Food preferences and eating behavior among children with autism spectrum disorder: A causal-comparative study in Lahore

AVICENNA
Healthcare development and innovation in the Arabian Gulf

OPEN ACCESS

Research article

Food preferences and eating behavior among children with autism spectrum disorder: A causal-comparative study in Lahore

Minahil Amin[1*], Syeda Iqra Faiyaz[1], Muhammad Salman Butt[2], Ahsan Javed[1], Javeria Saleem[2], Ayesha Saeed[1]

[1] Department of Nutrition, University of South Asia, Lahore, Pakistan
[2] Department of Public Health, University of the Punjab, Lahore, Pakistan

* Email: minahilamin349@gmail.com

ABSTRACT

This study aims to compare the eating behaviors, food preferences, and body mass index of children with and without Autism residing in Lahore, Pakistan. The study participants were aged 5-12 years, and were divided into two groups: 60 children with Autism spectrum disorder (ASD), and 120 typically developing (TD) school children. The sample was drawn from three Autism schools and three private schools through the purposive sampling technique. Data regarding the participants' basic personal history, food preferences, and eating behavior were obtained from their parents using a self-administered structured questionnaire. BMI for age percentiles of the children was obtained from standard charts, based on their height and weight measurements. Among participants with Autism, 46.7% were obese, compared to 23.3% of the participants without Autism. Children with Autism exhibited a significantly greater degree of limited variety (U= 2797.000, p= 0.009) and food refusal (U= 1586.000, p= 0.000) as compared to children without Autism. Greater preference for food in the vegetable group was related to a higher BMI for the age percentile, for children with Autism (r = 0.327, p = 0.011). A p-value ‹ 0.05 was considered to be statistically significant. Children with Autism exhibited selective eating and food refusal to a greater degree than children without Autism.

Keywords: autism, food refusal, food selectivity, feeding behavior, mealtime issues, physical status

1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurological and developmental disorder that manifests itself in early childhood and lasts lifelong [1]. There has been a marked increase in the worldwide prevalence of ASD, which researchers have suggested to be partially caused by altered diagnostic practices [2]. Despite the lack of population-based statistics of ASD from Lahore and other Pakistani cities, the prevalence pattern of ASD in Pakistan and neighboring South-Asian countries is expected to be similar to the rest of the world, with boys being four times more likely than girls to suffer from Autism. ASD is a health condition generally neglected in many developing countries [3], including Pakistan. The level

http://doi.org/10.5339/avi.2022.9

Submitted: 23 August 2022
Accepted: 29 September 2022

كيوساينس
QSCIENCE
دار جامعة حمد بن خليفة للنشر
HAMAD BIN KHALIFA UNIVERSITY PRESS

Cite this article as: Amin M, Faiyaz S, Butt M, Javed A, Saleem J, Saeed A. Food preferences and eating behavior among children with autism spectrum disorder: A causal-comparative study in Lahore. Avicenna 2022(2):9. http://doi.org/10.5339/avi.2022.9

of awareness and provision of specialized care regarding ASD is particularly low in the suburban areas of Pakistan, however, several private schools and professional practices have emerged in Lahore and other major Pakistani cities in recent years where efforts are being made to address the needs of people with ASD and related conditions.

The most worrying aspect of ASD is that it can contribute to a range of physical, mental, and social problems, resulting in a very low quality of life for these children [4]. Previous research found that participants with ASD had a high prevalence or risk of being overweight or obese, which increased with the age of the children [5]. Researchers have indicated that 7 out of 10 children with ASD are affected by feeding and eating problems, and these challenges often stem from autism-related hypersensitivities or a strong urge for consistency [6]. A study comparing the mealtime behaviors of children with and without ASD found that children with ASD exhibit a greater number of eating behavior problems [7]. Children with ASD are often particularly attracted to food with a specific taste, texture, color, food that is served or prepared in a specific way, or particularised with a favorite condiment [8]. Over-sensitivity to specific sounds, smells, or touch is also common among children with ASD [9].

In the majority of research conducted on children with ASD, little attention has been given to the study of their body growth and nutritional conditions. The results of the present study serve to contribute to the knowledge and awareness of food preferences and eating behaviors among children with ASD. This could further help to shape the strategies and practices adopted by nutritionists, parents, and professionals in the care of children with ASD.

This study aims to compare the eating behaviors, food preferences, and BMI of children with ASD and typically developing school children. The study also aimed to analyze any possible relationships between BMI, food preference, and eating behaviors of children with and without ASD.

