Comparative Analysis of Oral Health Status Between Children with ASD and Neurotypical Children in Inclusive School Settings

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ABSTRACT:

Background: Oral health disparities between children with autism spectrum disorder (ASD) and their neurotypical peers have been increasingly recognized as a significant public health concern. Children with ASD face unique challenges including sensory hypersensitivities, dietary selectivity, difficulties with oral hygiene routines, and limited access to cooperative dental care, all of which may contribute to poorer oral health outcomes. Inclusive school settings, where ASD and neurotypical children study together, provide an accessible and ecologically valid environment in which to conduct comparative oral health assessments.

Objective: To compare the oral health status, including dental caries prevalence, gingival health, oral hygiene indices, and dental trauma history, between children with ASD and neurotypical children enrolled in inclusive school settings.

Methods: A cross-sectional comparative study was conducted in inclusive schools involving 120 children aged 6–14 years: 60 children with clinically confirmed ASD diagnoses (Group I) and 60 age- and gender-matched neurotypical children (Group II). Oral health was assessed using the DMFT/dmft index for dental caries, the Gingival Index (GI), the Simplified Oral Hygiene Index (OHI-S), and a structured dental trauma and oral habit survey. Parents completed a validated oral health behavior questionnaire.

Results: Children with ASD demonstrated significantly higher mean DMFT scores, poorer gingival health, higher OHI-S scores reflecting

worse oral hygiene, and a greater prevalence of dental trauma and parafunctional oral habits compared to neurotypical children. Mean DMFT scores were 4.8 ± 1.6 in the ASD group versus 2.3 ± 1.1 in the neurotypical group ($p < 0.001$).

Conclusion: Children with ASD in inclusive school settings exhibit significantly poorer oral health across all measured parameters compared to neurotypical peers. These findings underscore the urgent need for targeted school-based oral health promotion programs, caregiver education, and ASD-specific preventive dental strategies to reduce oral health inequities in this population.

Keywords: Autism spectrum disorder, oral health, dental caries, DMFT index, neurotypical children, inclusive schools, gingival index, oral hygiene, pediatric dentistry, school dental health.

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Introduction

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition characterized by persistent deficits in social communication and interaction, accompanied by restricted, repetitive patterns of behavior, interests, or activities [1]. The global prevalence of ASD has increased substantially over recent decades, with current estimates placing the figure at approximately 1 in 36 children in developed nations and rising proportions in low- and middle-income countries as diagnostic awareness improves [2]. Despite growing recognition of the multisystem health needs of autistic children, oral health remains a critically underaddressed dimension of their overall wellbeing, with persistent disparities documented across multiple domains of oral health status [3].

Children with ASD face a constellation of condition-specific factors that predispose them to poor oral health. Sensory processing differences, a hallmark feature of ASD, frequently manifest as oral hypersensitivity, making tooth brushing, flossing, and other routine oral hygiene practices intensely aversive experiences [4]. This oral tactile hypersensitivity often results in incomplete or entirely avoided oral hygiene, with caregivers reporting significant difficulty in establishing and maintaining daily brushing routines for their autistic children [5]. The resulting accumulation of dental plaque creates a substrate for the development of dental caries and gingival inflammation.

Dietary selectivity is another well-documented characteristic of ASD that carries significant oral health implications. A substantial proportion of autistic children exhibit restricted food repertoires with strong preferences for carbohydrate-rich, processed foods with specific textures, as well as aversion to fruits, vegetables, and other nutritionally diverse foods [6]. This pattern of dietary selectivity not only increases cariogenic substrate availability but also deprives the oral environment of the buffering and protective effects of a varied diet [7]. Additionally, the prolonged feeding durations and grazing patterns commonly observed in autistic children extend the contact time between fermentable carbohydrates and tooth surfaces, further elevating caries risk [8].

Behavioral and communication challenges intrinsic to ASD present additional barriers to oral health maintenance. Many autistic children experience profound difficulties with transitions, novel environments, and unexpected physical contact, all of which characterize the typical dental visit experience [9]. Dental anxiety and phobia are disproportionately prevalent in ASD populations, often resulting in complete avoidance of dental care and the accumulation of untreated oral disease [10]. Furthermore, certain ASD-associated parafunctional behaviors, including bruxism, pica, and self-injurious behaviors directed at the oral region, can cause direct physical damage to dental hard tissues, soft tissues, and supporting structures [11].

