

Food and behavior profile of children with autism spectrum disorder (ASD) in city of Ouro Preto/MG

Abstract

Autism is a developmental disorder that affects communication, behavior, and social interaction. Autism symptoms may include delayed language development, difficulty making eye contact, repetitive movements or behaviors, and sensitivity to certain sensory stimuli. Therefore, the objective of this study was to evaluate the dietary and behavioral profile of children with Autism Spectrum Disorder (ASD) in city of Ouro Preto/MG. For this, the medical records of 11 children/young people assisted by the Association of Parents and Friends of the Exceptional (APAE) and the Psychosocial Care Center (CAPSij) in Ouro Preto/MG were evaluated. In addition, the responses obtained by parents and/or guardians about the dietary and behavioral profile of these individuals assisted by the institutions were evaluated using a questionnaire. The results were analyzed using word clouds and frequency analysis. In view of this, it is concluded that the dietary profile of children/young people with ASD is marked by food selectivity and that the main sensory aspect related to selectivity is texture, and that the foods most consumed by this group are industrialized foods, sugary foods and foods with low nutritional value. The least consumed are vegetables and fruits. In addition, the overload of mothers of children/young people with ASD was evident, being related to the great dependence of individuals on the mother.

Keywords: autism, food selectivity, word cloud

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Késia Regina Ferreira Santos,¹ Bruna Letícia Oliveira Gomes,¹ Sílvia Mendonça Vieira,¹ Marcelo Carlos Ribeiro,² Patrícia Aparecida Pimenta Pereira¹

¹Department of Food, Federal University of Ouro Preto, Brazil

²Department of Statistics, Federal University of Ouro Preto, Brazil

Correspondence: Patrícia Aparecida Pimenta Pereira, Department of Food, Federal University of Ouro Preto, Ouro Preto, Minas Gerais, Brazil, Tel +5535984356446, Email patricia.pereir@ufop.edu.br

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Introduction

According to the American Psychiatric Association, Autism Spectrum Disorder (ASD) is a developmental disorder that can be recognized by clinically significant deficits. Autism is persistent in communication, social interactions, and there are expressive deficits in verbal communication. It is a non-verbal, restricted pattern presence. It is repetitive in behavior, interests, and activities.¹ According to the 5th edition of the Diagnostic and Statistical Manual of Disorders mental disorders, Autism Spectrum Disorder is a disorder that encompasses the disorder autism, Asperger's disorder, childhood disintegrative disorder, and Rett syndrome. It is a global development disorder without other specification.¹ The etiology of the Autism Spectrum Disorder remains unknown. However, currently it is considered a syndrome of multicausal origin that involves genetic, neurological, and social factors in the child.^{2,3} Today, it is estimated that there are 70 cases of ASD for every 10,000 inhabitants in the world,⁴ being four times more common in boys.⁵ In Brazil, despite the scarcity of epidemiological studies that can provide a national estimate, recent studies have found that there are 27.2 cases of autism for every 10,000 inhabitants.^{6,7} The World Health Organization (WHO) states that autism affects one in every 100 children in the world and that the number of people diagnosed with autism exceeds 70 million.⁸

According to Lederman et al.⁹ environmental factors such as exposure to chemical agents, vitamin D and folic acid deficiency, use of substances such as antidepressants during pregnancy, prematurity, and low birth weight, multiple pregnancies, maternal infection during pregnancy, advanced parental age, smoking, and air pollution can increase the risk of ASD. In addition to suffering from significant deficits, a large part of this group has behavioral changes such as anxiety problems, obsessive-compulsive reactions, hyperactivity, attention deficit, sleep disturbances, difficulties in developing. Difficulty in understanding a relationship and difficulties in sensory changes. Which creates eating problems.¹⁰ Individuals with

