

Oral Health of Autistic Children and Awareness of Care Providers towards their Oral Hygiene

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ABSTRACT

Introduction: Autism is a lifelong neurodevelopmental disease characterised by qualitative abnormalities in reciprocal social interaction and patterns of communication. The incidence of autism has increased in recent years and therefore, the possibility of dentists encountering children with autism is higher. Knowledge about the prevalence of dental disease in these children and the awareness of their care providers towards oral health is crucial to provide quality dental healthcare.

Aim: To evaluate the oral health status of children with Autism Spectrum Disorder (ASD) and to assess the awareness of the parents/care providers regarding their oral health.

Materials and Methods: This study was a two-stage cross-sectional study carried out in July, August 2015 at AB Shetty Memorial Institute of Dental Sciences, affiliated to NITTE Deemed to be University. Twenty children diagnosed with ASD formed the study group while 20 healthy children formed the control group. A clinical examination assessed dental caries (DMFT/dft). Gingival disease and oral hygiene of all children were evaluated using the Loe and Sillness gingival index and simplified oral hygiene index, respectively. Parents/care providers of the autistic children were asked to complete a questionnaire regarding the oral hygiene practices and oral health problems of the children. Descriptive statistics were performed for continuous variables, frequencies and percentages for categorical variables and comparisons were made using the Mann-Whitney U test, independent t-test

and Chi-square test. Statistical analyses were conducted using EZR software (R version 3.6.3[©] 2020) and significance level was set at $p < 0.05$.

Results: The dft values in the children with autism were significantly lower than the control group ($p=0.035$). Children with autism had higher DMFT values, however this difference was not found to be significant ($p=0.757$). No statistically significant differences were found in the gingival and oral hygiene indices amongst the children with autism and their healthy controls, ($p=0.811$, 0.365 , respectively). An 85% ($n=17$) of children were found to use tooth brush and paste for oral hygiene procedures. An 85% ($n=17$) of children with autism had supervised tooth brushing while only 20% ($n=4$) of the children with autism had previously visited a dentist. Most care providers of children with ASD seemed to be unaware of the causative factors of dental disease. Pouching of food was not seen in most of the autistic children.

Conclusion: Caries experience in the permanent dentition in the autistic children and healthy children were comparable while autistic children had a lower caries experience in the primary dentition. Both autistic children and healthy children exhibited mild gingival inflammation. Whereas, the oral hygiene status was comparable amongst the two groups of children. Most of the autistic children had assisted tooth brushing (parental), however there were significant lacunae of knowledge in the oral health awareness of the parents/care providers.

Keywords: Autism spectrum disorder, Dental caries, Gingival index, Oral hygiene index

INTRODUCTION

Autism, first described by child psychologist Leo Kanner in 1943 is a "lifelong neurodevelopmental disease characterised by qualitative abnormalities in reciprocal social interaction and patterns of communication, and by a restricted, stereotyped, repetitive, repertoire areas of activities and interests" [1]. The Centers for Disease Control (CDC) reported that approximately 1 in 54 children in the US is diagnosed with ASD [2]. This figure however may not reflect the prevalence of ASD in India due to limited high-quality population based epidemiological surveys of ASD [3-5]. A previous study identified 43 children out of a total of 28,070 children in rural, urban and tribal area in the age group of 1-10 years as cases of ASD yielding a prevalence of 0.15%, 0.15% and 0.23% in India, respectively. [3]. Another study estimated the prevalence of ASD in 12 states across six regions of India in 2015-16 and found that 1.6% of adolescents screened positive for ASD [4].

