Araştırma makalesi

Research article

Eating Behaviors and Its Determinants: A Cross-Sectional Study In Autistic and Non-Autistic Children

Sercan KARA[1], Bircan KARA[2], Z. Begüm KALYONCU ATASOY[3], Hatice KAYA[4], Aytolan YILDIRIM[5]

ABSTRACT

Aim: Autism has increased globally, and it impacts nutrition. Factors related to mealtime behaviors of autistic children are understudied, especially in low- and middle-income countries. Thus, this study aims to compare the eating and mealtime behaviours of autistic children (n=60) with a non-autistic sample (n=62) from Istanbul, Türkiye.

Material and Methods: Parents were asked to complete a face-to-face questionnaire that included Children's Eating Behavior Inventory (CEBI) and anthropometric measures. MANCOVAs were used for comparing factors scores of CEBI between autistic and non-autistic participants by adjusting for potential covariates.

Results: The **"**Child's Positive Eating Behavior" and "Adverse conditions in terms of child at the mealtime" (such as vomiting and choking) factors differed significantly depending on the autism status, although negative eating behaviors during and after mealtime were present in both groups. No statistically significant differences were found between the autism and comparison groups on the BMI percentile along with the children's age and sex.

Conclusion: Our results highlight the need for evaluating the nutrition status of children at every age by not only using anthropometric measures and dietary intake but also assessing eating behaviors. Families could be guided on regulating their children's nutritional behaviors by focusing on development of positive attitudes.

Keywords: Autism spectrum disorders, autistic children, eating behaviour, mealtime problems, Türkiye

ÖZ

Otizmi Olan ve Olmayan Çocuklarda Yeme Davranışları ve Belirleyicileri: Kesitsel Bir Çalışma

Amaç: Otizm küresel olarak artmakta ve beslenmeyi etkilemektedir. Otizmli çocukların yemek zamanı davranışlarıyla ilgili faktörler, özellikle düşük ve orta gelirli ülkelerde yeterince araştırılmamıştır. Bu nedenle bu çalışma İstanbul'da yapılmış olup, otizmli çocuk örneklemi (n=60) ve kontrol grubunun (n=62) yeme davranışlarını değerlendirmek amaçlanmıştır.

Gereç ve Yöntem: Ebeveynler, Çocuklarda Yeme Davranışları Değerlendirme Ölçeği'ni (ÇYDDÖ) ve çocuklara ait antropometrik değişkenleri içeren bir anketi yüz yüze doldurmuşlardır. ÇYDDÖ'ye ait faktör puanları MANCOVA'lar yardımıyla değerlendirilmiş olup, analizlerde potansiyel karıştırıcı faktörler sabit tutulmuştur.

Bulgular: Her iki grupta da yemek sırasında ve sonrasında olumsuz yeme davranışları bulunmasına rağmen, "Çocuğun Sergilediği Olumlu Yeme Davranışları" ve "Çocuğun Yemek Esnasında Sergilediği Olumsuz Yeme Davranışları" (kusma, boğulma gibi) alt boyutları otizm durumuna göre anlamlı farklılık göstermiştir. Otizm ve kontrol grubu arasında BKİ persentil değerleri ile çocukların yaşı ve cinsiyeti arasında istatistiksel olarak anlamlı bir fark bulunmamıştır.

Sonuç: Araştırmadan elde edilen sonuçlar, farklı yaştaki çocukların beslenme durumunun değerlendirilmesinde sadece antropometrik ölçümler ve diyet alımı değil, aynı zamanda yeme davranışlarının da değerlendirilmesi gerektiğini vurgulamaktadır. Ailelerin, olumlu tutum geliştirmeye odaklanarak çocuklarının beslenme davranışlarını düzenlemeleri önerilmektedir.

Anahtar kelimeler: Otizm spektrum bozuklukları, Otizmli çocuklar, yeme davranışı, yemek zamanı problemleri, Türkiye

[1] Research Assistant, Ankara University, Faculty of Nursing, Department of Fundamental Nursing, Ankara, Türkiye, E-mail: srcnkara@ankara.edu.tr, Phone number: +09 0538 855 26 96, ORCID: 0000-0002-2420-5428

[2] Dr. Lecturer, Mustafa Kemal University Health Practice and Research Hospital, Istanbul University-Cerrahpasa Florence Nightingale Faculty of Nursing, Hatay, Türkiye, E-mail: bircankara91@gmail.com, Phone number: +09 0531 450 54 23, ORCID: 0000-0001-8220-8929

[3] Asst. Professor, Department of Nutrition and Dietetics, Istanbul Aydin University Faculty of Health Sciences, Istanbul, Türkiye, E-mail: z.begum.kalyoncu@gmail.com, Phone number: +09 0533 651 43 73, ORCID: 0000-0001-6208-3540

[4] Professor, Department of Nursing, Istanbul University-Cerrahpasa Florence Nightingale Faculty of Nursing, Istanbul, Türkiye, E-mail: haticeka@iuc.edu.tr, Phone number: +09 0535 216 16 03, ORCID: 0000-0002-8427-0125

[5] Professor, Department of Nursing, Istanbul Atlas University Faculty of Health Sciences and Istanbul Medipol University Faculty of Health Sciences, Istanbul, Türkiye, E-mail: aytolan.yildirim@atlas.edu.tr, Phone number: +09 0532 730 83 39, ORCID: 0000-0002-0475-6695

Received: 9 Haziran 2023, Accepted: 20 Eylül 2023

Atıf/Citation: Kara S, Kara B, Kalyoncu Atasoy ZB, Kaya H, Yıldırım A.. Eating Behaviors and Its Determinants: A Cross-Sectional Study In Autistic and Non-Autistic Children Hacettepe Üniversitesi Hemşirelik Fakültesi Dergisi 2024;11(1):107-115. DOI: 10.31125hunhemsire.1312278

INTRODUCTION

Autism Spectrum Disorder (ASD) is among the childhood neurodevelopmental disorders with symptoms appearing from the early childhood period. The American Psychiatric Association (APA) characterizes ASD with symptoms of limited and repetitive behaviour pattern, disordered social interaction and communication along with restrictive behaviors and interest[1,2].

