Open Access

ORIGINAL ARTICLE

Evaluation of Dental Caries and Periodontal Health Status in Children with Autism: a Case Control Study

Ahmed Bin Khalid Khan[1], Seeme Nigar[2], Naseer Ahmed[3], Anum Tanwir[4], Chander Kumar[5], Sara Altamash[6]

[1]Senior Registrar, Department of Periodontology, Altamash Institute of Dental Medicine, Karachi, Pakistan.
[2]Senior Registrar, Department of Oral Pathology, Altamash Institute of Dental Medicine, Karachi, Pakistan.
[3]Professor, Department of Prosthodontics, Altamash Institute of Dental Medicine, Karachi, Pakistan.
[4]Assistant Professor, Department of Pediatric Dentistry, Baqai Medical University, Karachi, Pakistan.
[5]Associate Professor, Department of Periodontology, Dow Dental College, Dow University of Health Sciences, Karachi Pakistan.
[6]Assistant Professor, Department of Orthodontics, Altamash Institute of Dental Medicine, Karachi, Pakistan.

ABSTRACT

Background: Dental problems are common in autistic children due to poor oral hygiene. During the dental treatment, main challenge is reduced ability of autistic kids to communicate. The objective of this study was to investigate about the oral health status of autistic children and to compare the risk of dental caries and periodontal disease between children with autism and healthy controls.

Methodology: This case-control study was conducted at the Milestone Charitable Trust and Defense Housing Authority (DHA), Sheikh Khalifa Bin Zayed School, for the duration of 04 months (1st Dec 2019 – 30th March 2020). Among cases, 67 autistic children and among controls,67 healthy children, of age 7 to 17 years, of either gender, were included. All the participants were examined and assessed for presence or absence of any carious lesions, and periodontal health. Data analysis was done using SPSS version 23.

Results: The overall mean age of included children was 12.51±2.99 years. Of 134 children, 53.7% were males and 46.3% females. The odds of periodontal disease were 5.52 times higher in autistic children as compared to healthy children ($p < .001$). The odds of dental caries were 3.43 times higher in autistic children as compared to healthy children ($p < .001$). In both age groups (<=10 years and >10 years), the risk of periodontal disease and dental caries was higher among autistic children as compared to normal children. While, according to gender, the risk of dental caries was higher among male autistic children as compared to normal children.

Conclusion: The odds of dental caries and periodontal disease were higher among autistic children as compared to healthy controls.

Keywords: Autism Spectrum Disorder, Dental caries, Periodontitis

Authors' Contribution:
[1]Conception; Literature research; manuscript design and drafting; [2,3] Critical analysis and manuscript review; [4,5]Data analysis; [6]Manuscript Editing.

Correspondence:
Naseer Ahmed
Email: naprosthodontist@gmail.com

Article info:
Received: July 1, 2021
Accepted: May 23, 2022

***Cite this article**. Khan A B H, Nigar S, Ahmed N, Tanveer A, Kumar C, Altamash S. Evaluation of Dental Caries and Periodontal Health Status in Children with Autism: a Case Control Study. J Islamabad Med Dental Coll. 2022; 11(2):103-109. DOI: https://doi.org/10.35787/jimdc.v11i2.734*

***Funding Source:** Nil*
***Conflict of Interest:** Nil*

Introduction

Autism spectrum disorder (ASD) is a complex developmental illness characterized by long-term neuro-developmental symptoms that appear in childhood. They are characterized by difficulties in social communication or interaction, as well as confined, repetitive patterns of interests, behavior, or activities, and odd sensory sensitivities or preferences. An "epidemic of autism" has been witnessed, all across the world, in the last decade or two. According to recent estimates, from the World Health Organization, one out of every 160 children have an ASD.[1]

CDC 2020 data have reported that the prevalence rate of ASD ranges from 0.1 to 43.6 with an average male: female ratio of 4:1. Due to their complex clinical manifestations, children with ASD pose unique behavioral challenges for dentists in provision of effective oral health care mainly due to anxiety and aggressive behavior of autistic children. Poor manual dexterity and lack of eye contact further complicate the problem. Parents and caregivers also face difficulties in provision of regular oral hygiene measures, due to the uncooperative behavior of children with ASD.[2]