The risk of developing dental caries and gingivitis is predicted to be greater in children with ASD due to incorrect brushing and flossing, and also because of problems encountered by the care providers when they brush their children's teeth [6-8]. It could also be attributed to insufficient manual dexterity of autistic children [9]. Further, these children tend to like soft and sweetened foods, they also show a tendency to pouch food inside the mouth instead of

swallowing due to poor tongue coordination, thereby placing them at a higher risk for dental caries development [10]. Most children with autism have difficulties with everyday activities like eating, drinking and tooth brushing. Autistic children have multiple medical and behavioural problems making their dental treatment extremely difficult [11]. Children with ASD create challenges for parents and dental professionals because the dental environment is a challenging environment with the capabilities, characteristics, and behaviour of children with ASD [12]. There is inadequate information about the prevalence of dental disease as well as knowledge about their dental care among parents/care providers of children with autism [13-15]. An understanding of their oral health status and their specific needs is essential to render quality oral healthcare for these children. Hence, this study was carried out to establish baseline information regarding the oral health status of children with autism and awareness of care-providers towards their oral health.

MATERIALS AND METHODS

This two-stage cross sectional study was conducted over two months, in July and August 2015 at AB Shetty Memorial Institute of Dental Sciences, affiliated to NITTE Deemed to be University. Ethical approval of the study was obtained from the Institutional Ethical Committee (Cert no. ABSM/EC/33/2015). In the first stage of the study, a comparative evaluation of the oral health status

of children with ASD and healthy children was performed. In the second stage of the study, the awareness and knowledge of the care providers of the autistic children regarding the oral health of their children was assessed.

The study included 40 children aged 6-12 years of either gender. Twenty children diagnosed with ASD and recruited from the Autism Sisu Kshema Kendram, Thrissur, Kerala, India formed the study group. Twenty healthy children free from ASD were randomly selected from a government school in the same area and served as the control. The purpose and nature of the study was explained to the principal of the institution as well the parents of the children. Parents of the participating children signed an informed consent before the study started.

Sample size calculation was based on the formula, $n=2\{(Z^2S^2)/d^2\}$. Substituting the above values to the formula $N=16 \gg 20$. Since there were two groups, total sample size was calculated to be $20 \times 2 = 40$.

Inclusion criteria: The children with autism who had the ability to follow simple instructions such as "sit down", "open your mouth and lower your hands", who allowed touching his/her face or mouth, had not received dental prophylaxis in the past six months, having no disorder such as Down's syndrome and other medical conditions which could affect his/her oral status were included in the study.

Exclusion criteria: Mentally challenged children, children on long-term medication such as anti-anxiety drugs, anti-psychotic drugs, anticonvulsants and children showing aggressive/hostile behaviour were excluded from the study.

A preliminary visit was scheduled for the autistic children to familiarise them with the examiner (a qualified Paediatric dentist) and dental auxiliary staff. Children with ASD were examined on an adjustable office chair, laid down flat on an exercise mattress, or in knee to knee position depending on their age and physical condition. Each child with ASD was accompanied by his /her parent/trainer who was present to make the child more comfortable. During examination the Tell-Show-Feel-Do technique was used for all children. Healthy children were examined on an adjustable office chair. All the children were examined under good lighting, either using natural light or hand torch using a sterile mouth mirror and Community Periodontal Index (CPI) probe while taking appropriate cross infection measures. A single examiner carried out the preliminary and subsequent examination. A qualified Paediatric dentist has performed the oral examination of all children. Children who failed to cooperate for a complete oral examination during the first visit were re-examined after 5-7 days.

Oral health status of the participating children was recorded using the modified World Health Organisation (WHO) oral health assessment form [16]. Decayed, Missing, Filled Teeth (DMFT) and decayed, filled teeth (dft) indices were used to record caries experience for permanent and deciduous teeth, respectively. Gingival status of the children was recorded using the Loe and Silness gingival index [17]. Gingival status was recorded as no inflammation (0), or mild (1), moderate (2) or severe (3) inflammation depending on qualitative changes in gingiva and bleeding on probing. The oral hygiene condition was assessed using the Simplified oral hygiene index [18] and recorded as good when oral hygiene score was 0-1.2, fair when it was 1.3-3 and poor when it was 3-6. For children who needed treatment, a report was prepared regarding the treatment needs and parents were informed about the same.

