Original Article

The Association of Parental Feeding Style, Mealtime Behaviour and Eating Disorders with Autism Spectrum Disorder and Child Nutritional Status

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Abstract
Background: Every parent desire optimal growth and development for their child, and nutrition is key to achieving this. Malnutrition can have lasting effects on a child's health and development, including for children with autism, where proper nutrition is crucial.
Aim: This study aimed to determine the association between feeding style, mealtime behavior, and eating disorders with the nutritional status of children aged 7-12 years with autism spectrum disorder (ASD) in Padang City.
Methodology: This research was carried out in descriptive and cross-sectional study design, data from 65 children with ASD were collected through anthropometric measurements and questionnaires include Parental Feeding Style Questionnaire (PFSQ), the Brief Autism Mealtime Behaviour Inventory (BAMBI), the Child Eating Behavior Questionnaire (CEBQ). Data were analysed using Chi-square test.
Result: Chi-square tests showed significant relationships between feeding style (p=0.010) and mealtime behavior (p=0.001) with nutritional status, but no significant relationship with eating disorders (p=0.498). The majority of children (60%) had malnutrition, 63.1% were subjected to inappropriate feeding practices, 64.6% experienced problematic mealtime behavior, and 78.5% had eating disorders.
Conclusion: Feeding practices and mealtime behavior significantly affect the nutritional status of children with ASD, while eating disorders do not.

Keywords: Autism Spectrum Disorder, Eating Disorder, Nutritional Status

Introduction

Optimal child growth and development is every parent's desire. Nutrition playing a crucial role in shaping child health and intelligence. Nutritional status is a key indicator of a child's growth success, and issues related to nutrition are particularly complex in children with special needs, such as Autism Spectrum Disorder (ASD) (Aisyah, Elvandari and Kurniasari, 2023). ASD is a neurodevelopmental disorder marked by social, communication, and behavioral impairments (Salari *et al.*, 2022). It affects individuals of all backgrounds, and though its exact cause remains unclear, studies suggest that genetics and environmental factors contribute to its development (Grabrucker, 2021).

Epidemiological surveys over the past 50 years have shown a sharp rise in ASD cases

globally, with boys being four to five times more likely to be diagnosed than girls (Napolitano *et al.*, 2022). A 2022 study revealed that approximately 1 in 100 children worldwide is diagnosed with ASD (Talantseva *et al.*, 2023). In Indonesia, the Ministry of Education and Culture reported 144,621 students with autism in 2020/2021, an increase from 133,826 the previous year (Pusdatin Kemendikbud, 2021). By 2021/2022, this number rose to 145,510, with males making up 88,088 of the total (Pusdatin Kemendikbud, 2022).

The rising incidence of ASD is linked to increased health concerns, ranging from undernutrition to obesity, often due to impaired nutrient absorption (Valenzuela-Zamora, Ramírez-Valenzuela and Ramos-Jiménez, 2022). Children with ASD are 40% more likely to become obese than their neurotypical peers and face higher risks of conditions like hyperlipidemia, diabetes, and heart disease as they age (Gray *et al.*, 2018). Studies show that 53.1% of children with ASD are obese, and underweight cases are six times higher than in neurotypical children.(Molina-López *et al.*, 2021)

Eating disorders in children with ASD are complex (Riccio, 2022). They often display sensory reactivity issues, disruptive behaviors, and gastrointestinal symptoms (Molina-López *et al.*, 2021). A 2022 study found deviant mealtime behaviors, such as food hoarding, rapid eating, and compulsive consumption of non-nutritious foods, in children with ASD (Ahumada *et al.*, 2022). Another study revealed that 46% to 89% of children with ASD have eating disorders, ranging from poor habits to extreme selectivity. These disorders lead to inadequate nutrient intake, contributing to malnutrition (Peverill *et al.*, 2019).

Behavioral issues have been linked to feeding difficulties in children with ASD (Blennerhassett, Richards and Clayton, 2023). Despite the significance of nutrition, the relationship between feeding practices, mealtime behaviors, and parenting feeding styles in children with ASD remains underexplored (Esposito *et al.*, 2023). This study aims to characterize and investigate the correlation between parenting feeding styles, mealtime behaviors and eating disorders in children with ASD and their nutritional status. In this context, answers to the following questions were sought throughout the research:

- What is the characteristic of parental feeding styles, mealtime behaviour, and eating disorder in children with ASD?
- What is the characteristic of nutritional status in children with ASD?
- What is the relationship between parental feeding styles , mealtime behaviour, and eating disorder with nutritional status in children with ASD?

Method

Research Design: This study employs a quantitative observational analytic method with a cross-sectional design

Population and sample: The population and sample consisted of 65 children aged 7-12 years, diagnosed with ASD, selected using a total sampling technique. The sample was not calculated in the study, and the entire population was attempted to be reached. In this context, a sample consisting of 65 pairs of children and parents who agreed to participate in the study and who could be reached formed the sample.