The inclusive school setting represents an increasingly prevalent educational model in many countries, reflecting policy commitments to educational equity and the integration of children with disabilities into mainstream educational environments [12]. Inclusive schools, by definition, enroll children with ASD alongside their neurotypical peers, creating a uniquely accessible and representative study context in which to conduct comparative oral health research. Unlike clinic-based studies, which may introduce selection bias toward children who are already accessing dental services, school-based assessments capture a broader cross-section of the ASD population, including those with limited healthcare access [13].

The DMFT index (for permanent dentition) and its primary dentition equivalent, the dmft index, remain the gold standard epidemiological tools for quantifying dental caries experience, measuring the cumulative number of decayed, missing, and filled teeth [14]. These indices, used alongside the Gingival Index (GI) of Loe and Silness and the Simplified Oral Hygiene Index (OHI-S) of Greene and Vermillion, provide a comprehensive, standardized picture of dental caries burden, periodontal health, and oral hygiene status respectively [15]. Together, these measures have been widely applied in pediatric oral health surveys and are well-validated for use in school-based epidemiological studies.

While several individual studies have reported higher caries prevalence and poorer oral hygiene in ASD children compared to neurotypical peers, the evidence base remains heterogeneous, with considerable variation in sample sizes, age ranges, assessment methodologies, and control group characteristics [16]. Many existing studies have been conducted in specialized clinic or special education settings, which may not reflect the oral health profile of the growing proportion of autistic children enrolled in inclusive mainstream educational environments [17].

Caregiver oral health knowledge, attitudes, and practices are recognized as critical determinants of pediatric oral health outcomes, and these factors may differ substantially between caregivers of autistic and neurotypical children [18]. Understanding parental oral health behaviors in the context of ASD is essential for designing effective preventive interventions. School-based oral health programs that incorporate caregiver education and support have demonstrated effectiveness in improving pediatric oral health outcomes in general populations, but their adaptation and testing for ASD populations remain limited [19].

Dental trauma, including crown fractures, luxation injuries, and tooth avulsions, represents an additional dimension of oral health that may be disproportionately prevalent in ASD children due to their higher rates of falls, reduced danger awareness, and the oral self-injurious behaviors associated with the condition [20]. Similarly, parafunctional habits such as bruxism, which has been reported at elevated frequencies in ASD populations, can cause significant attrition of dental hard tissues and contribute to temporomandibular joint dysfunction [11].

The present cross-sectional study was undertaken to comprehensively compare oral health status across multiple clinical parameters — dental caries, gingival health, oral hygiene, dental trauma history, and parafunctional habits — between children with ASD and neurotypical children in inclusive school settings. The findings are intended to generate robust epidemiological evidence that can inform the development of targeted, school-based oral health programs for ASD children and support advocacy for equitable oral healthcare access within inclusive educational frameworks [20].

Methodology

A cross-sectional comparative study was conducted across four inclusive primary and secondary schools in an urban district. The study population comprised 120 children aged 6–14 years divided into two groups: Group I consisted of 60 children with a confirmed diagnosis of ASD according to DSM-5 criteria, and Group II comprised 60 neurotypical children without any diagnosed neurodevelopmental condition, individually matched to Group I participants by age (± 6 months) and gender. Institutional ethics committee approval was obtained prior to study commencement, and written informed consent was

secured from the parents or legal guardians of all participating children. Child assent was obtained where developmentally appropriate.

Inclusion criteria for Group I required a confirmed ASD diagnosis documented by a developmental pediatrician or psychiatrist, enrollment in an inclusive school setting, and parental consent for participation. Children with co-occurring conditions causing significant cognitive impairment beyond ASD, those currently undergoing active orthodontic treatment, or those with craniofacial anomalies that would confound oral health assessment were excluded. Group II inclusion required confirmed absence of any neurodevelopmental diagnosis, age and gender matching to a Group I participant, and parental consent. Children in Group II with chronic systemic diseases known to affect oral health, or those currently on long-term medications with documented oral side effects, were excluded.

Oral health assessment was performed by two calibrated examiners under standardized conditions using natural light supplemented by a dental flashlight, a mouth mirror, and a CPI probe. Examiner calibration was conducted prior to the survey, with inter-examiner kappa agreement values exceeding 0.85 for all indices, confirming adequate reliability. The DMFT index was used to record caries experience in permanent teeth, and the dmft index was applied for primary teeth, following World Health Organization diagnostic criteria. The Gingival Index (GI) of Loe and Silness was used to assess gingival health at four sites per tooth, with scores ranging from 0 (healthy gingiva) to 3 (severe inflammation with spontaneous bleeding). The Simplified Oral Hygiene Index (OHI-S) of Greene and Vermillion was recorded by summing the Debris Index-Simplified (DI-S) and Calculus Index-Simplified (CI-S) scores, with higher values indicating poorer oral hygiene.

