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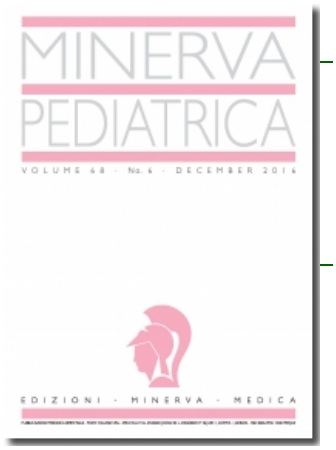

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Does children's body mass index associated with their parent's personality? A prospective controlled trial

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AIM: To elucidate the effect of the personal characteristics and psychological status of parents on their children's body-mass index by using validated questionnaires.
METHODS: Obese and healthy control goup was asseesed with The Parental Attitude Research Instrument (PARI) for the evaluation of parental attitudes towards their children. Additionally, Depression Anxiety and Stress Scale (DASS) were used to assess the relationships between parental depression, anxiety, stress and childhood obesity.
RESULTS: A total of 105 children and their parents were divided into two groups. The study group consisted of 58 children with a body mass index (BMI) of higher than 85th percentile whereas 47 children with normal BMI (< 85th percentile) were included as the control group. In both groups, the BMI of mothers which is between 25-and 30 kg/m2 and >30 kg/m2 had significant impact on the risk of children's obesity status 1.12-fold and 3.68-fold respectively. The PARI results provided that the children who had disciplined, over-protective parents and those in the parental incompatibility group had higher risk of being obese. Analysis of the DASS test results showed that children having depressed parents had significantly higher risk of obesity than children whose parents were not depressed ($p<0.05$).
CONCLUSION: Our results provided that, the parent's status such as obesity, depression and strict personal behaviours have negative impact on their children's weight which is resulting with obesity.

language: English

DOES CHILDREN'S BODY MASS INDEX ASSOCIATED WITH THEIR PARENT'S PERSONALITY? A PROSPECTIVE CONTROLLED TRIAL

Original Article

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Short title: Effect of parent's characteristics on child weight

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ABSTRACT:

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Conclusion: Our results provided that, the parent's status such as obesity, depression and strict personal behaviours have negative impact on their children's weight which is resulting with obesity.

Keywords: obesity, body mass index, parental attitude, psychological, children

INTRODUCTION

Obesity is defined as the accumulation of excess fat in the body as a result of a higher dietary consumption of energy than that of energy expended (1). The World Health Organization (WHO) has described obesity as a "global epidemic'' which is demonstrating its high frequency and prevalence. Moreover, childhood obesity may initiate weight problems in later years. It has been shown that more than half of the children aged over 10 years diagnosed with obesity are also diagnosed as obese in adulthood (2). This condition leads to increased frequency of a number of other diseases including cardiovascular disease, type 2 diabetes mellitus, and asthma within the upcoming years (3). The most commonly used method in determining obesity is the "body mass index" (BMI) measurement. Although there are no exact standards for definition of childhood obesity, percentiles higher than the 85th percentile for age and gender are used to indicate obesity (4,5).

Parents have significant influences on their child's weight. In addition to genetic influence, parenting style may have a role in the development of young children's dietary behaviour (6). Parents play an important role in the development of children's dietary behaviour, especially in the early years of life when parents have a high degree of control over their children's eating environment and experience. Current literature suggests that parenting styles emerged from the linear break-up of responsiveness and demandingness (7). Authoritative parenting style, i.e., one that is characterized by acceptance and responsiveness, including high levels of support, emotional connection, and democratic behavioral control has been related to several child outcomes including decreased risk-taking behavior, improved school achievement, and increased self-regulatory ability (8).

There is a growing body of research investigating the effect of parenting style on children's dietary behaviours (9-11). When evaluating the causes of childhood eating disorders, it is clearly seen that besides physical factors, psychological factors are also utmost

important (12, 13). Findings are mixed, however, as to the relationship between maternal depression and childweight (14). In addition, maternal depression was predictor a greater likelihood of overweight children, and depression was associated with more authoritarian and distant feding styles and reduced use of positive family meal practices (15).