Autism is a serious and permanent developmental disorder in which delays and deviations in mutual social interaction and communication skills, stereotypical behaviors, narrowed repertoire, and limited activities are seen[3].

ASD draws attention with its increasing prevalence in the world and Türkiye. While one out of every 2500 children in 1985 had been diagnosed with autism, the frequency increased to 250 in the year 2001 and later to 88 children in 2013[4,5]. Today, one out of every 44 children is born with autism, according to the Centers for Disease Control and Prevention[6]. Autistic people are found in all types of societies, as well as in various regions, races, and family structures, the risk of autism in boys is three to five times higher than in girls[5,7]. The ASD prevalence is estimated at nearly 1.5% in developed countries, and despite the lack of accurate data, the Autism Platform estimates the prevalence as 1 in 150 for Türkiye[8]. While according to the Türkiye Ministry of Health, in 2018, there were 107,834 people diagnosed with ASD (25,755 women and 82,079 men) from all age groups; The Autism Platform currently estimates that there are approximately 450,000 individuals with autism and around 125,000 children with autism in the 0-14 age group[4,9].

Although it is unknown what causes ASD, numerous studies have been conducted to elucidate the effects of both genetic and environmental factors[10,11]. It is hypothesized that a multitude of genes interact with one another to cause autism, which is assumed to have diverse and heterogeneous etiologies with overlapping symptoms[12]. Genetic, biochemical, metabolic, neuroanatomical, immunologic, and environmental factors have been linked to the possible etiology[11,13]. Between 46 to 89% of ASD cases were found to be affected by nutritional problems, with one meta-analysis reporting autistic children to be five times more likely to experience nutrition-related problems compared to non-autistic peers[14]. Since nutritional status is a primary concern for parents, feeding problems alarm the caregivers of children with ASD. Common dietary issues in the pediatric population with ASD include severe resistance to trying new foods, food choices that are limited to idiosyncratic preferences, retching while eating, mouthing food without a valid medical reason, and refusal of specific foods, especially large ones or the ones with particular smells and textures, due to sensory sensitivity[15]. These food selectivity behaviors of autistic children have been associated with nutritional deficiencies, gastrointestinal system (GIS) problems, oral-motor delay, sleep problems, and anxiety[16].

Healthy and balanced nutrition is fundamental for brain development from the prenatal period across a lifetime in terms of proper DNA methylation, neurotransmitter synthesis, synaptogenesis, etc. Proper brain development is especially crucial for children with autism, hence the relationship between specific nutrients such as Vitamin D and omega-3 fatty acids along with dietary patterns like gluten and/or casein-free diets with ASD symptoms have been investigated in previous research studies[12,17]. Yet, due to methodological issues and conflicting results, practical and thorough nutrition guidelines have not been developed for the population with ASD. Few guidelines that were developed such as the one that was published by the Türkiye Ministry of Health provide general recommendations and focus mostly on replenishing any nutrient deficiencies or providing algorithms for children with ASD who have GIS symptoms[18].

Since the current limited body of literature is mostly in line with the healthy nutrition advice for general population, more in-depth research on eating and mealtime behaviors of autistic children is required to prevent the nutrition-related deficiencies and better understand the behavioral issues that make mealtimes challenging for the parents. Most studies on nutrition-related behaviors of children with ASD have been conducted in high-income countries[19-23]. Yet, there is a big research gap in low-and-middle-income countries, such as Türkiye, where especially nutrition-related issues are seldomly addressed in ASD research. Since individuals with ASD are considered a disadvantaged group, most research studies could be performed with a limited scope. However, more country-specific research is needed to understand the nutrition-related behavioral dimension of ASD to inform support services and resources. Despite improved efforts to provide national and local capacity to support families of members with ASD, families are often compelled to face heavy social, emotional, and financial consequences in Türkiye[24]. As dietary behaviors develop in the family context[25] more research is needed regarding eating and mealtime problems in various countries.

Aim

Drawing on the Children's Eating Behavior Inventory (CEBI), the aim of the present study is to evaluate the relationship between cross-sectional determinants and eating behaviors among children with autism in a case-control study design.

MATERIAL and METHODS

Study Design

This cross-sectional study was carried out to evaluate the eating behaviors of children with autism along with a comparison group.

Study Sample

Participants of the current study comprised of parents of 122 children aged 4 to 18 years old**.** The parents of the autistic children were recruited from a government-run special education and practice center (n=60), and the parents of the comparison group were recruited from a state primary school (n=62). All the participants were recruited from facilities that are located in Istanbul, Türkiye. All the parents who were willing to participate in the study with formal written consent were included. The parents of the children with ASD were included if the diagnosis was

given by a psychiatrist or a pediatrician with the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-V) criteria.

Data Collection Tools

A short demographic survey, the Children's Eating Behavior Inventory (CEBI), and self-reported anthropometric measures were used. The demographic survey included fifteen questions that inquired about the child's date of birth, sex, and chronic disease status, as well as the age and employment status of the mother and father and family income status. A special education teacher was also consulted to determine the appropriateness of the language of the instrument.