The American Academy of Pediatrics has reported a prevalence rate of 1 out of 91 children in the age group of 3–17 years. Autistic patients display a higher propensity to specific malocclusions, open bite and swarming, and crowding. Oral habits like tongue thrusting, bruxism, lip biting and gingival pricking are most common complaints among kids with autism. It has been reported that children with ASD generally prefer sweet, soft and sticky food and therefore are more susceptible to dental caries. In addition, failure to maintain oral hygiene without assistance, predisposes children to periodontal diseases. [3]

Oral health of autistic children has been studied by many researchers, as a whole or in contrast to healthy controls. Literature shows that the occurrence of dental caries in children with ASD is debatable.[4-11] According to few studies, children with autism have an increased risk of dental caries due to food selectivity, poor oral hygiene maintenance and infrequent use of oral health care services. Furthermore, an increased risk of periodontal diseases has also been reported in the literature because of the same reasons.[4,7,11]

Contrarily, some studies show that children with ASD have a decreased incidence of dental caries and periodontal problems.[6,9,10]. Moreover, very few studies have assessed the oral health status of autistic children in Pakistan. With such conflicting results and lack of available information, the study was planned to investigate the oral health status of autistic children in Pakistan to update the existing knowledge and to help in planning dental care for the children with special needs.

Methodology

This case-control study was conducted at the Milestone Charitable Trust and Defense Housing Authority (DHA), Sheikh Khalifa Bin Zayed School, Karachi for the duration of 04 months from 1st Dec2019 – 30th March,2020. The sample size was estimated using online Open Epi calculator by taking statistics of dental caries in autistic kids as 76% [7] and in normal kids as 34.9% [8], level of significance as 95% and 90% power of study. The total sample size was 134. The data were obtained from the schools, by means of non-probability convenience sampling technique. In case group, children with confirmed diagnosis of autism, of age 7 to 17 years, of either gender were included whereas in control group, healthy children of age 7 to 17 years, of either gender were included. Agitated and aggressive children, children scared of dental evaluation, children having any dental treatment or thorough cleaning procedure during the last 6 months, children with presence of certain diseases that might increase or influence tooth decay, caries and the severity of periodontal disease, for example, diabetes mellitus were excluded from the study.

The study was approved from ethical review committee Altamash Institute of Dental Medicine . Permission letter or consent to examine the children was taken from the faculty members and class teachers as well as from the parents. All of the children were checked and assessed for dental health status, presence or absence of any carious lesions and periodontal health. The children were asked to sit on a normal chair. Illumination was provided using artificial light (torch). Oral health status was checked by using examination instruments including dental mirror, probe and explorer. Overall periodontal status was evaluated by basic periodontal examination (BPE). Dental caries was recorded using the Decayed Missing Filled Teeth index according to the established WHO criteria.[12]

The condition, health and inflammatory status of the gingiva was assessed by the gingival index. Oral hygiene status was noted as good, fair or poor depending on the Oral Hygiene Index. Plaque and calculus accumulation were assessed by Plaque Index and Calculus index. CPITN or WHO probe was used for the periodontal examination. The oral cavity was divided into six sextants. Each sextant contained at least two teeth. Periodontal probe was inserted parallel to the vertical axis of the tooth and walked circumferentially around the sulcus or pockets in all sextants and the scores were recorded. Lastly, questions were asked from the parents about overall oral health status of the children, either they followed regular tooth brushing or not, and the frequency of tooth brushing from both groups. They were asked if their child has any dental issues like bleeding either spontaneous or easily provoked, any irritation or inflammation, pain or toothache.

A single dentist (principal author) carried out all examinations. The parents/guardians were informed about the clinical findings through written information sheets made for the school record. Following the examination, oral health education was given, in addition to referrals to dental clinics, whenever these were deemed necessary.

Data analysis was done using SPSS version 23. Mean and SD were computed for age and DMFT score. Frequency and percentage were computed for gender, periodontal disease and dental caries. Chi-square test/Fischer exact test was applied for the comparison of periodontal disease and dental caries between autistic and healthy children. Crude odds ratio with 95% CI was estimated. Stratification with respect to age and gender were performed for comparison of periodontal disease and dental caries between autistic and healthy children. Adjusted odds ratio with 95% CI was estimated.

