Original Article

Feeding Problems of Preschool-Age Children With Autism Spectrum Disorder in Pathum Thani Province, Thailand

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Abstract

Introduction: Feeding problems are commonly observed in children with autism spectrum disorder (ASD). Among feeding problems, food selectivity is the most common issue. Improper feeding behaviors could lead to health issues and difficulties in parenting. The objective of this research is to compare eating problems among preschool-age children with autism and children with typical development (TD).

Methods: This case-control study was conducted in 30 children with ASD and 30 age- and gender-matched children with TD. Parents of children from both groups answered demographic questionnaires, the Brief Autism Mealtime Behavior Inventory (BAMBI) and questionnaires about attitude and strategies toward their child's behavioral problems.

Results: The mean total score of the BAMBI in children with ASD (45 ± 8.4) was significantly higher than children with TD (40 ± 7.4). Of the three domains in the BAMBI, food refusal was the only significantly different domain between two groups. The behaviors which were commonly mentioned by parents of children with ASD as problematic were expelling food that had been eaten and refusing to eat certain foods that they dislike. Parents from both groups did not differ in their emotion and confidence during mealtimes.

Conclusions: Preschool-age children with ASD have more eating problems than normal developing children. Food refusal behavior was an area of significant difference between the two groups. Therefore, when caring for preschooler with ASD, eating problems also should be focused on.

Keywords: Autism, Feeding problems, Food refusal, BAMBI, Thailand

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Introduction

Autism Spectrum disorder (ASD) is a common neurodevelopmental disorder.[1] Children with ASD have specific characteristics including the inability to develop age-appropriate social-communication skills, unusual repetitive patterns of behavior, and also hypo- or hypersensitivity of the sensory system.[2] Children with autism have difficulty in communication and also have certain characteristics, such as inflexibility and abnormal sensory perception, which can lead feeding problems.

Feeding problems in children is a common issue worldwide; 20 - 30% of children were reported to have feeding problems.[3] In Thailand, a study of preschool children found that 42% of parents reported that their children had feeding problems.[4] Another study found that 26.9% of children aged 1 - 4 years had feeding difficulties.[5] Feeding problems have been reported as having higher prevalence in children with neurodevelopmental disorders, ranging from 70 - 90%[6] Specifically in children with ASD, the prevalence ranged from 50 - 96%.[7, 8]

The most common feeding problem in children with ASD was food selectivity.[8] The definitions of food selectivity in research varied, covering picky eater, strong food preference, having a narrow range of foods as a core diet, refusing to try new foods, strong restriction to eat only certain food textures such as crispy or soft, refusing food with a certain texture, only eating when food is presented in a particular manner, such as on a specific plate, with a particular packaging color or a distinct color of the food.[7, 9, 10] Feeding problems were also defined as difficulties during mealtimes including, resisting sitting at a table, aggressive or disruptive behavior during mealtimes, eating only in a specific place, eating difficulty at school or regular restaurants.[8, 9]

The causes of eating abnormalities in ASD children are believed to be multifactorial. The core symptoms of ASD such as repetitiveness and rituals, fear of novelty and inflexibility, sensory perception abnormality could lead to food selectivity and feeding difficulties in unfamiliar situations.[8, 11-14]

Feeding difficulties may influence health status. Several studies interested in the nutrient intake of ASD children have found that although this group of children received energy and most of their nutrients as recommended, they had some nutrients in suboptimal levels, such as iron, calcium, vitamins, and fiber.[15, 16] Feeding problems also represent a source of concern and stress for most parents of children with ASD because feeding is a critical activity of daily living; up to 70% of parents admitted concern about their child's feeding.[17] Feeding problems can affect family functions in many ways; specific/selective eating behaviors make food preparation for the family complicated, a child's tantrum behaviors cause stress during family mealtime, difficulty eating in unfamiliar locations may result in problems with family socializing.