ASD often suffer sensory alterations that influence their bodily and environmental experiences and may affect adaptive behavior, leading to problems in daily activities, with a negative impact on routines, including sleeping, participating in social events, and eating.¹¹ For children with this disorder they are much more selective. They are resistant to the introduction of new foods. They create barriers to new food experiences and are more likely to have feeding difficulties than children with typical development (TD).¹² The conduct of refusing some foods leads to the formation of eating habits, favoring the reinforcement of the foods that are consumed.¹⁰ Food selectivity (FS) is characterized by the triad, which is composed of rejection of food, decreased appetite, and lack of interest in food. The combination of these factors can promote a restriction of the varieties of foods consumed and extreme resistance to tasting new foods.^{13,14} This is related to behavioral changes existing in Autism Spectrum Disorder, associated with a sensory disorder and tactile defensiveness, which can directly compromise the acceptance and textures of food and affect about 40% to 80% of children with this disorder.¹²

Among these factors, food selectivity based on texture, type, color, and flavor of food, in addition to refusal and food indiscipline during the act of eating stand out.¹⁵ Crasta et al.¹⁶ described that this public has preferences and practices food idiosyncrasy (unusual form of behavior in society). This creates fewer choices in food because of texture and selectivity in food category. There is dysphagia, which results in refusal to eat. Exclusionary behavior can often be transient or persist to the distant development of the child with autism, because they are very selective. They have resistance to new things.^{13,14} The primary goal of food learning is to expand the diversity of foods that a child accepts to at least cover their needs.¹⁷ Achieving this single goal is especially complex for children with ASD, as selectivity is by far the most common problem encountered in this public.¹⁸ Therefore, the objective of this study was to evaluate the dietary and behavioral profile of children with Autism Spectrum Disorder (ASD) in city of Ouro Preto/MG.

Materials and methods

Materials

This is a research with document analysis and with a quantitative and qualitative approach to the data, developed from the analysis of medical records of 11 children and young people who attend the Association of Parents and Friends of the Exceptional (APAE) and the Psychosocial Care Center (CAPSij), both in Ouro Preto, Minas Gerais, and the responses obtained through a questionnaire presented to parents and/or guardians. The participants of this study were 11 children and young people between 2 and 24 years old, whose inclusion criteria were having a diagnosis of ASD and being authorized by their parents to participate in the research. The study was carried out after obtaining consent and approval from the Ethics Committee for Research with Human Beings of the Federal University of Ouro Preto, under the number (CAEE 59327422.3.0000.5150).

Data collection from medical records

The data obtained for the research came from the attendance records of the participating children, such as reports of evaluations and reassessments that occurred throughout the monitoring of the child or young person, taking into account the attendance records of each session of occupational therapy, speech therapy, psychology, psychiatry, physiotherapy, and multidisciplinary interventions. The medical records were studied for 3 (three) months (November 2022 to January 2023).

Development of the questionnaire

Based on the analyzes carried out in the medical records, a questionnaire was created to assess the dietary and behavioral profile of children with Autism Spectrum Disorder (ASD). Respondents were informed about the study and agreed to participate through the Free and Informed Consent Form (TCLE). The evaluation was carried out through an online questionnaire (Google Forms), according to Shan et al.¹⁹ with modifications. The questionnaire included questions about gender and age of the children, pregnancy, childbirth and postpartum, tastes of the children/youth with ASD, nutrition of the children/youth with ASD, relationships between the child/youth and family and friends, learning, physical and psychological characteristics, illnesses and health and/or physical development problems, behaviors, and family financial issues totaling 115 questions. The sample consisted of parents and/or guardians of 11 children and young people assisted by CAPSij and APAE in Ouro Preto/MG.

Evaluation of results

The medical records and some open questions from the questionnaire data were analysed through an online word cloud generator (www.wordclouds.com by Zigomatic, Vianen The Netherlands) accessed in February 2023. The word cloud is a relevant technique for mining unstructured texts. In a word cloud, each word has its size and color intensity governed by relevance in a given text, that is, the higher the frequency of a given term, the greater its representation in the generated cloud. According to Kim et al.²⁰ word clouds are useful for demonstrating prominent terms and for understanding associations and hierarchical relationships. Words like “that” and “she/he” were excluded because they did not represent relevant information or were linguistic crutches in writing, which would pollute the graphic representation. The data obtained simplified data were analysed using MS office Excel and the closed questions of the questionnaire were tabulated in Excel spreadsheets and discussed in percentage numbers for each question questioned.