The criteria for inclusion in the study are stated below.

- Diagnosed with ASD by Diagnostic and Statistical Manual of Mental Disorder (DSM-5) Criteria and do not have any mental disorder comorbid
- Being 7 to 12 years old,
- Voluntarily agreeing to participate in the study.

Data Collection: Research data were collected from January to May 2024 at five autism-specialized elementary schools (SDLB) in Padang City. The study utilized both primary and secondary data. Primary data included direct anthropometric measurements and responses to questionnaires on participant characteristics, completed by caregivers.

Data Collection Tools: Height (cm) was measured using a stature meter (SH24, Jakarta, GEA, Indonesia) with three repetitions, and the average value was used. Children were measured standing straight

against a wall, with measurements taken only when the child was calm. Weight (kg) was recorded using a digital scale (HN-289, Kyoto, OMRON, Japan) with three repetitions, and the average value was used. Weight measurements were conducted with the child standing upright on the scale, after removing any items that could add weight, and only when the child was still. Age (in years and months) was calculated based on the child's birth date. Data was processed using WHO Anthro+ software to calculate BMI-for-age z-scores. Secondary data, including the prevalence and population of children with ASD and other characteristics, were obtained from research studies, reports, books, journals, and relevant institutions such as the Indonesian Ministry of Health (Kemenkes RI), the Indonesian Ministry of Education and Culture (Kemendikbud RI), and the Education and Culture Office of Padang City (Disdikbud Padang), as well as demographic data from the SDLB's Student Data System (Dapodik).

Research instruments included respondent characteristic questionnaires and anthropometric measurements. Caregivers' feeding styles were assessed using the 24-item Parental Feeding Style Questionnaire (PFSQ) with two dimensions, demandingness (17 items) and responsiveness (7 items). Responses were rated on a five-point Likert scale (never to always). Feeding styles were classified as Authoritative (both scores at/above the mean), Authoritarian (high demandingness, low responsiveness), Indulgent (low demandingness, high responsiveness), or Neglectful (both scores below the mean). (Demir and Özcan, 2022),

Mealtime behavior in children with ASD was measured using the 18-item Brief Autism Mealtime Behavior Inventory (BAMBI); scores over 34 indicate problematic behavior. (Ghazali, Buhari and Ilias, 2023). Eating disorders were evaluated with the Child Eating Behavior Questionnaire (CEBQ), a validated tool categorizing behaviors into food avoidance (satiety responsiveness, food fussiness, emotional undereating) and food approach (food responsiveness, enjoyment of food, desire to drink, emotional overeating). A child was classified as having an eating disorder if the food approach score was lower than the food avoidance score. (Demir and Özcan, 2022)

Validity and reliability tests were conducted to ensure the quality of the instruments. All questionnaires used were previously translated and validated in Indonesian. The instruments were pre-tested on 30 participants. Validity was determined using item-total correlation; an item was considered valid if the calculated correlation coefficient (r count) exceeded the critical value of the r table. Reliability was assessed using Cronbach's alpha, with values greater than 0.70 indicating high reliability. All instruments met these criteria, confirming that they were both valid and reliable for use in the study.

Ethical Issues: The study received ethical approval from the Health Research Ethics Committee of the Faculty of Public Health, Andalas University, under the reference number B/19/UN.16.12.D/PT.01.00/2024. Before the research, parents signed the informed consent form. The research was conducted in accordance with the principles of the Declaration of Helsinki.

Results

The results in Table 1 show that the majority of children diagnosed with ASD were male (70.8%), with most aged between 7 and 8 years (35.4%). In this study, most children with ASD were cared for by their parents (87.3%), with the majority of parents aged 36-45 years (55.4%). Nearly half of the caregivers had a university-level education (49.2%).

According to Table 2, the majority of children with ASD had malnutrition (60.0%), with two-thirds of them (63.1%) receiving improper feeding care from their caregivers. Additionally, two-thirds of the children exhibited problematic mealtime behavior (64.6%), and the majority (78.5%) experienced eating disorders.

The findings show that most children with ASD (60.0%) had malnutrition, while 40.0% were classified as having normal nutrition status. This indicates that nearly two-thirds of the study respondents had abnormal nutritional status. These results align with the findings on research reported that nearly two-

thirds (59.4%) of children with ASD had abnormal BMI-for-age z-scores, with the remaining 40.6% having normal nutritional status (Wijayanti and Mutalazimah, 2018). This is further supported by Raspini et al., who noted that children with ASD tend to have abnormal nutritional status, being more prone to overweight and obesity compared to children with normal growth (Raspini *et al.*, 2021).

