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Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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Food Eating of Mothers and Their Daughters in Relation to Mothers' Body Mass Index

[1]Lidia Wadolowska, [1]Malgorzata Anna Slowinska, [2]Kamila Pabjan-Adach and [1]Ewa Niedzwiedzka
[1]Department of Human Nutrition, University of Warmia and Mazury, Olsztyn, Poland
[2]Nursing and Midwifery, Faculty of Health Science, Swietokrzyska Academy, Kielce, Poland

Abstract: Similarities in food eating by mothers and daughters were studied in relation to mothers' body mass index. The study included 97 pairs of mothers and daughters aged 43.3±6.0 years and 16.0±3.1 years, respectively. Food eating was determined by the food intake frequency method, using the calibrated FFQ questionnaire. Mothers-daughters family pairs were divided into 3 groups according to terciles of the mothers' BMI. Significant correlation between the amount of food eaten by mothers and daughters was found in both extreme terciles for 75% of products. The obtained results indicate on a significant similarity in food eating by mothers and their daughters, which in a limited degree depended on mothers' body mass. The BMI of overweight mothers was a good predictor of daughters' body mass index, which suggests that family environment promotes obesity among their children.

Key words: BMI, daughters, mothers, family environment, food eating

Introduction

Family environment is one of the external factors influencing choice, frequency and amount of food eaten by people living together in a household (Feunekes *et al*., 1998; Jezewska-Zychowicz, 2004; Jurikova and Duranova, 2005; Neumark-Sztainer *et al*., 2003a, 2003b; Story *et al*., 2002). In the twins studies is was estimated that environmental factors explained 60-85% of the changeability in food eating (Van den Bree *et al*., 1999). Traditional social roles attribute bigger share in fulfilling families food needs to women. According to Van den (Bree *et al*., 1999) women are more susceptible to environmental influences that men, which may determine bigger influence of mothers on their daughters. (Mosca *et al*., 2006) showed that women who were aware of having higher risk of health loss undertook more preventive actions connected to themselves and their families.

Present study states a hypothesis that occurrence of nutritional status disorders, such as overweight or obesity, may incline mothers to modify assortment and amount of food they eat and thus indirectly determine their children nutrition. The aim of the work was to show similarities in food eating by mothers and their daughters and its relation to mothers' body mass.

Materials and Methods

Sample: The studies included 97 pairs of mothers and their daughters aged 43.3±6.0 years old (from 32.7 to 57.0 years) and 16.0±3.1 years old (from 12.0 to 21.0 years), respectively. Women and girls lived in cities and villages of North-Eastern Poland. The sample was chosen using the snowball method. People with nutrition disorders, such as anorexia, were excluded from the study. One family pair was rejected because of small credibility of daughter's food interview. Most of mothers and daughters did not apply any diets (77.6% and 85.7% of the sample, respectively). Most of women had secondary or primary education (78.6% of the sample), and most daughters were learning in a secondary school (85.7% of the sample). Average economic situation of family was declared by 83.7% of the sample.

Food intake assessment: Food intake was assessed by the food intake frequency method. Using the calibrated FFQ questionnaire information was gathered on habitual frequency and amount of eating 165 products (Wadolowska, 2005). Eating frequency for products and dishes was described by respondents freely, declaring habitual eating frequency of products and dishes during a day, week, month and year (open questions). The amount of products and dishes was described on the basis of photos from "Album of food products with different portion size" (Szponar *et al*., 2000). Products and dishes were aggregated into 24 groups for further analysis. Girls had no age subgroups separated, as differences in food eating by younger (12÷15 years) and older girls (16÷21 years) were small and applied mostly to coffee, tea and alcohol drinks.

Nutritional status assessment: On the basis of weight and height measures the BMI was calculated, and for girls also the index of BMI's standard deviation (Z-score). Warsaw girls of the same age were accepted as reference population (Palczewska and Niedzwiecka, 2001). Then, family pairs mother-daughter were divided into 3 groups according to terciles of mothers' BMI

Table 1: Sample characteristic (Me±QD, min-max)

