

## Oral Health Status of Autistic Children in India

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*Autism is one of the most severe childhood neuropsychiatric disorders. Autistic individuals are characterized by impairment in social interaction with a restricted range of interests and often, stereotyped repetitive behaviors. Studies on oral health conditions in children with autism are sparse. The complicated disability itself makes clinical research difficult. **Aim:** The need for baseline information regarding the oral health status of children with autism is essential. **Method:** The present study assessed the oral health status of 106 autistic children aged 4 to 15 years in Bangalore city, India. The dental caries was recorded according to the WHO criteria; oral hygiene was assessed using the Oral Hygiene Index-Simplified (OHI-S) and its modification for deciduous dentition. The behavior of children towards dental treatment was also assessed using the Frankel's behavior rating scale. Data obtained was subjected to statistical analysis. **Results** showed that caries experience among autistic children was lower; however they were found to have more debris and calculus deposits. **Conclusions:** Negative behavior towards dental treatment was seen in autistic children.*

**Keywords:** Autism, dental caries, oral hygiene, behavior, India.

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### INTRODUCTION

Individuals with Special Health Care Needs encompasses a wide variety of physical, developmental, mental, sensory, behavioral, cognitive, and emotional impairments that require medical management, health care interventions, and/or use of specialized services or programs.<sup>1</sup>

One such disability affecting the world population at a dramatic rate is autism. Autism is a complex neurodevelopmental disorder characterized by qualitative impairments in social interaction and communication, with restricted, repetitive, stereotyped patterns of behavior, interests and activities. It is categorized under a group of disorders known as Pervasive Developmental Disorders. These behaviors manifest along a wide spectrum and commence before 36 months of age.<sup>2</sup> An individual with autism will have difficulty with three domains: language and communication, socialization and repetitive behaviors.<sup>3</sup> As a result, the autistic child has limited ability to understand and communicate, and to learn and participate in social relationships.<sup>4</sup>

The prevalence rate of autism was reported to vary between 4 and 13 per 10,000.<sup>5,6</sup> Centre for Disease control and Prevention in 2006 reported the prevalence as 5.7 per 1,000 (National Survey of Children's Health), with a male: female ratio of 3.7:1.<sup>7</sup> Presently, the generally accepted prevalence value is one in 1000 children.<sup>8</sup>

Although the prevalence of autism is rising globally, there is no published data regarding its prevalence in India. Autistic individuals require a unique management of their behavioral characteristics.<sup>3</sup> Thus, with the high prevalence of children with autism, dentists are likely to have one or more children with this disorder in their practice. These autistic children could exhibit behavioral symptoms such as temper tantrums, hyperactivity, short attention span, impulsivity, agitation, anger, and a tendency for aggressive and self-injurious behaviors.

Most autistic children have problems with their day to day activities such as eating, drinking, sleeping, bathing and tooth brushing. All these factors could make them more prone to oral disease. Children with autism also commonly have damaging oral habits such as bruxism, tongue thrusting, pricking at the gingiva, lip biting, and pica.<sup>9</sup>

Not much data is available, on the oral health status of autistic children in India. The information about the oral health status of autistic children would enable pediatric dentists to plan and provide appropriate preventive protocol as well as effective treatment for these patients.

Hence, this study was planned and conducted to obtain baseline information regarding the oral health status, dental needs, habits and behavioral attitudes of children diagnosed with autism in Bangalore city.

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## MATERIALS AND METHOD

The present study was carried out at different institutions and schools for autistic children in the city of Bangalore, India. These included Apoorva Centre for Autism, Shristi Special Academy, Bethany Special School, Spastics Society of Karnataka, Academy for Severe Handicaps and Autism (ASHA) and Mobility India.

The study protocol was presented to the Institutional ethical review board which comprised of the Dean of the Institution, Heads of the various departments, a medical practitioner, a surgeon, a legal expert/member of the judiciary, a philosopher and a member of a non-government organization; following which the clearance to conduct the study was obtained.

Children with pervasive developmental disorders other than autism, very uncooperative children who were known to show hostile or aggressive behavior, children associated with other medically compromised conditions like congenital heart disease, bleeding disorders and seizure disorders and children on long – term medications were not included in the study.

Initially, 132 autistic children aged 4 to 15 years were selected for the study. Out of these, parental consent was not given for 10 children and 16 children who exhibited violent and aggressive behavior could not be examined even on subsequent visits. Thus, 106 autistic children including boys and girls, aged 4-15 years formed the study group.

The parents/caregivers of all children were informed of the nature of investigation. Prior to examination, written consent was obtained from the parent/caregiver. They were to answer a questionnaire which included information on the child's chronological age, parent's educational status, occupation and family income, any other associated disorder, previous dental history, habits pertaining to oro-facial trauma and oral hygiene practices. The information regarding demographics and medical history of each child was obtained from their medical records. Every family was assured of the confidentiality of the data obtained and that the resultant information would be used only for research purposes.

