



EATING BEHAVIOR AND NUTRITIONAL STATUS OF PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER

COMPORTAMENTO ALIMENTAR E ESTADO NUTRICIONAL DE PRÉ-ESCOLARES COM TRANSTORNO DO ESPECTRO AUTISTA

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ABSTRACT: To analyze the influence of eating behavior on the nutritional status of preschoolers with Autism Spectrum Disorder, through a descriptive, explanatory and quantitative field research, with 44 preschoolers diagnosed with ASD, of both sexes, aged 2 to 5 years, enrolled in daycare centers in the interior of Paraíba, Brazil. Questionnaires containing sociodemographic and clinical data were applied, in addition to the nutritional assessment and the application of the Maze Scale to assess eating behavior in children with ASD. Descriptive exploratory and linear regression analyses were performed. Most children were male, in the age group of 4 years and presented adequate growth parameters. The eating behavior factors that impacted nutritional status were chewing motor skills, oppositional behavior, food selectivity and rigid behaviors. Although most children have an adequate Body Mass Index, there are significant numbers of risk of overweight, overweight or childhood obesity.

KEYWORDS: Eating Behavior. Nutritional Status, Preschoolers. Autism Spectrum Disorder.

RESUMO: Analisar a influência do comportamento alimentar no estado nutricional de pré-escolares com Transtorno do Espectro Autista, por meio de uma pesquisa de campo, descritiva, explicativa e de abordagem quantitativa, com 44 pré-escolares com diagnóstico de TEA, de ambos os sexos, de 2 a 5 anos, matriculados em creches no interior da Paraíba, Brasil. Aplicou-se questionários contendo dados sociodemográficos, clínicos, além da avaliação nutricional e da aplicação da Escala Labirinto para avaliação do comportamento alimentar em crianças com TEA. Foram realizadas análises descritivas exploratória e de regressão linear. A maioria das crianças foram do sexo masculino, na faixa etária de 4 anos e apresentaram parâmetros de crescimento adequados. Os fatores de comportamento alimentar que impactaram no estado nutricional foram motricidade na mastigação, comportamento opositor, seletividade alimentar e comportamentos rígidos. Apesar de a maioria das crianças apresentarem Índice de Massa Corporal adequado, existiram números expressivos de risco de sobrepeso, sobrepeso ou obesidade infantil.

PALAVRAS-CHAVE: Comportamento Alimentar. Estado Nutricional. Pré-escolares, Transtorno do Espectro Autista.

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by atypical development, behavioral manifestations, deficits in communication and social interaction, and patterns of repetitive and stereotyped behaviors, which may include a restricted repertoire of interests and activities¹. In the year of 2023, one in every thirty-six children aged 8 years was diagnosed with ASD in the United States². According to Canal Autismo³, there are still no prevalence numbers for ASD in Brazil. For ICD-10 and DSM-V TR, in some cases, autism can be diagnosed within the first years of life, especially if the symptoms are quite evident and persistent⁴.

In 2023, the American Psychiatric Association established five mandatory conditions in the latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V-T), which are: Persistent deficits in communication and social interaction; Restricted and repetitive behaviors; Symptoms present in early childhood; Significant impairments in daily life (need for support); and Exclusion of another condition that better explains the symptoms⁵. Although it is not considered a diagnostic criterion, abnormal sensory reactivity (hypo- or hyper-responsive) has a direct impact on eating behavior and has even been included in the diagnostic criteria for ASD in the DSM-5⁵.

Children with ASD present characteristics and factors that may involve behavioral and feeding alterations, making it difficult for them to participate in various activities, which can affect their development and quality of life⁶. Among these characteristics, the following can be highlighted: food selectivity, refusal of new foods, chewing problems, behaviors such as difficulty sitting at the table or interacting during meals, and taking food from other people's plates⁷.