2. METHODOLOGY

The causal-comparative study design was used, and the participants were divided into two groups, children with ASD, and TD school children. The grouping of the participants was done based on the absence or presence of ASD, which is the perceived cause of problematic eating behaviors and limited food preferences. 180 participants (60 children with ASD and 120 TD children) were included, using the purposive sampling technique. Children aged 5-12 years and enrolled, for the last year before data collection, in an Autism school (for children with ASD) or private school (for children without ASD) were included in the study. Children enrolled in Autism schools had previously been diagnosing children for ASD at the time of admission in the school, using standard diagnostic tools (Childhood Autism Rating Scale and Gilliam Autism Rating Scale). Children not living with their parents, children who had surgery, or were suffering from a disease or food allergy that could have a particularly restrictive effect on their diet, were excluded from the study [10].

Written consent was obtained from the school administration. For the children who met all the inclusion criteria, data was collected using a self-administered structured questionnaire. The right to informed consent, confidentiality, anonymity, and withdrawal was clearly stated. The personal history form contained questions regarding the demographic and clinical characteristics of the children. Data regarding the food preferences of the participants were collected using the Food Preference Questionnaire (FPQ), which requires parents to rate their child's preference for 75 commonly consumed individual food items, divided into six major food groups. Responses to the items are represented by a Likert scale [11]. The parent-reported 18-item Brief Autism Mealtime Behavior Inventory (BAMBI) was used in the study for evaluating the eating behavior problems exhibited by the participants [12]. The height of the children (rounded off to the nearest cm) was obtained using a wall-mounted height chart, and weight (rounded off to the nearest kg) was measured using a Seca 803 digital weighing scale. BMI-for-age percentiles for the children were obtained using CDC (2000) standard growth charts. Data collection for the case and comparison groups was carried out simultaneously over a period of 11 weeks.

IBM SPSS Statistic 23 was the software used for data analysis. Descriptive statistics included frequency for categorical variables, the mean, and standard deviation for continuous variables. Mann-Whitney U test was used for comparing the food group preferences, components of eating behavior, and BMI for age percentiles of children with and without ASD. Spearman Rho and Pearson correlations were used to analyze data for possible correlations between BMI, components of eating behavior, and the number of food items consumed.

3. RESULTS

Children between the age of 5-12 years were included in the study. The mean age of children with ASD was 8.77 years, and the mean age of TD children was 9.42 years. Among participants with ASD, 26.7% were girls, and 73.3% were boys, whereas 53.3% of the TD participants were girls, and 46.7% were boys. According to BMI-for-age percentiles, 1.7% of the participants with ASD were underweight, 11.7% were overweight and 46.7% were obese. In comparison to this, 20% of the TD participants were underweight, 11.7% were overweight, and only 23.3% were obese. The data regarding the basic personal characteristics of the participants are presented in **Table 1**.

Table 1. Basic characteristics of the study participants.

Characteristics of the child	**Children with ASD (n=60)**	**TD children (n=120)**
	Mean (SD)	**Mean (SD)**
Age of child	8.773 (2.581)	9.418 (2.338)
Age of introduction of infant food to the child	7.750 (3.239)	6.375 (2.238)
Age of introduction of table food to the child	16.500 (7.643)	14.450 (5.627)
Number of food items consumed by the child (total = 75)	44 (17.42)	51 (8.68)
Gender	**F (%)**	**F (%)**
Female	16 (26.7%)	64 (53.3%)
Male	44 (73.3%)	56 (46.7%)
BMI for age percentile		
Underweight	1 (1.7%)	24 (20%)
Normal	24 (40%)	54 (45%)
Overweight	7 (11.7%)	14 (11.7%)
Obese	28 (46.7)	28 (23.3%)
Method by which milk was fed to the child when s/he was a baby		
Bottle/ formula milk	9 (15%)	18 (15%)
Mother's milk	5 (8.3%)	8 (6.7%)
Both	46 (76.7%)	94 (78.3%)

Mann-Whitney U test was used to compare the participants with and without ASD based on BMI for age percentiles, eating behaviors, and food preferences. A p-value ‹0.05 was considered to be statistically significant. The results of the Mann-Whitney U test revealed a statistically significant difference between children with and without ASD based on BMI for age percentiles (U= 2401.000, p= 0.000). The analysis of the BAMBI showed that limited variety was exhibited often and at almost every meal by 31.7% of the participants with ASD, and by 19.2% of the TD participants. Food refusal was exhibited often or at almost every meal by 30% of the participants with ASD, and by only 6.7% of the TD participants. Mealtime behaviors pertaining to the characteristic factor of ASD were shown often or at almost every meal by 5% of the children with ASD, and by none of the TD participants. In accordance with the results of the Mann-Whitney U test, a statistically significant difference was seen among participants with and without ASD based on limited variety (U= 2797.000, p= 0.009), food refusal (U= 1586.000, p= 0.000) and characteristic factor of ASD (U= 1551.000, p= 0.000). Data regarding the BMI-for-age percentiles and components of the eating behavior of the participants are shown in **Table 2**.