Table 1: Frequency Distribution of Respondent Characteristics

Characteristic	f	%
Gender		
Male	46	70.8
Female	19	29.2
Child Age		
7 - 8 years old	23	35.4
8 years 1 month - 9 years old	8	12.3
9 years 1 month - 10 years old	7	10.8
10 years 1 month - 11 years old	8	12.3
11 years 1 month - 12 years old	19	29.2
Relationship Between Caregivers and Children		
Parents	57	87.7
Not Parents	8	12.3
Caregiver Age		
18-25 years old	1	1.5
26-35 years old	13	20.0
36-45 years old	36	55.4
46-65 years old	15	23.1
Caregiver Education		
Secondary Education		
Junior High School/Equivalent	3	4.6
Senior High School /Equivalent	25	38.5
Tertiary Education		
Diploma	3	4.6
Bachelor	32	49.2
Master/Doctoral	2	3.1

Table 2: Frequency Distribution of Dependent and Independent Variables

Variabel	f	%
Nutritional Status		
Malnutrition (z-score BMI-for-Age <- 2 SD and or z-score BMI-for-Age > +1 SD	39	60.0
Normal (z-score BMI-for-Age -2 SD sd +1 SD)	26	40.0
Parental Feeding Practices		
Inappropriate (Authoritarian, Neglectful, and or Indulgent)	41	63.1
Appropriate (Authoritative)	24	36.9
Mealtime Behaviour		
Problematic mealtime behaviour (BAMBI score >34)	42	64.6

Non problematic mealtime behavior (BAMBI score ≤34)	23	35.4
Eating Disorder		
Experienced eating disorder (food approach score < food avoidance score)	51	78.5
Not experienced eating disorder (food approach score > food avoidance score)	14	21.5

Table 3: Relationship between Independent Variables and Dependent Variables

Independent Variabels	Nutritional Status (BMI-for-Age)						p-value (POR)
	Malnutrition		Normal		Total		
	f	%	f	%	f	%	
Parental Feeding Practices							
Inappropriate (Authoritarian, Neglectful, and or Indulgent)	30	46.2	11	16.9	41	63.1	0.010 (4.545)
Appropriate (Authoritative)	9	13.8	15	23.1	24	36.9	
Total	39	60.0	26	40.0	65	100	
Mealtime Behaviour							
Problematic mealtime behaviour (BAMBI score >34)	34	52.3	8	12.3	42	64.6	0.001 (15.300)
Non problematic mealtime behavior (BAMBI score ≤34)	5	7.7	18	27.7	23	35.4	
Total	39	60.0	26	40.0	65	100	
Eating Disorder							
Experienced eating disorder (food approach score < food avoidance score)	29	44.6	22	33.8	52	78.5	0.498
Not experienced eating disorder (food approach score > food avoidance score)	10	15.4	4	6.2	14	21.5	
Total	39	60.0	26	40.0	65	100	

Discussion

In this study, feeding practices were categorized into two groups: appropriate feeding practices, characterized by authoritative caregivers, and inappropriate feeding practices, characterized by authoritarian, indulgent, or neglectful caregivers. A chi-square test, as shown in Table 3, revealed a significant association between feeding practices and the nutritional status of children with ASD (p=0.010; POR=4.545). Children with ASD who were subjected to inappropriate feeding practices were 4.5 times more likely to have abnormal nutritional status than those who were raised with proper feeding approaches.

The study also revealed that two-thirds of caregivers of children with ASD (63.1%) implemented inappropriate feeding practices, while 36.9% followed appropriate methods. These findings align with Syarfaini et al., who found that most parents of children with special needs, including ASD, practiced inappropriate feeding methods (72.9%), with only 27.1% adopting proper approaches. Similarly, a study in Brazil reported that 68.1% of caregivers practiced improper feeding techniques, while only 31.1% followed appropriate methods (Fontanezi *et al.*, 2024).

Based on the chi-square test, a significant relationship was found between feeding

practices and the nutritional status of children with ASD in special schools in Padang in 2024 (p=0.010; POR=4.545). This finding is consistent with research by Hughes *et al*., which highlighted that parental feeding practices are closely associated with their children's nutritional status. Indulgent feeding styles were linked to higher BMI in children (Hughes *et al.*, 2021). The study also mirrors findings by Eow *et al*., which found a significant relationship between feeding practices and higher BMI or obesity in children with ASD (Eow *et al.*, 2022). However, another study by Aisyah *et al*., did not find a significant association between feeding practices and the nutritional status of children with ASD in Bandung (p-value = 0.881) (Aisyah, Elvandari and Kurniasari, 2023).

Proper feeding practices are crucial for children with ASD. The authoritative approach, marked by high expectations for daily eating patterns and responsive caregiving, is associated with adequate food quantity and quality. A semi-structured qualitative study by Ismail *et al*., concluded that feeding children with ASD is a major challenge for caregivers. The prevalence of abnormal nutritional status is significantly higher among children with ASD compared to typically developing peers, emphasizing the need for appropriate feeding methods that balance expectations and responsiveness from caregivers (Ismail *et al.*, 2020).