Children's Eating Behavior Inventory: CEBI was developed and standardized by Lynda A. Archer in 1990, in Canada[26]. The scale was designed for families to fill out regarding issues with children's eating and mealtimes. The scale was found to have six sub-domains while adaptation to Turkish was done. The names of the sub-domains (i.e. factors) were established as the Child's Positive Eating Behaviours, Negative Eating Behaviours Shown by the Child during the Meal, Negative Eating Behaviours Shown by the Child after the Mealtime, Opinions and Behaviors of Mother, Child's Behaviour Related to Food Preparation, Adverse Conditions in Terms of Child at the Mealtime[27]. Each item of the scale includes response options such as "always-1, often-2, sometimes-3, rarely-4, never-5" prepared with a five-point Likert system to determine how often the behavior in question occurs. Some items are reverse coded. The adaptation of the scale to Turkish society was carried out by Ünlü H, in 2011[27].

In our study, as a result of the Kaiser-Meyer-Olkin (KMO) and Barlett analysis, it was seen that the KMO value was 0.806, and the Barlett value was less than 0.05, so that factor analysis was feasible. As a result of factor analysis, 6 factors with a total variance of 67.94% were formed, and the scale was reduced to 28 items. The general reliability of 28 items on the scale was found to be 0.813. The test-retest reliability was found to be 0.87.

Data Collection

Mothers provided information on the weight (in kilograms) and height (in centimeters) of their children. The body mass index (BMI) values were calculated and evaluated by using BMI-for-age percentile charts by the CDC that referenced the sex- and age-specific childhood growth values[6]. The BMI-for-age percentile categories were used as follows: Underweight <5th percentile, Normal Weight 15th – 85th percentile, Overweight 85th – 95th percentile, and Obesity >95th percentile. During the data collection process, each participant had to read and give their written informed consent for voluntary participation without pay or compensation.

Data Analysis

The Shapiro-Wilks test was used to assess the normality of data. In addition to descriptive statistical methods (mean, standard deviation, frequency), the Student t-test was used for the between-group evaluation of normally distributed quantitative data. The Mann-Whitney U test was used for the between-group evaluation of quantitative data that did not show normal distribution. The Kruskal Wallis test was used to evaluate the quantitative data that did not show normal distribution between more than two groups, the Mann-Whitney U test was used to determine the group that caused the difference, and the Chi-Square test and Continuity (Yates) Correction were used to evaluate the qualitative data. One-way multivariate analysis of covariance (MANCOVA) was used to test for univariate and multivariate effects of CEBI sub-domains (i.e. the 6 factors) while controlling for autism status, sex of the child, age of the child, family income status, and BMI percentile categories. In all the tests, significance was accepted at the $p<0.05$ level. The data were analyzed with SPSS software, version 21 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 21.0. IBM Corp: Armonk, NY, USA).

Ethical Considerations

Before the research, permission was obtained from the relevant institutions and Non-Interventional Research Ethics Committee of Medipol University (Decision No: 384 / 27.06.2018). All the participants were mothers.

RESULTS

A total of 122 parents completed the survey, among whom 60 had children with autism. Nearly 67 percent (n=81) of the children were boys, compared to 33.6 percent (n=41) of the girls. The ages were between 4 and 18 years. The BMI percentile of the children ranged from 1.06 to 99.9, with a mean of 69.99±32.02. Of the children, 3.3% (n=4) were underweight, 48.4% (n=59) had normal weight, 17.9% (n=22) had overweight, and 30.1% (n=37) had obesity according to CDC weight status category.

It was found that 13.9% (n=17) of the children had a chronic disease, and 38.5% (n=47) used drugs continuously (Table 1). Table 1 also includes information about the sociodemographics of the families. The age of the mothers was between 24 and 67, with a mean of 38.27±6.44 and a median of 38 years. The fathers were between the ages of 30 and 65, with a mean of 42.37±6.92 and a median of 41 years. It was determined that 30.3% (n=37) of them were employed. The employment rate was 93.4% (n=114) among the fathers. While 64.8% (n=79) of the participants had an income level that covered their expenses, families having a child with ASD were found to have significantly lower income levels compared to the control families (p-value 0.016).

It was found that the mean age of the children with autism along with their parents, the ratio of males, and the rate of continuous drug use of children with autism were significantly higher than those children without autism (Table 1).

In Table 2, scores of the Children's Eating Behavior Inventory were evaluated depending on autism status.

MANCOVA analyses were performed for six CEBI factor mean scores taken as dependent variables for the children with independent variables of autism status, sex of children, age of children, family income level, and BMI-percentile categories (Table 3).

