevent obesity in childhood.

Ethics

Ethics Committee Approval: The study was approved by the İzmir University of Health Sciences Tepecik Training and Research Hospital Ethics Committee.

Informed Consent: Consent form was filled out by all participants.

Authorship Contributions:

Medical Practices: Y.Ç.A., M.B., B.A., Concept: Y.Ç.A., M.B., Design: Y.Ç.A., M.B., B.A., O.B., Data Collection or Processing: Y.Ç.A., B.A., TT., E.B., O.B., Analysis or Interpretation: Y.Ç.A., B.E., Literature Search: Y.Ç.A., B.A., E.B., B.E., TT., Writing: Y.Ç.A., M.B.

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References

1. Önal Z, Adal E. Çocukluk Çağında Obezite. Okmeydanı Tıp Dergisi 2014;30:39-44.
2. Alpcan A, Durmaz ŞA. Çağımızın dev sorunu: Çocukluk çağlığı obezitesi. Turkish Journal of Clinics and Laboratory 2015;6:30-3.
3. Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. N Engl J Med 1992;327:1350-5.
4. Heude B. Anthropometric relationships between parents and children throughout childhood: the Fleurbaix-Laventie Ville Santé Study. Int J Obes (Lond) 2005; 29:1222-9.
5. Andriani H. Parenteral weight changes as key predictors of child weight changes. BMC Public Health 2015;15:645.
6. Silva GK. Latina mothers' influences on child appetite regulation. Appetite 2016;103:200-7.
7. Silva GK, Power TG, Beck AD, et al. Stability in the feeding practices and styles of low-income mothers: questionnaire and observational analyses. Int J Behav Nutr Phys Act 2018;15:28.
8. Arenz S, Ruckerl R, Koletzko B, von Kries R. Breast-feeding and childhood obesity- a systematic review. Int J Obes Relat Metab Disord 2004; 28:1247-56.
9. Wang J, Wu Y, Xiong G, et al. Introduction of complementary feeding before 4 months of age increases the risk of childhood overweight or obesity: A meta-analysis of prospective cohort studies. Nutr Res 2016;36:759-70.

10. Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC growth charts for the United States: Methods and development. *Vital Health Statistics* 2002;11:1-190.
11. Bundak R. Body mass index references for Turkish children. *Acta Paediatr* 2006;95:194-8.
12. Faith MS, Van Horn L, Appel LJ, et al. Evaluating parents and adult caregivers as "agents of change" for treating obese children: evidence for parent behavior change strategies and research gaps: a scientific statement from the American Heart Association. *Circulation* 2012;125:1186-207.
13. Boutelle KN, Cafri G, Crow SJ. Parent predictors of child weight change in family based behavioral obesity treatment. *Obesity* (Silver Spring) 2012;20:1539-43.
14. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting Obesity in Young Adulthood from Childhood and Parental Obesity. *New England Journal of Medicine* 1997;337:869-73.
15. Stunkard AJ, Berkowitz RI, Stallings VA, Cater JR. Weights of parents and infants: is there a relationship? *Int J Obes Relat Metab Disord* 1999;23:159-62.
16. Wen LM, Baur LA, Simpson JM, Rissel C. Mothers' awareness of their weight status and concern about their children being overweight: findings from first-time mothers in south-west Sydney. *Aust N Z J Public Health* 2010;34:293-7.
17. Huus K, Ludvigsson JF, Enskär K, Ludvigsson J. Risk factors in childhood obesity-findings from the All Babies In Southeast Sweden (ABIS) cohort. *Acta Paediatr* 2007;96:1321-5.
18. Ziol-Guest KM, Dunifon RE, Kalil A. Parental employment and children's body weight: Mothers, others, and mechanisms. *Soc Sci Med* 2013;95:52-9.
19. Penilla C. Obstacles to preventing obesity in children aged 2 to 5 years: Latino mothers' and fathers' experiences and perceptions of their urban environments. *Int J Behav Nutr Phys Act* 2017;14:148.
20. Tambalis KD, Mourtakos S, Panagiotakos DB, Sidossis LS. Association of Exclusive Breastfeeding with Risk of Obesity in Childhood and Early Adulthood. *Breastfeed Med* 2018; Nov 9. [Epub ahead of print]
21. Huus K, Ludvigsson JF, Enskär K, Ludvigsson J. Exclusive breastfeeding of Swedish children and its possible influence on the development of obesity: a prospective cohort study. *BMC Pediatr* 2008;8:42.
22. Bhutta ZA, Das JK, Rizvi A, et al. Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? *The Lancet* 2013;382:452-77.
23. Vitta BS, Benjamin M, Pries AM, Champeny M, Zehner E, Huffman SL. Infant and young child feeding practices among children under 2 years of age and maternal exposure to infant and young child feeding messages and promotions in Dar es Salaam, Tanzania. *Matern Child Nutr* 2016;12:77-90.
24. Fewtrell M, Bronsky J, Campoy C, et al. Complementary Feeding: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2017; 64.
25. Michaelsen KF, Grummer-Strawn L, Bégin F. Emerging issues in complementary feeding: Global aspects. *Matern Child Nutr* 2017;13:2.