Table 2. Comparison of children with and without ASD based on BMI for age percentiles and eating behavior.

	Children with ASD (n=60)	TD Children (n=120)	Mann Whitney U (p-value)
BMI for age percentile			
Underweight	1 (1.7%)	24 (20%)	2401.000 (0.000)
Normal	24 (40%)	54 (45%)	
Overweight	7 (11.7%)	14 (11.7%)	
Obese	28 (46.7)	28 (23.3%)	
Limited variety factor of eating behavior			
N/R	-	7 (5.8%)	2797.000 (0.009)
SE	10 (16.7%)	33 (27.5%)	
OCC	31 (51.7%)	57 (47.5%)	
OFT	18 (30%)	20 (16.7%)	
AAEM	1 (1.7%)	3 (2.5%)	
Food refusal factor of eating behavior			
N/R	13 (21.7%)	89 (74.2%)	1586.000 (0.000)
SE	14 (23.3%)	12 (10%)	
OCC	15 (25%)	11 (9.2%)	
OFT	13 (21.7%)	8 (6.7%)	
AAEM	5 (8.3%)	-	
Characteristic factors of ASD of eating behavior			
N/R	8 (13.3%)	69 (57.5%)	1551.000 (0.000)
SE	16 (26.7%)	31 (25.8%)	
OCC	20 (33.3%)	14 (11.7%)	
OFT	13 (21.7%)	6 (5%)	
AAEM	3 (5%)	-	

Key: N/R= Never/ Rarely, SE= Seldom, OCC= Occasionally, OFT= Often, AAEM= At Almost Every Meal

Analysis of the data collected using the Food Preference Questionnaire (FPQ) showed that snacks were the most preferred, and vegetables were the least preferred food group both for children with and without ASD. Food items in the snacks group were disliked by one of the TD children, whereas only 6.7% of the children with ASD expressed a dislike for snack food. 41.6% of the participants with ASD and 21.7% of the TD participants disliked vegetables. The results of the Mann-Whitney U test demonstrated a statistically significant difference among participants with and without ASD based on preference for starches (U= 2421.000, p= 0.000), dairy (U= 2319.500, p= 0.000), snacks (U= 1440.000, p= 0.000), fruits (U= 1520.500, p= 0.000), and vegetables (U= 2685.000, p= 0.004). Children with and without ASD were not significantly different based on protein preference (U= 3076.000, p= 0.085). Data regarding the food preferences of the participants are shown in **Table 3**.

Table 3. Comparison of children with and without ASD on the basis of food preferences.

	Children with ASD (n=60)	TD Children (n=120)	Mann Whitney U (p-value)
Protein (meat) preference			
DAL	2 (3.3%)	2 (1.7%)	3076.000 (0.085)
DIS	10 (16.7%)	12 (10.0%)	
NLND	16 (26.7%)	29 (24.2%)	
LIK	28 (46.7%)	63 (52.5%)	
LAL	4 (6.7%)	14 (11.7%)	
Starches preference			
DAL	1 (1.7 %)	-	2421.000 (0.000)
DIS	8 (13.3 %)	6 (5%)	
NLND	19 (31.7 %)	18 (15%)	
LIK	27 (45%)	69 (57.5%)	
LAL	5 (8.3%)	27 (22.5%)	
Dairy preference			
DAL	3 (5%)	2 (1.7%)	2319.500 (0.000)
DIS	16 (26.7%)	11 (9.2%)	
NLND	21 (35%)	27 (22.5%)	
LIK	15 (25%)	64 (53.3%)	
LAL	5 (8.3%)	16 (13.3%)	
Snacks preference			
DAL	-	-	1440.000 (0.000)
DIS	4 (6.7%)	-	
NLND	16 (26.7%)	5 (4.2%)	
LIK	32 (53.3%)	37 (30.8%)	
LAL	8 (13.3%)	78 (65%)	
Fruits preference			
DAL	3 (5%)	-	1520.500 (0.000)
DIS	9 (15%)	3 (2.5%)	
NLND	13 (21.7%)	10 (8.3%)	
LIK	32 (53.3%)	45 (37.5%)	
LAL	3 (5%)	62 (51.7%)	
Vegetables preference			
DAL	5 (8.3%)	-	2685.000 (0.004)
DIS	20 (33.3%)	26 (21.7%)	
NLND	16 (26.7%)	32 (26.7%)	
LIK	15 (25%)	64 (53.3%)	
LAL	5 (8.3%)	16 (13.3%)	

