Relationship Between Obesogenic Family Environment, Children's Smartphone Usage, and Depressive Symptoms

Obezojenik Aile Ortamı ile Çocukların Akıllı Telefon Kullanımı ve Depresif Belirtileri Arasındaki İlişki

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ABSTRACT

Objective: Childhood obesity has become a most common public health problem. We aimed to examine the relationship between obesogenic family practices for childhood obesity, children's obesity, smartphone usage times, and depressive symptoms.

Material and Methods: In the present study, we conducted on 96 families and their children aged 6-14 who applied to our pediatric clinic from October 2020 to July 2021. Parents and children who agreed to participate in the study filled out an online questionnaire containing sociodemographic data, children's weight, and height information, "The Children's Depression Inventory (CDI)," and "Family Nutrition and Physical Activity Screening Tool (FNPA)."

Results: The present study found 80.2% (n=77) of the children were primary school students, and 19.8% (n=19) of them were secondary school students. We found a significant negative correlation between FNPA score and depressive symptoms in primary school students (r and p values; r=-0.276, p=0.015). Obesogenic family environment was correlated with higher depressive scores in primary school children. We also confirmed that primary and secondary school children with obesogenic family environments spent more time on smartphones (p respectively p=0.009, p=0.031).

Conclusion: The FNPA is an easily applicable tool to determine obesogenic family factors. Children with an obesogenic family environment should be carefully evaluated for depressive symptoms and smartphone usage time.

Key Words: Behavior, Children, Depression, Family Environment, Nutrition, Smartphone Use

ÖZ

Amaç: Çocukluk çağı obezitesi günümüzde en yaygın halk sağlığı sorunu haline gelmiştir. Çocukluk obezitesi için obezojenik aile uygulamalarının, çocukluklardaki obezite, akıllı telefon kullanım süresi ve depresif belirtiler ilişkisini incelemeyi amaçladık.

Gereç ve Yöntemler: Bu araştırmayı, Ekim 2020 - Temmuz 2021 tarihleri arasında çocuk kliniğimize başvuran 6-14 yaş aralığında olan 96 çocuk ve onların ailesi ile gerçekleştirdik. Çalışmaya katılmayı kabul eden ebeveynler ve çocuklar, sosyodemografik verilerini, çocukların kilo ve boy bilgilerini, "Çocuklar İçin Depresyon Envanteri (CDI)" ve "Aile Beslenmesi ve Fiziksel Aktivite Tarama Aracı (FNPA)" içeren bir online anketi doldurdular.

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Bulgular: Bu araştırmada çocukların %80.2'sinin (n=77) ilkokul öğrencisi, %19.8'inin (n=19) ortaokul öğrencisi olduğu saptanmıştır. İlkokul öğrencilerinde FNPA puanı ile depresif belirtiler arasında negatif yönde anlamlı bir ilişki bulduk (r ve p değerleri; r=-0.276, p=0.015). İlkokul çocuklarında, obezojenik aile ortamı daha yüksek depresif puanlarla ilişkiliydi. Obezojenik aile ortamına sahip olan ilkokul ve ortaokul çocuklarının akıllı telefonu daha uzun süreli kullandıklarını doğruladık (sırasıyla p=0.009, p=0.031).

Sonuç: FNPA, obezojenik aile faktörlerini belirlemede kolay uygulanabilir bir araçtır. Obezojenik aile ortamına sahip çocuklar, depresif belirtiler ve akıllı telefon kullanım süreleri açısından dikkatle değerlendirilmelidir.

Anahtar Sözcükler: Davranış, Çocuklar, Depresyon, Aile Ortamı, Beslenme, Akıllı telefon kullanımı

INTRODUCTION

Childhood obesity is one of the most critical public health challenges nowadays. Obesity and its related diseases are largely preventable. Thus the prevention of obesity in children requires high priority (1). Ihmels et al. (2) developed the Family Nutrition and Physical Activity (FNPA) tool to determine risky family environmental factors for childhood obesity. Peyer et al. (3) showed the FNPA tool to have high validity in screening for childhood obesity risk. The previous study, conducted in the United States, identified the applicability of the FNPA tool for preventing and treating obesity by determining obesogenic risk factors in normal-weight children and roles as a guide for health professionals to initiate treatments with those currently overweight or obese. Some researchers showed a relationship between the FNPA score and obesity in children (4). We can get information about the obesogenic family environment via this tool.