According to Botton⁸, children with ASD tend to consume food rich in carbohydrates and fats, with restrictions on food rich in proteins, vitamins, and minerals, which can affect their nutritional profile. The assessment of nutritional status is a relevant step in monitoring child growth, allowing, through parameters related to food intake, physical and anthropometric evaluation, a better understanding of the clinical condition of children with ASD⁹. In this context, the follow-up and supervision of a nutritionist is of utmost importance to mitigate possible nutritional alterations, considering how dietary restrictions can cause health problems for any individual⁹.

This study aimed to analyze the influence of eating behavior on the nutritional status of preschool children with ASD enrolled in municipal daycare centers.

METHODOLOGY

This was a descriptive, explanatory, field study with a quantitative approach, conducted with 44 preschool children aged 2 to 5 years, of both sexes, diagnosed with ASD according to ICD-10¹⁰ and DSM-V¹¹, who were regularly enrolled in full-time daycare centers in the city of Patos, a municipality located in the state of Paraíba, Brazil.

The present study was approved by the Research Ethics Committee, under the registration number 6.631.339 (CAE no. 76165023.2.0000.5181), and was carried out during the months of February and March 2024. Initially, a meeting was held, previously scheduled with the parents or guardians and caregivers, to explain the research and obtain authorization for the children's participation through the signing of the Informed Consent Form. A sociodemographic questionnaire was applied, consisting of questions regarding the child: sex, age, age at ASD diagnosis, and whether they receive multiprofessional follow-up.

In the second stage, anthropometric data (weight and height) of the children were collected, always in the early afternoon, with the caregivers present. For weight measurement, a portable digital scale from the brand Original Line, with a capacity of up to 180 kg, was used. The children were weighed without shoes or sandals, without objects in their hands, pockets, or head accessories, with both feet positioned evenly on the scale and looking straight ahead, as recommended by the World Health Organization (WHO)¹². Height was measured using a portable digital stadiometer, graduated in centimeters, with a maximum measurement capacity of 200 cm. The children stood in anatomical position, that is, upright, barefoot, with their feet together and their buttocks supported against the wall¹². The nutritional status classification of the preschoolers was carried out following the Body Mass Index for age (BMI/A), Weight for age (W/A), and Height for age (H/A) indices, as recommended by the National Food and Nutrition Surveillance System¹³, according to the cut-off points for children aged 2 to 5 years¹⁴. In cases where the child refused, a new day was scheduled for the evaluation, and if they refused again, they were excluded from the study.

In the third stage, the LABIRINTO Scale for the Assessment of Eating Behavior in people with ASD was applied with the children's caregivers to identify factors that may influence the children's eating behavior. The scale, validated in Brazil in 2019, aims to identify alterations in eating behavior through 26 questions grouped into seven factors: chewing motor skills (items 1, 2, 3, and 4), food selectivity (items 5, 6, and 7), mealtime skills (items 8, 9, 10, 11, and 12), inappropriate mealtime behaviors (items 13 and 14), rigid eating behaviors (items 15, 16, 17, 18, 19, and 20), oppositional eating behaviors (items 21, 22, and 23), and food allergies and intolerances (items 24, 25, and 26)¹⁵. A multiple linear regression analysis (enter method) was conducted to investigate the extent to which the scale's factors impact the children's nutritional status.

Finally, a session was held with the children's caregivers to present the results and provide guidance on strategies that can contribute to the better development of eating habits in preschool children with ASD (Figure 1).

The data were tabulated using the Statistical Package for the Social Science (SPSS) software, version 25.0 (SPSS® Inc, Chicago, IL). The results were obtained through exploratory descriptive analysis (mean, standard deviation, absolute frequency, and relative frequency) and inferential analyses, and were presented in tables and graphs.

This project was conducted based on Resolution No. 466/2012¹⁶ and Resolution No. 510/2016¹⁷. The study included preschool children aged 2 to 5 years, with a confirmed ASD diagnosis, who were regularly enrolled in full-time municipal daycare centers in Patos, PB, and whose parents granted authorization through the Informed Consent Form. Children were excluded if they were not present on the days of the study, if they had a genetic syndrome, or if they presented emotional or sensory dysregulation.