Feeding styles vary from culture to culture, such as the manner of mealtime arrangement, the flavor profile of food, and also acceptable behavior during mealtime. For example, it's common for Thai parents and other caregivers to let their children have meals away from the table, and it is not uncommon to find parents following young children around and feeding them.[4, 5, 18] Living with extended family in Thailand also influenced feeding behavior; many children were taken care of by grandparents who were less likely to feel negative about the child misbehaving during mealtimes.[18]

As previously mentioned, it is possible that different cultures could contribute to different eating problems in children with ASD. Few studies from other Asian countries displayed variation in feeding problems in children with ASD as measured by the same questionnaire.[19-21] As far as we know, feeding problems have not been studied in preschool-age children with ASD in Thailand. Our research aims to compare eating problems among children with autism and children with typical development (TD) during preschool years and also the impact of feeding problems on their caregiver.

Methods

This case-control study was conducted at Thammasat University Hospital (TUH), Pathum Thani province, Thailand during 2019. The study was approved by the Human Research Ethics Committee of Thammasat University No.1 (Faculty of Medicine). Project No MTU-EC-PE-0-003-62, Number of COA 083/2019

Participants

Children with ASD

A sample of 30 children with ASD was recruited from the Developmental and Behavioral Unit of the Pediatric Department, and Child and Adolescent Psychiatric clinic, Thammasat University

Hospital. Inclusion criteria were (1) children who were diagnosed with ASD by developmental and behavioral pediatricians based on DSM V criteria and (2) aged 3 - 6 years old. Children who had medical problems including congenital heart disease, chronic lung disease, chronic kidney disease, endocrine disease, and genetic syndrome and also the children who were not accompanied by their main caregiver were excluded from the study.

Children with TD

A sample of 30 children with typical development was recruited from the Well Child Clinic and the children outpatient service of Thammasat University Hospital. Children with TD were matched with children with ASD by age (within 6 months) and gender. The exclusion criteria were children with medical concerns, as mentioned in the ASD group or children with any developmental concerns. The DENVER II test was used to screen for any developmental delays in this group.[22] Only children with normal screening were enrolled in the study.

Process

Parents of children with ASD who had eligible criteria were informed about the project. Parents who agreed to participate signed the consent and then answered the questionnaire by themselves at the clinic. Then the participants in the TD group, who were gender and age-matched with children with ASD were invited to participate in the project and were screened by Denver II to assess whether they have developmental delays. Only children who had normal screening would continue to join the project, and one of their parents who was a main caregiver would answer the questionnaires.

Measurements

The Brief Autism Mealtime Behavior Inventory (BAMBI)

The BAMBI was developed by Lukens & Linscheid, which aims to determine feeding problems in children with ASD.[23] The BAMBI is a parent self-report questionnaire consisting of 18 items. The scale yields a total score, as well as scores on three domains.[8] A higher score of BAMBI indicates problematic feeding and mealtime behavior. The score is obtained from a 5-point Likert scale, there are 4 items which require reverse calculation in the scale. The three domains of BAMBI are limited variety, food refusal, and features of autism. BAMBI has good validity; the internal consistency was reported as high (Cronbach's coefficient alpha = 0.88), test-retest reliability and inter-rater reliability were reported as high (r = 0.87 and 0.88 respectively).[23] The BAMBI was translated into Thai for use in this study with permission from the author. Content validity was evaluated by 5 experts, and the Thai-version BAMBI questionnaire was pilot tested with parents to determine the correct understanding of the questions.

The Denver II

The Denver II meant to be used to identify young children aged 0 - 6 years with developmental problems by trained examiners.[22] It contains 125 items to examine four developmental domains. The validation of Denver II revealed sensitivity of 0.67 - 0.83 and a negative predictive value of 0.90, which is proper to use as a screening test. The Denver II was translated into Thai and widely used in Thailand.

