

# Oral Health Assessment of Children with Autism Spectrum Disorder in Special Schools

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## ABSTRACT

**Background:** Sensory over-responsivity is an important factor influencing the ability of children with an autism spectrum disorder to receive proper oral care. Dental care remains the most prevalent, unmet health care need for children with special health care needs.

**Aim and objective:** To assess the oral health of children with autism in special schools.

**Materials and methods:** A cross-sectional study was conducted to record the oral health problems of 142 autistic children attending special schools across the suburbs of Mumbai city in India. Clinical examination was carried out for the presence of dental plaque, gingivitis, caries, restorations, traumatic injuries, and self-injurious habits. The participants were divided into three groups based on their age.

**Results:** Children with primary and mixed dentition had a higher incidence of dental caries when compared with the permanent dentition group. Good oral hygiene was observed in the study population with a mean OHI-S score of  $0.88 \pm 0.79$ . Traumatic dental injuries, bruxism, drooling of saliva from the corner of the mouth, and self-injurious habits were also recorded.

**Conclusion:** Due to the nature of their neurological deficit and difficulty in providing dental treatment, it is recommended that preventive dental care be enforced on these children.

**Keywords:** Autism, Cross sectional study, Oral health status.

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## INTRODUCTION

Differently abled children are at a larger risk of poor oral health due to their restricting conditions and inadequate access to dental care. Individuals with special health care needs (SHCN) may be at a higher risk for oral diseases throughout their lifespan.<sup>1-3</sup> Patients with mental, developmental, or physical disabilities who cannot comprehend or assume accountability for, or co-operate with preventive oral health practices are especially vulnerable.<sup>4</sup> One such disabling condition is autism spectrum disorder (ASD), which is a set of neurodevelopmental disorders that are characterized by complex behavioral phenotype and deficits in both social and cognitive functions. Pervasive developmental disorder refers to an umbrella term to which ASD belongs. Autism spectrum disorder was first described in 1943 by an American child psychologist, Leo Kanner, and consists of the following five subtypes: (a) Autism disorder, (b) Asperger's syndrome, (c) Rett's syndrome, (d) Childhood disintegrative disorder, and (e) Pervasive developmental disorder-not otherwise specified.<sup>5</sup> It is distinguished by a characteristic triad of symptoms (a) impairments in social interactions, (b) impairments in communication, and (c) restricted interests and repetitive behavior.<sup>5</sup>

Self-injurious behavior occurs in 4–5% of autistic individuals and may range from self-pinching, scratching to severe self-biting or head banging.<sup>6</sup> Despite the predisposing factors that these children have, they do not seem to pose a higher risk for caries when compared with their healthy counterparts.<sup>7,8</sup> Few studies have documented the oral health status of children with autism.<sup>9-11</sup> However, PubMed literature search did not yield any study, aiming to assess the oral health problems in autistic children in Mumbai. Hence, the present study was conducted to determine the oral health status of children with autism across the suburbs of Mumbai and assess their parental knowledge and awareness regarding oral health.

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## MATERIALS AND METHODS

An observational, transversal study was carried out with 142 pediatric patients of age 3–17 years, diagnosed with autism and attending special schools spread across the suburbs of Mumbai City. This included “Khushi Pediatric Therapy Centre” and “Santosh Institute for Autism”. Ethical approval for the study was obtained from the institutional ethics committee (EC/PG-15/PEDO/2015). Participants were selected based on a diagnosis of autism from their school medical records. Autistic children associated with convulsion disorders, learning disorders, and attention deficit hyperactivity disorder (ADHD) were also included in the study. Initially, 148 autistic

children were selected for the study with parental consent. Out of these, six children exhibited extremely aggressive behavior due to which they were excluded from the study. Based on age, children were divided into three groups: primary dentition group (3–6 years), mixed dentition group (7–11 years), and permanent dentition group (12–17 years). All patients were examined by a single operator with the help of a mouth mirror and explorer under artificial light.