Dental trauma history was recorded using the Ellis classification system through clinical examination supplemented by parental history. Parafunctional oral habits including bruxism, mouth breathing, tongue thrusting, and digit sucking were documented by parental questionnaire validated for use in ASD populations. Parents of all children completed a structured oral health behavior questionnaire capturing toothbrushing frequency, fluoride toothpaste use, dietary habits, dental visit frequency, and barriers to dental care. Statistical analysis was performed using SPSS version 26.0. Independent samples t-tests compared continuous variables between groups, and chi-square tests analyzed categorical data. A p-value of less than 0.05 was considered statistically significant.

A total of 120 children completed the study assessments. Baseline demographic characteristics of both groups were comparable, confirming successful matching, as presented in Table 1. No statistically significant differences in age or gender distribution were identified between the groups at the outset of the study.

Table 1: Baseline Demographic Characteristics of Study Participants

Parameter	Group I (ASD)	Group II (Neurotypical)
Total Participants	60	60
Mean Age (years)	9.8 ± 2.3	9.7 ± 2.1
Gender (Male/Female)	46/14	44/16
Age Range (years)	6–14	6–14
School Type	Inclusive	Inclusive

Dental caries experience, as measured by DMFT and dmft indices, was significantly higher in Group I compared to Group II. Children with ASD recorded a mean DMFT score of 4.8 ± 1.6, compared to 2.3 ± 1.1 in neurotypical children, representing a statistically significant difference ($p <$

0.001). The mean dmft scores followed a similar pattern, as detailed in Table 2.

Table 2: Dental Caries Experience — DMFT and dmft Index Scores

Index	Group I (ASD)	Group II (Neurotypical)	p-value
Mean DMFT Score	4.8 ± 1.6	2.3 ± 1.1	< 0.001
Mean dmft Score	5.4 ± 1.9	2.8 ± 1.3	< 0.001
Caries-Free Children (%)	8.3%	31.7%	< 0.001
Untreated Caries (%)	73.3%	38.3%	< 0.001

Gingival health assessment using the Gingival Index revealed significantly poorer periodontal status in the ASD group. The mean GI score was 1.82 ± 0.47 in Group I compared to 0.93 ± 0.38 in Group II (p < 0.001), indicating moderate gingival inflammation in the ASD group versus mild inflammation in the neurotypical group. The distribution of GI scores across severity categories is presented in Table 3.

Table 3: Gingival Index (GI) Scores and Severity Distribution

GI Category	Group I — ASD (%)	Group II — Neurotypical (%)
Healthy (GI = 0)	5.0%	28.3%
Mild Inflammation (GI 0.1–1.0)	21.7%	55.0%
Moderate Inflammation (GI 1.1–2.0)	53.3%	15.0%
Severe Inflammation (GI 2.1–3.0)	20.0%	1.7%
Mean GI Score	1.82 ± 0.47	0.93 ± 0.38

Oral hygiene status assessed using the OHI-S demonstrated significantly worse oral hygiene in children with ASD. The mean OHI-S score was 3.21 ± 0.74 in Group I compared to 1.64 ± 0.58 in Group II (p < 0.001), reflecting poor oral hygiene in the ASD group versus fair oral hygiene in the neurotypical group. Component scores of the OHI-S are detailed in Table 4.

Table 4: Simplified Oral Hygiene Index (OHI-S) Component Scores

OHI-S Component	Group I (ASD)	Group II (Neurotypical)	p-value
Mean Debris Index-Simplified (DI-S)	1.88 ± 0.46	0.96 ± 0.34	< 0.001
Mean Calculus Index-Simplified (CI-S)	1.33 ± 0.41	0.68 ± 0.29	< 0.001
Mean OHI-S Total Score	3.21 ± 0.74	1.64 ± 0.58	< 0.001
OHI-S Category: Poor (%)	65.0%	10.0%	< 0.001
OHI-S Category: Fair (%)	28.3%	51.7%	< 0.05

OHI-S Category: Good (%)	6.7%	38.3%	< 0.001

The prevalence of dental trauma history and parafunctional oral habits was notably higher in the ASD group compared to neurotypical children, as presented in Table 5. Bruxism was the most frequently reported parafunctional habit in the ASD group, documented in 45% of children, compared to only 12% in the neurotypical group.

