

Risk classification in children with autism spectrum disorder and identification of potential for early tooth loss due to dental caries: an observational cross-sectional clinical study

Classificação de risco em crianças com transtorno do espectro autista e identificação de potencial para perda dentária precoce por cárie dentária: estudo clínico transversal observacional

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Resumo

Introdução: O transtorno do espectro autista (TEA) é uma desordem do desenvolvimento neurológico que afeta a comunicação, o desempenho social, comportamental e intelectual. **Objetivo:** O objetivo do presente estudo foi analisar o risco de cárie em crianças com TEA e crianças com desenvolvimento neurotípico (DN). **Material e método:** Foram incluídas 116 crianças, sendo 55 com TEA e 61 com DN. Os pais responderam a um questionário sociodemográfico. Todas as crianças foram submetidas a exame clínico e à classificação de risco segundo a Classificação de Risco às Principais Afecções Bucais–SES/SP, conforme preconizada pela Resolução SS – 12. Os dados foram submetidos a análise estatística, considerando nível de $\alpha=5\%$. **Resultado:** Dentre as crianças, 72 eram do sexo masculino e 44 do feminino ($p<0,05$). Na análise do fator cárie, observou-se diferença significativa entre os grupos na condição de dentes hígidos, com maior prevalência no grupo DN ($p<0,05$), nas demais variáveis, não houve diferença significativa. No fator biofilme, foi observada diferença significativa entre os grupos tanto nos riscos baixo quanto alto ($p<0,05$). Em relação ao risco de cárie, verificou-se diferença significativa entre os grupos, sendo observado maior risco no grupo TEA ($p<0,05$). **Conclusão:** As crianças com TEA apresentam maior risco de cárie quando comparado ao grupo DN, segundo a avaliação de classificação de risco.

Descritores: Transtorno do espectro autista; cárie dentária; saúde bucal.

Abstract

Introduction: Autism spectrum disorder (ASD) is a neurodevelopmental condition that affects communication, as well as social, behavioral, and cognitive functioning. **Objective:** The main objective was to analyze the risk of caries in children with ASD compared to those with ND. **Material and method:** A total of 116 children participated in the study, including 55 diagnosed with ASD and 61 with ND. Parents completed a sociodemographic questionnaire. All children underwent a clinical oral examination and were classified according to the Risk Classification for Major Oral Conditions–SES/SP, as outlined in Resolution SS–12. Statistical analyses were conducted with a significance threshold of $\alpha = 0.05$. **Result:** Of the participants, 72 were male and 44 female ($p < 0.05$). A significantly higher prevalence of sound teeth was observed in the ND group ($p < 0.05$), while no significant differences were found for other variables. Regarding biofilm accumulation, significant differences were noted in both low- and high-risk categories ($p < 0.05$). The ASD group demonstrated a significantly higher risk for dental caries ($p < 0.05$). **Conclusion:** Children with ASD exhibited a greater risk of developing dental caries compared to their neurotypical peers, as determined by the SES/SP risk classification.

Descriptors: Autism spectrum disorder; dental caries; oral health.



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INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impairments in communication, social interaction, behavior, and cognitive functioning. Individuals with ASD frequently display restricted and repetitive patterns of behavior and interests¹.

Over the past two decades, the global prevalence of ASD has increased markedly². According to the latest data from the Brazilian Institute of Geography and Statistics (IBGE), the 2022 Demographic Census identified approximately 2.4 million individuals diagnosed with ASD in Brazil, representing 1.2% of the population aged two years and older. Among students aged six years and older, 760,800 were diagnosed with ASD, accounting for 1.7% of the school population—indicating a higher prevalence among children and adolescents³. ASD is approximately four times more prevalent in males than in females².

Children with ASD often present additional risk factors that may compromise oral health, including a preference for soft and sugary foods and masticatory difficulties, which increase susceptibility to dental caries⁴. Furthermore, challenges such as limited manual dexterity, the need for caregiver supervision during tooth brushing^{4,5}, and sensory sensitivities to toothpaste flavors or textures⁶ may contribute to increased plaque accumulation and a higher incidence of gingivitis⁵.