Parameter	D	Mothers			Daughters		
		I tercile N=32	III tercile N=32	Total N=97	I tercile N=32	III tercile N=32	Total N=97
Age (years)	m, d	42.4±6.9	45.0±7.5	43.3±6.0	15.6±2.6	17.0±3.9	16.0±3.1
		33.9÷50.7	35.1÷57.0	32.7÷57.0	12.0÷19.9	13.1÷21.0	12.0÷21.0
BMI (kg/m^2)	m, d	21.2±1.8	30.5±5.7	24.0±5.9	19.1±2.7	21.0±3.5	19.7±3.2
		18.0÷22.5	26.4÷43.2	18.0÷43.2	14.3÷27.9	14.5÷29.3	14.3÷29.3
BMI Z-score	d	-	-	-	-0.3±0.9	0.2±1.4	-0.2±1.2
					-1.6÷2.9	-1.8÷3.5	-1.8÷3.5
Overweight* (% of the sample)	m	0.0	100.0	43.3	3.1	15.6	9.3
Obesity** (% of the sample)	m	0.0	53.1	17.5	3.1	6.2	3.1

* mothers: BMI>25, daughters: BMI>90 percentile; ** mothers: BMI>30, daughters: BMI>97 percentile;
D - differences significant statistically at p<0.05 between III tercile and I tercile among mothers (m) or daughters (d)

Table 2: Tau Kendall correlation between the BMI of pairs of mother-daughter or amount of food eating of mothers and daughters

Category	S	I tercile N=32	III tercile N=32	Total N=97
BMI	III, t	0.12	0.48	0.27
Food items				
Other animal fats	I, III, t	0.66	0.61	0.57
Sauces	I, III, t	0.56	0.44	0.51
Fruit	I, III, t	0.40	0.56	0.49
Mixed dishes	I, III, t	0.55	0.46	0.49
Sweet fruit preserves	I, III, t	0.51	0.50	0.49
Vegetable fats	I, III, t	0.54	0.47	0.46
Soups	I, III, t	0.60	0.38	0.46
Milk fats	I, III, t	0.31	0.38	0.45
Juices	I, III, t	0.53	0.52	0.44
Meat products	I, III, t	0.52	0.33	0.43
Cereal products	I, III, t	0.44	0.31	0.41
Eggs	I, III, t	0.38	0.44	0.38
Fish and sea food	I, III, t	0.38	0.31	0.36
Vegetables	III, t	0.21	0.51	0.33
Potatoes	I, III, t	0.38	0.37	0.33
Nuts	III, t	0.12	0.40	0.30
Dairy products	I, III, t	0.35	0.28	0.30
Non-alcohol drinks	I, t	0.37	0.16	0.28
Sweets	I, t	0.31	0.20	0.28
Beans	I, t	0.31	0.13	0.25
Tea	t	0.22	0.22	0.23
Alcohol drinks	t	0.24	0.14	0.17
Coffee		0.08	0.12	0.12
Salty snacks	III	-0.05	0.25	0.12
Total food without drinks	I, III, t	0.59	0.57	0.46

S - correlation significant at p<0.05 for I tercile and III tercile, respectively, or in total sample (t); for all products the correlation coefficients for pairs of mother-daughter did not differ significantly between I tercile and III tercile

(I tercile:below 22.64 kg/m^2; II tercile: from 22.64 to 26.32 kg/m^2; III tercile: over 26.32 kg/m^2). Mothers from III tercile were on average older by 3.6 years than mothers from I tercile, and daughters by 1.4 years, respectively (Table 1).

Statistical analysis: Food eating was described by median and quartile deviation (Me±QD in g/day), as feature distribution was inconsistent with normal

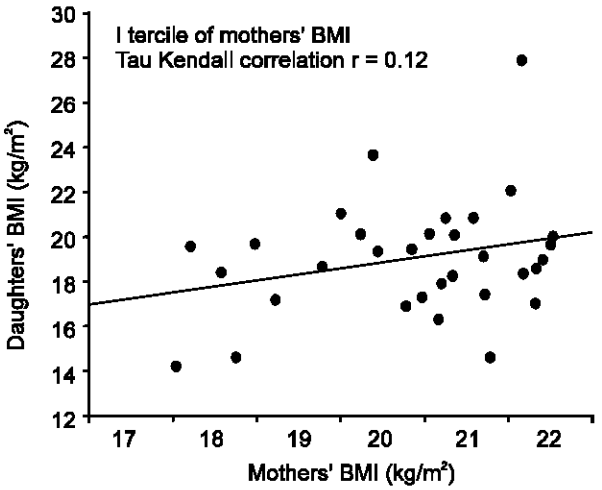

Fig. 1: The graf of correlation between mothers' BMI and daughters' BMI of family pairs in I tercile of mothers' BMI

distribution. The amount of eaten food by mothers and daughters was compared using the Kendall Tau correlation coefficient. Food intake by mothers and daughters from I tercile and III tercile was compared by the Kruskal-Wallis test. All statistical analysis was carried out in STATISTICA PL v.7.1 computer program.