Table 5: Prevalence of Dental Trauma and Parafunctional Oral Habits

Parameter	Group I — ASD (%)	Group II — Neurotypical (%)
History of Dental Trauma	36.7%	13.3%
Bruxism	45.0%	11.7%
Mouth Breathing	38.3%	16.7%
Tongue Thrusting	21.7%	8.3%
Digit Sucking	18.3%	10.0%
Pica / Oral Self-Injurious Behavior	23.3%	0.0%

Parental oral health behavior survey findings are summarized in Table 6. Children with ASD were significantly less likely to brush twice daily, less likely to use fluoride toothpaste consistently, and had markedly fewer dental visits per year compared to neurotypical children. Additionally, a higher proportion of ASD caregivers reported significant barriers to accessing dental care for their child.

Table 6: Parental Oral Health Behavior Survey Findings

Behavior / Factor	Group I — ASD (%)	Group II — Neurotypical (%)
Twice-Daily Toothbrushing	28.3%	71.7%
Consistent Fluoride Toothpaste Use	41.7%	78.3%
Dental Visit in Past 12 Months	35.0%	73.3%
Caregiver-Reported Difficulty with Brushing	78.3%	13.3%
High-Sugar Diet Frequency (daily)	65.0%	28.3%
Reported Barrier to Dental Access	70.0%	18.3%

Figure 1: Comparative bar graph illustrating mean DMFT scores, mean Gingival Index scores, and mean OHI-S scores for children with ASD (Group I) and neurotypical children (Group II) in inclusive school settings. The ASD group consistently demonstrates significantly higher scores across all three oral health indices, reflecting greater caries burden, poorer gingival health, and worse oral hygiene status. Data bars

represent group means with standard deviation error bars; asterisks denote statistically significant between-group differences ($p < 0.001$).

Collectively, the results reveal a consistent and statistically significant pattern of oral health disadvantage in children with ASD across all measured parameters, including dental caries prevalence and severity, gingival inflammation, oral hygiene status, dental trauma history, and parafunctional habit burden. These findings are further compounded by oral health behavior data demonstrating lower frequencies of preventive behaviors and greater barriers to dental care access among ASD families compared to neurotypical counterparts.

Discussion

The findings of this comparative cross-sectional study provide compelling epidemiological evidence of significant oral health disparities between children with ASD and neurotypical peers in inclusive school settings. The substantially higher mean DMFT scores, poorer gingival health, worse oral hygiene indices, greater dental trauma prevalence, and higher burden of parafunctional habits observed in the ASD group, all supported by corroborating parental behavior data, collectively paint a concerning picture of oral health inequity that demands urgent attention from dental public health practitioners, school administrators, and policymakers.

The mean DMFT score of 4.8 ± 1.6 recorded in the ASD group, compared to 2.3 ± 1.1 in neurotypical children, is consistent with and extends the findings of Jaber (2011) [3], who reported significantly higher caries experience in autistic children compared to age-matched controls. The more than twofold difference in mean DMFT scores observed in the present study underscores the cumulative impact of the multiple ASD-associated risk factors for dental caries, including inadequate oral hygiene, cariogenic dietary patterns, and limited preventive dental care access. The particularly striking finding that only 8.3% of ASD children were caries-free, compared to 31.7% of neurotypical children, highlights the disproportionate caries burden carried by this population from a young age.

The significantly higher proportion of untreated caries in the ASD group (73.3% versus 38.3%) is a finding of profound clinical and public health significance. Untreated caries in childhood is associated with pain, sleep disturbance, difficulty eating, school absenteeism, and impaired quality of life [21]. For autistic children, who may have limited capacity to communicate dental pain, the consequences of untreated caries may be particularly severe and difficult to identify, potentially manifesting instead as behavioral changes or self-injurious behavior [22]. This finding reinforces the critical importance of proactive, school-based dental surveillance programs that do not rely solely on family-initiated dental visits, which are clearly insufficient in the ASD population.

The gingival health findings, with mean GI scores of 1.82 in the ASD group versus 0.93 in the neurotypical group, reflect the direct oral health consequences of the documented difficulties with toothbrushing in autistic children. Seventy-eight percent of caregivers in the ASD group reported significant difficulty assisting their child with toothbrushing, compared to only 13.3% of neurotypical caregivers, a stark disparity that directly explains the observed gingival inflammation differentials. These findings are concordant with those of Orellana et al. (2012) [23], who identified significantly higher plaque and gingival index scores in autistic adults and attributed these to oral hygiene deficits arising from sensory aversions to oral care. Addressing toothbrushing aversion through sensory desensitization approaches and occupational therapy input represents an important intervention avenue suggested by these data.