## EXAMINATION OF AUTISTIC CHILDREN

These individuals have great difficulties in interacting with other people, and in understanding and following instructions. The fear of unknown treatment causes the autistic child to resist entry to the oral cavity.<sup>10</sup> Therefore, affected children may be incapable of cooperating in the dental setting. In addition to these characteristics, subjects often show increased sensitivity to sounds, light, odors and colors, a feature that also makes achieving good oral health very difficult.<sup>11</sup>

The autistic children are very dependent on routines and continuity in treatment. Thus, unfamiliar dental staff cannot examine them. Hence, a preliminary visit to assess their capabilities, obtain a medical history and gauge the extent of dental disease was done. It is also suggested that the same person performs all clinical examinations and evaluations.<sup>12</sup>

Although, this may not be methodologically ideal, as it precludes blinding, it was a prerequisite for our study.

For the autistic children, a prior schedule for examination was prepared and 2-5 (an average of 3) children were examined per day. Oral examination was carried out strictly in the presence of parents/caretakers. The parent/caretaker were informed about the examination before hand so that they could explain the procedure to the child with the help of pictures. This was done to familiarize the children. The objective was to achieve cooperation from the children and gain the confidence of the parents. The examination was done in a surrounding familiar to the child and in natural daylight, with the child seated on a chair. During the examination procedure, the "Tell-Show-Feel-and-Do" technique<sup>13,14</sup> was used with all the children. Compliance was further enhanced by giving short, clear commands and positive verbal reinforcements. Those children, who failed to cooperate for a complete oral examination during the first visit, were re-examined after 5-7 days.

The behavior of each patient was assessed and recorded according to Frankel Behavior Rating scale<sup>15,16</sup> The socio-economic status (SES) was assessed according to the modified Kuppaswamy scale<sup>17</sup> which was based on education, occupation and income of family. This scale is an important tool in hospital and community based research in India. Extra-oral examination including that of hair, face, head, neck, limbs and digits was done to identify signs of trauma, self injury, scars and deleterious habits. Trauma to the anterior teeth was also recorded according to Ellis's Classification.<sup>18</sup> The material used for brushing and the technique and frequency of brushing followed was also recorded.

The WHO criteria (1997) was used to diagnose and record dental caries.<sup>19</sup> Caries was recorded by a single assistant sitting besides the examiner, so that the codes given by the examiner could be easily heard. Caries was recorded in natural daylight using mouth mirror with good reflecting surface and CPI probe. Training and calibration for examination of dental caries was carried out in the Department of Pedodontics and Preventive Dentistry, The Oxford Dental College, Hospital and Research Centre, Bangalore.

Oral hygiene status was assessed using the Simplified Oral Hygiene Index (OHI-S) given by Green and Vermilion<sup>20</sup> and its modification for the deciduous dentition as given by Miglani *et al*<sup>21</sup>

The statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data.

## RESULTS

The study comprised of 91 boys (85.84%) and 15 girls (14.2%). Age and gender distribution is shown in Table 1. Table 2 shows the distribution of autistic children according to socio-economic status. A large number of autistic children exhibited negative behavior. (Table 3)

Table 4 shows the type of self-inflicting trauma/habits seen in autistic children. Pica eating and biting of extremities was seen to be the most common. Eleven (10.34%)

**Table 1.** Distribution of children according to age and gender

Age (years)	Autistic children (n =106)	
	Male	Female
4-5	11 (10.4%)	1 (0.94%)
6-8	30 (28.30%)	1 (0.94%)
9-12	38 (35.84%)	11 (10.4%)
13-14	12 (11.32%)	2 (1.9%)
Total	91 (85.84%)	15 (14.2%)

**Table 2.** Distribution of autistic children according to their socio-economic status (kuppuswamy's scale)

Socio-economic status	Autistic children (n=106)		95% CI
	n	%	
Upper	38	35.8	27.36-45.38
Upper middle	33	31.1	23.11-40.48
Lower middle	21	19.8	13.34-28.40
Upper lower	14	13.2	8.03-20.96
Lower	0	0.0	-

**Table 3.** Behavior of autistic children towards dental treatment according to frankel's behavior rating scale

Behavior rating scale	Autistic children	
	(n=106)	n%
Definitely negative	9	8.5
Negative	60	56.6
Positive	37	34.9
Definitely positive	0	0.0

autistic children had trauma to the dentition. Trauma to primary anterior teeth was seen in 1 (0.94%) autistic child, 10(9.4%) autistic children showed trauma to the permanent anterior teeth.