Demographic and parental perception toward feeding questionnaires

A demographic questionnaire was designed to collect information of the respondents including; age, gender, relationship to the child, educational level, and income. The data collected of children included; gender, age, numbers of siblings, educational level, weight, and height. For children with ASD, additional details; age at diagnosis, medication received, and the child's current language proficiency level were also gathered from the questionnaire.

Parental perception toward feeding problems was measured by a newly developed questionnaire consisting of 14 items which consists of two parts. The first part (9 items) asked about strategies that parents use to manage the feeding problems of their child and the second part (5 items) asked about feelings and attitude toward their child's feeding behavior. The questionnaire is a Likert-type. Scores of each item range from 1 (never) to 5 (almost every meal). The content of the questionnaire was face validated by five developmental and behavioral pediatricians and child psychiatrists for appropriateness.

Statistical analysis

A sample of 29 children from each group was calculated to detect the effect of ASD on eating problems with the power of 80% and the significant level of 0.05. The prevalence of eating problems in general population and in children with ASD were estimated at 42%[4, 5] and 75% (50 - 96%),[7, 8] respectively.

Descriptive analysis was used to describe the demographic data and prevalence of feeding problems in percent and mean ± SD. Mann-Whitney U test and the Fisher's exact test were used to compare the continuous and categorical factors between the two groups. The significance level established for this study was $P < 0.05$.

Results

Table 1 provides characteristics of the study participants in two groups and their caregiver who answered the questionnaire. The respondents were mostly mothers who graduated at least high school level. Most of the children who participated in the study were boys, which was in accordance with the prevalence of ASD. The mean age of children with ASD was 56 months. Participants from two groups did not differ in educational level, family income, number of siblings, number of adults in the family, or Z-score of weight. Children in ASD groups were diagnosed at the age of around 3 years and one third of them received medication which may affect their dietary and eating habits; one participant received methylphenidate, which has a side effect of anorexia, while eight children took risperidone, which could increase appetite. The level of language skills of children varied from not speaking to being able to speak consistently in sentences.

Table 1 Demographic data of main caregivers and children

Demographic data	ASD group (n = 30)	TD group (n =30)	*P*-value
Main caregiver, N (%)			
Female	28 (93.3)	26 (86.7)	.67
Relation with children, N (%)			
- Mothers	27 (90.0)	25 (83.3)	.48
- Father	2 (6.7)	4 (13.3)	
- Grandparent	1 (3.3)	1 (3.3)	
Age (year), mean ± SD	37.8 ± 6.8	34.1 ± 7.0	.41
Education, N (%)			
- < Primary school (6 years)	4 (13.3)	2 (6.7)	.78
- Secondary school (12 years)	7 (23.3)	10 (33.3)	
- Bachelor's degree and Postgraduate	19 (63.4)	18 (60.0)	
Children			
Boy, N (%)	28 (93.33)	28 (93.33)	1.00
Age (month), mean ± SD	56.13 ± 14.16	50.93 ± 15.64	.18
Educational level, N (%)			
- Preschool	9 (30.0)	7 (23.3)	.36
- Kindergarten	16 (53.3)	21 (70)	
- Primary school	5 (16.7)	2 (6.7)	
Average family income per month (Thai Baht), N (%)			
- < 10,000	3 (10.0)	3 (10.0)	.47
- 10,000 - 30,000	20 (66.7)	22 (73.3)	
- > 30,000	7 (23.3)	5 (16.7)	

Table 1 Demographic data of main caregivers and children (Cont.)