The OHI-S data further corroborate the oral hygiene findings, with 65% of ASD children classified in the poor oral hygiene category compared to only 10% of neurotypical children. The elevated Calculus Index scores in the ASD group (1.33 versus 0.68) suggest prolonged periods of inadequate plaque removal, consistent with the parental reports of infrequent twice-daily brushing (28.3% in ASD versus 71.7% in neurotypical children). These findings align with those of

Marshall et al. (2010) [24], who documented significantly higher plaque scores in autistic children and identified oral tactile sensitivity as the primary caregiver-reported barrier to oral hygiene maintenance. Fluoride varnish application by school dental teams and the use of adapted oral hygiene aids such as vibrating toothbrushes and flavored toothpastes may offer practical strategies for improving plaque control in this population.

The markedly higher prevalence of bruxism (45% versus 11.7%) observed in the ASD group is consistent with existing literature documenting elevated bruxism rates in ASD, with proposed mechanisms including dopaminergic dysregulation, antiepileptic medication side effects, and heightened stress arousal [25]. The clinical implications of bruxism in childhood include accelerated dental attrition, enamel fractures, dentinal hypersensitivity, and temporomandibular joint stress. Regular dental monitoring for bruxism-related tooth wear and appropriate management with occlusal splints where indicated should be incorporated into dental care protocols for autistic children. The significantly higher prevalence of pica and oral self-injurious behaviors in the ASD group (23.3% versus 0%) highlights a uniquely ASD-specific oral health risk factor with potential for traumatic dental and soft tissue injuries requiring specific clinical vigilance.

Dental trauma prevalence was significantly higher in the ASD group (36.7% versus 13.3%), which may reflect the greater risk of accidental falls associated with motor coordination difficulties prevalent in ASD, reduced danger awareness, and the direct oral trauma associated with self-injurious behaviors [26]. These findings have implications for injury prevention counseling for families of autistic children, including guidance on mouth guard use during physical activities and school sports, as well as environmental safety modifications to reduce fall risk.

The dietary behavior data, showing daily high-sugar food consumption in 65% of ASD children versus 28.3% of neurotypical children, directly implicates dietary selectivity as a key modifiable caries risk factor in the ASD population. Nutritional counseling that acknowledges the real constraints of ASD-related dietary selectivity while pragmatically reducing cariogenic exposure, delivered in a non-judgmental manner to caregivers, represents an important component of a comprehensive oral health promotion strategy for this population [27].

The finding that only 35% of ASD children had attended a dental visit in the past 12 months, compared to 73.3% of neurotypical children, and that 70% of ASD caregivers reported significant barriers to dental access, underscores the systemic failures in oral healthcare access for autistic populations. These barriers, which include dental professional anxiety about treating autistic patients, inadequate training in ASD management, long waiting times for specialized sedation services, and out-of-pocket cost burdens, require systemic solutions including expanded training of dental professionals in ASD management, development of accessible community dental services, and integration of oral health screening into inclusive school programs [28].

School-based oral health programs represent a particularly promising delivery platform for the ASD population identified in this study. By embedding oral health screening, preventive interventions such as fluoride varnish and fissure sealants, and caregiver education into the inclusive school environment, these programs can reach autistic children who may not be accessing community dental services. Future research should evaluate the effectiveness of ASD-adapted school dental programs in improving the oral health parameters identified in the present study as areas of significant disparity.

Conclusion

Children with ASD in inclusive school settings exhibit significantly poorer oral health compared to their neurotypical peers across all measured parameters, including dental caries experience, gingival health, oral hygiene status, dental trauma prevalence, and parafunctional oral habit burden. These disparities are underpinned by a complex interplay of ASD-specific sensory, behavioral, dietary, and systemic factors, compounded by inadequate preventive dental care access and caregiver challenges in maintaining oral hygiene routines. The findings establish a clear evidence

base for targeted oral health interventions in this population, including school-based oral health screening and preventive programs, caregiver education and support, ASD-adapted oral hygiene strategies, and advocacy for improved dental care access. Addressing oral health inequities in autistic children is a moral and public health imperative that requires concerted action across dental, educational, and policy domains.

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