Results and discussion

Eleven (11) medical records of patients from the Association of Parents and Friends of the Exceptional (APAE) and the Center for Psychosocial Care for Children (CAPSij), both in Ouro Preto, Minas Gerais, were examined, focusing on the considerations, behaviors, preferences and interactions of children and young people diagnosed with ASD. Table 1 shows the frequency of responses regarding gender and age of individuals assessed in this study. According to Table 1 it was observed that 81.8% of the children and young people assisted by the aforementioned institutions are male and none are aged between 0 and 2 years (baby). According to Maenner et al.²¹ Autism Spectrum Disorder is 4 times more common among boys than among girls, corroborating the data obtained by the present study. In Figure 1 after processing the 2,056 words analyzed, the word cloud was obtained as an output, in which the most used keywords in the medical records are presented. It can be seen, in the word cloud (Figure 1), that the most evident words are: “speech”, “feeding”, “child”, “birth”, “mother”, “overburdened”, “pregnancy”, “planned”, “likes”, “irritation”, “presents”, “play”, “difficulty”, “contact”, “objects”.

Table 1 Demographic differences by gender and age of individuals assisted by APAE and CAPSij

Variables		Frequency (%)
Sex	Feminine	18.2
	Masculine	81.8
	Baby	0
Age	Child	90.9
	Young	9.1

These words portray the records of the analyzed medical records, and may highlight some words such as “mother”, “difficulty”, “burdened”. As primary caregivers of children with ASD, mothers often face a variety of problems, such as a heavy financial burden, discrimination, stigma and ineffective therapy.²² It was reported by Estes et al.²³ an increased risk of anxiety and depressive symptoms in mothers of children with ASD compared to the risk in mothers of children without ASD. According to Heim et al.²⁴ mothers of individuals with ASD have considerable alterations in the hypothalamic-pituitary-adrenal (HPA) axis, the axis responsible for responses to internal and external stimuli, in comparison with mothers of the same age of typical children, and, according to Yehuda et al.^{25,26} Heim et al.²⁴ and Miller et al.²⁷ these alterations found in this axis of autistic mothers are similar to those found in other groups that experienced chronic stress, including parents of children with cancer, combat soldiers, Holocaust survivors and individuals suffering from PTSD (Post-traumatic Stress Disorder). Table 2 shows the frequency distribution of responses on the relationship of patients assisted in the institutions of this study with family and friends. It was observed that 90.9% of the analyzed autistic individuals have their mother as a reference and 63.6% are totally dependent on their mother, which can generate these changes leading to their overload. “Irritation” was also an evident word in the word cloud (Figure 1).

Table 2 Frequency distribution of response about the relationship with family and friends

Questions		Frequency (%)
Do you relate better with adults than with children?	Yes	72.7
	No	27.3
Do you have the mother as a reference?	Yes	90.9
	No	9.1

Table Continued...

Questions	Frequency (%)
Is it totally dependent on the mother?	Yes 63.6 No 36.4
Do you have a good relationship with your father or father figure?	Yes 81.8 No 18.2



Figure 1 Word cloud produced from the medical records of children and young people with ASD.