Key: DAL= Dislikes a lot, DIS= Dislikes, NLND= Neither likes nor dislikes, LIK= Likes, LAL= Likes a lot

Spearman Rho and Pearson correlations were used to examine if there is a possible correlation between BMI-for-age percentiles, food preferences, and age. Higher BMI for age percentile was found to be associated with greater preference for food items in the vegetable group, for children with ASD ($r = 0.327$, $N = 60$, $p = 0.011$). Data related to possible correlations between BMI, the number of food items consumed and age is shown in **Table 4**.

Table 4. Correlations between components of eating behavior, food preferences and BMI.

	Children with ASD	TD Children
Limited variety factor and BMI for age percentile	0.137 (0.298)	0.112 (0.223)
Food refusal factor and BMI for age percentile	-0.001 (0.996)	0.054 (0.557)
Characteristic factors of ASD and BMI for age percentile	0.165 (0.208)	-0.024 (0.794)
Snacks preference and BMI for age percentile	0.104 (0.430)	0.015 (0.873)
Vegetable preference and BMI for age percentile	0.327 (0.011)	0.153 (0.094)
Age and number of food items consumed	0.244 (0.060)	0.000 (0.999)
Age at which infant food items were introduced and number of food items consumed	-0.143 (0.274)	-0.256 (0.005)
Age at which table food items were introduced and number of food items consumed	-0.236 (0.069)	0.045 (0.623)
Age of child and number of food items consumed	0.244 (0.060)	0.000 (0.999)

4. DISCUSSION

In a study conducted in 2015 on 23 children with ASD recruited from Sharjah Autism Center, 12 of the participants were obese and 5 were found to be overweight [13]. A similar possible link between Autism and obesity was also suggested by the results of the present study, according to which 11.7% of the participants with ASD (n=60) were overweight and 46.7% of them were categorized as obese in accordance with their BMI for age percentile.

A study was conducted in 2010 to investigate the mealtime behaviors of 24 children with Autism and 24 TD children. The results indicated that 62% of the children with ASD were picky eaters compared to only 12% of the TD children. The limited variety was exhibited by 38% of the children with ASD, and by only 8% of the TD children [14]. An analogous finding was also observed in the present study, in which analysis of the BAMBI showed that 31.7% of the participants with ASD, and 19.2% of the TD participants exhibited limited variety. 30% of the participants with ASD, and only 6.7% of the TD participants were found to be picky eaters.

In the present study, vegetables were the least preferred food group, as 41.6% of the participants with ASD and 21.7% of the TD participants disliked vegetables. According to the results of a study conducted in 2013 on 30 children with ASD in which different types of food were offered to the children during a mealtime observation, vegetables were rejected 61% of the time. These are most likely to be rejected by the children with ASD [15].

The findings of the present study indicated that from the 75 food items mentioned in the FPQ, participants with ASD consumed 44 food items, thus exhibiting greater food selectivity than TD participants who consumed 51 food items on average. In a study conducted in 2011, participants with ASD ate 33.5 food items on average, and TD children consumed 54.5 of the total 174 food items mentioned in the data collection tool [16].

Higher BMI for age percentile was found to be associated with a greater preference for food items in the vegetable group, for children with ASD ($r = 0.327$, $N = 60$, $p = 0.011$). A similar finding was also reported in a study conducted by Evans and Anderson in 2012, in which multivariable linear regression was used for the analysis of dietary patterns. Vegetable consumption was found to have a positive association (b-coefficient=0.14, p=0.05) with BMI among children with ASD [17].

The suitability of the FPQ to the study was limited because some of the food items most commonly consumed by children in Pakistan were not mentioned in the FPQ. The small sample size might have affected the study results and their generalizability. Future research regarding this subject should be

conducted on a larger scale with bigger sample size, or by dividing the participants based on their degree of severity of ASD.

5. CONCLUSION

The study highlighted the greater likelihood of children with ASD being overweight or obese in comparison to TD school children. Concerns related to problematic eating behaviors were reported more frequently by the parents of children with Autism. The total number of food items consumed by the case group was lesser than that consumed by the comparison group, which indicated that the case group exhibited pronounced selective eating. Food preferences of the case and comparison group were found to be significantly different from each other, on the basis of which the null hypothesis: 'The food preferences and eating behaviors of children with Autism are not different from the food preferences and eating behaviors of typically developing school children', was rejected.