Parents' psychological state and parenting style can affect the lifestyles of their children and may seriously influence the quality of their diet, resulting in weight gain (16). In addition to children of strict parents, eating disorders are also commonly seen in children of relaxed, or even neglectful, parents (17-19). Most studies have been focused on school-aged children and adolescents, with few studies of this kind conducted specifically among young children (6). Thus, one of the strategies for prevention of obesity in childhood is the psychological assessment, and treatment and support for parents. However there is not enough well conducted studies to prove the effectivity of this strategy. Therefore, our main goal is to demonstrate that, whether the personal characteristics of parents may lead to excess and irregular eating which may then cause obesity in their children.

PATIENTS AND METHODS:

The Ethic committee of Istanbul Medipol University approved the study protocol (approved number and date was 10840098-13/17.01.2014). At least 1 parent signed an informed consent for participation after having read an explanatory note. Subjects were given case numbers, and identities were kept confidential.

After obtaining institutional review board approval, this study was carried out between January and April 2014. A total of 105 children and their parents were enrolled according to the eligibility criteria. Children whose body-mass index over 85th percentile between 8-14 year old were accepted as obese (n=58) and enrolled into the study group 47 children with

normal BMI (< 85th percentile) were included as the control group in Turkish sample. Obese children who have metabolic conditon such as chronic diseases including endocrinological disorders, type-1 diabetes mellitus, hypertension, psychiatric disorders or other acute and chronic disease were excluded. Additionally, children with neurological and musculoskeletal system disorders were excluded since these disorders may cause obesity due to immobility.

Anthropometric measurements

History and physical examination were performed including anthropometric measurements (weight, height, blood pressure). Standardized protocols were used by the trained examiners. The weight of children wearing minimal clothing was measured to the nearest 0.1 kg with a portable electronic scale. Each time it was moved, the scale was recalibrated and standardized. Height was measured with a fiberglass tape. Body mass index (BMI) was calculated as weight (in kilograms)/height (in meters)2. Body circumferences were measured with subjects in the standing position. Using the tables provided by the waist circumference percentiles in a nationally representative sample, we determined subjects with increased waist circumference (> 90th percentile) (20). Body proportions normally change during pubertal development and may vary among persons of different race and ethnic groups. Age- and sex-specific cutoff points of BMI were used to assess the overweight and obesity status. These cutoff points of BMI were developed and published from the centile curves of an international reference population (21). All mothers were also assesed in regarding to these aspect.

Blood pressure

Blood pressure was measured by manuel sphingomanometer. Small and medium cuffs were used for arm circumferences of less than 22 and 22 to 32 cm, respectively. To find the age-specific height percentile level for each case, we used the growth curves drawn for

healthy Turkish children (22). Using the tables provided by the Task Force Report on High Blood Pressure in Children and Adolescents, we determined children and adolescents with elevated blood pressure (≥95th percentile) (23). All mothers were also assesed in regarding to these aspect.

The study group consisted of 58 children with a body mass index (BMI) of higher than 85th percentile whereas 47 healthy children with normal BMI (below than 85th percentile) were included as the control. All children undergone systemic physical examination, length, weight, and arterial blood pressure. A blood sample was obtained and fasting glucose levels, HbA1c, lipid profiles, and liver enzyme levels were detected. Fundus examination was carried out by an ophthalmologist for the detection of possible pseudotumorcerebri. Patients who were diagnosed with acanthosis nigricans were referred for evaluation for insulin resistance and these children were excluded. Acanthosis nigricans was thought closely related with insülin resistance and diabetes mellitus. As excessive and persistant eating habit may lead to insulin resistance, these habits may interfere our aim and findings because our study was to investigate relationship between personal characteristics of parents and obesity regarding to psychological impact in children. Thus, acanthosis nigricans was excluded. In addition, patients' blood pressure was measured and all were in normal ranges. Sociodemographic questionnaires included age, marital status, mother's education level, employment status, monthly income, number of children, eating habits, and obesity among any family member. After completion of the physical examination, children were referred to a psychologist for further evaluation.