Table 3 presents the results obtained on irritability of children/young people evaluated in the present study. It is noted that 45.5% of the evaluated individuals present aggressive behavior, with 63.6% presenting irritability when missing a game or dynamic and 100% presenting irritability when being contradicted. According to studies by Mayes et al.²⁸ Simonoff et al.²⁹ and Mandy et al.³⁰ autistic young people have high rates of irritability, and, according to Gadow et al.³¹ and Maskey et al.³² in autistic populations, high levels of irritability often manifest as behavioral problems such as oppositional behavior, aggression, tantrums, and severe noncompliance. Aspects related to pregnancy and childbirth were also highlighted in the word cloud (Figure 1). Table 4 shows the frequency distributions of answers about pregnancy, childbirth, post childbirth and breast-feeding of children/young people assisted. It was observed that about 70% of the analyzed pregnancies were unplanned, but 100% of them were well accepted. In addition, all mothers received prenatal care and only 18.2% had complications during pregnancy, among these complications, the most cited was arterial hypertension. More than 90% of mothers did not use alcoholic beverages, narcotic substances and/or cigarettes during pregnancy and most deliveries (63.6%) were natural. Birth was premature in 18.2% of cases and post-term in 27.3% of cases, with 9.1% of deliveries using forceps. Regarding breastfeeding, 90.9% of the mothers breastfed, with more than 60% breastfeeding for more than 6 months. A study carried out by Hadjkacem et al.³³ found that the risk factors retained for autism were male gender, prenatal urinary tract infection, acute fetal distress, difficult labor and respiratory infection. Hypertension in pregnancy largely affects maternal and child health and is also gaining attention as a possible risk factor for mental and neurodevelopmental disorders in offspring.³⁴ Furthermore, evidence suggests that the nutritional status of the newborn, particularly the duration of breastfeeding, plays a key role in the pathogenesis of autism spectrum disorder.^{35,36}

Table 3 Frequency distribution of response about irritability of assisted children/young people

Questions	Frequency (%)
Do you show aggressive behavior?	Yes 45.5 No 54.5
Are you irritable when missing a game/dynamic?	Yes 63.6 No 36.4
Are you irritable when you are contradicted?	Yes 100 No 0

Table 4 Frequency distribution of response about pregnancy, childbirth, post childbirth and breast-feeding of assisted children/young people

Questions	Frequency (%)
Pregnancy	
Was the pregnancy planned?	Yes 27.3 No 72.7
Was the pregnancy well accepted?	Yes 100 No 0
Did you have prenatal care?	Yes 100 No 0
Were there complications during the pregnancy?	Yes 18.2 No 81.8
Did you use alcoholic beverages, narcotic substances and/or cigarettes during pregnancy?	Yes 9.1 No 90.9
childbirth and post childbirth	
What is the mode of childbirth?	normal/natural 63.6 cesarean section 36.4
Were there any complications at childbirth?	Yes 18.2 No 81.8
Was the childbirth premature?	Yes 18.2 No 81.8
Was the childbirth post-term?	Yes 27.3 No 72.7
Childbirth with forceps?	Yes 9.1 No 90.9
Breast-feeding	
Were you breast-feeding?	Yes 90.9 No 9.1
Breast-feeding was exclusive for how long?	Less than 6 months 0
	6 months 27.3
	More than 6 months 63.6
	was not breastfed 9.1

Another highlighted word in the cloud was “food” (Figure 1), being one of the reported characteristics most present in the behavior of patients/students assisted in the institutions of the present study. Also, in Figure 1, the word “selectivity” was observed, which in the case of the medical records evaluated is directly related to the word “food” and is a term used to designate the behavior of rejection of food, and decreased appetite. It is the absence of interest in food.^{13,14} According to Apa¹ and Tanner et al.³⁷ food selectivity is twice as common in children with Autism Spectrum Disorder than in typical

children. According to the answers given by parents or guardians in the questionnaire, all children and young people with ASD in the present study show food selectivity, with 36.4% showing intense selectivity (food refusal and/or rejection of most foods and/or food groups), 27.3% with moderate selectivity (rejection of several foods in one or more food groups) and 36.4% with mild selectivity (rejection of specific foods, but consuming items from all food groups) (Figure 2). Figure 3 shows the sensory aspects related to food refusal reported by parents and/or guardians. It was observed that texture is the sensory aspect of most food refusal (81.8%) (Figure 3) followed by flavor (63.6%), odor (36.4%) and presentation form (36.4%). Figure 4 shows the word cloud of responses from parents and/or guardians about which foods are refused in terms of texture.