Although ASD is not associated with specific oral manifestations, several studies have reported a higher prevalence of dental caries^{4,5,7,8} and periodontal conditions such as gingivitis and gingival hyperplasia⁷⁻⁹ in this population. Conversely, other studies have found lower caries prevalence^{9,10} and reduced plaque indices¹⁰ among children with ASD.

Motor coordination difficulties and limited cooperation during oral hygiene routines further contribute to plaque accumulation and elevate the risk of dental caries and periodontal disease^{4,5}. Given the evidence suggesting increased susceptibility to oral health issues among individuals with ASD, it is crucial to assess these conditions in children with ASD and compare them to those with neurotypical development (ND), using the risk classification criteria established by the São Paulo State Department of Health. This study hypothesized that children with ASD would exhibit a higher prevalence of dental caries and gingivitis than ND children, due to the oral hygiene challenges often encountered by caregivers, which are exacerbated by sensory sensitivities common in this population. The main objective was to analyze the risk of caries in children with ASD compared to those with ND.

MATERIAL AND METHOD

Study Design

This cross-sectional observational clinical study was conducted between January 2023 and January 2025. The research protocol was approved by the Human Research Ethics Committee of the School of Dentistry of Araçatuba, UNESP (CAAE: 59159422.0.0000.5420), and complied with the ethical principles outlined in the Declaration of Helsinki (1975).

Sample Size Calculation

The sample size was determined based on a population of 200 individuals with ASD receiving outpatient dental care at the Center for Dental Assistance for People with Disabilities (CAOE). Assuming a homogeneous distribution, a sampling error of 10%, and a precision level of 5%, the minimum required sample size for a 95% confidence interval was 96 participants, equally distributed between the ASD group ($n = 48$) and the ND group ($n = 48$). The calculation was performed using the online tool available (<https://comentto.com/calculadora-amostal/>).

Sample Selection

Participants were selected via simple random sampling. A total of 116 children aged 5 to 12 years were included: 61 (52.5%) neurotypical children recruited from the Pediatric Dentistry Clinic and 55 (47.4%) children diagnosed with ASD receiving care at CAOÉ, both affiliated with the School of Dentistry of Araçatuba (FOA/UNESP). Legal guardians were individually informed about the study and signed an informed consent form. Children capable of understanding the study also received an assent form, signed by their guardians.

Inclusion and Exclusion Criteria

Inclusion criteria encompassed children aged 5 to 12 years, of both sexes, with a confirmed diagnosis of ASD levels 1, 2, or 3^{11,12}. For the ND group, the same criteria applied, excluding the ASD diagnosis. Exclusion criteria for both groups included lack of cooperation during oral examination, unstable general health status, and presence of hematological disorders^{11,12}.

Examiner Calibration

Prior to data collection, examiner calibration was conducted to ensure consistency in the application of evaluation forms and risk classification criteria.

Sociodemographic Questionnaire

A structured sociodemographic questionnaire was administered to parents or legal guardians by a single examiner. The instrument included questions regarding patient identification, duration of dental follow-up, systemic and behavioral characteristics, oral hygiene practices, and parental knowledge of oral health^{11,12}.

Clinical Parameters

Caries risk was assessed through clinical oral examinations based on the “Risk Classification for Major Oral Conditions–SES/SP,”¹³. The risk of dental caries, classified as low, moderate, or high, was determined based on the condition of the caries-related factor and the presence or absence of biofilm. The classification criteria included: (A) sound tooth structure; (B) presence of restoration; (C) chronic caries or provisional restoration; (D) active white spot lesion; (E) pit, fissure, and groove lesions without evident pulpal involvement; (F) proximal surface lesions, incisal edge angles, and cervical third lesions without evident pulpal involvement; and (G) suspected pulpal and periapical involvement¹³.