RESULTS

The results of the study showed that 72.7% of the participants were male and 47.6% of the children were 4 years old. A total of 72.7% received the diagnosis at 2 years of age, and 72.7% receive multiprofessional follow-up, as presented in Table 1.

Regarding nutritional status, in terms of BMI for age of the preschool children, 56.8% had an adequate BMI/A, and the data related to W/A and H/A are presented in Table 2.

Table 1. Demographic and clinical characteristics of preschool children with ASD enrolled in municipal daycare centers in Patos-PB, 2024.

Sex of preschool children	Absolute frequency (n)	Percentage frequency (%)
Female	12	27,3%
Male	32	72,7%
Age of preschool children		
2 years	3	6,8%
3 years	19	43,2%
4 years	21	47,7%
5 years	1	2,3%
Age at ASD diagnosis		
2 years	32	72,7%
3 years	11	25%
4 years	1	2,3%
Receives multiprofessional follow-up?		
Yes	32	72,7%
No	12	27,3%

Source: Own authorship, 2024.

Table 2. Nutritional status classification of preschool children with ASD enrolled in municipal daycare centers in Patos-PB, 2024.

Nutritional status classification				
BMI for age (BMI/A)				
Thinness	Adequate BMI	Risk of overweight	Overweight	Obesity
4,5%	56,7%	11,3%	13,6%	13,6%
Weight for age (W/A)				
Underweight for age	Adequate weight for age		High weight for age	
4,5%	63,6%		31,8%	
Height for age (H/A)				
Very short stature for age	Short stature for age		Adequate stature for age	
2,3%	2,3%		95,5%	

Source: Own authorship, 2024.

Among the factors of the LABIRINTO Scale for assessing eating behavior in children with ASD, the most frequent, regardless of intensity, was mealtime skills (93.1%), followed by oppositional eating behavior (86.3%) and food selectivity (72.7%). Among these factors, the most frequent behavior within each factor was also assessed, as shown in Table 3.

A multiple linear regression analysis (enter method) was conducted to investigate the extent to which the factors of chewing motor skills, food selectivity, mealtime skills, inappropriate eating behaviors, rigid eating behaviors, oppositional eating behavior, and food allergies and intolerances impacted the children's nutritional status.

The results showed a significant influence of the factors on the children's nutritional status ($F(7, 36) = 17,887, p < 0,001; R^2_{\text{adjusted}} = 0,733$). Table 4 presents the coefficients for all predictors. As can be seen, the factors that significantly impacted nutritional status were chewing motor skills ($b = 0.334, p \leq 0.001$), food selectivity ($b = 0.317, p \leq 0.001$), rigid eating behaviors ($b = 0.301, p \leq 0.001$), and oppositional eating behavior ($b = 0.357, p \leq 0.001$).

Table 3. Eating behavior of preschool children with ASD enrolled in municipal daycare centers in Patos-PB, 2024.

Eating behavior presented by preschool children	Absolute frequency (n)	Percentage frequency (%)
Factor 1: Chewing motor skills	15	34%
Difficulty chewing food	11	73,3%
Factor 2: Food selectivity	32	72,7%
Avoids eating fruits	26	81,2%
Factor 3: Mealtime skills	41	93,1%
Has restlessness/motor agitation when sitting at the table	32	78%
Factor 4: Inappropriate mealtime behavior	16	36,3%
Vomits during or immediately after meals or during or immediately after meals, spits up, or chews food again	13	81,2%
Factor 5: Rigid eating behaviors	34	77,2%
Has eating rituals (e.g., food must be arranged on the plate in a specific way; if the ritual is not followed, the child refuses to eat or becomes irritated or upset)	23	67,6%
Factor 6: Oppositional eating behavior	38	86,3%
Eats a large amount of food in a short period of time	23	60,5%
Factor 7: Food allergies and intolerances	8	8,1%
Lactose intolerance or food allergy	4	0,5%

Source: Own authorship, 2024.