Table 1. Descriptive Characteristics of Children and Their Parents

Descriptive Characteristics		Autistic Children (n=60)	Non-autistic Children (n=62)	Total	t/χ^2	p
		n (%)	n (%)	n (%)		
Age of the child	**X̄±SD**	11.63±3.82	8.06±1.28	9.85±3.33	**6.961**	**0.001****
Sex of the child	**Girl**	7 (11.7%)	34 (54.8%)	41(33.6%)	**23.572**	**0.001****
	Boy	53 (88.3%)	28 (45.2%)	81(66.4%)		
BMI percentile	**Underweight**	3 (5%)	1 (1.6%)	4 (3,3%)	**2.766**	**0.429**
	Normal	25 (41.7%)	34 (54.8%)	59 (48.4%)		
	Overweight	12 (20%)	10 (16.1%)	22 (18%)		
	Obesity	20 (33.3%)	17 (27.4%)	37 (30.3%)		
Chronic disease status	**Yes**	12 (20%)	5 (8.1%)	17(13.9%)	**2.695**	**0.101**
	No	48 (80%)	57 (91.9%)	105(86.1%)		
Presence of medical treatment	**Yes**	40 (66.7%)	7 (11.3%)	47(38.5%)	**37.178**	**0.001****
	No	20 (33.3%)	55 (88.7%)	75(61.5%)		
Age of the mother (years)	**X̄±SD**	39.57±7.26	37.02±5.29	38.27±6.44	**2.222**	**0.028***
Age of the father (years)	**X̄±SD**	43.88±8.09	40.90±5.22	42.37±6.92	**2.425**	**0.017***
Education level of the mother (last graduated)	**Primary school**	18 (30%)	11 (17.7%)	29 (23.8%)	**6.219**	**0.101**
	Secondary school	11 (18.3%)	8 (12.9%)	19 (15.6%)		
	High school	18 (30%)	32 (52.6%)	50 (41%)		
	University	13 (21.7%)	11 (17.7%)	24 (19.7%)		
Employment status of the mother	**Employed**	13 (21.7%)	24 (38.7%)	37 (30.3%)	**3.424**	**0.064**
	Unemployed	47 (78.3%)	38 (61.3%)	85 (69.7%)		
Education level of the father (last graduated)	**Primary school**	15 (25%)	10 (16.1%)	25 (20.5%)	**3.571**	**0.312**
	Secondary school	12 (20%)	9 (14.5%)	21 (17.2%)		
	High school	18 (30%)	28 (45.2%)	46 (37.7%)		
	University	15 (25%)	15 (24.2%)	30 (24.6%)		
Family income status	**Income meets expenses**	32 (53.3%)	47 (75.8%)	79(64.8%)	**5.799**	**0.016***
	Income does not meet expenses	28 (46.7%)	15 (24.2%)	43(35.2%)		

X̄: Mean, SD: Standard Deviation, t: Student-t Test, χ^2: Chi-Square Test and Continuity (Yates) Correction, *p<0.05, **p<0.01

Table 2. Children's Eating Behaviour Inventory Scores of Children

Children's Eating Behaviour Inventory (CEBI)	Autistic Children (n=60) Mean ±SD (Median)	Non-autistic Children (n=62) Mean ±SD (Median)	Z	p
Child's positive eating behaviours	3.67±0.86 (3.8)	4.35±0.56 (4.4)	**-4.761**	**0.001****
Negative eating behaviours shown by the child during the meal	1.91±0.54 (1.83)	1.97±0.67 (1.83)	**-0.227**	**0.821**
Negative eating behaviours shown by the child after the mealtime	2.21±0.69 (2.17)	1.80±0.50 (1.67)	**-3.583**	**0.001****
Opinions and behaviors of mother	2.89±0.62 (2.83)	2.66±0.46 (2.67)	**-2.580**	**0.011***
Child's behaviour related to food preparation	2.47±0.89 2.33)	2.72±0.75 (2.67)	**-1.555**	**0.120**
Adverse conditions in terms of child at the mealtime	1.33±0.59 (1)	1.07±0.30 (1)	**-3.312**	**0.001****

SD: Standard Deviation, Z: Mann Whitney U Test, *p<0.05, **p<0.01

Significant differences were found for CEBI Factors 1 and 6 (p-values of <0.001 and 0.014, respectively) for the autism status variable. Children with autism had significantly lower scores on the domain of "Child's positive eating behaviours", while they had significantly higher scores in the domain of "Adverse conditions in terms of child at the mealtime" compared to the non-autistic children after adjusting for all the covariates. CEBI Factor 1 was found to be 3.67 ± 0.86 for children with autism vs. 4.35 ± 0.56 for the comparison group. For CEBI Factor 6, children with autism had an average score of 1.34 ± 0.6, and the comparison group had a score of 1.07 ± 0.3 (Table 4). For our research sample, autism status did not affect CEBI Factors 2, 3, 4, and 5 when controlling for age, sex, income, and BMI percentile categories. Moreover, a significant difference was found for CEBI factor 4 (p-value of 0.035) for the family income variable (Table 3). Parents with lower income had significantly higher scores for CEBI factor 4 compared to the parents with higher income (2.96 ± 0.66 vs. 2.68 ± 0.46). Parents of the children with autism had significantly higher scores on the domain of "Opinions and behaviors of mother" (Table 3). The rest of the MANCOVA analyses did not show any significant results for the sex of the child, age of the child, and BMI percentile categories (p>0.05). However, the relationship between each factor and the aforementioned variables was in the expected direction (Table 3).

DISCUSSION

The current study results support previous literature that autistic children exhibit more eating behavior problems as evaluated by CEBI compared to non-autistic peers in Türkiye, although negative eating behaviors during and after mealtime were present in both groups of children. The present findings indicate that the main difference between cases and comparison group was in the domains of Child's Positive Eating Behavior and Adverse conditions in terms of child at the mealtime (such as vomiting and choking) after adjusting for potential confounders. This is in line with Caliskan Demir and Ozcan's (2022) findings where they investigated the nutritional behavior of children with ASD in a case-control study in Türkiye. In their study, the autistic participants also displayed more food selectivity behaviors along with emotional over- and undereating, which led parents to use emotional feeding more[2].

