



FEEDING BEHAVIORS IN CHILDREN WITH AUTISM SPECTRUM DISORDER: A CROSS-SECTIONAL STUDY

Otizm spektrum bozukluğu olan çocuklarda yeme davranışları: Kesitsel bir çalışma

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Özet

Çalışmanın amacı, Otizm Spektrum Bozukluğu (OSB) olan çocuklardan oluşan bir örnekleme davranışsal beslenme sorunlarını incelemek ve beslenme sorunlarının çocuğun cinsiyeti ve ebeveynlerin başa çıkma stratejileri hakkındaki duygularıyla ilişkisini incelemektir. Bu çalışma, 6-15 yaş arası OSB'li çocuklarla yapılan kesitsel bir çalışmaydı. OSB'li çocuk/adolesanların ebeveynleri sosyodemografik bilgileri, beslenmeyle ilgili soruları ve çocuğun davranışsal beslenme sorunlarını ve ebeveynlerin duygularını değerlendirmek için Davranışsal Pediatrik Besleme Değerlendirme Ölçeği'ni (DPBDÖ) tamamlamıştır. Boy uzunluğu ve vücut ağırlığı, vücut kütle indeksi (BKİ) persentillerini hesaplamak için kullanıldı. Yaş ve cinsiyete ilişkin persentiller hafif şişmanlığı ve obeziteyi tanımlamak için kullanıldı (sırasıyla ≥ 85 . ve ≥ 95 . persentil). Araştırmanın örneklemini %45,8'i obez olan 70 OSB'li çocuk (Erkek: 49, kız: 21) oluşturmuştur. OSB'li erkeklerde obezite sıklığı OSB'li kadınlara göre daha yüksekti. DPBDÖ puanları kızlarda erkeklere göre tüm puanlarda (toplam puan, toplam problem, çocuk toplam puanı, çocuk problem, ebeveyn toplam puanı ve ebeveyn sorunu) daha yüksekti. DPBDÖ toplam puanı zayıf çocuk grubunda (özellikle kızlarda) daha yüksekti ($p < 0,05$). Bu çalışma, OSB'li çocuklarda problemlili beslenme davranışlarının cinsiyete göre farklılık gösterebileceğini ortaya koymuştur. Beslenme davranışındaki farklılıklara göre davranışsal müdahaleler geliştirilmelidir.

Anahtar kelimeler: Otizm spektrum bozukluğu, davranışsal pediatrik besleme değerlendirme ölçeği, gelişimsel yetersizlikler, yeme bozukluğu, cinsiyet farklılıkları.

Abstract

This study aimed to examine the behavioral feeding problems in a sample of children with Autism Spectrum Disorder (ASD) and to examine the relationship of feeding problems to child sex and parents feelings about strategies to cope. This was a cross-sectional study of children aged 6-15 years with ASD. The parents or caregivers of the children/adolescents with ASD completed the following: sociodemographic information, questions about nutrition, and the Behavioral Pediatric Feeding Assessment Scale (BPFAS) for assessing the child's behavioral feeding problems and parents' feelings. Height and weight were used to calculate body mass index (BMI) percentiles. These percentiles for age and sex were used to define overweight and obesity (≥ 85 th and ≥ 95 th percentiles, respectively). The sample of the study consisted of 70 children with ASD (male: 49, female: 21), of which 45.8% were obese. The frequency of obesity in the males with ASD was higher than that in the females with ASD. BPFAS scores were higher in the females than in the males for all frequencies (total score, total problem score, child total score, child problem, parent total score, and parent problem). BPFAS total score was higher in the underweight children group (especially in the females) ($p < 0.05$). This study demonstrated that problematic feeding behaviors in children with ASD may differ according to sex. Behavioral interventions should be developed according to differences in feeding behavior.

Keywords: Autism spectrum disorder, behavioral pediatric feeding assessment scale, developmental disabilities, feeding disorder, sex differences.