Table 4. Predictor variables of the nutritional status of preschool children with ASD enrolled in municipal daycare centers in Patos-PB, 2024.

Predictors	Standardized coefficients		
	Beta	t	p
Nutritional status (Constant)	-	4,841	0,00
Chewing motor skills	0,334	3,706	0,00*
Food selectivity	0,317	3,698	0,00*
Mealtime skills	0,156	1,637	0,11
Inappropriate eating behaviors	0,074	0,817	0,41
Rigid eating behaviors	0,301	3,398	0,00*
Oppositional eating behavior	0,357	3,998	0,00*
Food allergies and intolerances	0,014	0,167	0,86

Note: significant impact ($p < 0.05$). Source: Own authorship, 2024.

DISCUSSION

The data found in the study revealed a higher prevalence of boys diagnosed with ASD, corroborating a recent study¹⁸ which cited a ratio of 4 boys for every 1 girl diagnosed. Another author associated this higher prevalence with the fact that girls with autism exhibit socially specific behaviors, masking symptoms more effectively, which leads to underreporting of ASD¹⁹.

Silva, Carneiro and Vasconcelos²⁰ found that most children with ASD were only diagnosed after the age of three, with early diagnosis being extremely important for the more effective development of their skills²¹. These data are consistent with the results presented in this study, in which 93.2% of the preschool children were diagnosed after the age of three.

Caetano and Gurgel⁷ revealed that 80.8% of the children with ASD participating in their study received multiprofessional therapy and highlighted the importance of access to the healthcare network for these children through a public, free, and quality health system offered by the municipality itself. In the present study, 72.7% received multiprofessional follow-up in their own city through the public services provided.

A study with children aged 2 to 9 years, participants of a social movement in the city of Macaé – RJ, showed that 53.5% of the children were overweight²². The present study showed that most participants had an adequate nutritional status, which may be related to the provision of an appropriate menu recommended by the National Food and Nutrition Program (PNAE) to compose the school meal menus offered in municipal daycare centers, which should be tailored to each age group according to their nutritional needs²³.

In this study, 38.5% of the children were at risk of overweight, overweight, or obesity, highlighting the high prevalence of excess weight among children with ASD, which may be associated with an inadequate eating pattern and should be addressed carefully to prevent the emergence of nutritional problems²⁴. According to Quedas *et al.*²⁵, individuals with ASD are more prone to obesity and excessive weight gain than other members of the population. Thus, we see the importance of the nutritionist and their interventions to minimize consequent problems and provide a better quality of life²⁶.

Children with ASD may present eating behavior alterations that can contribute to problems in food intake, leading to atypical development, considering that the period of child development requires adequate and balanced nutrition²⁷.

In the present study, 93.1% of the participants exhibited some behavior related to the mealtime skills factor, which may be related to the lack of concentration and hyperactivity commonly observed in ASD²⁸. This finding is consistent with a study conducted with children aged 2 to 10 years diagnosed with ASD, in which the mealtime skills factor was one of the factors with the highest scores among the participants²⁹.

Among the skills analyzed, restlessness/motor agitation when sitting at the table was the most prevalent behavior among the participants, corroborating the study by Bittar, Soares, and Maynard³⁰, in which this behavior was observed in more than 50% of children with ASD. The author of the LABIRINTO Scale relates this problem to the difficulty that children with ASD have in eating in groups, which makes learning by imitation more difficult, favoring the emergence of eating behavior impairments, such as being unable to sit at the table throughout the entire meal¹⁵.