Unexpectedly, despite significantly lower positive eating behavior and higher adverse conditions reported among children with ASD, no statistically significant differences were found between cases and comparison group on BMI-percentiles and weight status category (p>0.05). In both groups, obesity frequencies were above the national and Istanbul-wide pediatric obesity levels (33.3% for children with autism and 27.4% for the comparison group). According to the most recent Türkiye Demographic and Health Survey, which was conducted in 2018, the prevalence of overweight/obesity was found to be 8% among children below five years of age (7% for girls and 9% for boys). Among the Nomenclature of Territorial Units for Statistics (NUTS) regions of Türkiye, Central Anatolia Region (8.7%) and Istanbul (8.1%) were found to have the highest rates of childhood obesity[27]. Furthermore, Türkiye Childhood (Primary School 2 Grade Students) Obesity Surveillance Initiative (COSI-TUR) 2016 reported that 9.9% of all the primary school grade 2 students had obesity and 14.6% had overweight. According to that study, the highest prevalence of obesity was found first in Aegean Region with 15.9% and the second was in Istanbul Region with 13.4%[28]. Considerably high rates of obesity among the study participants could be due to the presence of negative eating behaviors during and after the mealtime in both cases and controls in our study. Parallel to our study findings, Bicer and Alsaffar (2013) also reported obesity levels to be 32.3% in their study, where they evaluated 164 children with autism, whose ages ranged from 4 to 18 years in Istanbul[7]. This finding is also in line with a comprehensive meta-analysis, which reported feeding problems that are found among children with ASD not always manifested as a higher risk for compromised growth[14].

Table 3. MANCOVA Table for The Factors of Children's Eating Behavior Inventory (n=122)

Variables		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Autism status	CEBI Factor 1[1]	8.281	1	8.281	16.344	**0.000****	0.124
	CEBI Factor 2[2]	0.004	1	0.004	.012	0.914	0.000
	CEBI Factor 3[3]	1.291	1	1.291	3.571	0.061	0.030
	CEBI Factor 4[4]	0.764	1	0.764	2.619	0.108	0.022
	CEBI Factor 5[5]	0.117	1	0.117	.169	0.682	0.001
	CEBI Factor 6[6]	1.358	1	1.358	6.260	**0.014***	0.052
Sex of the child	CEBI Factor 1	0.495	1	0.495	0.976	0.325	0.008
	CEBI Factor 2	0.034	1	0.034	0.090	0.764	0.001
	CEBI Factor 3	0.527	1	0.527	1.458	0.230	0.013
	CEBI Factor 4	0.277	1	0.277	0.951	0.331	0.008
	CEBI Factor 5	1.202	1	1.202	1.732	0.191	0.015
	CEBI Factor 6	0.000	1	0.000	0.001	0.973	0.000
Family income status	CEBI Factor 1	1.352	1	1.352	2.669	0.105	0.023
	CEBI Factor 2	0.238	1	0.238	0.639	0.426	0.006
	CEBI Factor 3	0.042	1	0.042	0.116	0.734	0.001
	CEBI Factor 4	1.325	1	1.325	4.541	**0.035***	0.038
	CEBI Factor 5	0.029	1	0.029	0.042	0.838	0.000
	CEBI Factor 6	0.008	1	0.008	0.037	0.848	0.000
Age of the child	CEBI Factor 1	1.199	1	1.199	2.366	0.127	0.020
	CEBI Factor 2	0.809	1	0.809	2.177	0.143	0.019
	CEBI Factor 3	0.293	1	0.293	0.811	0.370	0.007
	CEBI Factor 4	0.417	1	0.417	1.430	0.234	0.012
	CEBI Factor 5	0.172	1	0.172	0.249	0.619	0.002
	CEBI Factor 6	0.117	1	0.117	0.540	0.464	0.005
BMI percentile categories	CEBI Factor 1	1.581	2	0.790	1.560	0.215	0.026
	CEBI Factor 2	0.464	2	0.232	0.624	0.537	0.011
	CEBI Factor 3	0.438	2	0.219	0.606	0.547	0.010
	CEBI Factor 4	0.171	2	0.085	0.293	0.747	0.005
	CEBI Factor 5	0.078	2	0.039	0.056	0.946	0.001
	CEBI Factor 6	1.016	2	0.508	2.342	0.101	0.039

[1]R Squared = 0.241 (Adjusted R Squared = 0.201), [2]R Squared = 0.033 (Adjusted R Squared = -0.018), [3]R Squared = 0.136 (Adjusted R Squared = 0.091), [4]R Squared = 0.098 (Adjusted R Squared = 0.051), [5]R Squared = 0.039 (Adjusted R Squared = -0.011), [6]R Squared = 0.119 (Adjusted R Squared = 0.073CEBI Factor 1: Child's positive eating behaviors, CEBI Factor 2: Negative eating behaviors shown by the child during the meal, CEBI Factor 3: Negative eating behaviors shown by the child after the mealtime, CEBI Factor 4: Opinions and behaviors of mother, CEBI Factor 5: Child's behavior related to food preparation, CEBI Factor 6: Adverse conditions in terms of child at the mealtime

Table 4. Descriptive Results of The MANCOVA Table for The Factors of Children's Eating Behavior Inventory (n=122)