Demographic data	ASD group (n = 30)	TD group (n =30)	*P*-value
Number of siblings, mean ± SD	1.7 ± 0.7	1.7 ± 0.6	.84
Number of adults in family, mean ± SD	3.1 ± 1.2	2.9 ± 1.0	.47
Age at diagnosis, mean ± SD	3.2 ± 0.7	-	-
Medication, N (%)			
- Methylphenidate	1 (3.3%)	-	-
- Risperidone	8 (26.6%)	-	
Language level, N (%)			
- No words to few words	10 (33.3%)	-	-
- Phrases to short sentences	13 (43.3%)	-	
- Fluent in sentences	7 (23.3%)	-	

The mean total and each domain score of the BAMBI comparing children with ASD and TD groups is shown in Table 2. The total score of the ASD group was significantly higher than the TD group, indicating that children with ASD had more mealtime behavioral problems. When considered in detail, it was found that the ASD group had a higher mean score of each domain than the TD group, but the difference was only significant in the food refusal domain. However, the number of items that are mentioned as problematic for families did not differ in either group.

Table 2 The BAMBI score of children in both groups

BAMBI score	ASD group mean ± SD	TD group mean ± SD	*P*-value
Total score	45.0 ± 8.4	40.0 ± 7.4	.02
Limit variety domain	20.8 ± 3.9	18.9 ± 4.3	.08
Food refusal domain	11.1 ± 3.2	9.1 ± 2.9	.01
Features of autism domain	10.5 ± 2.8	10.0 ± 2.7	.13

Table 3 shows details of the BAMBI questions from both groups which found that eating problems in the ASD group were significantly greater than the TD group in the following issues; expels food that has been eaten, displays self-injurious behavior during mealtime, closes mouth tightly when food is presented, prefers the same food at each meal, not accepting a variety of food, and prefers food prepared in a particular way. However, there was no significant difference in the number of parents who thought the behavior disturbed their everyday life. The top three eating behaviors that parents of children with ASD children mentioned as problematic were; expelling food that has been eaten, disliking certain food and refusing to eat them, and turning their face or body away from food, respectively.

Table 3 Scores and perception of parents for each question of the BAMBI comparing both groups

BAMBI Items		Score			Mention as problematic		
		ASD group	TD group	*P*-value	ASD group	TD group	*P*-value
		Mean ± SD	Mean ± SD		N (%)	N (%)	
1	My child cries or screams during mealtimes	1.6 ± 0.8	1.3 ± 0.7	.09	8 (26.7)	4 (13.3)	.33
2	My child turns their face or body away from food	2.4 ±1.2	2.4 ± 1.1	1.00	13 (43.3)	8 (26.7)	.27
3	My child remains seated at the table until the meal is finished*	2.9 ± 0.9	3.2 ± 1.1	.43	11 (36.7)	8 (26.7)	.58
4	My child expels (spits out) food that has been eaten	2.9 ± 0.8	2.3 ± 0.8	.01	15 (50)	10 (33.3)	.29
5	My child is aggressive during mealtimes	1.6 ± 0.8	1.4 ± 0.7	.23	6 (20)	6 (20)	1.00
6	My child displays self-injurious behavior during mealtimes	1.3 ± 0.6	1.0 ± 0.0	.02	6 (20)	3 (10)	.47
7	My child is disruptive during mealtimes	1.9 ± 0.9	1.5 ± 0.8	.07	11 (36.7)	6 (20)	.25
8	My child closes their mouth tightly when food is presented	2.2 ± 1.1	1.6 ± 0.9	.01	9 (30)	5 (16.7)	.36
9	My child is flexible about mealtime routines*	3.1 ± 1.4	3.0 ± 1.5	.52	5 (16.7)	4 (13.3)	1.00
10	My child is willing to try new foods*	3.0 ± 1.1	3.1 ± 1.1	.52	12 (40)	7 (23.3)	.26
11	My child dislikes certain foods and won't eat them	3.5 ± 0.9	3.7 ± 1.0	.55	15 (50)	13 (43.3)	.79
12	My child refuses to eat foods that require a lot of chewing	1.8 ± 1.1	1.8 ± 1.1	.90	6 (20)	5 (16.7)	1.00
13	My child prefers the same foods at each meal	3.5 ± 1.0	2.8 ± 1.2	.02	8 (26.7)	8 (26.7)	1.00
14	My child prefers "crunchy" foods (e.g., snacks, crackers)	3.2 ± 0.9	2.8 ± 1.1	.15	6 (20)	4 (13.3)	.73

* reverse questions; points were scored in reverse, score 1 indicated almost every meal and score 5 indicated never.