The children were assessed for clinical parameters like dental plaque, gingivitis, dental caries, restorations, bruxism, and self-injurious habits. A clinical observation form was developed to record the findings of the oral assessment. A visual inspection of the presence of plaque was considered a positive result.

Each student accompanied by his/her teacher was brought to the examination room and seated on an adjustable chair. The “Tell-Show-Feel-Do” technique was used to manage the behavior of all students. The WHO criteria were used to record dental caries.<sup>12</sup> The deft index was used to record dental caries in the primary dentition, the DMFT index for the permanent dentition, and deft and DMFT indices for the mixed dentition.<sup>13</sup> Gingival status was recorded as generalized or localized gingival inflammation depending on the amount of gingival redness and bleeding during the examination. Oral hygiene status was assessed using the Simplified Oral Hygiene Index (OHI-S) given by Greene and Vermillion<sup>14</sup> and its modification for the deciduous dentition as given by Miglani et al.<sup>15</sup> Bruxism was diagnosed based on the presence of wear facets on the incisal and occlusal surfaces. Traumatic dental injuries were recorded by visual examination.

### Questionnaire

A structured questionnaire was distributed to all the parents of the participating children in this study. The aim was to extract information regarding the sociodemographic data regarding parents’ occupation and educational status and assess their knowledge on the importance of oral hygiene. The questionnaires also collected information about the dental history, oral hygiene practices, and parental prediction of the child’s co-operation during the examination. Details regarding the age at which brushing was started, techniques of brushing, and frequency of dental visits were also recorded. All the questionnaires were distributed in the respective schools and parents returned them to schools after filling them.

### Statistical Analysis

Data were analyzed using statistical analysis software, SPSS version 16.0. One-way ANOVA test with *post hoc* Tukey’s test was used to compare the mean scores of DMF, def, OHI-S between primary, mixed, and permanent dentition of autistic children. A Chi-square test was used to compare the proportion of males and females between different age groups. An independent sample *t*-test was used to compare mean scores of DMF, def, OHI-S between males and females in each age group. Statistical significance was kept at a *p* value of <0.05.

### RESULTS

Table 1 shows the age and gender distribution of the participated children in the study. There were significantly more males (114) than females (28). The total number of autistic children with primary, mixed, and permanent dentition were 21, 59, and 62, respectively.

The two components of OHI-S were separately assessed using the independent *t* test. Table 2 depicts an overall comparison of the

oral hygiene status of autistic children across different age groups. The Debris Index (DI-S) and Calculus Index (CI-S) components did not show a statistically significant difference across the three age groups, with a mean DI-S of  $0.56 \pm 0.46$  and mean CI-S of  $0.32 \pm 0.40$ . Autistic children with permanent dentition showed more debris and calculus component. The mean OHI-S in autistic children with permanent dentition was  $1.02 \pm 0.89$ , which was found to be statistically insignificant.

The overall prevalence of dental caries among autistic children was found to be 4.90 (Table 3). It was observed that 90.4, 94.9, and 83.87% reported dental caries in the following age groups—3 to 6, 7 to 11, and 12 to 17-year-old, respectively. Table 4 depicts the mean deft and DMFT scores according to age. A detailed comparison between the separate components of caries experience was done between the three study groups and it was found to be statistically significant (Table 5). 13.38% of autistic children examined exhibited traumatic injuries. Drooling of saliva from the corner of the mouth was frequently observed in these children, predisposing them to oral infections (Table 6). Nine children were found to have bruxism while eight children exhibited some kind of self-injurious habits (Table 6). According to Kuppaswamy’s socioeconomic scale, 80.3% of the study population belonged to the upper-middle class (Fig. 1). The majority of the parents (83.80%) of the children who participated in the study were graduates and 82.56% of the study population was using toothbrushes and toothpaste for brushing (Table 7).