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Introduction

Autism spectrum disorder (ASD) is a common heterogeneous neurodevelopmental disorder that is defined by the presence of main characteristics like language delay, social interaction/communication impairment, and restricted/repetitive patterns of behavior (1). Since the 1980s the prevalence of ASD has increased dramatically. According to the March 2023 report published by the Centers for Disease Control and Prevention (CDC), the prevalence of autism, which was 1 in 44 in the previous report, reached 1 in 36 in children aged 8 years (2). Feeding disorders are a common co-occurring condition in children with ASD. The incidence of feeding disorders in children with ASD varies between 6.0% and 89.0% (3, 4). Feeding disorders include selective eating, food refusal, pica, ruminating, vomiting, and overeating (5); food neophobia/fussiness/aversion, atypical eating (6); and chewing and swallowing problems (such as chewing without swallowing) and fast eating (7). Selective eating (SE) is a common problem for children with ASD (8). Despite the fairly common occurrence of SE in children with ASD, little is known about its effect on family mealtimes (9). Mealtimes can be challenging for children with ASD due to deficits in social communication, motor delays, olfactory, textural, and tactile sensory sensitivities, and difficulties sitting for mealtime routines (10). Mealtime behavior problems are more

common in children with ASD and are a serious concern for the parents (9).

ASD is more common in males than in females and little is known about differences between the sexes in behavioral problems in children with ASD (11). Sex differences are observed in ASD, especially in social and cognitive functioning. Females diagnosed with ASD have fewer social problems in the first years of their development, but they encounter more difficulties and more social problems in adolescence compared to males (12). It has been determined that females with ASD have more social problems than males, show social communication difficulties, and have more specific symptoms related to attention and thinking. In addition to all these problems, it has also been reported that females with ASD tend to have episodes of eating problems than males (13). Baraskewich et al. (14) stated that the occurrence and presentation of eating and feeding problems are likely affected by factors including age, sex, and gender. We hypothesized that feeding problems might differ according to sex. It is not known whether feeding problems in addition to eating problems differ by sex.

This cross-sectional study aimed to determine the rate of behavioral feeding problems in a sample of children with ASD and to examine the relationship of feeding problems to child sex and caregiver feelings about strategies to cope.

Material and Method

Participants and data collection

A cross-sectional study was conducted, between January-May 2017, with children aged 6-15 years diagnosed with ASD and enrolled at four Special Education and Rehabilitation Centers (SERCs) under the control of the Ministry of National Education in Ankara and their parents/caregivers. All parents and caregivers who agreed to take part in the study gave written informed consent.

The inclusion criteria for the study were as follows: being aged 6-15 years and diagnosed with ASD, not having tooth problems or swallowing issues, not

diagnosed with a disease or disorder known to affect dietary habits, not have a food allergy, and not having any dietary restrictions (like a gluten-free, casein-free diet).

A total of 85 children diagnosed with ASD were recruited via SERCs. During the study, 15 parents dropped out because of not attending treatment appointments (n: 6), not wanting to continue to participate (n: 4), and not allowing weight or height to be measured (n:5). Therefore, the study was completed with 70 children (M: 49, F: 21) whose parents agreed to participate.

According to the post hoc power analysis, for the difference between male and female participants' Behavioral Pediatric Feeding Assessment Scale (BPFAS) total frequency score and total behavior problem the effect size was calculated to be 0.7358237 and 0.8485281 while the post hoc power of the study ($1-\beta$) was 0.794 and 0.876 ($\alpha = 0.05$), respectively.

The study data were obtained through a questionnaire using face to face interviews with the parents. The questionnaire included socio-demographic information about the parents and the children with ASD and the BPFAS. Some anthropometric measurements (weight and height) of the children with ASD were obtained as well.

Behavioral Pediatric Feeding Assessment Scale

The BPFAS (15) is a 35-item standardized caregiver questionnaire designed to obtain information about the mealtime behavior of children using likert scale (never to always). The scale is adapted to Turkish by Önal et al. (16) While 25 items on the scale contain expressions related to eating behavior for children, 10 items express the parents' feelings about and strategies for dealing with the child's mealtime behaviors. This measure asks parents to rate the frequency with which a mealtime behavior occurs on a likert scale and then to indicate whether that behavior is a problem in a binary fashion (yes/no). It yields six scores: total frequency score, total problem, child frequency score, child behavior problems, parent feelings/strategies frequency score, and parent feelings/strategies problems. Increased score reflects an increased level of problematic feeding behaviors and eating habits (15).