Childhood obesity treatment is based on some medical and nonpharmacological treatment recommendations. The most critical step in nonpharmacological treatment is identifying the barriers in the family environment that may go against lifestyle changes (5). Some researchers suggested that the family environment plays an essential role in more effective prevention and intervention of childhood obesity (6). In this respect, it is essential to recognize risky family behaviors for childhood obesity, especially in school-age children, and to take precautions to prevent children from obesity (7).

Obesity can bring together other physical and psychological comorbidities (8). An evaluation of 13 longitudinal studies' meta-analyses confirmed the bidirectional relationship between obesity and depression. They found that depressed adolescents had a 70% higher risk of obesity whereas obese adolescents had a 40% higher risk of depression (9). The Centers for Disease Control and Prevention has emphasized the increase in depression in children in recent years and that depression can result in suicide in children (10). Panchal et al. (11) confirmed that parent-child communication was protective against depression in children. Similarly, Whittle et al. (12) suggested the importance of parents in influencing children's health.

Other conditions related to childhood obesity are increasing children's screen time and decreasing physical activity. In the digital world, the child has frequently become using smartphones (13). Children's problematic smartphone use had been associated with poorer mental health and obesity in children (13,14).

The present study aimed to evaluate the relationship between the obesogenic family environment with obesity, smartphone usage, and depressive symptoms in primary and secondary school students.

METHODS

We conducted the present prospective cross-sectional study on children between the ages of 6-14 and their families who applied to the university pediatric clinics between October 01, 2020, and January 01, 2021. We predicted that approximately a total of "600 children" would refer to the outpatient clinic during the study, and we calculated the target sample size to be at least "68"(15).

We planned to include the present study with seven-year-old children because the "Children's Depression Inventory" can be conducted above seven years old. One hundred twenty children family pairs applied to our pediatric clinic; 24 did not fill out the questionnaire, and 96 children and their families who filled out an online questionnaire were included in the study.

We sent these questionnaire forms to families via e-mail. The online questionnaire consisted of the families' sociodemographic characteristics, children's height and weight information, "The Children's Depression Inventory (CDI)," and "Family Nutrition and Physical Activity Screening Tool." Participants (families-children) filled out the online questionnaire. The children and their families filled together the "Children's Depression Inventory", and the parents completed the rest.

According to parents-reported, we recorded the children's weight and height as values on March 2020 and March 2021. The body mass index (BMI) was calculated using the weight/height2 formula. The percentiles of the BMI were grouped according to Turkish children's reference values (16). We classified children's weight status according to de BMI percentiles. We defined underweight (below the 5th percentile), normal (the 5th-85th percentile), overweight (the 85-95 percentile), and obese (above the 95th percentile). We recorded the children's values in March 2020 as their weight status before the pandemic and their values in March 2021 as their weight status during the pandemic.

We asked about the children's smartphone usage times except for study and homework. Responses scored; less than an hour/day =1 point, 1-2 hour= 2 points, 2-3 hours/day=3 points, >3 hour=4 points.

Ihmel et al. (2) developed the Family Nutrition and Physical Activity Screening Tool (FNPA) to determine the obesogenic family and child practices. Özdemir et al. (17) conducted Turkish validity and reliability study of FNPA. The FNPA contains ten risk factors with two items each (Family meals, family eating habits, food preferences, beverage preferences, restriction/reward, screen time, healthy environment, family activity, child activity, and family schedule/sleep pattern). The FNPA aims to determine risky family and child behaviors regarding child nutrition and obesity. The FNPA scores ranged from 20 to 80. There is no cut-off value for FNPA scores. Higher scores show a less obesogenic family environment. The present study's mean FNPA score was 57.7±7.1 (39-73).