### DISCUSSION

The prevalence and severity of dental caries in India have been increasing over the last five decades. Dental caries remains the most prevalent, unmet health care need for children with or without special needs, as they present with a complex array of developmental delays, all of which can complicate routine dental examination and treatment.<sup>15,16</sup>

Studies of oral health conditions in autistic children in Mumbai are sparse. Complicated neurological disabilities like autism make clinical research difficult due to the uncooperative nature of this population. The Centre for Disease Control estimates that one in every 59 children is autistic.<sup>17</sup> Due to this alarming prevalence rate, it can be assumed that dental practitioners can encounter an autistic patient at some point in their clinical practice. So practitioners should be aware of the problems that these children pose to dental treatment and means of overcoming them. Behavioral disorders make oral hygiene and dental care very difficult for these patients.

A well-recognized feature in autism is difficulty with sensory processing.<sup>18</sup> Sensory over-responsivity is an important factor influencing the ability of children with ASD to receive oral care,

**Table 1:** Age and sex distribution of participants

		Gender		<i>p</i> * value
		Male	Female	
Age, years	3–6	15 (13.2%)	6 (19.2%)	0.1711
	7–11	45 (39.5%)	14 (53.8%)	
	12–17	54 (47.3%)	8 (26.9%)	
	Total	114 (100.0%)	28 (100.0%)	142 (100.0%)

\*Mean

**Table 2:** Overall comparison of oral hygiene status of autistic children across different age groups

		<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>p* value</i>	<i>Post hoc test**</i>
Debris	2–6 years (primary dentition)	21	0.4719	0.26017	0.49	Primary = mixed = permanent dentition
	7–11 years (mixed dentition)	59	0.5500	0.48679		
	12–17 years (permanent dentition)	62	0.6066	0.48882		
	Total	142	0.5632	0.46107		
Calculus	2–6 years (primary dentition)	21	0.2271	0.17892	0.08	Primary = mixed = permanent
	7–11 years (mixed dentition)	59	0.2731	0.38283		
	12–17 years (permanent dentition)	62	0.4111	0.47093		
	Total	142	0.3265	0.40815		
OHI_S	2–6 years (primary dentition)	21	0.6743	0.33769	0.14	Primary = mixed = permanent
	7–11 years (mixed dentition)	59	0.8069	0.79688		
	12–17 years (permanent dentition)	62	1.0216	0.89305		
	Total	142	0.8811	0.79986		

\*Mean; \*\*post hoc test mean

**Table 3:** Overall comparison of caries experience of autistic children across different age groups

		<i>N</i>	<i>Mean</i>	<i>Std. deviation</i>	<i>p* value</i>	<i>Post hoc test**</i>
deft	2–6 years (primary dentition)	21	6.143	3.468	<0.001	Primary > mixed > permanent dentition
	7–11 years (mixed dentition)	59	3.847	3.258		
	12–17 years (permanent dentition)	62	0.532	1.544		
	Total	142	2.739	3.389		
DMFT	2–6 years (primary dentition)	21	0	0	<0.001	Primary = mixed < permanent
	7–11 years (mixed dentition)	59	1.423	1.831		
	12–17 years (permanent dentition)	62	3.613	3.596		
	Total	142	2.169	2.970		
Caries experience (def + DMF)		142	4.908	3.543		

\*Mean; \*\*post hoc test mean

**Table 4:** Comparison of mean deft and DMFT scores of autistic children according to age

<i>Age group (years)</i>	<i>Autistic children (n = 142) Deft</i>	<i>Autistic children (n = 142) DMFT</i>
3–6	6.143 ± 3.468	0
7–11	3.847 ± 3.258	1.423 ± 1.831
12–17	0.532 ± 1.544	3.613 ± 3.596

with these children exhibiting higher incidences of uncooperative behavior in the dental office.<sup>19</sup> This study assessed the oral health status of children with autism attending special schools across the suburbs of Mumbai. This study showed that 89.4% of the autistic children examined had dental caries. Jaber who studied a sample of 61 autistic children, observed that 77% of the autistic children had dental caries compared to 46% of the healthy patients in the control group.<sup>10</sup> Similar results were observed by Namal et al., who studied 62 autistic children in Turkey and concluded that 58.1% of

his study sample had some caries experience.<sup>20</sup> The main cited barriers to the provision of dental care to differently abled children are the problems of inaccessibility to dental health services, cost of dental treatment, and behavioral problems in the dental office.<sup>1</sup>