	CEBI Factor 1	CEBI Factor 2	CEBI Factor 3	CEBI Factor 4	CEBI Factor 5	CEBI Factor 6
Autism Status						
With autism	3.67 ± 0.86	1.91 ± 0.54	2.21 ± 0.69	2.91 ± 0.61	2.48 ± 0.89	1.34 ± 0.6
Without autism	4.35 ± 0.56	1.97 ± 0.66	1.8 ± 0.5	2.66 ± 0.46	2.72 ± 0.75	1.07 ± 0.3
Sex						
Female	4.32 ± 0.6	1.94 ± 0.61	1.78 ± 0.47	2.65 ± 0.51	2.79 ± 0.83	1.11 ± 0.43
Male	3.87 ± 0.85	1.94 ± 0.61	2.11 ± 0.68	2.85 ± 0.56	2.5 ± 0.81	1.25 ± 0.51
Family income status						
Low income	3.79 ± 0.89	1.98 ± 0.65	2.04 ± 0.62	2.96 ± 0.66	2.57 ± 0.97	1.24 ± 0.54
Meets expenses	4.14 ± 0.72	1.92 ± 0.59	1.98 ± 0.64	2.68 ± 0.46	2.62 ± 0.74	1.18 ± 0.45
BMI-percentile categories						
Under/normal weight	3.97 ± 0.83	1.98 ± 0.65	1.98 ± 0.53	2.78 ± 0.53	2.6 ± 0.86	1.1 ± 0.3
Overweight	4.17 ± 0.78	1.93 ± 0.59	1.9 ± 0.72	2.8 ± 0.6	2.56 ± 0.79	1.23 ± 0.51
Obesity	4.01 ± 0.75	1.87 ± 0.54	2.09 ± 0.73	2.75 ± 0.59	2.6 ± 0.82	1.35 ± 0.67

CEBI Factor 1: Child's positive eating behaviours, CEBI Factor 2: Negative eating behaviours shown by the child during the meal, CEBI Factor 3: Negative eating behaviors shown by the child after the mealtime, CEBI Factor 4: Opinions and behaviors of mother, CEBI Factor 5: Child's behavior related to food preparation, CEBI Factor 6: Adverse conditions in terms of child at the mealtime

Similarly, in a recent comparative study that was conducted in India, there were no significant differences in anthropometric measures between autistic participants and the comparison group[29]. Therefore, these findings indicate a need for routine screening of selective eating habits and adverse conditions that lead to food refusal among children with ASD in order not to miss any underlying nutritional deficiency[30].

For CEBI factors, MANCOVAs did not show any significant association with the age and sex of the children. The results of the present study suggest that eating behaviors do not change depending on these factors. However, the factor that corresponds to "opinions and behaviors of mother" was higher among lower income participants. The effect of age on nutrition-related behaviors has been disputed widely as some findings demonstrate dietary choosiness to decrease with increased age and others not supporting this claim. In the original article where CEBI was developed, Archer et al. reported age to be irrelevant as a factor for the occurrence of eating and mealtime problems[26]. Similarly, in a research that was conducted in Massachusetts, USA, Bandini et al. (2010) also did not find an association between decreased food selectivity and age when children with ASD compared with typically developing peers[19]. Furthermore, in a recent scoping review on problematic eating behavior of women with autism, the writers concluded that adult women with autism not only exhibited eating behaviors that are frequently seen in ASD, but also they exhibited high levels of disordered eating behavior that is commonly seen in eating disorders[31]. Unfortunately our findings do not support the commonly held belief that dietary choosiness is outgrown with age.

Maternal views and behaviors sub-dimension scores in children with autism were found to be statistically significantly higher for lower-income families. It has been suggested that family income level affects nutrition in children with ASD[32]. In a study conducted by Taşyürek (2017), it was determined that there is a significant relationship between the negative behaviors observed during feeding in the parents of autistic children and higher Beck depression scores[33]. In this study, it is seen that the average score of the sub-dimension of opinion and behaviors of the mother is low, and it can be said that the mothers are under stress, in terms of the nutritional behaviors of children with ASD. In studies conducted, mothers with autistic children stated that mealtimes were a source of stress for them, and they regularly felt nervous, sad, and helpless[34]. This might indicate that the eating behaviors of children might negatively affect the social lives of families in lower-income settings. Furthermore, lower-income mothers might face challenges in providing a variety of foods that could accommodate the sensory sensitivities of children with ASD. Also, the restricted food preferences of children with ASD could undermine the parents' efforts to provide balanced and nutritious meals amidst financial constraints. Since children with ASD could have difficulty communicating their hunger or fullness, lack of resources to access speech therapy could further aggravate the problematic feeding behaviors. Last but not least, the burden of raising a child with ASD could be compounded by financial difficulties. Girli (2014), found that parents are afraid of going out to dinner in a public place such as a restaurant because they are ashamed of their children's strange behavior while eating. This finding is in parallel with the literature that those family members will need expert support in this regard.

While the present study provided an updated insight into the eating behaviors of Turkish children with autism, the lack of in-depth nutritional assessment limited the evaluation of dietary intake. An additional possible weakness of the present study was inherent to the using a cross-sectional sample from Istanbul only; therefore, future multi-center, longitudinal studies could be carried out to assess the long-term effect of eating behaviors on the nutritional status of children from multiple regions of Türkiye. Last but not least, in Türkiye, person-first language is used in scientific and official documents when referring to autism despite the growing demand of the local community to be addressed with identity-first language[35]. Since there is no ultimate consensus on the preferred language of autistic people[36]. We hope to extend the perspective by using multiple terminologies to describe autism in Turkish people.

The findings in this study paralleled the literature, showing that negative behaviors occur during meals in autistic children, which negatively affects the nutrition of children with ASD. In this context, while evaluating the nutrition status of the children, dietitians and nurses should not only rely on using anthropometric measures and dietary intake but also inquire about eating behavior.

Nurses have a very important role in the early diagnosis and management of ASD. In this context, nurses should have the adequate knowledge and skills to detect ASD. They should be able to make early interventions for supporting the growth and development of the individuals with ASD as well as supporting their families. In order for nurses to take a more active role in the care of autistic individuals, in-service training for primary health care nurses as well as supplementing undergraduate and graduate health sciences programs with elective courses related to developmental disorders could be suggested. Health professionals should develop various strategies to manage the treatment process of ASD in an interdisciplinary manner.