Anthropometric Measurements

All measurements were recorded by the same dietitian researcher. The body weight and height of all participants were measured once. Body weights were

Results

Table 1 shows the demographic information of the 70 children with ASD and their parents who participated. Seventy percent of the children were male (n: 49). The children had a median age of 12.0 years. The

measured with a Tanita SC 330 Body Composition Analyzer (Tanita Corp., Tokyo, Japan). The average weight of clothing was accepted as 1 kg for each child. The body type selected was standard in all children. The heights of all children were measured with a tape measure. During the measurements, the National Health and Nutrition Examination Survey Procedures were followed.

BMI values were calculated and assessed by using BMI percentile values according to age, which shows growth and development for children. Those below the 5th percentile were considered underweight, those in the 5th-85th percentile normal weight, those in the 85th-95th percentile overweight, and those above the 95th percentile obese (17).

Data Analysis

Data analysis was performed using SPSS Version 22 with statistical significance set at $p < 0.05$. In the selection of the analyses, the conformity of the data to the normal distribution was evaluated by visual (histogram) and analytical (Kolmogorov-Smirnov test) methods. Descriptive statistics for demographic and anthropometric characteristics were presented as mean \pm SD (for normally distributed variables) or as a proportion of the total sample size by sex. Chi-square tests were used to analyze relationships between sex and BMI percentile groups. Comparisons between males and females with ASDs were made using t-tests for BPFAS scores/problems. One-way analysis of variance (ANOVA) was used to compare BPFAS total score between BMI percentile groups. The Tukey post-hoc test was used to indicate which group differences were statistically significant.

Ethical approval

Ethical approval for the study was obtained from the Ankara University Faculty of Rectorate Ethics Committee (protocol number: 04-132-16).

majority of the parents reported that they had graduated from high school. Maternal and paternal ages according to the sex of the children are also given in Table 1. According to sex, there were no significant differences

between the mothers' and fathers' education levels, maternal and paternal age, ages of the children or medication use (Table 1).

Most of the questionnaires were completed by the mother (mother: 95.7%; father: 4.3%).

Table 1: Demographic information of the children with ASD and their parents.

Variables	Males (n:49)		Females (n:21)	
Child Age (Median (Q₁-Q₃)) (year)	12.00 (10.0-14.0)		12.00 (7.5-14.0)	
Maternal age (Mean±SD) (year)	28.34±5.03		28.04±4.58	
Paternal age (Mean±SD) (year)	32.10±4.90		32.61±3.70	
Medication	n	%	n	%
Use	21	42.8	10	47.6
Don't use	28	57.2	11	52.4
Medication type				
Antipsychotics	10	47.6	5	50.0
Stimulants	6	28.6	2	20.0
Antiepileptic	5	23.8	3	30.0
Mother's Education				
High School	36	73.5	16	76.2
University/Master	13	26.5	5	23.8
Father's Education				
High School	26	53.1	15	71.4
University/Master	23	46.9	6	28.6

As shown in Table 2, at the time of participation in the study, 63.1% of the males (n: 31) and 55.8% of the females (n: 8) were obese according to age-corrected BMI. There was a significant difference in BMI percentile between the sexes (p<0.05).

The females had a greater frequency of mealtime behavior problems than did the males (mean of total frequency score (BPFAS) 72.14 vs. 65.97 p<0.05) (Table 2). BPFAS scores revealed highly significant sex differences for the children and parents (except for child behavior problem) (p<0.05).

The females who were obese had worse mealtime behavior than the males in the same percentile group (p<0.05). The difference between the scores in the other groups was not statistically significant according to sex (p>0.05). The total frequency score indicated that the children who were underweight in the current study were facing more behavioral problems related to mealtimes than children who were obese (p<0.05) (Table 2).