Statistical Analysis

Data were compiled and analyzed using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). A significance level of $\alpha = 0.05$ was adopted for all statistical tests. Associations and correlations between the ND and ASD groups were evaluated using Student’s t-test for continuous variables and the chi-square test for categorical variables, with Bonferroni post hoc correction. Results were expressed as arithmetic means or percentages.

RESULT

A total of 116 children aged 5 to 12 years participated in the study, comprising 61 (52.6%) from the ND group and 55 (47.4%) from the ASD group. Of these, 72 were male (62.1%) and 44 female (37.9%) ($p < 0.05$; Figure 1), with a significantly higher proportion of males in the ASD group compared to the ND group ($p < 0.05$). The mean age was 9.01 ± 2.30 years in the ASD group and 8.21 ± 2.12 years in the ND group.

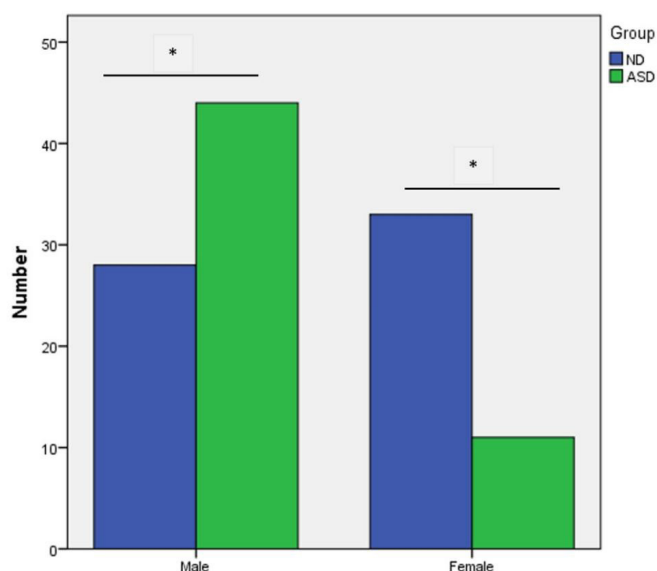


Figure 1. Distribution of sex in the ND and ASD groups. *Significant difference between groups.

According to caregiver reports on functional independence, 67.2% of children in the ND group were classified as independent, whereas 69.1% of those in the ASD group were considered partially dependent ($p < 0.05$). Regarding oral hygiene, 63.6% of children with ASD were dependent on assistance, while 82% of children in the ND group were independent ($p < 0.05$; Table 1). No statistically significant differences were observed between groups in other variables, including dietary habits, frequency of daily toothbrushing, perceived oral health status, oral hygiene quality, and presence of oral discomfort ($p > 0.05$; Table 1).

Caries-Related Factors

Analysis of caries-related parameters (Table 2) revealed a statistically significant difference in the prevalence of sound teeth, which was notably higher in the neurotypical development (ND) group compared to the autism spectrum disorder (ASD) group. The most frequently observed type of carious lesion in both groups was located in pits and fissures, without evidence of pulpal involvement.

Biofilm Factor

The biofilm parameter was evaluated based on the presence of gingivitis affecting at least three dental elements. Gingivitis was classified as “negative” when absent and “positive” when present in three or more teeth. A statistically significant difference was identified between the groups. In the ASD group, gingivitis was observed in 100% of participants, whereas in the ND group, the prevalence was 85.2%. Conversely, absence of gingivitis was recorded in 0% of the ASD group and 14.8% of the ND group (Figure 2).