A pre-structured questionnaire formulated in the local language (Malayalam) was given to the parents/care providers pertaining to the oral hygiene practices and oral health problems of the children with autism. The study used a questionnaire formulated and designed for a previous study which assessed oral health awareness of care providers of visually impaired children [19]. The study modified this questionnaire for children with autism. The modified questionnaire was sent for validation by experts (face and content validity) before

translation into Malayalam language. The Malayalam version of the questionnaire containing 25 items was then distributed among the local population, not included in the study for cognitive interviewing. The translation into Malayalam was performed by a native student. This document was then translated and verified by language expert who had the expertise of a professional college level teacher teaching Malayalam with more than 10 years of teaching experience. Cronbach's alpha value of 0.725 for the translated version of the questionnaire.

STATISTICAL ANALYSIS

Data collected was subjected to statistical analysis. Descriptive statistics were displayed as mean \pm standard deviation for continuous variables, and frequencies and percentages for categorical variables. The variables were checked for normality using Shapiro-Wilk test for normal distribution. The data did not follow a normal distribution. The data on caries experience between the deciduous and permanent dentition of the two groups of children were compared using the Mann-Whitney U test, gingival index scores using independent t-test, and the oral hygiene status of the children between the two groups using Chi-square test. Statistical analyses were conducted using EZR software (R version 3.6.3[®] 2020 The R Foundation for Statistical Computing) and significance level was set at $p < 0.05$.

RESULTS

Children with autism comprised of 14 boys and six girls while the healthy controls comprised of 12 boys and eight girls. The mean age of the children with ASD was 9.2 ± 1.1 years and healthy controls were 9.45 ± 1.0 years. Children with autism had higher DMFT values, however this difference was not found to be significant ($p = 0.757$), [Table/Fig-1].

The dft values in the children with autism were significantly lower than the control group ($p = 0.035$), [Table/Fig-1].

Group	N	Median (Q3, Q1)	U	p-value
dft index scores				
ASD	20	0 (1.25, 0)	129.5	0.035*
Control	20	2 (4.00, 0)		
DMFT index scores				
ASD	20	0 (1.25, 0)	210	0.757
Control	20	0 (1.00, 0)		

[Table/Fig-1]: Caries experience of the control and the autistic group. Mann-Whitney U test statistic.

*p-value < 0.05 significant; ASD: Autism spectrum disorder; DMFT: Decayed, Missing, Filled permanent teeth

There was no statistically significant difference in the inter group comparison of gingival index scores of the children with ASD and healthy controls ($p = 0.811$), [Table/Fig-2].

When oral hygiene status of the two groups were compared, the study found no statistically significant difference ($p = 0.833$), [Table/Fig-3].

Gingival index			
Group	Mean	Standard deviation	p-value
Control (n=20)	0.20	0.246	0.811
ASD (n=20)	0.27	0.322	

[Table/Fig-2]: Gingival indices of the control and the autistic group. Independent t-test; *p-value < 0.05 significant; ASD: Autism spectrum disorder

Oral hygiene status	Control (%)	ASD (%)	Chi-squared test (p-value)
Good	1 (5)	2 (10)	$\chi^2 = 0.365$ (0.833)
Fair	3 (15)	3 (15)	
Poor	16 (80)	15 (75)	

[Table/Fig-3]: Oral hygiene status of the control and the autistic group. *p-value < 0.05 -significant; Chi-squared test; ASD: Autism spectrum disorder

[Table/Fig-4,5] show the results of the responses to the questions asked in the survey. A total of 17 (85%) children with autism used tooth brush and tooth paste. Seven (35%) of the children brushed twice a day, while 10 (50%) brushed once daily. Up to 17 (85%) of children needed assisted tooth brushing (parental). A total of 15 (75%) of parents were aware of the tooth problems of their wards. However, none of them were aware that deposits on the tooth surface could lead to oral health problems. Only 4 (20%) children had ever visited a dentist [Table/Fig-4,5].