The Parental Attitude Research Instrument (PARI) test was used for the evaluation of parental attitudes towards their children. PARI is a self-report assessment, which evaluates parents' nurturing styles on a scale. This test includes 60 questions with a scale of 4 possible answers (1-4), ranging from 1 ("I do not agree at all") to 4 ("I agree completely"). Originally

developed by Schaefer and Bell, and later on, it was validated in Turkish language (24). The test includes 5 sub-categories: democrat, protectiveness, discipline, parental incompatibility, and rejection of the role of a housewife. The 22th and 44th items are reversed, and high points for any sub-category indicate high level of agreement with the projected attitude of that sub-category.

During the second part of the study, relationships between parental depression, anxiety, stress, and the development of obesity in their children were assessed by a specialist psychologist using the "Depression Anxiety and Stress Scale (DAS)." DAS is a self-report assessment, which evaluates stress, depressive symptoms, and anxiety in an individual. It is based on a scale of 4 possible answers ranging from 0 "never" to 3"always," and includes 42 questions. This test was developed by Lovibond and colleagues and adapted for the Turkish language by Akın *et al.* (25). For each category of the test, the minimum score is 0, and the maximum score is 42. The rating system related to the strength of each category is shown in Table 1.To validate the original scale changes between categories, factor loads were .36-.80for the depression sub-category .31-0.64 for the anxiety sub-category, and .40-.76for the stress sub-category. Internal consistency for depression, anxiety, and stress were .96, .89, and.93, respectively. Factor loads for the Turkish scale for depression, for the anxiety sub-category and for the stress sub-category scale were.39-.88, .59-.78, and.56-.82, respectively. Internal consistency for depression, anxiety, and stress were .90, .92, and.92 respectively. These values prove the validity and reliability of DASS.

Statistical Analysis

Analysis of results was performed by using the SPSS 18.0 program. The chi-square test was used to evaluate categorized qualitative differences between groups, and the student's

t-test was used for comparison of quantitative results, like age and test scores. Logistic regression analysis was used to investigate the qualitative and quantitative factors in parental contribution to child obesity. All the variables were statistically compared between the groups. p-values of less than 0.05 were considered significant.

RESULTS:

The study group was consisting of 58 children and 26 (45%) were male and 32 (55%) were female. The average age was 12.1±4.2 years (range, 4-14 years). Demographic characteristics of children and parents from each group are shown in Table 2.

The effect of maternal BMI on their child's BMI was analyzed by single regression analysis. It was shown that children of mothers with a BMI of 25-30, and above 30, had a higher probability of being obese than children whose mothers had an average BMI ($p<0.01$). After correcting with the z-value for child height-weight, children of mothers with a BMI of 25-30 had a 1.12-fold higher risk of obesity, while, children of mothers with a BMI above 30 had a 3.68-fold higher risk. In contrast, we found that children of mothers with a BMI less than 20 had lower obesity risk ($p<0.05$).(Table 3)

In terms of the relationship between familial income and subject obesity, there was no significant difference between children of families with income ≤15th percentile and children of median income families, while children from low-income families had a 2.84-fold higher risk of being obese.

Although there was a higher frequency of obesity in children with employed mothers, this difference did not reach statistical significance ($p=0.36$). During the first year after birth, subjects fed on formula only, or formula and breast milk, had 1.5-fold higher risk of obesity

than subjects fed on breast-milk only. When effects of maternal education level on childhood obesity were analyzed, there were no significant differences in the risk of obesity between groups. Children with divorced parents had no difference in risk of obesity than those of non-divorced parents, and it was shown that the risk of obesity falls with increasing the sibling number.(Table 4)

When results of the PARI test were analyzed, 3 of the sub-categories were found to effect obesity. Children of disciplined, over protective parents and those in the parental incompatibility group had higher risk of being obese. The highest effect was seen for the parental incompatibility group.(Table 5)

Analysis of the DASS test results revealed that children with a mother and/or father who was depressed had a higher risk of obesity than children whose parents were not depressed ($p<0.05$).(Table 6)

DISCUSSION

Although, still not clearly elucidated, the global understanding for the mechanisms of childhood obesity is improving. It is obvious that obesity have significant association with several other diseases and it is increasing the individual's risk of mortality and morbidity. The initial step which needs to be taken for the prevention and treatment of obesity is the change in lifestyle. This starts from the family itself and the relationships between the parents and children are need to be revisited. In this research, we have tried to discuss the precautions related to familial risk factors in the development of obesity.