Age is another important factor that affects the development of caries. Older patients often present more caries.<sup>20</sup> In this study, however, children with primary and mixed dentition were observed to have a higher incidence of caries than those with permanent dentition. Owing to multiple studies that have assessed the oral health of autistic children, there are different schools of thought regarding the prevalence of dental caries in these children.<sup>7,10,20–24</sup> Jaber, Rekha et al., and Yashoda and Puranik found that a mean deft/DMFT was significantly higher in children with autism than in controls.<sup>10,22,24</sup> This view, however, differs from that of Namal et al. and Shapira et al., who found a decreased caries susceptibility as compared to their normal counterparts.<sup>20,23</sup> Our study results are similar to those of Lowe and Lindemann who observed that autistic

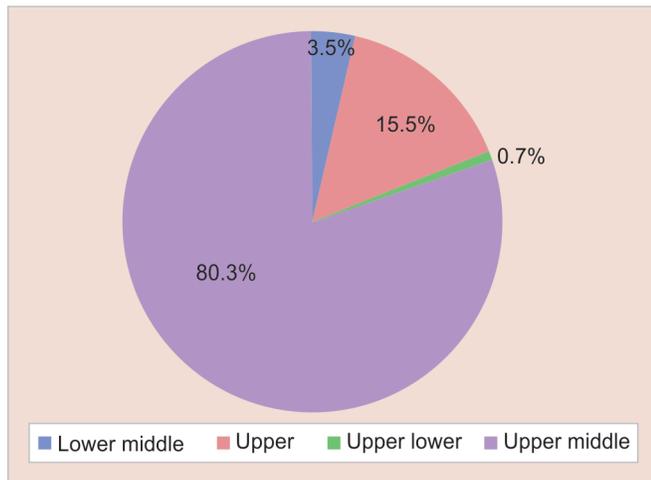
**Table 5:** Comparison of separate D and d component of caries experience among autistic children

		N	Mean	Std. deviation	p* value	Post hoc** test
D	2–6 years (primary dentition)	0			<0.001	Mixed < permanent dentition
	7–11 years (mixed dentition)	59	1.3051	1.72461		
	12–17 years (permanent dentition)	62	3.0806	2.97144		
	Total	121	2.2149	2.59232		
d_t	2–6 years (primary dentition)	21	4.6190	2.71065	<0.001	Primary > mixed > permanent
	7–11 years (mixed dentition)	59	2.7966	2.74037		
	12–17 years (permanent dentition)	62	0.3387	1.25376		
	Total	142	1.9930	2.70407		

\*Mean; \*\*post hoc test mean

**Table 6:** Type of habits seen in autistic children

Habits/trauma	No. of children affected (n = 142)	%
Bruxism	9	6.33
Drooling of saliva	14	9.85
Self-injurious habits	8	5.63
Traumatic injuries	19	13.8



**Fig. 1:** Distribution of socioeconomic status of participants in the study

patients had a higher caries rate in the primary dentition.<sup>21</sup> The permanent dentition group in our study showed a mean DMFT of 3.61. This was slightly lower than the DMFT reported by Damle and Patel who documented a DMFT of 3.80 among 12-year-old children in Mumbai.<sup>15</sup> Only a few Indian studies have assessed autistic children in places like Chennai and Karnataka in India.<sup>22,25</sup> This was a comprehensive study that assessed oral health problems of autistic children in the Mumbai suburban region as well as their parental knowledge and attitude toward oral health.