Results

The mean age of children from both groups was 12.51±2.99 years (range: 7-17 years). The mean age of autistic children (n=67) was 13.06±2.917 years with 50.7% females and 49.3% males. The mean age of healthy children (n=67) was 11.97±2.99 years and majority of them were males (58.2%). Only 19.4% autistic children brushed their teeth twice or thrice a day and 16.4% once a day while 26.9% normal children brushed their teeth twice/thrice daily and 38.8% brushed at least once a day. The remaining 64.2% autistic and 34.3% healthy children brushed their teeth occasionally. There was a significant association between oral hygiene and brushing among both groups with p value 0.005.

Out of 134 children, 67 children had periodontal disease. The odds of periodontal disease were 5.52 times higher in autistic children as compared to healthy children (OR=5.52, 95% CI=2.64-11.57). Hence, there was statistically significant association between autism and periodontal disease ($p < .001$).

Out of the total (67) autistic children, 47 developed periodontal diseases. Whereas in the control group, 20 developed periodontal diseases. Furthermore, in age group ≤10 years, the odds of periodontal disease were 6.37 times higher among autistic children as compared to normal children (AOR=6.37, 95% CI=1.42-28.60). Similarly in age group>10 years, the

odds of periodontal disease were 2.70 times higher among autistic children as compared to normal children (AOR=2.70, 95% CI=1.18-6.13). Among males, the odds of periodontal diseases were 7.95 times higher in autistic children as compared to normal children (AOR=7.95, 95% CI=2.76-22.92). Whereas in females, the odds of periodontal disease were 3.87 times higher in autistic children as compared to normal children (AOR=3.87, 95% CI=1.34-11.17). Therefore, autistic male children had high proportion of periodontal disease as compared to female autistic children (75.7% vs 64.7%). A statistically significant association between autism and periodontal disease ($p < .001$) was found. (Table 1)

In addition, 49.3% of the total children had dental caries. The minimum DMFT recorded was 1 while the maximum was 3 with mean ± SD of 1.74± 0.83. The odds of dental caries were 3.43 times higher in autistic children as compared to healthy children (OR=3.43, 95% CI: 1.68-6.97). There was statistically significant association between autism and dental caries (p=0.001). Out of the total (67) autistic children, 43 developed dental caries. Whereas in the control group, 23 developed dental caries. Moreover, in age group, ≤10 years, the odds of dental caries were 6.37 times higher among autistic children as compared to normal children (AOR=6.37, 95% CI=1.42-28.60). Similarly in age group>10 years, the odds of dental caries was 2.70 times higher among autistic children as compared to normal children (AOR=2.70, 95% CI=1.18-6.13). Among males, the odds of dental caries were 4.50 times higher in autistic children as compared to normal children (AOR=4.50, 95% CI=1.66-12.14). Whereas among females, statistically insignificant association was observed between dental caries and autism (p=0.078). However, autistic male children had high proportion of dental caries as compared to female autistic children (66.7% vs 61.8%). (Table 2)

Table I: Stratification analysis with respect to age and gender of periodontal disease between both groups

	Autistic children (n=67)	Healthy children (n=67)	p-value	Adjusted OR (95% CI)
Age group≤10 years				
Periodontal disease				
Yes	10 (76.9%)	7 (30.4%)	0.014*	6.37 (1.42-28.60)
No	3 (23.1%)	16 (69.6%)		
Age group>10 years				
Periodontal disease				
Yes	37 (68.5%)	13 (29.5%)	0.0001*	2.70 (1.18-6.13)
No	17 (31.5%)	31 (70.5%)		
Male				
Periodontal disease				
Yes	25 (75.8%)	11 (28.2%)	0.0001*	7.95 (2.76-22.92)
No	8 (24.2%)	28 (71.8%)		
Female				
Periodontal disease				
Yes	22 (64.7%)	9 (32.1%)	0.011*	3.87 (1.34-11.17)
No	12 (35.3%)	19 (67.9%)		

Table II: Stratification analysis with respect to age and gender of dental caries between both groups				
	Autistic children (n=67)	**Healthy children (n=67)**	**p-value**	**Adjusted OR (95% CI)**
Age group≤10 years				
Dental caries				
Yes	9 (69.2%)	6 (26.1%)	0.017 *	6.37 (1.42-28.60)
No	4 (30.8%)	17 (73.9%)		
Age group>10 years				
Dental caries				2.70 (1.18-6.13)
Yes	34 (63%)	17 (38.6%)	0.025 *	
No	20 (37%)	27 (61.4%)		
Male				
Dental caries				
Yes	22 (66.7%)	12 (30.8%)	0.002 *	4.50 (1.66-12.14)
No	11 (33.3%)	27 (69.2%)		
Female				
Dental caries				
Yes	21 (61.8%)	11 (39.3%)	0.078	2.49 (0.89-6.96)
No	13 (38.2%)	17 (60.7%)		