Nearly fifty percent of autistic children had caries in the primary dentition. With regard to the permanent dentition, 16.86% autistic children were affected with caries. Table 5 shows distribution of autistic children affected with caries according to age. The comparison of mean deft and DMFT scores of between autistic children according to age is seen in Table 6.

The mean OHI-S score in autistic children was 2.19, the mean DI-S (Debris Index – Simplified) score was 1.45. The CI-S (Calculus Index – Simplified) score for autistic children was 0.85. With regard to oral hygiene practice, 28 autistic children brushed twice daily. It was observed that 78 autistic brushed only once daily. Sixty-five autistic children used fluoridated dentifrice whereas non-fluoridated dentifrice was used by 41 children. Thirty-four autistic children used finger to clean their teeth. Sixty-eight autistic children used a toothbrush to clean their teeth. Powered toothbrush was used by only 4 autistic children to clean their teeth.

**Table 4.** Type of self-inflicting trauma/habits seen in autistic children

Self-inflicting Habits	No. of children affected (n=106)	%	95%CI
Pica eating	12	11.32	6.60-18.75
Biting of extremities/ inanimate objects	12	11.32	6.60-18.75
Flapping of hands	8	7.54	3.87-14.19
Non –functional grinding	5	4.7	2.03-10.57
Head Banging	4	3.77	1.48-9.30
Pinching	4	3.77	1.48-9.30
Hair pulling	3	2.83	0.9-7.99
Slapping	3	2.83	0.9-7.99
Pricking with sharp object	3	2.83	0.9-7.99

**Table 5.** Distribution of children affected with caries according to age

Age (years)	Autistic children(n =106)	
	Total	Affected
4-5	12	6 (50.0%)
6-8	31	14 (45.2%)
9-12	49	24 (48.9%)
13-14	14	3 (21.4%)
Total	106	47 (44.3%)

**Table 6.** Comparison of mean deft and DMFT scores of autistic children according to age

Age – group (years)	Autistic children (n=106) deft	Autistic children (n=106) DMFT
4-5	2.33±3.57	0.08±0.28
6-8	1.77±2.43	0.06±0.36
9-12	1.47±2.09	0.33±0.69
13-14	0.29±1.07	0.21±0.58

## DISCUSSION

This study assessed the oral health status, dental needs, habits and behavioral attitudes of children diagnosed with autism in Bangalore city. Children aged 4 to 15 years were included in the study. Various medical disorders including congenital heart disease, bleeding disorders and seizure disorders have an impact on the oral health of an individual. So, autistic children with any other medical disorder were excluded from the study. The effects of long term medications, especially those containing hidden sugars on the dentition is well documented and is considered to be a risk factor for dental caries.<sup>22</sup> Hence, autistic children on long-term medication were also not included in the study.

The socio-economic status was assessed according to the

Kuppuswamy's socio-economic scale<sup>17</sup> and was based on education, occupation and income of family. This scale is an important tool in hospital and community based research in India. The prevalence of autism appears to be unrelated to race, socio-economic status or level of parental education.<sup>23</sup> Several earlier reports have suggested that families of autistic children have a higher social class distribution.<sup>24,25</sup> We observed that almost 67% of the autistic children were from the upper class and none belonged to the lower class.

Self-injurious behavior is one of the most distressing events for autistic children. It may take the form of pinching, scratching or head banging and can even involve the oral structures.<sup>26-29</sup> Signs of trauma and scars observed during clinical examination was verified with the history and parent's response, for any possible findings of child abuse and/or neglect. Questioning of both parents and teachers revealed it to be a result of repeated self-injurious behavior practiced by the autistic child.

With regard to self-injurious behavior, the findings of our study did not agree with other studies. We observed self-injurious behavior to be present in only 40 (37.73%) children. Murshid *et al*<sup>14</sup> reported self-injurious habits of hitting, banging, biting, pricking, pinching and grinding to be present in 70% of autistic children. More than one type of self-injurious habit was present in some children. In our study, pica eating, biting of extremities/inanimate objects and flapping of hands were most commonly seen. Some of the common things which the children in our study consumed were inanimate objects, shampoo, soap, hair, soil and dust. Other habits which were seen included non-functional grinding, head banging, pinching, hair pulling, slapping and pricking with a sharp object.

In autistic individuals, there is a failure to use facial expression and use of body language to interact with others. Verbal and non-verbal skills are delayed or absent. Echolalia and delayed echolalia are also present.<sup>12</sup> This may lead to frustration as they are unable to express their feelings. More than 50% of children in our study were non-verbal. Their emotional outburst manifested in the form self-injurious behavior. According to the parents/caretakers, such outbursts occur when the autistic child is either very happy or sad.

The behavior of each child was assessed by means of the Frankel's behavior rating scale which is a simple and easy method. Negative behavior in autistic children was reported by Loo *et al*<sup>15</sup> and Murshid *et al*<sup>14</sup> to be 55.2% and 87.25%, respectively. Sixty five percent of autistic children in our study showed negative behavior.