Table 1. Sociodemographic characteristics of the ND and ASD groups

Variables	GROUPS	
	ND (%)	ASD (%)
General Dependence		
Independent	67.2 ^a	30.9 ^b
Partially dependent	32.8 ^a	69.1 ^b
Oral Hygiene Dependence		
Independent	82 ^a	36.4 ^b
Dependent	18 ^a	63.6 ^b
Diet		
General	98.4 ^a	92.7 ^a
Soft	1.6 ^a	7.3 ^a
Toothbrushing Frequency per day		
0 times/day	0 ^a	1.8 ^a
1 time/day	14.8 ^a	5.5 ^a
2 times/day	45.9 ^a	49.1 ^a
3 times/day	39.3 ^a	43.6 ^a
Perception of Oral Health		
Good	55.7 ^a	65.5 ^a
Average	37.7 ^a	29.1 ^a
Poor	6.6 ^a	5.5 ^a
Oral Hygiene Quality		
Satisfactory	59 ^a	56.4 ^a
Unsatisfactory	41 ^a	43.6 ^a
Oral Discomfort		
Yes	18 ^a	18.2 ^a
No	82 ^a	81.8 ^a

Abbreviations: ND = neurotypical development; ASD = autism spectrum disorder. Different superscript letters (a, b) indicate statistically significant differences between groups according to Bonferroni post hoc test.

Table 2. Distribution of caries-related conditions according risk classification in ND and ASD groups

Caries-related factors	ND (%)	ASD (%)	p-value
A – Sound teeth	68.9	45.5	p < 0.05
B – Presence of restorations	1.6	3.6	ns
C – Chronic caries or provisional restoration	0	0	ns
D – Active white spot lesion	0	3.6	ns
E – Carious lesion in pits and fissures without pulpal involvement	29.5	45.5	ns
F – Carious lesion on proximal, incisal, or cervical surfaces without pulpal involvement	0	1.8	ns
G – Suspected pulpal involvement or fistula	0	0	ns

Abbreviations: ND = neurotypical development; ASD = autism spectrum disorder; ns = not significant. Pearson's chi-square test was applied for each variable.

Caries Risk Assessment

Caries risk was evaluated based on the SES/SP classification criteria, revealing a statistically significant difference between the groups. In the ND group, 16.4% of participants were classified as low risk. In contrast, all individuals in the ASD group (100%) and 83.6% of those in the ND group were categorized as high risk (Figure 3).

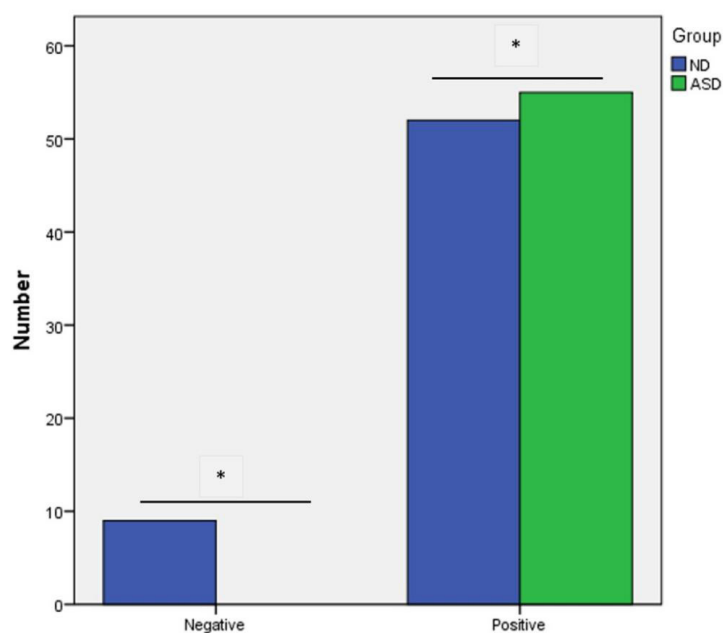


Figure 2. Biofilm status observed in the ND and ASD groups. *Significant difference between groups.