The Children's Depression Inventory (CDI) is a 27-item tool to determine depressive symptoms in children aged 7–17. Oy (18) conducted the reliability and validity of The CDI in Turkish children. The items are scored as 0, 1, or 2. Higher total scores show increased depressive symptoms in children. We used the Children's Depression Inventory (CDI) to determine the children's depressive symptoms.

The study was approved by Başkent University Medical and Health Sciences Research Board (28.04.2021-21/82).

Statistical Analysis

Numerical variables were evaluated for normality of data distribution by performing the Shapiro- Wilk test. Categorical measurements were summarized as numbers (n) and percentages (%), whereas numerical measurements were summarized as the mean±standard deviation and median (minimum-maximum). Since the assumption of normal distribution was not met, Kruskal Wallis tests were applied to compare the differences among the response groups regarding scale variables. The relationship between the scale scores was used with the Spearman correlation test. The categorical data analysis was done using the Pearson Chi-Square test and Generalized Fisher (Fisher-Freeman-Halton) Exact test. The Mc-Nemar-Bowker test was used to analyze the relationship between the children's screen time before and during the pandemic. Values with a $p < 0.050$ were considered statistically significant in all tests. Statistical analyses were conducted using SPSS v25.0 software (SPSS Inc., IBM, USA).

RESULTS

The present study found 80.2% (n=77) of the children were primary school students, and 19.8% (n=19) of them were secondary school students (Table I). There was no difference between the two groups in terms of the male/female ratio (p=0.437).

Table I: Sociodemographic data

Sociodemographic data of the parents and children	Frequency n (%)
Mother's Educational Status	
High School and below	21 (21.9)
University	48 (50.0)
Post-graduate	27 (28.1)
Father's Educational Status	
High School and below	19 (19.7)
University	42 (43.8)
Post-graduate	35 (36.5)
Family's Monthly Income	
2800 TL and below	1 (1.0)
2801-5600 TL	15 (15.6)
5600-8400 TL	19 (19.8)
8400 TL and above	61 (63.6)
Marital Status	
Married	84 (87.5)
Divorced	12 (12.5)
Number of Siblings	
-	25 (26.0)
1	65 (67.7)
2	6 (6.3)
Children's Educational Status	
Primary school	77 (80.2)
Secondary school	19 (19.8)
The male/female ratio of the children	
Primary school	37/40
Secondary school	9/10

TL: *Turkish Lira*

We found that 78.1% of mothers and 80.3% of fathers graduated from university or graduate school, most parents (87.5) were married, and most parents' (63.9) monthly income was more than three times the minimum wage. Table I represents the sociodemographic factors of the parents and children. The mean age of the children was 9.0±2.0 (6-14) years, and Female/Male was 1.23 in terms of gender distribution. We analyzed children's depressive scores and FNPA scores according to primary school children (7-10 years old) and secondary school students (11-14).

We found no significant relationship between the sociodemographic characteristics of the parents with the children's educational status (primary school or secondary school), smartphone usage time, and depressive symptom levels (p>0.050).

Table II represents the weight status of primary and secondary school students. We found higher obesity rates in primary school students during the pandemic than before the pandemic (p=0.025). On the other hand, there were no differences in the obesity rates of secondary school children before and during the pandemic (p=0.564).

We found no relationship between primary and secondary school students' obesity with FNPA scores (p values respectively; p= 0.127, p=0.643).

Table III represents the FNPA scores of primary and secondary school students. We confirmed a higher obesogenic family environment in secondary school students than in primary school children (p=0.004). The mean FNPA scores of the primary school children were 58.82±7.02 (Table III).

The present study found that children who more spent time on smartphones had a higher risky family environment for obesity (p=0.009). Similar to primary school students, there was a significant relationship between children's smartphone usage time, and obesogenic family environment in secondary school students (p=0.031). Table IV represents the relationship between FNPA scores and smartphone usage times of the children.