Table 2: Mealtime behaviors and BMI percentile groups of children with ASD by sex.

BMI groups for age	Male (n:49)		Female (n:21)		Total		p ^a
	n	%	n	%	n	%	
Underweight	1	2	4	19.0	5	7.1	
Normal	17	34.7	9	42.9	26	37.1	
Overweight	5	10.2	2	9.5	7	10.0	0.043
Obese	26	53.1	6	28.6	32	45.8	
BPFAS Scores (Mean±SD)							p^b
Child frequency score	47.48±7.17		51.47±8.16		48.68±7.64		0.045
Parent feelings/strategies	18.51±3.41		20.66±3.74		19.15±3.63		0.022
Frequency score							
Child behavior problem	6.14±2.54		7.47±2.73		6.54±2.65		0.054
Parent feelings/strategies	1.71±1.22		2.71±1.79		2.01±1.47		0.027
Problem							
Total frequency score	65.97±9.24		72.14±10.95		67.82±10.11		0.018
Total behavior problem	7.87±3.33		10.19±4.16		8.57±3.73		0.016
BPFAS Total Frequency Score (Mean±SD)							

Underweight	64.00±00.00	81.75±6.75	78.20±9.85 ^x	0.100
Normal	70.17±9.97	70.55±12.17	70.30±10.54	0.933
Overweight	65.40±13.61	64.00±1.41	65.00±11.15	0.896
Obese	63.42±7.19	70.83±10.40	64.81±8.23 ^y	0.045

p^c= 0.014

^aFisher Exact, ^bStudent t testi, ^cOneWay Anova, ^{x,y}Total frequency score differed between the obese and underweight groups

Table 3 shows situations in which parents face the most problems. According to the families, the most problematic behavior for both girls and boys was "eats junky snack food but not at mealtime" behavior. The proportion of the females who did not try any

new foods was 9.5%, while it was 6.2% for the males. The parents of the females stated that 'I sometimes feel that my child's pattern hurts his/her general health' at a higher rate than the parents of the males (respectively 90.5% and 81.6%).

Table 3: Questions about problems parents face the most.

BPFAS Items	Male				Female			
	Never (%)	Sometimes (%)	Always (%)	Problem (%) Yes*	Never (%)	Sometimes (%)	Always (%)	Problem (%) Yes*
Child								
Will try new foods	6.2	91.8	2.0	44.9	9.5	90.5	-	66.7
Takes longer than 20 minutes to finish a meal	49.0	51.0	-	34.7	19.0	76.2	4.8	61.9
Eats junky snack food but will not eat at mealtime	4.1	63.2	32.7	79.6	-	71.4	28.6	85.7
Gets up from table during mealtime	28.6	71.4	-	63.3	14.3	85.7	-	61.9
Eats vegetables	6.1	93.9	-	38.8	-	100.0	-	57.1
Tries to negotiate what s/he will eat and what s/he will not eat	10.2	85.7	4.1	69.4	14.3	85.7	-	57.1
Parent								
I use threats to get my child to eat	59.2	38.8	2.0	18.4	23.8	71.4	4.8	52.4
If my child does not like what is being served, I make something else	53.1	44.9	2.0	42.7	38.1	61.9	-	47.6
I feel that my child's pattern hurts his/her general health	18.4	81.6	-	67.3	9.5	90.5	-	81.0

Discussion

Feeding problems are quite common in children with ASD (18). The present study evaluated whether feeding behavior in children with ASD differed by sex. To the best of our knowledge, this is the first study to evaluate feeding behavior in children with ASD according to sex. In the present study, the fact that the females with ASD had worse feeding behavior than the males supported our hypothesis.

The scale used in the evaluation of feeding behaviors with the highest published psychometric profile is the BPFAS. In the

study of Bandini et al. (19), it was found that the frequency of problematic mealtime behaviors decreased as children with autism got older. The fact that the median age of the children in this study is older may explain the lower BPFAS score compared to the literature.