If one, or both, parents are obese, the risk of obesity for their children increases (26). This finding was confirmed in out study and a correlation between the BMI of mothers and their children has been shown. Accordingly, if a mother's BMI is higher than 30, the risk of

obesity in her child is 3.68 times higher. This is thought to be related to genetic and environmental factors (lifestyle and eating habits).

Another factor which needs to be taken into account is the socioeconomical status of the family. The prevalence of obesity in children of parents with higher incomes is lower than that of society in general (26). In other words, if family income is low, a child's obesity risk increases by 2.84 times. As family income decreases, the frequency of unvaried high-calorie diets and unhealthy eating habits increases which results with obesity.

The risk of obesity for children who were formula fed during the first year of life is 1.5-fold higher than for those who were fed breast-milk only. This result is also in compliance with the previous report which demonstrates that feeding with formula increased the risk of obesity by 2.5-fold (27).

In our research, the risk of obesity in children whose mothers worked was slightly higher, although this result was not statistically significant. This is in agreement with other studies (28). The risk of obesity increases as sibling number increases, we found that, when compared with society in general, the risk of obesity for a child with 2 siblings is 2.28-fold higher, and the risk of obesity for a child with 3 siblings is 2.67-fold higher. Similar studies show that the risk with 1 sibling is 1.68-fold higher and that with 2 siblings is 1.87-fold higher. It is thought that as the number of siblings increases, the time a mother has to attend to each child decreases, leading to a less-varied diet and increase in fast food consumption resulting in weight gain (29).

The psychological well-being of parents and their approach to their children are factors in obesity that do not receive as much attention as they should. It is known that stress, anxiety, and depressive symptoms in parents are related to excess weight and obesity in their children (30-31). In addition, we have found that depression in mothers leads to a 2-fold

higher risk of obesity in their children. One might speculate that in children whose parents are depressive are less likely to eat breakfast, have a higher fast-food consumption, and spend more time watching television which results with obesity.

Having a mother with strict behaviours and excessive control over their child's feeding habits are directly related to a child's risk of obesity (32,33). Based on classifications from the PARI scale we found that the risk of obesity for children whose mothers are disciplined is 1.2-fold higher. Moreover for children whose mothers are excessively protective, it is 1.74-fold higher. These attitudes in mothers can lead to a decrease in physical activity of their children which results with obesity.

In this study, we did not mention about biochemical parametres because all participant were in normal ranges. As a matter of fact that biochemical parametres were measured to excluded obesity with comorbidity such as metabolic conditions. Taken all together, although many factors are associated, we found that the personal characteristics of the parents and their relationship with their children significantly effects the risks of childhood obesity. Preventive steps should be taken in order to decrease the incidence of this global disease.

Conflicts of interest: none

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TABLES

Table1. Depression Anxiety and Stress Scale

	DEPRESSION	ANXIETY	STRESS
NORMAL	0-9	0-7	0-14
MILD	10-13	8-9	15-18
MODERATE	14-20	10-14	19-25
SEVERE	21-27	15-19	26-33
VERY SEVERE	28+	20+	34