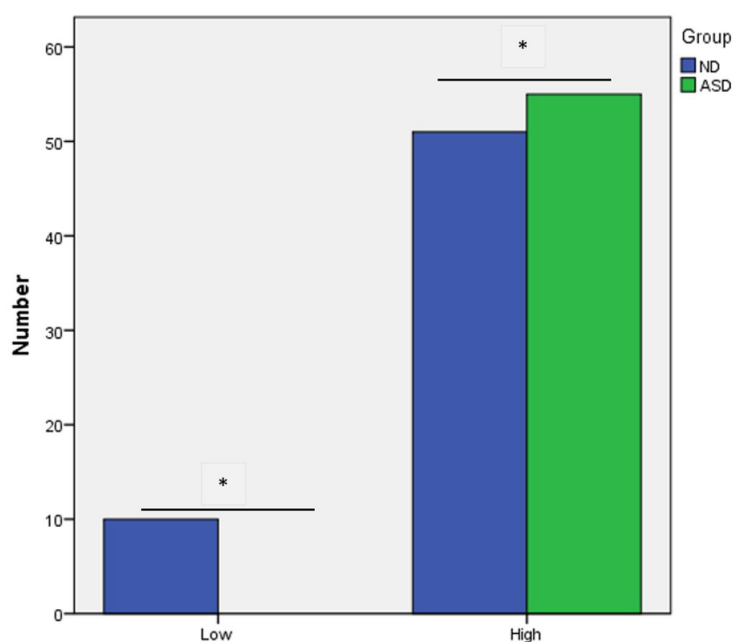


Figure 3. Distribution of caries risk levels in ND and ASD groups. *Significant difference between groups.

Overall, the carious lesions identified in the study population were considered clinically manageable, with no cases requiring tooth extraction or endodontic intervention. Lesions affecting permanent molars were observed in 16 children (13.6%), including 9 from the ASD group and 7 from the ND group (Figure 4). When analyzed proportionally, 16.4% of children with ASD and 11.5% of those with ND presented this type of lesion, although the difference was not statistically significant. Despite the slightly higher frequency in the ASD group, the lesions were predominantly classified as “pit and fissure caries without pulpal involvement,” indicating a low likelihood of requiring invasive treatment.

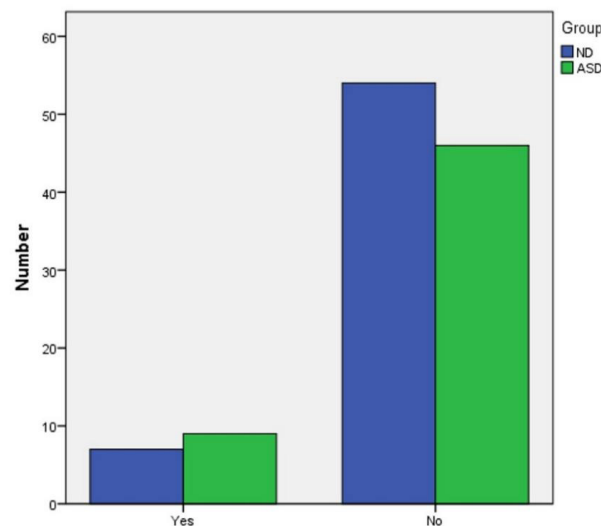


Figure 4. Number of children with caries in permanent molars in the ND and ASD groups.

DISCUSSION

In the present study, a higher prevalence of males was observed in the ASD group. This finding is consistent with existing literature indicating a greater incidence of ASD among males^{12,14,15}, although some studies have reported a predominance of females among children with ASD¹⁶. Given the broad spectrum of symptoms and severity levels encompassed by ASD, the current sample—composed predominantly of children classified as level 1—may not fully represent the heterogeneity of the condition. As such, the generalizability of the findings and recommendations may be limited.

Children in the ASD group demonstrated greater dependence in both general and oral health care compared to those in the ND group, which may be associated with increased disorder severity¹⁴. Caregiving responsibilities were predominantly assumed by mothers, corroborating previous studies identifying women as the primary caregivers for children with special needs^{12,14,15}. This reflects a persistent societal pattern in which women bear the majority of domestic and caregiving duties, while fathers primarily contribute through financial support¹⁵.