No.	Question	Response	n	(%)
1.	Tooth cleaning aids used	Tooth paste and brush	17	85
		Tooth powder and finger	3	15
2.	How often does your child brush?	Once a day	10	50
		Twice a day	7	35
		More than twice a day	1	5
		Not even once a day	2	10
3.	Knowledge of fluoride in the tooth paste?	Yes	0	0
		No	0	0
		Don't know	20	100
4.	Supervision of tooth brushing in children?	Child alone	3	15
		Child with others assistance	17	85
5.	Frequency of changing the tooth brush	Three times a month	9	45
		More than three months	11	55
6.	Type of dental treatment received	Only checkup done	2	10
		Treatment done	2	10
		None	16	80
7.	How often is your child taken to the dentist?	Only when there is a problem	4	20

[Table/Fig-4]: Frequency of responses to questions asked in the survey.

No.	Question	Number of children (Frequency) Yes	Number of children (Frequency) No
1.	Use of dental floss in cleaning the child's teeth	0	20
2.	Tongue cleaning as a part of child's oral hygiene	0	20
3.	Powered/electric tooth brushes used instead of manual tooth brushes	0	20
4.	Modification done to tooth brushing	0	20
5.	New methods used to teach the child to brush the teeth	0	20
6.	Halitosis observed	2	18
7.	Complain of tooth ache	5	15
8.	Awareness about accumulation of deposits on tooth surfaces a causative factor for dental caries/gum disease	0	20
9.	Knowledge that daily removal of deposits through tooth brushing is essential to prevent dental disease	0	20
10.	Awareness that frequent consumption of sweets causes tooth decay	18	2
11.	Awareness of any form of injury to tooth or jaw	0	20
12.	Awareness of fluoride therapies as a preventive measure for dental caries	0	20
13.	Observation of bleeding gums while brushing	3	17
14.	Has the child been taken for a dental consultation in the past	4	16
15.	Tendency to eat sweet food	7	13
16.	Tendency to eat same type of food	5	15
17.	Noticed child pouching food in mouth	2	18
18.	Is your child on medication?	1	19

[Table/Fig-5]: Frequency of responses to questions asked in the survey.

DISCUSSION

Over the past two decades there has been an increase in reporting and awareness of autism. Knowledge and awareness of autism has grown significantly over the years among the general public, parents, health professionals, and the research community [20]. However, little is known about the general and oral health problems of autistic children and awareness about their specific needs in India.

In the present study, the caries experience of the children with ASD in the primary teeth was significantly lower than that of the healthy controls ($p=0.035^*$). Preference for sweet food was assessed in the questionnaire survey and it was found that only 7 (35%) children preferred sweet food, hence the authors concluded that this factor could be a probable reason for the lower caries experience in the primary teeth of the children with ASD. Previous studies by Weddell JA et al., and Ferrazzano GF et al., reported that individuals with ASD have an inclination for soft and sweetened food which makes them more prone to dental caries [21,22]. In contrast to present study findings, Moraels-Chavez MC found that children with ASD exhibited higher caries prevalence in primary teeth than in permanent teeth [15]. The present study found a higher caries prevalence in the permanent teeth in children with ASD, however this difference was not statistically significant. This could be due to the fact that, with increasing age of the child assistance provided by the care providers during oral care practices tend to become more challenging. This result was in agreement with results of Duker LI et al., who reported a higher rate of caries among children with ASD [7].