It was determined that autistic children had significant problems in eating behaviors compared to non-autistic children. For this reason, it is important to support and educate family members with autistic children in this regard and to monitor the development of the children. Based on these results, it can be said that families should be informed about the nutritional status of children and be trained on the regulation of their children's nutritional behaviors by focusing on the development of positive attitudes. Recruiting more dietitians and nurses to enhance capacity building in primary healthcare settings would contribute to fostering a family approach to nutrition by including all the members of the family to improve their skills in behavior management.

CONCLUSION

In this case-control study, eating and mealtime behaviours of autistic and non-autistic children were compared with multivariate analysis of covariance by controlling for age, sex, income, and child's obesity status. "Child's Positive Eating Behavior" and "Adverse conditions in terms of child at the mealtime" (such as vomiting and choking) factors differed significantly depending on the autism status, although negative eating behaviors during and after mealtime were present in both groups. No statistically significant differences were found between the autism and comparison group on weight status category along with age and sex of the children. Our results highlight the need for evaluating the nutrition status of children at every age by not only using anthropometric measures and dietary intake, but also assessing eating behaviors. Families could be guided in regulating their children's nutritional behaviors by focusing on the development of positive attitudes.

Ethics Committee Approval: Approval was obtained from the Non-Interventional Research Ethics Committee of Medipol University (Decision number: 384 / 27.06.2018).
Conflict of Interest: None.
Funding: None.
Exhibitor Consent: Informed consent was obtained from the participants for this study.
Author contributions
Study design: SK, BK, HK
Data collection: SK, AY
Literature search: SK, ZBKA
Drafting manuscript: ZBKA, SK
Data analysis: ZBKA
Acknowledgment: The preliminary results of this study were presented as an oral presentation at the Conference on Disability Research on November 15-16, 2018, in Istanbul, Türkiye.
*The preliminary results of this study were presented as an oral presentation at the Conference on Disability Research on November 15-16, 2018, in Istanbul, Türkiye
Etik Kurul Onayı (Kurul adı, tarih ve sayı no): Medipol Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu'ndan alınmıştır (Karar No: 384, Karar Tarihi: 27.06.2018).
Çıkar Çatışması: Bildirilmemiştir.
Finansal Destek: Yoktur.
(Finansal destek alındıysa belirtiniz.)
Katılımcı Onamı: Bu çalışma için katılımcılardan aydınlatılmış onam alınmıştır.
Yazar katkıları
Araştırma dizaynı: SK, BK, HK
Veri toplama: SK, AY
Literatür araştırması: SK, ZBKA
Makale yazımı: ZBKA, SK
Veri analizi: ZBKA
Teşekkür: Bu çalışmanın gerçekleştirilmesinde katkıda bulunan tüm katılımcılara içtenlikle teşekkür ederiz.
*Bu çalışmanın preliminer sonuçları 15 -16 Kasım 2018 tarihlerinde İstanbul, Türkiye'de gerçekleştirilen Engellilik Araştırmaları Konferansı'nda sözel bildiri olarak sunulmuştur.

REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5. (Vol. 5, No. 5). Washington, DC: American Psychiatric Association; 2013.
2. Demir AC, Özcan Ö. The nutritional behavior of children with autism spectrum disorder, parental feeding styles, and anthropometric measurements. Nord J Psychiatry. 2021;76(1):64-70. doi:10.1080/08039488.2021.1934109.
3. Türkoğlu S, Bilgiç A, Uslu R. Otistik spektrum bozukluğu olan ayrı yumurta üçüzleri: Olgu sunumu ve gözden geçirme. Nöropsikiyatri Arşivi. 2012;49,167-171.
4. Otizm Platformu, Otizm [Internet]. 2022 [Erişim Tarihi 11 Mart 2023]. Erişim Adresi: http://www.odfed.org/otizm
5. WHO, Autism spectrum disorders [Internet]. 2020 [Erişim Tarihi 11 Mart 2023]. Erişim Adresi: https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders.
6. Defining Child BMI Categories [Internet]. 2023 [Erişim Tarihi 11 Mart 2023]. Erişim Adresi: https://www.cdc.gov/obesity/basics/childhood-defining.html
7. Bicer AH, Alsaffar AA. Body mass index, dietary intake and feeding problems of Turkish children with autism spectrum disorder (ASD). Research in developmental disabilities. 2013;34(11):3978-87.
8. Baxter AJ, Brugha TS, Erskine HE, Scheurer RW, Vos T, Scott JG. The epidemiology and global burden of autism spectrum disorders. Psychol Med. 2015;45(3):601-13.
9. Facts about Autism [Internet]. 2021 [Erişim Tarihi 21 Aralık 2021]. Erişim Adresi https://nationalautismcenter.org/autism/
10. Kahane L, El-Tahir M. Attachment behavior in children with autistic spectrum disorders. Advances in Mental Health and Intellectual Disabilities. 2015;9(2):79–89.
11. Özbaran B, Gökçen Köse S ve Erermiş S. Yaygın Gelişimsel Bozukluklarda Sosyal Biliş. Klinik Psikofarmakoloji Bülteni. 2014;19:323-32.
12. Van der Wurff I, Oenema A, de Ruijter D, Vingerhoets C, van Amelsvoort T, Rutten B et al. Scoping Literature Review of the Relation between Nutrition and ASD Symptoms in Children. Nutrients. 2022;26;14(7)
13. Pehlivantürk B, Bakkaloğlu B, Ünal F. Otistik Bozukluk Etyolojisi: Genetik Etkenler. TJCAMH. 2003;10:88-96.
14. Sharp WG, Berry RC, McCracken C, Nuhu NN, Marvel E, Saulnier CA et al. Feeding problems and nutrient intake

in children with autism spectrum disorders: Meta-analysis and comprehensive review of the literature. JADD. 2013;43(9):2159-73.