Motor coordination difficulties and limited cooperation during toothbrushing may contribute to plaque accumulation, thereby increasing the risk of dental caries and periodontal disease^{4,5}. No statistically significant differences were found between groups regarding daily brushing frequency, contrasting with findings by Agbor et al.⁸, who reported that over 70% of their sample brushed only once daily. However, flossing frequency was notably low among children with ASD, primarily due to oral sensitivity, which impairs effective hygiene even under caregiver supervision¹⁷. Consequently, children and adolescents with ASD tend to exhibit poorer oral hygiene and higher rates of gingival disease compared to their neurotypical peers¹⁸.

Although children with ASD do not present oral characteristics directly attributable to their systemic condition¹⁹, they appear more susceptible to microbial imbalances in the oral cavity, such as dysbiosis—particularly when xerostomia is induced by medication use—which may increase the risk of dental caries and periodontal disease²⁰.

Both groups tested positive for biofilm presence. These findings align with those of Diab et al.²¹, who reported greater gingival inflammation and poorer oral hygiene in children with ASD compared to ND children. Similarly, AlHumaid et al.²² observed a high prevalence of gingival disease among individuals with ASD. A systematic review further confirmed that individuals with ASD exhibit deficient oral hygiene and elevated rates of gingival disease compared to neurotypical individuals¹⁸. In contrast, Rodrigues et al.¹² found that although individuals with ASD relied on others for oral hygiene, they maintained satisfactory plaque control.

In this study, caries risk assessment revealed a significantly higher risk in the ASD group. Previous research supports this finding: Prakash et al.²³ reported caries prevalence of 80% in children with ASD versus 62.6% in ND children, while Ashour et al.²⁴ found a prevalence of 65.8%, with variation across ASD severity levels. AlHumaid et al.²² documented high prevalence in both primary (76%) and permanent teeth (68%), emphasizing the importance of parental practices such as reduced sugar intake and consistent oral care during dental transitions. Although systematic reviews like Asiri et al.²⁵ associate higher caries prevalence in children with ASD with poor hygiene and elevated sugar consumption, others, such as Lam et al.²⁶, argue that ASD is not inherently a predisposing factor for oral diseases. These discrepancies underscore the influence of cultural and sociodemographic variables across study populations.

Additional correlations between caries history and the variables studied revealed no statistically significant differences. Regarding clinical management, conservative treatment was considered appropriate in most cases, with extractions recommended only for teeth nearing physiological exfoliation.

Despite the increased susceptibility to oral diseases, these conditions can be effectively managed through individualized preventive strategies developed by dental professionals. Such strategies should aim to introduce children with ASD to specialized dental care early, facilitating adaptation to clinical environments¹⁹. However, communication challenges commonly associated with ASD may hinder comprehension of oral hygiene instructions. Moreover, resistance to change due to repetitive behaviors and rigid routines may complicate the adoption of new hygiene habits²⁷. Meta-analyses have highlighted substantial parental concern regarding the oral health of children with ASD, reinforcing the need for caregiver education through targeted programs and initiatives²⁵.

CONCLUSION

Based on the findings of this study, children with ASD aged 5 to 12 years exhibited a significantly higher risk of dental caries compared to their neurotypical peers.

AUTHORS' CONTRIBUTIONS

Alessandra Marcondes Aranega: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing – original draft preparation, Writing – review and editing, Visualization, Supervision, Project administration, Funding acquisition. Daniela Atili Brandini: Conceptualization, Methodology, Software, Validation, Investigation, Writing – review and editing, Visualization, Supervision. Caio Jesus de Souza: Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – review and editing. João Victor Soares Rodrigues: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft preparation, Writing – review and editing. Leticia Helena Theodoro: Conceptualization, Methodology, Software, Resources, Writing – review and editing, Visualization, Supervision.

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CONFLICTS OF INTERESTS

The authors declare no conflict of interest.

DATA AVAILABILITY

Data is available on demand from referees.

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