Mealtime behavior in children with ASD was categorized into two groups, non-problematic behavior, indicated by a BAMBI score of ≤34, and problematic behavior, indicated by a BAMBI score >34. The chi-square test revealed a significant association between mealtime behavior and the nutritional status of children with ASD (p=0.001; POR=15.300). Children with ASD and problematic mealtime behavior were 15 times more likely to have abnormal nutritional status than those with non-problematic behavior.

Mealtime behavior in children with ASD is defined as a complex interaction of physiological, psychological, social, and genetic factors that affect meal timing, food intake, and food choices. The study showed that two-thirds (64.6%) of children with ASD exhibited problematic mealtime behavior, while the remaining 35.4% did not. This is consistent with Ghazali *et al*., who found that 88.2% of children with ASD fell into the problematic mealtime behavior category (Ghazali, Buhari and Ilias, 2023). Another research also reported that 91.4% of children with ASD experienced problematic behavior during meals (Nor, Ghozali and Ismail, 2019). Kittana *et al*., on their research highlighted that children with ASD are more likely to exhibit deviant eating behavior than their typically developing peers (Kittana *et al.*, 2023).

The statistical analysis revealed a significant association between mealtime behavior and the nutritional status of children diagnosed with ASD in special schools in Padang in 2024 (p=0.001; POR=15.300). This aligns with Kittana *et al*., who noted that children with ASD predominantly displayed deviant mealtime behaviors, and those children tended to have higher BMI compared to others with fewer behavioral issues during meals (Kittana *et al.*, 2023). Furthermore, another research also found a significant relationship (p-value = 0.004) between mealtime behavior and the nutritional status of children with special needs (Ayasrah, Ahmad and Khasawneh, 2023). However, a study by Ghazali *et al*., noted that while 88.2% of children with ASD exhibited problematic mealtime behavior, there was no significant relationship between this and daily energy, carbohydrate, protein, and fat intake or nutritional status (Ghazali, Buhari and Ilias, 2023).

Deviant eating behavior and food selectivity are common among children with ASD. A further study by Molina-López *et al*., found that changes in mealtime behavior in children with ASD were linked to oral health issues and sensory sensitivity. Common mealtime behavioral deviations among these children include food refusal, limited food variety, imbalanced intake, and unusual food preferences. If these deviations persist, children are at risk of extreme malnutrition (Molina-López *et al.*, 2021).

Eating disorders were categorized into two groups, those without eating disorders (food

approach score ≥ food avoidance score) and those with eating disorders (food approach score < food avoidance score). The chi-square test did not reveal a significant relationship between eating disorders and the nutritional status of children with ASD (p=0.498). This study also showed that 78.5% of children with ASD experienced eating disorders, while only 21.5% did not. These findings are consistent with Ahumada *et al*., who found that 91.67% of children with ASD had eating disorders, particularly food selectivity (Ahumada *et al.*, 2022). Similarly, Gray *et al*., reported that the majority (71%) of children with ASD had eating disorders. Eating disorders among children with ASD are varied and result from multiple factors, including sensory processing issues, irrational fears, and environmental and familial influences (Gray *et al.*, 2018).

The statistical analysis did not find a significant relationship between eating disorders and the nutritional status of children with ASD in special schools in Padang in 2024 (p=0.498). This finding is consistent with van Dijk *et al*., who reported that children with ASD experienced more eating disorders than their typically developing peers, but no significant relationship was found between eating disorders and nutritional status in children with ASD or typically developing children (van Dijk, Buruma and Blijd-Hoogewys, 2021). Similarly, another research found no relationship between eating disorders and BMI in children with ASD (da Silva and Gomes, 2024). However, Ayasrah *et al*., found a significant relationship between eating disorders and the nutritional status of children with ASD (p-value = 0.004) (Ayasrah, Ahmad and Khasawneh, 2023). While no significant association was found between eating disorders and nutritional status in this study, children with eating disorders tended to exhibit abnormal nutritional status.

Conclusion: In this study, the majority of children diagnosed with ASD were male, most were within the age group of 7-8 years, and the majority were raised by their parents. Two-thirds of these children were subject to inappropriate feeding practices, two-thirds exhibited problematic mealtime behavior, and most experienced feeding disorders. Both feeding practices and mealtime behavior showed a significant relationship with the nutritional status of children with ASD, while feeding disorders did not demonstrate a significant association with their nutritional status.

Limitation of the Study: This study has some limitations. First, the main data of the research data (PFSQ, BAMBI, and CEBQ) were obtained by self-report method. Second, the study was conducted cross-sectionally, and the data obtained are valid only for the time during which the study was conducted, and may change over time.

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