Results

Mothers' BMI and daughters' BMI was not correlated (r=0.12, NS; Table 2, Fig. 1) among those family pairs, in which mothers had low body mass (BMI<22.64). In family pairs with high mothers' body mass (BMI>26.32) a significant correlation between mothers' BMI and daughters' BMI was shown (r=0.48, p<0.05; Table 2; Fig. 2). In the total sample the correlation between mothers' BMI and daughters' BMI was weak (r=0.27, p<0.05; Table 2). The tendency to bigger frequency of overweight among daughters was stated for daughters from III tercile than for daughters from I tercile (15.6% vs. 3.1% of the sample, p<0.1; Table 1). Obesity occurrence among daughters from extreme terciles (6.2% vs. 3.1%

Table 3: Food eating (Me±QD in g/day) of mothers and daughters in relation to mothers' body mass index

		Mothers		Daughters	
Food items	D	I tercile N=32	III tercile N=32	I tercile N=32	III tercile N=32
Alcohol drinks	d	5.3±9.9	6.3±14.1	0.0±0.2	1.1±8.7
Beans		10.9±10.4	15.0±15.4	7.4±12.2	7.0±10.7
Cereal products		186.5±140.6	185.2±123.0	233.0±176.2	254.9±134.3
Coffee		400.0±300.0	250.0±325.0	0.0±27.9	0.0±39.3
Dairy fats		28.2±37.8	20.6±43.1	27.5±47.0	27.7±56.8
Dairy products		169.1±210.9	247.2±307.6	255.9±398.3	245.5±306.3
Eggs		14.3±16.4	14.3±17.1	14.3±20.0	14.3±21.9
Fish and sea fruit		22.2±19.5	23.6±30.0	15.9±19.0	11.5±18.1
Fruit		282.2±322.8	311.8±592.5	268.6±183.7	264.9±374.0
Juices		101.9±102.6	81.7±228.6	133.9±118.3	207.7±321.1
Meat products	m	152.5±72.6	189.6±150.0	140.3±122.7	154.0±79.9
Mixed dishes		76.2±48.2	85.0±96.1	87.4±51.8	90.8±137.9
Non-alcohol drinks		131.1±244.6	189.3±222.6	72.4±194.6	137.5±242.3
Nuts	m	0.9±2.3	2.0±4.2	3.0±4.4	2.2±3.5
Other animal fats		1.3±5.1	1.5±5.1	0.0±3.3	0.9±4.0
Potatoes		164.3±77.2	175.8±84.1	180.1±104.5	169.0±116.3
Salty snacks		2.2±5.4	2.6±2.2	23.2±33.8	19.4±30.9
Sauces		22.9±22.5	17.2±26.5	19.8±30.0	12.9±30.6
Soups		162.9±157.1	171.4±188.1	148.6±175.2	114.3±156.2
Sweet fruit preserves		65.7±117.1	88.9±228.3	31.2±152.9	85.0±243.9
Sweets		82.9±44.8	67.3±106.9	112.4±61.5	119.1±125.8
Tea		400.0±267.9	500.0±500.0	275.0±317.9	250.0±428.6
Vegetable fats		19.1±36.4	20.5±21.9	14.7±29.8	21.9±32.2
Vegetables		274.4±245.5	376.6±251.8	205.0±172.9	247.7±180.1
Total food without drinks		2022.3±986.0	2297.6±1373.8	2017.6±1282.4	206.8±1290.2

D - differences statistically significant at $p<0.05$ between I tercile and III tercile among mothers (m) or daughters (d)

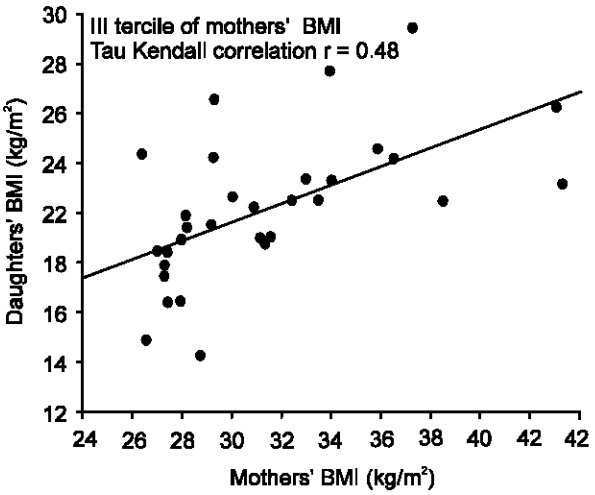

Fig. 2: The graf of correlation between mothers' BMI and daughters' BMI of family pairs in III tercile of mothers' BMI