Nomenclature

Abbreviation	Description
ASD	Autism Spectrum Disorder
BAMBI	Brief Autism Mealtime Behavior Inventory
BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CARS	Childhood Autism Rating Scale
FPQ	Food Preference Questionnaire
GARS	Gilliam Autism Rating Scale
IBM SPSS	International Business Machines Statistical Package for Social Sciences
TD	Typically Developing

REFERENCES

1. Chauhan A, Singh M, Jaiswal N, Agarwal A, Sahu JK, Singh M. Prevalence of cerebral palsy in Indian children: a systematic review and meta-analysis. Indian J Pediatr. 2019 Dec;86(12):1124-30.
2. Hansen SN, Schendel DE, Parner ET. Explaining the increase in the prevalence of autism spectrum disorders: the proportion attributable to changes in reporting practices. JAMA Pediatr. 2015 Jan 1;169(1):56-62.
3. Nadeem G, Bibi A, Suhaib B, Ahmed S, Ali S. Clinical and demographic features of 76 children with autism spectrum disorders at a centre in Pakistan. J Coll Physicians Surg Pakistan. 2019 Apr 1;29(4):390-1.
4. De Vries M, Geurts H. Influence of Autism Traits and Executive Functioning on Quality of Life in Children with an Autism Spectrum Disorder. J Autism Dev Disord [Internet]. 2015 [cited 2022 Aug 19];45(9):2734–43. Available from: http://dx.doi.org/10.1007/s10803-015-2438-1
5. Xiong N, Ji C, Li Y, He Z, Bo H, Zhao Y. The physical status of children with autism in China. Res Dev Disabil. 2009 Jan 1;30(1):70-6.
6. Nadon G, Feldman D, Gisel E. Feeding Issues Associated with the Autism Spectrum Disorders. In: Fitzgerald, M, editor. Recent Advances in Autism Spectrum Disorders - Volume I [Internet]. London: IntechOpen; 2013 [cited 2022 Aug 19]. Available from: https://www.intechopen.com/chapters/43414 doi: 10.5772/53644
7. Zobel-Lachiusa J. Sensory Differences and Mealtime Behavior in Children With Autism. Am J Occup Ther. 2015 Sep;69(5):1-8.
8. Obray, H, Durward C. Overcoming Feeding Difficulties in Picky or Selective Eating in ASD Strategies to Expand a Selective Eater's Diet. 2019 Aug:1–4.
9. Autism: What is autism? Natl Autistic Soc [Internet]. 2016 [2022 Aug 20]; Available from: https://www.autism.org.uk/about/what-is/asd.aspx
10. Mari-Bauset S, Llopis-Gonzalez A, Zazpe-Garcia I, Mari-Sanchis A, Morales-Suarez-Varela M. Nutritional status of children with autism spectrum disorders (ASDs): a case–control study. J Autism Dev Disord. 2015 Jan;45(1):203-12.
11. Fildes A, van Jaarsveld CH, Llewellyn CH, Fisher A, Cooke L, Wardle J. Nature and nurture in children's food preferences. Am J Clin Nutr. 2014 Apr 1;99(4):911-7.
12. Lukens CT, Linscheid TR. Development and validation of an inventory to assess mealtime behavior problems in children with autism. J Autism Dev Disord. 2008 Feb;38(2):342-52.
13. Attlee A, Kassem H, Hashim M, Obaid RS. Physical status and feeding behavior of children with autism. Indian J Pediatr. 2015 Aug;82(8):682-7.
14. Provost B, Crowe TK, Osbourn PL, McClain C, Skipper BJ. Mealtime behaviors of preschool children: Comparison of children with autism spectrum disorder and children with typical development. Phys Occup Ther Pediatr. 2010 Jul 1;30(3):220-33.
15. Sharp WG, Jaquess DL, Lukens CT. Multi-method assessment of feeding problems among children with autism spectrum disorders. Res Autism Spectr Disord [Internet]. 2013 [cited 2022 Aug 20];7(1):56–65. Available from: http://dx.doi.org/10.1016/j.rasd.2012.07.001
16. Zimmer MH, Hart LC, Manning-Courtney P, Murray DS, Bing NM, Summer S. Food variety as a predictor of nutritional status among children with autism. J Autism Dev Disord. 2012;42(4):549–56.
17. Evans E, Must A, Anderson S. Dietary patterns and body mass index in children with autism and typically developing children. Res Autism Spectr Disord. 2011;6(1):399–405.