Sixty eight children had their first dental examination done at the time of our study. Six children had taken treatment under general anesthesia and 5 children were treated under sedation. Twenty seven children who were taken for routine dental check-up and treatment failed to cooperate and therefore the parent could not get any treatment done for these children.

Nearly 10% autistic children suffered trauma to the dentition, which was seen to occur more in the permanent teeth.

However the parents did not relate this trauma to their autistic condition.

In our study, 48.8% of autistic children were caries free. With regard to the permanent dentition, 83.13% of autistic children were caries free. This implies that autistic children had lower caries in spite of their disability, improper brushing and dietary habits. Lower caries scores were observed in both their primary as well as their permanent dentition.

Clinical examination was not supplemented by radiographs in the diagnosis of caries. This was because the study was carried out at the special schools and it would have been extremely difficult to gain the co-operation of all the children for taking a radiograph. Their mean deft score was 1.89, with a decayed component of 1.58 indicating the unmet dental needs of these children.

Though many factors influence an individual's dental caries risk, there is not enough evidence to show whether autism is a risk factor for caries.<sup>30</sup> The unique fixation of diet shown by these children might contribute to a minimal amount of dental disease, if the diet is particularly low in carbohydrates.<sup>4</sup> Demands for low textured foods from patients with autism are relatively common and do not necessarily imply dental pathology.<sup>31</sup> High sensitivity to taste and food consistency is common in people with autism, and it is important that dental staff are aware of this fact.<sup>11</sup>

Autistic children are less partial to sweets and characteristically are more regular in their behavior at meals than other healthy children.<sup>32</sup> In our study too, the autistic children did not have a preference for sweets and in-between meal snacking was also not observed. Moreover, the children preferred semi-solid and liquid food, which has a fairly good clearance.<sup>33</sup>

Both the 'extracted due to caries' component and the 'filled' component were low (0.12 and 0.19, respectively) indicating less dental treatment in these children. DMFT score of autistic children was 0.27, where the 'decayed', 'missing' and 'filled' components were 0.22, 0 and 0.05, respectively.

Further, out of the six special schools where the study was carried out, it was only one school which had an inhouse dental set-up, where routine dental check up and treatment under general anesthesia or conscious sedation was carried out. It was observed in our study, that many parents did take their children to the dentist. Due to highly uncooperative behavior, the treatment could not be carried out on the dental chair. Also, some parents did not pay attention to caries in the deciduous dentition and thus neglected their dental treatment. The cost of treatment under general anesthesia, the associated medical conditions of the child and reluctance by the dentists in handling autistic children are other hurdles for dental treatment.

This is in accordance with Loo *et al*<sup>15</sup> who reported that autistic children were more likely to be caries free and had lower DMFT scores than their unaffected peers. Lowe and Lindeman<sup>27</sup> reported that patients with autism have a lower hygiene level but comparable caries index when compared with patients without autism. Shapira *et al*<sup>34</sup> found that caries

rates in non-institutionalized children with autism were similar to that of unaffected children. Kamen and Skier<sup>35</sup> also found that caries susceptibility was lower in people with autism than in unaffected people.

Autistic patients may object to the taste or texture of a food or oral product such as a toothpaste or toothbrush, which result in poor oral hygiene and a subsequent increase in caries and periodontal conditions. It is worthwhile to have the patient sample different toothpastes or oral hygiene products until a tolerable one is found.<sup>3</sup>

In this study, the oral hygiene of autistic children was fair, with a mean score of 2.19. The DI-S (Debris Index – Simplified) score was 1.45. The presence of more debris in these children can be attributed to decreased frequency of rinsing/swishing combined with the lack of interest in oral hygiene. All the autistic children could not brush independently and needed assistance, motivation and supervision. Forty five (42.5%) children were unable to spit or had difficulty in spitting while brushing. As some parents (38.7%) were aware of the risk of fluoride ingestion from toothpaste, they used a non-fluoridated dentifrice for their children. Due to hypersensitivity seen in some children, their parents used a finger to brush the teeth. The horizontal scrub technique was followed for cleaning their teeth.

In India, there is no published data regarding the prevalence of autistic children. Further, only few institutions provide specialized training for these individuals. Parent education and motivation is required for diet control and regular dental visits. An interdisciplinary holistic approach including psychotherapy, speech therapy, parental counseling, would help pediatric dentists in delivering optimal preventive and restorative care to autistic children.

## CONCLUSION

From this cross-sectional study, it can be observed that autistic children had significantly lower caries score. Their oral hygiene was fair, with a significantly more debris component. They exhibited self-injurious behavior. Negative behavior was mostly seen in autistic children.

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