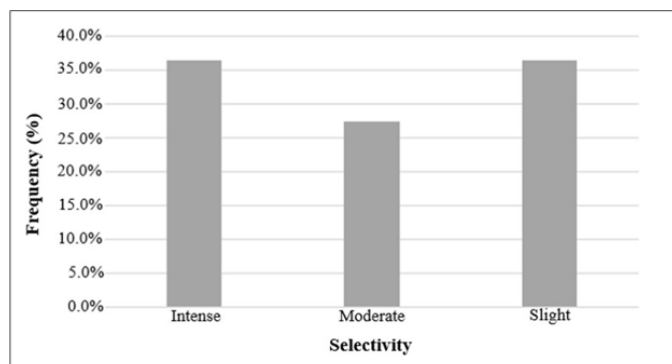


Figure 2 Intensity of food selectivity of children/youths.

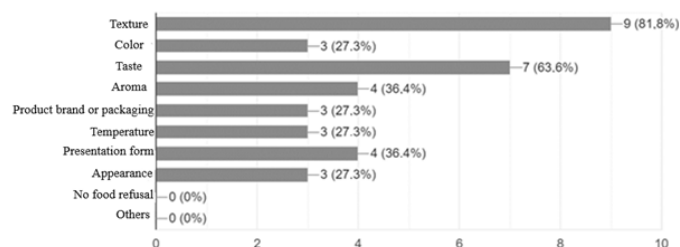


Figure 3 Sensory aspects linked to food refusal of assisted children/young people.

It was observed that beans, pumpkin, rice, soup, pasta, yams, tomatoes, melons, watermelons, bananas, and apples are the foods most rejected (Figure 4), with attributes related to oily texture, soft, wet, granular, pasty, porous and velvety are the most repudiated. Still, it was observed that, in relation to the method of preparation, those foods prepared with peel, beaten, mixed or whole are the most refused. According to Page et al.³⁸ the foods least consumed by children with ASD are generally fruits, greens, vegetables, meats, and some soft cereals. Still, Chistol et al.³⁹ reports that these foods are usually prepared in complex consistencies, which are generally rejected by children with ASD who have oral sensory hyperresponsiveness. Therefore, children with ASD who exhibit this atypical sensory response generally prefer crunchy, uniform and semi-dry textures.⁴⁰ On the other hand, the foods most consumed by the parents and/or guardians of the analyzed children and young people with ASD were, for the most part, foods without great nutritional value, such as sweets, pasta and sugary drinks (Figure 5).

Studies on the trend of changes in the dietary pattern of the Brazilian population in recent decades highlight the increased consumption of meat and industrialized foods (soda, biscuits, and ready-to-eat meals) and the reduction in the consumption of legumes, roots and tubers,

fruits and vegetables.^{41,42} These products, which contain sugar and fat, are the cheapest, which consequently induces their consumption by the low-income layer; therefore, this part of the population ends up suffering from obesity and diseases resulting from a poor diet.⁴³ Based on the questionnaire presented, more than half of the evaluated public (54.5%) receive a family allowance or other government aid and 9.1% have health consequences due to food selectivity, including high cholesterol and anemia. The preference of individuals with ASD for processed foods that are generally high in energy and poor in nutrients was reported by Cermak et al.¹⁷ Suarez et al.⁴⁴ Hubbard et al.⁴⁵ and Johnson et al.⁴⁰ In Table 5 are the frequency data related to tastes, reading, speaking and writing of the assisted children/young people.



Figure 4 Word cloud with foods and their characteristics most rejected by the children/young people assisted.



Figure 5 Word cloud of foods most consumed by assisted children and young people.