We found a significant negative correlation between FNPA score and depressive symptoms in primary school students (r and p values; r=-0.276, p=0.015). This finding expressed that primary school children with higher obesogenic family environments had more depressive symptoms. But we showed no relationship between obesogenic family environment and depressive symptoms in secondary school students (r and p values; r=-0.457, p=0.065)

We also showed higher depressive symptoms in secondary school students than in primary school children (p=0.018). The CDI scores of the secondary school students were 11.4±8.46 (Table III). We found no relationship between children's obesity and depressive symptoms (p=0.647). We found no significant relationship between children's smartphone usage times, and depressive scores (p=0.162).

Table II: The weight status of primary and secondary school children

Body Mass Percentile	Before the pandemic	During the pandemic	p
Primary School Students			
Underweight*	5 (6.5)	5 (6.5)	
Normal*	41 (53.2)	37 (48.1)	0.025
Overweight*	20 (26.0)	13 (16.9)	
Obese*	11 (14.3)	22 (28.6)	
Secondary School Students			
Underweight*	-	-	
Normal*	13 (68.4)	14 (73.7)	0.564
Overweight*	4 (21.1)	3 (15.8)	
Obese*	2 (10.5)	2 (10.5)	

***** *n(%)*

Table III: Depressive symptoms and obesogenic family environment of the primary and secondary school students

Scores	Primary School Students	Secondary School Students	p
FNPA Total Score			
Mean ± SD	58.82±7.02	53.55±6.08	0.004*
Median (min-max)	59 (39-73)	56 (42-62)	
Beck Total Score			
Mean ± SD	7.61±5.94	11.4±8.46	0.018*
Median (min-max)	6 (1-30)	9.5 (1-37)	

***p<0.050, Mann-Whitney U test, **min**: Minimum, **max:** Maximum, **SD:** Standart Deviation*

Table IV: The relationship between smartphone usage time and FNPA scores of the primary and secondary school children

Smartphone Usage Time	FNPA Scores		
	Mean ± SD	Median (min-max)	p
Primary School Children's Smartphone Usage Times			
< 1 hour	61.8±6.3	62.50 (51-73)	0.009*
1-2 hours	58.18±5.8	59.00 (47-70)	
2-3 hours	55.75±6.2	56.00 (49-67)	
> 3 hours	54.71±7.7	55.50 (39-69)	
Secondary School Children's Smartphone Usage Times			
< 1 hour	57.8±3.3	58.5 (52-62)	0.031*
1-2 hours	-	-	
2-3 hours	58.0±0.1	58.0 (58-59)	
> 3 hours	50.8±6.2	53.1 (42-58)	

***p<0.050, **SD:** Standart Deviation, **min**: Minimum, **max:** Maximum*

DISCUSSION

The family environment plays a critical role in the mental and physical health of the children. Childhood obesity was associated with an obesogenic family practice (4). In this regard, children might be protected from obesity and obesity-related comorbidities by interfering with family practices. To our knowledge, no study examined the relationship between obesogenic family practice with children's depressive symptoms and digital media use. The present study examined the relationship between the obesogenic family environment with obesity, smartphone usage, and depressive symptoms in primary and secondary school students.

Ihmel et al. (2) developed the Family Nutrition and Physical Activity Screening Tool (FNPA) to determine the obesogenic family and child practices. This scale provides information about the high-risk family environment and child behaviors regarding children's obesity. Herbenict et al. (19) suggested that implementing the FNPA tool at a school-based clinic might effectively determine children at high risk for obesity . Tucker et al. (4) conducted a study on 564 5-18 age children; they found a relationship between lower FNPA scores and severe obesity odds in children . On the other hand, Peyer et al. (3) suggested that The FNPA is also used to inform the arrangement of family-centered obesity treatment for children. Unlike previous studies, our present study did not find a relationship between FNPA scores, and obesity in children. We might explain this finding by that we recorded children's weight and height according to the parent's self-report. They might not accurately remember their children's weights and heights.