Children with autism have certain behavioral factors that may lead to an increased risk of dental caries. Among these factors are poor masticatory ability, pouching of food, lack of manual dexterity, and xerostomia causing medications.<sup>23</sup> Caregivers of

autistic children examined in this study also observed that most of these children had a tendency to directly swallow their food instead of chewing. This could add to the etiological factors for caries. Despite these predisposing factors, Kopel stated that patients with ASD did not exhibit any unique hard or soft tissue features and the prevalence of dental disease was nearly similar to other children.<sup>8</sup>

The autistic children in our study underwent their daily routine of oral hygiene measures at home under the supervision of their parents. Besides, they were also subjected to brushing their teeth by the trainers at the respective schools which could account for their good oral hygiene (mean = 0.88) (Table 2). Similar results were reported by Du et al. who found that children with autism had lower plaque scores than children without autism.<sup>9</sup>

One of the most distressing events for children with autism is self-injurious habits which involve hitting, head banging, pinching, or lip biting.<sup>6</sup> Eight children showed signs of self-inflicted injuries, with lip biting and head banging being the most common habits. Nineteen of these children were observed to have some type of dental trauma, the most common being Ellis class II, i.e., fractures enamel and a considerable amount of dentin without pulp exposure.

Providing oral care to children with ASD requires patience and a thorough understanding of the child’s degree of intellectual ability. Children with ASD are dependent on their parents for the necessities of life. Thus, parental characteristics and beliefs are important considerations to improve the child’s oral health. In the present study, the majority of the parents of children with autism belonged to the upper-middle socioeconomic status group, which is as per a study published by Lotter, who suggested that families of autistic children have a higher social class distribution.<sup>26</sup> More than half the parents (56.8%) felt that their child would not cooperate during an oral examination at the dentist due to which most of them refrained from visiting the dentist. Not surprisingly enough, Marshall et al. have reported that up to 25% of parents experience difficulty when accessing dental care for a child with ASD, of which the most frequently reported barrier was lack of communication and behavioral problems.<sup>11</sup>

While few cited the cost of dental treatment in Mumbai to be a major factor for delay in getting dental treatment, it is alarming that the majority of the children in this study began brushing only after 3 years of age. The difficulty in keeping these children

**Table 7:** Data on the toothbrushing method used among different age groups

		Age, years			p* value
		2–6	7–11	12–17	
Method of cleaning	Finger	2 (9.5%)	0 (0.0%)	2 (3.2%)	0.10
	Toothbrush	1 (4.8%)	12 (20.3%)	9 (14.5%)	
	Toothbrush with toothpaste	18 (85.7%)	47 (79.7%)	51 (82.3%)	
	Total	21 (100.0%)	59 (100.0%)	62 (100.0%)	

\*Mean

still for more than a few seconds was cited as one of the principal reasons. The majority of the parents (46.5%) believed that the general health of the child was affected only when he had dental pain. The lack of awareness and absence of regular dental check-ups due to unaffordability and preconceived notions of parents regarding the autistic child hampers the provision of proper oral health care services to them. Patients with SHCN should be enrolled in a Dental Home at birth itself since this provides an opportunity to implement individualized preventive oral health practices, thus reducing the child’s risk of preventable disease.<sup>2</sup> This study considered only special schools for autism, so autistic children not attending schools were beyond the scope of this study. More extensive studies are required to determine the prevalence of oral problems in autistic children.

For autistic children, dental hygiene maintenance is often superseded by the need for constant supervision, feeding, diapering, and associated medical disorders. An interdisciplinary holistic approach including parental counseling and preventive dental treatment would help pediatric dentists in delivering optimal dental care to autistic children.

**CONCLUSION**

This cross-sectional study showed that autistic children with primary and mixed dentition showed a higher caries index. The children examined in this study showed good oral hygiene. Due to the nature of their neurological deficit and difficulty in providing dental treatment, it is recommended that preventive dental care be enforced on these children and their caregivers.

**AUTHOR CONTRIBUTION**

Adesh Kakade, Anitha Santosh and Sayali Mali designed the research plan. Anitha Santosh, Bhagyashree Deshmukh, and Sayali Mali acquired the relevant permissions and conducted the oral examination of the children. Vilas Takate and Akanksha Juneja helped analyze the data. Anitha Santosh drafted the manuscript; Adesh Kakade, Akanksha Juneja, RS, and Vilas Takate contributed to writing and finalizing the manuscript.

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