Table 3 Scores and perception of parents for each question of the BAMBI comparing both groups (Cont.)

BAMBI Items		Score			Mention as problematic		
		ASD group	TD group	*P*-value	ASD group	TD group	*P*-value
		Mean ± SD	Mean ± SD		N (%)	N (%)	
15	My child accepts or prefers a variety of foods*	3.3 ± 1.3	2.6 ± 1.2	.03	9 (30)	5 (16.7)	.36
16	My child prefers to have food served in a particular way	1.7 ± 1.0	2.2 ± 1.1	.08	5 (16.7)	3 (10)	.70
17	My child prefers only sweet foods (e.g., candy, sugary cereals)	2.3 ± 1.1	2.2 ± 0.9	.52	4 (13.3)	4 (13.3)	1.00
18	My child prefers food prepared in a particular way	2.6 ± 1.2	1.9 ± 1.2	.04	8 (26.7)	4 (13.3)	.33

* reverse questions; points were scored in reverse, score 1 indicated almost every meal and score 5 indicated never.

According to the questions asked about parental attitudes toward feeding practice, parents from both groups did not differ in their emotion and confidence during mealtimes (Table 4). Only half of the parents from both groups are confident in their ability to manage their child's feeding and mealtime behavior. The number of parents of children with ASD who feeled that their children's eating habits were causing health problems was greater. The most common strategy which both groups employed to manage their child's feeding problem was reward and comment when their child is eating well.

Table 4 Attitude of caregivers toward their child's feeding problem and the strategies that caregivers implement in both groups

Item	Questions	Answer as usually to almost every meal		*P*-value
		ASD group	TD group	
		N (%)	N (%)	
1	I feel confident in my ability to manage my child's behavior at mealtime	13 (43.3)	14 (46.7)	1.00
2	I feel that my children's eating habits are causing health problems	9 (30.0)	5 (16.7)	.36
3	I feel angry and frustrated with my child during meals and take a long time to calm down	2 (6.9)	0 (0.0)	.23
4	I do not agree with other adults in the house about how to feed my child	2 (6.7)	0 (0.0)	.49
5	I feel certain that my child gets enough food	17 (56.7)	19 (63.3)	.79
6	I threaten my child so that they could try a bite of food	6 (20)	2 (6.7)	.25
7	I coax my child to take a bite	8 (26.7)	3 (10)	.18
8	If my child does not like what is being served, I make something else	14 (46.7)	6 (20)	.05

Table 4 Attitude of caregivers toward their child's feeding problem and the strategies that caregivers implement in both groups (Cont.)

Item	Questions	Answer as usually to almost every meal		*P*-value
		ASD group	TD group	
		N (%)	N (%)	
9	When my child refuses to eat I will force it in their mouth if necessary	2 (6.7)	3 (10)	1.00
10	I reward/praise my child when they are eating well	19 (63.3)	18 (60)	.24
11	I let my child play or watch TV during meals, so that they could eat more	4 (13.3)	8 (26.7)	.33
12	I walk around to feed my child if they refuse to eat at the table	7 (23.3)	4 (13.3)	.50
13	I repeatedly offer my child food to try that they do not like	10 (33.3)	5 (16.7)	.23
14	I don't give my child anything until the next meal so that my children can eat more	4 (13.3)	4 (13.3)	1.00

Discussion

To date, the BAMBI questionnaire has been used to study eating problems in children with autism in many countries.[8, 14, 19, 21, 23-28] As far as we know, our research was the first research study in Thailand. In line with other research, the result of our study revealed that children with ASD have more feeding problems when compared with children at the same age, who had typical development.