In literature, the differences that can be observed in males and females with ASD are limited. Based on BPFAS scores, the present study shows that females' feeding behavior is worse than males'. The difference in feeding behaviors by sex in our study may

have been due to heightened rates of social communication disorders, lethargy, and irritability in the females with ASD than in the males observed in another study (20). The fact that females have more gastrointestinal disorders (GDs) (21) and physical health challenges (22) and greater risk for depression and anxiety (23) than males may also affect their feeding behaviors.

As in the general population, overweight and obesity in children with ASD are a major concern. Conditions such as lack of physical activity due to insufficient motor skills, neuroleptic drug use that may cause an increase in body weight, atypical eating behavior, high energy food consumption, GDs such as constipation, and impaired sleep patterns cause overweight and obesity (24, 25). According to previous studies, overweight and obesity in children with ASD varies between 16.7% and 58.0% and between 20.0% and 30.0%, respectively (25, 26). The fact that more than half of the children with ASD were overweight and obese in the present study is consistent with the literature. Unhealthy weight is known to pose many health risks. If no precautions are taken for children with autism, the situation will become more dangerous for families and individuals with autism at later ages.

In the present study, the prevalence of overweight and obesity was higher in the males (63.3%), while the prevalence of underweight was higher in the females (19.0%). In our study, the females' high rates of finishing their meal late, getting up from the table at mealtimes, and being threatened by their parents may have affected their food consumption. The high obesity rates in the males may have been caused by the excessive junk food determined in the present study (eats junky snack food but will not eat at mealtimes (85.9% always and sometimes)). In addition, this rate may have been caused by many factors that were not examined (physical activity, food consumption, drug use, GDs, etc.).

The present study shows that underweight children with ASD have more feeding problems than obese children. Results are contradictory in the literature. Although in one study it was determined that half of the children with autism who had high-level problematic mealtime behavior determined by BAMBI (Brief Autism Mealtime Behavior Inventory) were underweight (27), in another study overweight and obese

children with ASD had more feeding behavioral problems (28). The present study may have indicated that worsening feeding behaviors of children with ASD may cause susceptibility to obesity in children, as well as increasing malnutrition.

It is known that children with ASD have a higher risk of developing nutritional problems compared to their peers (29). It is stated that the reluctance to try foods in normally developing children peaks between 2 and 6 years of ages and improves at later ages (30). In the literature, it has been determined that 41.7%-95.0% of children with autism between the ages of 3 and 11 refuse or are not willing to try new foods (31, 32). In another study, 18 children with ASD were examined in two time periods (mean 6.8 and 13.2 years) and there were improvements in food refusal with increasing age (19). In the present study, the lower frequency of refusal of new foods than the rates in the literature may be explained by the children's higher age. In addition, although the rates of never trying new foods for females and males in the present study were close to each other, this situation was seen as more problematic behavior in females for their parents. The parents may have been more sensitive or more anxious about problematic feeding behaviors in their daughters.

Parental anxiety, negative eating patterns, and communication difficulties are additional social reinforcers that contribute to the continuation of maladaptive feeding behaviors in this population (4). When mealtimes are not enjoyed and family members do not respect children's needs and choices, the relationship may be affected and the feeding problem persists (33). Families should be educated on this issue and should not reinforce their children's problematic feeding behaviors.

This was an original study examining the nutritional behavior differences by sex in children with ASD but it has some limitations. First, mealtime behaviors were assessed by a parent-reported questionnaire only. Parents can be under intense stress, which can lead to under- or over-reporting about their children. Second, factors that may affect children's feeding behavior, such as GDs and parents' feeding behavior, were not measured. Lastly, the dropping out of some children with autism from the study is one of the limitations of the study.

Conclusions

It is known that feeding problems in children with ASD create several risks for growth, nutrient balance, learning, and other behavioral problems. Therefore, behavioral interventions should be developed for

problematic feeding behavior, which can be more severe in females. In this context, parents should be willing to take necessary precautions by evaluating their children's feeding behaviors.

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