Risky behavior for obesity in children increased during the COVID-19 pandemic (20,21). The present study confirmed higher obesity rates in primary school students during the pandemic than before. However, we found no differences in the obesity rates of secondary school children before and during the pandemic. Only 19 of the children were secondary school students. Due to this, we might not find a significant increase in obesity rates among secondary school children during the pandemic. Some studies showed that obese children had a high risk for depression or depressive children were more likely to be obese (9). In the literature, there was no study to examine the relationship between obesogenic family environment and children's psychological status. The present study found that primary school children with higher obesogenic family environments had more depressive symptoms. This situation can be explained as follows, a family that shows careless behavior in terms of obesity may also be inattentive in terms of the emotional needs of their child. However, future studies that examine other factors related to the psychological state of the children are needed. We thought this finding contributed to the literature. Unlike primary school children, we showed no relationship between obesogenic family environment and depressive symptoms in secondary school students. The small sample size of secondary school children might explain no significant differences in secondary school children.

In the present study, we found no significant difference between the sociodemographic characteristics of the parents and the children's smartphone usage time and depressive symptom levels. Current studies showed the relationship between family sociodemographic data and children's screen use and behavior (22). Some studies showed that depressive symptoms in school children are associated with certain socio-demographic factors, family socioeconomic status, and family relationships (23,24). The parents conducted in our study had similar sociodemographic characteristics that may have affected this situation. We believe that participants with similar characteristics might make our study meaningful by excluding parenteral factors related to children's depressive symptoms.

Another critical issue is that smartphone use has become popular among children. Children spend more time on smartphones nowadays (25,26). Our present study found that more smartphone usage time was associated with a higher obesogenic family environment in primary and secondary school children. In this process, how long children use smartphones gains importance. Problematic smartphone use can bring some negative consequences. Some studies showed that problematic smartphone use for entertainment was positively associated with obesity (14). Sohn et al. (27) evaluated 41 studies as a systematic review, and they found a significant relationship between depression and problematic smartphone use in adults. Lee et al. (28) found that smartphone addiction was positively related to depression among low-income male students . The present study revealed no relationship between children's smartphone usage time with obesity though there was a relationship between the obesogenic family environment and smartphone usage time of the children. Children with an obesogenic family environment may have healthy body mass index at now, but these children may become obese later in life. The present cross-sectional study might not show the relationship between smartphone use, obesity, and depressive symptoms. Re-evaluating these children after a few years will be more meaningful to determine the long-term effects of the obesogenic family environment like obesity.

On the other hand, the present study showed some differences between primary and secondary school students. We confirmed that higher obesogenic environment, and more depressive symptoms in secondary school students than primary school children. Similar to our study, some studies showed that depression symptoms were more common in older children (29). These differences might be explained small sample size of secondary school students. Future studies with more primary and secondary school students are needed.

In summary, FNPA is a feasible tool in well-child visits to determine risky family environments for childhood obesity. It is known the relationship between FNPA score, and obesity in children. The present study showed a relationship between FNPA scores, children's smartphone usage time, and depressive symptoms. Health professionals might be careful about children with lower scores of FNPA regarding obesity, smartphone use, and psychological status.

CONCLUSION

We found that the risky family environment for childhood obesity was associated with depressive symptom levels in primary school children. The present study also confirmed that obesogenic family practices were related to more smartphone usage time in primary and secondary school students. To our knowledge, no study examined the relationship between obesogenic family practices, smartphone usage time, and depressive symptoms in children. We believe that our research will contribute to science. Future comprehensive studies on parental attitudes, children's behavior, and mental health are needed.

LIMITATIONS

There are several limitations of the present study. The first limitation was the small sample size of secondary school children. We examined the children's weight and height according to the parent's self-report. Families may not remember precisely this information retrospectively. Small sample sizes may overestimate the FNPA impact on children's depression levels. Another limitation of our study is determining the psychological well-being of children using scales Children's

Depression Inventory. We determined the levels of depressive symptoms, not to diagnose depression. For this reason, future studies may need to include child psychiatrists and evaluate the psychological status of the children more clearly.

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