15. Marshall J, Hill RJ, Ziviani J, Dodrill P. Features of feeding difficulty in children with Autism Spectrum Disorder. International journal of speech-language pathology. 2014;16(2):151-8.
16. Nogay NH, Nahikian-Nelms M. Effects of nutritional interventions in children and adolescents with autism spectrum disorder: an overview based on literature review. International Journal of Developmental Disabilities. 2022;31:1-4.
17. Mari-Bauset S, Zazpe I, Mari-Sanchis A, Llopis-Gonzalez A, Suárez-Varela MM. Anthropometric measurements and nutritional assessment in autism spectrum disorders: A systematic review. Research in Autism Spectrum Disorders. 2015;9:130-43.
18. Bilim N. Türkiye Nüfus ve Sağlık Araştırması Temel Bulgular. 2019. http://www.hips.hacettepe.edu.tr/tnsa2018/rapor/2018_TNSA_Ozet_Rapor.pdf
19. Bandini LG, Anderson SE, Curtin C, Cermak S, Evans EW, Scampini R et al. Food selectivity in children with autism spectrum disorders and typically developing children. J. Pediatr. 2010;157(2):259-64.
20. De Crescenzo F, D'Alo GL, Morgano, GP, Minozzi S, Mitrova Z, Saulle R et al. Impact of polyunsaturated fatty acids on patient-important outcomes in children and adolescents with autism spectrum disorder: A systematic review. Health Qual. Life Outcomes. 2020;18:1-12.
21. González-Domenech PJ, Díaz Atienza F, García Pablos C, Fernández Soto ML, Martínez-Ortega JM, Gutiérrez-Rojas L. Influence of a Combined Gluten-Free and Casein-Free Diet on Behavior Disorders in Children and Adolescents Diagnosed with Autism Spectrum Disorder: A 12-Month Follow-Up Clinical Trial. J. Autism Dev. Disord. 2020;50:935-48.
22. Piwowarczyk A, Horvath A, Pisula E, Kawa R, Szajewska H. Gluten-Free Diet in Children with Autism Spectrum Disorders: A Randomized, Controlled Single-Blinded Trial. JADD. 2020;50:482-90.
23. Hannant P, Cassidy S,Renshaw D, Joyce A. A double-blind, placebo-controlled, randomised-designed GABA tea study in children diagnosed with autism spectrum conditions: A feasibility study clinical trial registration: ISRCTN 72571312. Nutr. Neurosci. 2019;24:45-61.
24. T.C. Sağlık Banlığı Şişmanlık Araştırması Cosi-Tur [Internet]. 2016. [Erişim Tarihi 11 Mart 2023]. Erişim Adresi: https://tekirdagism.saglik.gov.tr/TR-44030/cocukluk-cagi-sismanlik-arastirmasi-turkiye-2016-cosi-tur-2016.html
25. Figueroa R, Kalyoncu ZB, Saltzman JA, Davison KK. Autonomous motivation, sugar-sweetened beverage consumption and healthy beverage intake in US families: differences between mother–adolescent and father–adolescent dyads. Public health nutrition. 2019;22(6):1010-8.
26. Archer LA, Rosenbaum PL, Streiner DL. The children's eating behavior inventory: reliability and validity results. Journal of Pediatric Psychology. 1991;16(5):629-42.
27. Ünlü H. Okul öncesi dönem çocuklar için yeme davranışı değerlendirme ölçeğinin Türk çocuklarına uyarlanması [Doktora tezi]. İsanbul: Marmara Universitesi; 2011
28. Data & Statistics on Autism Spectrum Disorder [Internet]. 2023 [Erişim Tarihi 11 Mart 2023]. Erişim Adresi: https://www.cdc.gov/ncbddd/autism/data.html
29. Malhi P, Venkatesh L, Bharti B, Singhi P. Feeding problems and nutrient intake in children with and without autism: A comparative study. The Indian Journal of Pediatrics. 2017;84(4):283-8.
30. Mazurek MO, Vasa RA, Kalb LG, Kanne SM, Rosenberg D, Keefer A et al. Anxiety, sensory over-responsivity, and gastrointestinal problems in children with autism spectrum disorders. Journal of Abnormal Child Psychology. 2013;41(1):165-76.
31. Schröder SS, Danner UN, Spek AA, van Elburg AA. Problematic eating behaviours of autistic women—A scoping review. European Eating Disorders Review. 2022;30(5):510-37.
32. Demirel F,Üner A, Kırımi E. Van İli Kırsalındaki Annelerin Çocuk Beslenmesindeki Alışkanlıkları ve Uygulamaları. Van Tıp Dergisi. 2001;8(1):18-22.
33. Taşyürek E. Otizm Spektrum Bozukluğu Tanısı Konulan Çocuklarda Uyku ve Beslenme Sorunları [Uzmanlık tezi]. Ankara: Hacettepe Üniversitesi; 2017.
34. Girli A. An Examınatıon Of The Relatıonshıps Between The Socıal Skill Levels, Self Concepts And Aggressive Behavıor Of Students With Special Needs In The Process Of Inclusion Education. Cukurova University Faculty of Education Journal. 2014;42(1):23-38.
35. Aydın Y. Otizmli mi Otistik mi [Internet]. 2021 [Erişim Tarihi 21 Aralık 2021]. Erişim Adresi: https://gelecekbilimde.net/otizmli-mi-otistik-mi/
36. Vivanti G. Ask the editor: What is the most appropriate way to talk about individuals with a diagnosis of autism?. J. Pediatr. 2020;50:691-3.