The oppositional eating behavior factor was the second most frequent among the preschool children, and within this factor, the behavior of eating a large amount of food in a short period of time was the most prevalent (60.5%), corroborating the study by Milane, Pilatti, and Bortolozzo³¹, in which this behavior was prevalent in 57.5% of the participating children. The results found by Caetano and Gurgel⁷ indicated that energy intake (EER) was above the recommended levels for 53.85% of children with ASD, and they associated this finding with the frequent dietary errors characteristic of the disorder, which contributes to excess weight and the risk of developing pathologies.

Among the rigid eating behavior factors, the most frequent was "Has a ritual for eating." Rodrigues³² conducted a study with 35 children in the municipality of Bauru/SP and concluded that when the children's preferences at mealtimes were not respected, such as serving the same food, not sitting at the table, and eating at the time the child determines, they exhibited behaviors such as pushing, throwing food, and crying.

Regarding food selectivity, a literature review conducted with studies from 2010 to 2019 identified this factor as the most common eating disorder among children with ASD, affecting about 83% of this population³³. This factor influences gastrointestinal health due to the children's restricted food repertoire, which can lead to nutritional deficiencies and may be related to the fact that these children present tactile and olfactory sensory alterations³⁴.

Among the children who presented problems in the food selectivity factor, 86.2% exhibited the behavior of "avoiding eating fruits," corroborating the study by Paula *et al.* (2020), in which children avoided consuming fruits, vegetables, and legumes during meals. Caetano and Gurgel⁷ found in their

study that children with ASD have inadequate intake of calcium, phosphorus, selenium, vitamin D, thiamine, riboflavin, and vitamin B12, with fruits being excellent sources of these nutrients, and deficiencies can also cause gastrointestinal symptoms and alterations in the intestinal microbiota³⁵. The food allergies and intolerances factor was the least recurrent, corroborating the study by Pereira³⁶, in which this factor was also the least prevalent among the children.

Although it was not the most prevalent among the preschool children, statistical analysis showed that the “chewing motor skills” factor impacted nutritional status, which does not occur only due to physical disorders but is mainly associated with behavior, such as refusal to chew or swallow, and may be related to inadequate caloric intake⁵.

The food selectivity factor showed significance with nutritional status. In this study, a higher prevalence of overweight (38.5%) was observed compared to thinness (4.5%). Contrary to the results presented in this study, Roy *et al.*³⁷ identified that selective children are more likely to be underweight at the age of 5 years. Silva, Carneiro, and Vasconcelos²⁰ revealed that 69.2% of children with ASD who presented the food selectivity factor had aversions to vegetables used in meal preparations, and this characteristic can be an obstacle at mealtimes.

Regarding rigid eating behaviors, which in this study showed a significant impact on the nutritional status of the children, Soares³⁸ found that the higher the score for this factor, the greater the prevalence of caloric inadequacy, associated with macro- and micronutrients. These behaviors can affect the consumption of an adequate meal, thus impacting the children's nutritional status and development³⁰.

The oppositional eating behavior factor also showed a significant impact on nutritional status, corroborating the study by Milane, Pilatti, and Bortolozzo³¹, which correlated this factor negatively with the dietary quality of children with ASD. In the same regard, Rodrigues *et al.*³⁹ demonstrated that children with ASD who had greater behavioral difficulties had diets rich in ultra-processed foods, a fact that can contribute to weight gain and increased risks for cardiovascular and metabolic diseases⁴⁰.

CONCLUSION

The study identified that, although most children had an adequate BMI for age, there were still significant numbers at risk of overweight, overweight, or childhood obesity. The eating behavior factors that had a significant impact on the children's nutritional status were chewing motor skills, food selectivity, rigid eating behaviors, and oppositional eating behavior.

Thus, the study expands the knowledge of parents/guardians and caregivers of the children and provides greater information to nutritionists, highlighting the need for health professionals, especially nutritionists, to stay updated on eating behavior alterations in children with ASD, considering that these can impact the nutritional status of this population. This ensures better nutritional status and a better quality of life for the children.

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