Table 2. Demographics of the test group and control group

	Study group (n=58)	Control group (n=47)	P value
Gender			
Male	26 (44.8%)	19 (40.2%)	0.66
Female	32 (55.2%)	28 (59.8%)	0.23
Age (year)	12.1±4.2	11.3±2.3	0.46
Maternal BMI			
<20 **kg/m^2**	5 (8.6%)	3 (6.38%)	0.38
20-25 **kg/m^2**	15(25.8%)	13 (27.65%)	0.23
25-30 **kg/m^2**	26 (44.8%)	22 (46.8%)	0.08
>30 **kg/m^2**	12 (20.6%)	9 (19.4%)	0.6
Income *			
High(>85 percentile)	15 (25.86%)	9 (19.4%)	0.13
Moderate (15-85 percentile)	27 (46.55%)	21(44.68%)	0.46
Low (<15 percentile)	16 (27.58%)	17 (36.17%)	0.66
Working Mother	32 (55.17%)	26 (55.31%)	0.41
Education Level			
Higher education	24 (41.37%)	18 (38.29%)	0.06
High school	20 (34.48%)	18 (38.9%)	0.09
Primary school	14 (24.13%)	11 (23.40%)	0.06
Number of children			
1	26 (44.8%)	20 (42.55%)	0.13
2	20 (34.6%)	15 (31.91%)	0.24
>3	12 (20.6%)	11(23.40%)	0.13

***According to datas of Turkish Statistical Institute Income and Living Conditions Survey,2013**

Table 3.The effect of mother's BMI on children's risk of obesity

BMI ± (Mother)	Cumulative index	Risk factor	Corrected risk factor
Low (BMI<20)	2.7	0.42 (0.22-0.78)**	0.45 (0.25-0.84)**
Normal (20< BMI<25)	4.3	1	
Over-weight (25<BMI<30)	9.2	1.3 (0.99-3.42)*	1.12 (0.84-3.26)
Obese (BMI>30)	19.6	3.5 (1.22-4.89)***	3.68(1.78-5.32)***

* p<0.5, ** p<0.1, ***p<0.05; ± BMI (**kg/m^2**)

Table 4.The effect of demographic categories on children's risk of obesity

	Cumulative index	Risk factor	Corrected risk factor
Gender			
Male	6.1	1	
Female	7.3	1.4 (0.65-1.63)*	1.53 (1.07-1.94)*
Working mother			
No	7.2	1	
Yes	9.6	1.36 (0.82-1.99)	1.21 (0.53-1.44)
Formula support			
No		1	
Yes		1.84 (1.02-2.33)	1.5 (0.97-2.1)
Education level			
Higher education	6.2	1	
High school	8.2	1.24 (0.92-1.68)	0.84 (0.58-1.34)
Primary school	9.3	1.47 (1.04-2.08)*	0.95 (0.59-1.37)
Non-educated	9.8	1.68 (1.39-2.42)*	0.96 (0.59-1.59)
Income			
High	3.9	1	
Moderate	7.6	1.76 (1.15-2.36)*	1,11 (0.78-1.58)
Low	10.5	2.91 (1.66-3.45)***	2.84 (1.39-3.78)**
Number of siblings			
1	3.7	1	
2	8.3	2.32 (1.39-3.74)**	2.28 (1.43-4.27)**
>3	9.3	2.64 (1.66-4.08)**	2.67 (1.20-4.22)*

* p<0.5, ** p<0.1, ***p<0.05

Table 5. PARI classification. Effects on children's risk of obesity

Pari Sub-Groups	Cumulative Index	Risk Factor	Corrected Risk Factor
Democracy	3.4	1	
Refusal Of Housewife Role	3.6	1.1 (0.62-1.43)	0.78 (0.42-1.12)
Disciplined	5.2	1.5 (0.96-2.3)*	1.2(0.98-1.58)
Over Protective	6.3	1.8 (1.02-3.48)*	1.74(1.15-2.67)*
Parental Incompatibility	7.2	2.3 (1.10-4.72)**	2.5 (1.39-4.25)**

* p<0.5, ** p<0.1, ***p<0.05

Table 6. Effect of DASS score on children's risk of obesity

DASS Score	Cumulative Index	Risk Factor	Corrected Risk Factor
Depression	4.3	1	
Notdepressed	7.3	2,4 (1.20-4.82)**	2.0 (1.15-4.24)**

** p< 0.05