Discussion

Gingival and periodontal diseases, as well as compromised oral health, are crucial and major difficulties in children with autism and other learning impairments.[7] When compared to normal persons with no special requirements or impairments, the frequency and occurrence of numerous oral illnesses are much greater in exceptional children with autism disorder.[1,6] People with autistic condition may find it difficult to execute simple and basic chores, such as keeping proper dental hygiene.[1] Caries in autistic children should be closely monitored, and interventions should be devised to alter the children's everyday activities in order to encourage them to acquire more favorable dental health practices.[13,14]

In the current study, we have evaluated the proportion of dental caries and periodontal disease among children with autistic disorders as compared to healthy controls. It shows that 64.2% of the autistic children had dental caries whereas only 34% of the normal children had decayed teeth. Suhaib et al. observed similar results in a Pakistani study, with autistic children having a greater prevalence of dental caries than healthy controls (50% vs 22.2%).[15]The reason that dental caries is more common in children with ASD might be related to the children's inability to brush properly, independently and brushing less frequently , resulting in poor oral hygiene.[15,16] Another fact is that the children with autism occasionally favor sweetened and soft meals, and they prefer to stuff them into their pockets and mouths to the brim rather than swallowing them which may lead to dental caries.[16,17]

Moreover, dental caries was observed in 69.2% of the autistic children belonging to age group age≤10 where as in age group >10 years, 63% of autistic children showed carious lesions. This is in contrast to the other studies, where it was observed that as the age of ASD children increases, the frequency of dental caries also increases. This finding was observed among autistic children with a growing number of permanent teeth. Caretakers are finding it more difficult to brush their children's teeth as they become older.[17-19] We also found male gender as a significant risk factor for dental caries among autistic children. Hassan et al. also found that male gender in autistic children was significantly associated with dental caries.[17] Another study also showed that male autistic children had high frequency of caries than females.[20]

According to our study, 70.1% of the autistic children had periodontal disease. We also found that frequency of periodontal disease was higher in

autistic children of age≤10 years and male gender. In another study Hussein et al. also observed high incidence of periodontal disease among children with autism as compared to normal children ($p<0.05$).[21] Vajawat et al. also revealed the frequency of periodontal disease was higher among autistic children as compared to healthy controls ($p=0.001$).[22] Due to difficulties with plaque management and oral defensiveness to oral hygiene equipment in the mouth, such as tooth brushing, people with ASD are more prone to develop periodontal disease.[23]

However, there are certain limitations of the study, the mean age did not match between the two groups and there was a 1-year difference; this cofounder should be controlled in future study as this might have an effect on the results. Moreover, blinding was not performed. Within limitations of the study, it is concluded that the outcome of the study should be considered as the baseline and to be used with caution. Further studies are warranted to work on the identified loopholes.

Furthermore, the children with autistic disorder have bad oral hygiene, various dental, gingival and periodontal problems which are most likely due to improper coordination, lack of proper understanding, physical and mental disability and various other associated abnormalities, or muscular restrictions and constraints.[16,17,20,24] This study provides necessary data and information regarding dental conditions and dental needs of the group of children suffering from autism which might enable and help policy makers to design and create successful oral health educational programs for children with learning disabilities particularly autistic children. This research highlights the need for more efforts and work in this field. Further awareness is needed for the accomplishment of long term oral and periodontal needs of children with autism.

Conclusion

The odds of dental caries and periodontal disease were higher among autistic children as compared to healthy children.