Table 5 Frequency distribution of answers about tastes, reading, speech and writing of assisted children/young people

Questions	Frequency (%)
Like to read?	Yes 9.1
	No 90.9
Do you like to play with other children?	Yes 18.2
	No 81.8
Do you like to draw?	Yes 63.6
	No 36.4
Do you like to write?	Yes 27.3
	No 72.7

Table Continued...

Questions		Frequency (%)
Do you have speech delay?	Yes	72.7
	No	27.3
Do you have delay in reading?	Yes	90.9
	No	9.1
Are you interested in the area of languages (Portuguese)?	Yes	9.1
	No	90.9
Are you interested in English or another foreign language?	Yes	63.6
	No	36.4
Presents stereotyped speech	Yes	72.7
	No	27.3
Does it present infantile speech?	Yes	45.5
	No	54.5
Do you maintain eye contact?	Yes	63.6
	No	36.4
Has elective mutism	Yes	36.4
	No	63.6

It is noted that only 9.1% of individuals with ASD at present like to read (Table 5). In addition, 90.9% of these have a delay in reading and 90.9% are not interested in the language area when focused on the Portuguese language. However, in relation to the foreign language (English) 63.6% are interested. Regarding the tastes and learning of children and young people with ASD, Boyer & Mailloux⁴⁶ reported that individuals with ASD have specific difficulties in the cognitive mechanism necessary to represent mental states and, according to Davidson & Weismer⁴⁷ the factors that most contribute to learning disorders are interpersonal relationship difficulties and sociocognitive disorders. According to Nation et al.⁴⁸ Huemer & Mann⁴⁹ and Lucas & Norbury⁵⁰ the majority of the population with ASD has difficulty in the area of understanding. Westerveld et al.⁵¹ argued that learning to read is just another challenge for children with autism, since their study found that approximately 30% to 60% of these children struggle with literacy skills.

The writing of individuals with ASD is marked by delay and difficulty.⁵² It was observed that 72.7% of the evaluated children/young people do not like to write (Table 5). Studies show that handwriting quality in children with autism, as well as reduced handwriting speed, are worse when compared to typical children.⁵³⁻⁶⁰ It was observed that 72.7% of the evaluated individuals presented speech delay and stereotyped speech (automatic repetition of a word, syllable or sound, which is interspersed between sentences, without any purpose). Still, about 45% have infantile speech and 63.6% have elective mutism (only talk or answer a restricted number of people). Some children with ASD may not be able to communicate using speech or language, or have very limited speaking skills, while others may have a rich vocabulary and be able to talk about specific subjects in detail. Thus, it can be inferred that great difficulty in speech can bring harm to the child or young person with ASD. In addition, the absence of developed speech or language affects the ability of children with ASD to interact with other people, especially with people their age.⁶¹ This fact can be verified in the present study, in which 81.8% of the evaluated individuals do not like to play with other children of their age and 72.7% relate better with adults (Tables 2 and 5). Still, it was observed that 36.4% of the evaluated children/young people do not maintain eye contact. According to Quill⁶² individuals on the autism spectrum have difficulty initiating interactions, and combining eye contact and gestures, and these deficiencies hinder their participation in social interaction.

Conclusion

The study showed that there is an indication of a relationship between food selectivity and sensory refusal of certain foods due to their texture, raising the hypothesis that this sensory aspect may be responsible for the low consumption of vegetables, fruits, and greens in this group and the high search for processed foods, sugary foods and nutrient-poor foods. In addition, it was found that the overload of mothers of children with ASD is a point of attention and that this overload is related to the great dependence of these individuals on their mothers. This may be in part due to the delay in learning and the difficulties in learning and social interactions noted in the study, requiring the mother to perform simple tasks and more complex tasks. In view of this, further studies are suggested with larger samples in order to understand the entire dietary and behavioral profile of individuals with ASD in different age groups and also practical studies aimed at the elaboration of healthy foods with textures with greater acceptance by children with ASD and elaboration of practical courses or mini-courses aimed at this public, aiming at their greater autonomy.

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Conflicts of interest

The authors declare that they don't have any conflicts of interest.

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