In the study from Luken & Linscheild, the developers of the BAMBI questionnaire, the mean total score of children with ASD and children with TD in their study was 49 and 32.5, respectively.[23] In our study, the mean total BAMBI score of children with ASD was 45 which was less than the original, but still within range of other studies.[8, 14, 19, 21, 23-28] The mean total score of the BAMBI was significantly higher in the ASD groups, however, only scores in the food refusal domain had a statistically significant difference between the two groups.

In terms of eating behavior problems, previous research had found that a limited variety domain was the most common feeding problem among children with autism. Unexpectedly, our study did not find that children with ASD had a greater score in this domain than children with TD. When comparing this domain score with the original study, the limited variety score of the ASD groups in our study was lower. The studies from Hong Kong, Brazil, and India also found that the score in this domain is less than that of the original.[19, 21, 24] We presume that the reasons for this may be explained by; characteristics of Thai food and the way we prepare meals for children. In Thailand, the food eaten by adults is often spicy, so preschoolers usually cannot eat the same food as adults. Therefore, children's non-spicy foods is usually prepared separately from food for other family members, and parents often choose to prepare meals for their children following their child's preference. Therefore, the food selectivity in preschool children with ASD might be less problematic in Thailand than other countries where foods were prepared for all of the family members.

In our study, we found that about half of parents in the ASD group make something else for their child if their child does not like the foods being served, which is significantly higher than parents in the TD group. Noticeably, 50% of parents in the ASD group admitted that when their child do not eat food they dislike, it was a disturbing issue. Although the limited variety problem has not yet reached a significant level, there was information indicating that children with autism had more food selectivity than the children with TD. The scores of some items in this domain revealed significantly higher scores

in children with ASD including; preferring the same food, not preferring a wide variety of foods and loving foods that is prepared in a particular way. Future research in older children, specifically when Thai parents begin to change the way they prepare meals for children (the same food for all family members) may reveal more food selectivity problems in children with ASD.

The food refusal domain was significantly different between the two groups in our study. Questions in this domain asked about inappropriate behavior when children did not want to eat. Children in the ASD group were more likely to expel food that had been eaten and also close their mouth tightly when food was presented. This behavior may actually be part of food selectivity, whenever they eat food they dislike, they displayed that behavior. A half of parents in the ASD group rate expelling food as problematic behavior, which is one of the two behaviors most worried about by parents.

The last domain of the BAMBI was ASD features, which asked about behavior during mealtime that was inopportune such as leaving the table, displaying aggressive or self-injurious behavior. The score of the ASD group was almost exactly the same with that of the TD group. It is noteworthy that the scores of children with ASD were close to the original paper and higher than many studies. This indicated that children with ASD in our study were not less likely to have problems, but the fact that children with TD had more challenging behaviors made no difference between the groups.

The results of this research were consistent with previous international researches which found that children with ASD had more eating problems than typical children, and the problems could be found from preschool age. Therefore, when taking care of children with ASD, besides focusing on developmental stimulation, medical providers should also pay attention to the child's eating problems and help their caregivers on solving the problems.

This research is the first study in Thailand that examined the eating problems in preschooler with ASD compared to typical children. However, we acknowledged that the study had some limitations as follows; First of all, the study had small sample size and took place only in Pathum Thani Province, so the results may not be generalizable to the rest of Thailand. Secondly, although the BAMBI was the standard measurement, the questionnaire asking about attitude of caregivers toward their child's feeding problem and the strategies that caregivers implement to deal with feeding problems was a newly developed and only face validation by experts was performed. Therefore, the score is merely a comparative representation of the two groups, and did not have a cut-off point score that indicated problematic.

Our study has revealed that preschool-age children with ASD have more eating problems than normal developing children. Of the three domains in the BAMBI, food refusal was the domain which was significantly different between the two groups. Therefore, when caring for preschooler with ASD, eating problems should be focused on.

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