There were no statistically significant differences when the mean gingival indices of the autistic group and the control group were compared ($p=0.811$). All children with and without ASD displayed mild gingivitis. Hence, in spite of supervised parental brushing, the study observed mild gingivitis in these children. This result was consistent with the findings of Naidoo M and Singh S who found a high prevalence of mild gingivitis in children with ASD [23]. In a recent study by Önel SE and Kirzioğlu Z, the authors reported that children with autism had significantly higher periodontal and gingival index values compared to children without autism [14]. These differences could be due to differences in oral hygiene habits and parental supervision of tooth brushing. Comparison of oral hygiene scores of the autistic and the healthy children revealed no significant differences ($p=0.833$). Most of the autistic as well as healthy controls displayed good oral hygiene. Parental supervision during home oral hygiene practices could have contributed to the good oral hygiene seen in children with ASD. Önel SE and Kirzioğlu Z also found that parents play a major role in improving oral hygiene status of children with autism [14]. In contrast to the results of the present study Jaber MA et al., reported that majority of children with autism had either poor or fair oral hygiene [24].

Parents play a crucial role in healthcare of children with ASD. Kalyoncu IO and Tanboga I have reported less frequent brushing in children with ASD than in normally developing children, with brushing most often carried out by parents or under parental supervision [25]. A recent study by Suhaib F et al., found the frequency of brushing and independent brushing amongst children with ASD and their healthy siblings was significantly different [26]. In the present study, none of the autistic children could brush independently and needed assistance and supervision. This could be because of their limited manual dexterity and sensory issues [27,28]. In this study, up to 17 (85%) children had assisted tooth brushing (parental) which probably has contributed to the satisfactory oral hygiene status of the children. Asimakopoulou K et al., and Magoo J et al., have reported supervised tooth brushing for children with ASD with percentages ranging from 27% to 86.5%, respectively [29,30].

From the results of the questionnaire survey it appears that although most parents (90%) of the children with ASD were aware about frequent consumption of sweet food causing dental decay they seemed to have poor knowledge about the other causative factors of dental disease. They were not aware of caries preventive measures such as fluoride in the toothpaste. In the current study, children with autism visited a dentist only when parents felt that there was a problem. Therefore, only 4 (20%) children had ever visited the dentist. The reasons for this could be physical, financial, and psychological burdens of taking care and coping with an autistic child [31,32]. Most parents seemed to be unaware of the importance of a dental visit. Stein LI et al., reported that children with ASD experienced greater difficulties and barriers to care in both home and dental office settings than their typically developing peers [33].

Children with ASD are often cited as having certain food preferences, which includes sweets and soft foods [34,35]. In this study, only 7 (35%) children showed a preference for sweet food. Stookey GK had observed that pouching of food rather than swallowing is a typical characteristic in children with autism [36]. This can lower the salivary pH and increase their susceptibility to dental caries. However, in this study, parents of only two children with autism seemed to have noticed pouching of food in the children and were aware of this habit. Although the parents and care providers of the autistic children had some knowledge and awareness of the dental problems of their wards, most of them did not realise the need of good, regular oral hygiene practices and the need for regular dental visits.

Regular dental visits for these children should be encouraged and facilitated. Tailor made innovative teaching methods could be devised to teach tooth brushing to these children. Hence there is a need for suitable comprehensive oral health educational programs for these parents and children to achieve optimal oral health for the children.

Limitation(s)

This study was conducted at only one centre and hence the sample size was small so the results cannot be extrapolated for the entire population. Data regarding parental awareness of oral health of healthy controls was not collected and comparative analysis of this aspect could not be done.

CONCLUSION(S)

Caries experience in the permanent dentition in the autistic children and healthy children were comparable while autistic children had a lower caries experience in the primary dentition. Mild gingivitis was seen in all the children which emphasises the need for preventive intervention. Children with autism as well as healthy children exhibited a good oral hygiene. Most of the autistic children had assisted tooth brushing (parental), however there were significant lacunae of knowledge in the oral health awareness of the parents/care providers. Children with autism had very poor access to dental care. Effective oral health promotion strategies need to be implemented to improve oral health status of autistic children and improve the awareness of their care providers.

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