of the sample, NS) did not differ significantly. Total amount of food eaten by mothers and daughters was highly correlated in both extreme terciles of the mothers' BMI (r=0.59 and r=0.57, respectively; Table 2). Significant correlation between the amount of food eaten by family pairs of mother-daughter was stated for 75% of groups of products (for 18 out of 24 analyzed). In the lower tercile high correlation ($p\geq0.5$) was found for 8 groups of products (33%), including: other animal fats, soups, sauces, mixes dishes, vegetable fats, juices, meat products and sweet fruit preserves, and in the higher tercile for 5 groups of products (21%), including: other animal fats, fruit, juices, vegetables and sweet fruit preserves. Lack of similarity was noted for only a few products, including nuts, salty snacks, vegetables, coffee, tea and alcohol drinks for those family pairs that had low body mass (BMI<22.64) and beans, sweets, non-alcohol drinks for those family pairs whose mothers had high body mass (BMI>26.32). No significant differences in correlation coefficients values were shown for pairs of mother-daughter between I tercile and III tercile for all 24 groups of products.

The total amount of eaten food by mothers with higher BMI in comparison to mothers with lower BMI and eaten food by daughters from I tercile in comparison to daughters from III tercile did not differ significantly (Table 3). Differences in food groups eaten by mothers or daughters from extreme terciles were small and concerned meat products and nuts for mothers and alcohol drinks among daughters.

Discussion

The revealed for 75% of groups of products significant correlation in food eating by mothers and daughters indicates on a big influence of family environment on

food eating by youth. Similarities in food eating by mothers and daughters could result from an obvious practical reasons such as common food shopping and eating family meals. American youth aged 12÷17 years consumed at home about 70% meals and snacks (Story *et al.*, 2002). It should be assumed that this percentage is even higher among Polish youth. However, similarities in food eating by family members should not be explained by only organizational reasons. (Feunekes *et al.*, 1998) revealed for 15-year-old Dutch youth that food eating by family pairs of mother-child was stronger correlated than for family pairs of father-child. It confirms strong mother's position in shaping children's eating behaviour. The highest correlation for mothers and children was stated for butter/margarine added to boiled vegetables, becon, pizza, soups, mince meat, fishsticks, cheese, French fries, fried sausages (Feunekes *et al.*, 1998). In our study the highest correlation in food eating by mothers and daughters was revealed for fats, sauces, fruit, mixed dishes, sweet fruit preserves, soups, juices, meat dishes, cereals products. The mentioned products state basic assortment of food eaten usually by the Poles (Laskowski, 2005). Mothers and daughters were found to have no correlation in eating such drinks as tea, coffee and alcohol drinks, which confirms findings of (Fisher *et al.*, 2004) for American children.

Mothers' body mass influenced the food eating correlation of family pairs of mother-daughter in a limited degree. In both family pairs subgroups with low or high BMI a significant correlation was stated for the same number of groups of products (75% each), however high correlation was more often stated for mothers with low BMI rather than by those with high BMI (33% vs. 21% of groups of products). Mothers with high BMI, despite overweight, did not apply any limits to consumption. In comparison to women with low BMI they ate considerably more meat products and nuts, but the total amount of food eaten by mothers of both extreme terciles did not differ significantly. It appears that lack of limitations in food eating observed among mothers with overweight determined small differences in food eating by mothers and daughters in relation to mothers' body mass. Mothers' influence on limitations in food eating by their 5-year-old daughters was revealed by Birch and Fisher (2000). However, in the cited study the described correlation concerned women limiting their food eating and their daughters were much younger (5 years vs. 12÷21 years).

As shows this study and Birch and Fisher's findings (2000), the mothers' BMI is a bad predictor of daughters' BMI. However, this study reveals that after separating mothers with overweight the correlation between mothers' and daughters' BMI increased almost twice in comparison to total sample, showing high correlation. It is confirmed by the noted tendency to higher frequency of occurring overweight simultaneously among mothers and daughters. The occurrence of correlation between mothers and children overweight showed *i.a.* Burke *et al.* (2001); Laitinen *et al.* (2001) and Williams (2001). It suggests that family environment can promote obesity among children (Butte *et al.*, 2006; Faith *et al.*, 2004; Wang and Zhang, 2006). Explaining reasons for that issue needs further deeper studies.

Conclusion: The obtained results indicate on a significant similarity in food eating by mothers and their daughters, which to a limited degree depended on mothers' body mass. The BMI of mothers with overweight was a good predictor of body mass index of daughters, which suggests influence of family environment on promoting obesity among children.

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