References

1. WHO. Autism spectrum disorders 2021 [cited 2021 11 Jun]. Available from: https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders.
2. AlHumaid J. Dental experiences related to oral care of children with autism spectrum disorders in Saudi Arabia: A literature review. Saudi Dent J. 2021;27;34(1):1-10. https://doi.org/10.1016/j.sdentj.2021.09.023
3. Suhaib F, Saeed A, Gul H, Kaleem M. Oral assessment of children with autism spectrum disorder in Rawalpindi, Pakistan. Autism. 2019;23(1):81-6.
4. Ferrazzano GF, Salerno C, Bravaccio C, Ingenito A, Sangianantoni G, Cantile T. Autism spectrum disorders and oral health status: review of the literature. Eur J Paediatr Dent. 2020 Mar;21(1):9-12. doi: 10.23804/ejpd.2020.21.01.02.
5. Pi X, Liu C, Li Z, Guo H, Jiang H, Du M. A Meta-Analysis of Oral Health Status of Children with Autism. J Clin Pediatr Dent. 2020;44(1):1-7. doi: 10.17796/1053-4625-44.1.1.
6. Kalyoncu I, Tanboga I. Oral Health Status of Children with Autistic Spectrum Disorder Compared with Non-authentic Peers. Iran J Public Health. 2017;46(11):1591-3.
7. AlHumaid J, Gaffar B, AlYousef Y, Alshuraim F, Alhareky M, El Tantawi M. Oral Health of Children with Autism: The Influence of Parental Attitudes and Willingness in Providing Care. Scientific World Journal. 2020;2020:8329426.
8. Morales-Chávez MC. Oral Health Assessment of a Group of Children with Autism Disorder. J Clin Pediatr Dent. 2017;41(2):147-149. doi: 10.17796/1053-4628-41.2.147.
9. Zhang Y, Lin L, Liu J, Shi L, Lu J. Dental Caries Status in Autistic Children: A Meta-analysis. J Autism Dev Disord. 2020Apr;50(4):1249-1257. doi: 10.1007/s10803-019-04256-x.
10. Fakroon S, Arheiam A, Omar S. Dental caries experience and periodontal treatment needs of children with autistic spectrum disorder. Eur Arch Paediatr Dent. 2015 Apr;16(2):205-9. doi: 10.1007/s40368-014-0156-6.

11. Du RY, Yiu CK, King NM, Wong VC, McGrath CP. Oral health among preschool children with autism spectrum disorders: A case-control study. Autism. 2015;19(6):746-51. doi: 10.1177/1362361314553439.
12. WHO. Mean number of Decayed, Missing, and Filled Permanent Teeth (mean DMFT) among the 12-year-old age group (Internet). Available from: https://www.who.int/data/gho/ indicator-metadata-registry/imr-details/3812
13. Goenka P, Dutta S, Marwah N, Sarawgi A, Nirwan M, Mishra P. Prevalence of Dental Caries in Children of Age 5 to 13 Years in District of Vaishali, Bihar, India. Int J Clin Pediatr Dent. 2018;11(5):359-64.
14. Delli K, Reichart PA, Bornstein MM, Livas C. Management of children with autism spectrum disorder in the dental setting: concerns, behavioural approaches and recommendations. Med Oral Patol Oral Cir Bucal. 2013;18(6):e862-8.
15. Suhaib F, Saeed A, Gul H, Kaleem M. Oral assessment of children with autism spectrum disorder in Rawalpindi, Pakistan. Autism. 2019;23(1):81-6.
16. Hariyani N, Soebekti RH, Setyowati D, Bramantoro T, Palupi LS, Oktarina, et al. Factors influencing the severity of dental caries among Indonesian children with autism spectrum disorder - a pilot study. Clin CosmetInvestig Dent. 2019;11:227-33.
17. Hassan GS, Rafique T, Ghosh R, Biswas AK, Rahman HA. Oral hygiene practice and dental status of autistic children. Bangladesh Medical Research Council Bulletin. 2020;46(2):90-8.
18. Sharp WG, Berry RC, McCracken C, Nuhu NN, Marvel E, Saulnier CA, et al.Feeding problems and nutrient intake in children with autism spectrum disorders: a meta-analysis and comprehensive review of the literature. J Autism Dev Disord. 2013;43(9):2159-73.
19. Heaton LJ, Swigart K, McNelis G, Milgrom P, Downing DF. Oral health in patients taking psychotropic medications: Results from a pharmacy-based pilot study. J Am Pharm Assoc. 2016;56(4):412-7.
20. Naidoo M, Singh S. The Oral health status of children with autism Spectrum disorder in KwaZulu-Nata, South Africa. BMC Oral Health. 2018;18(1):165.
21. Hussein F, Mustafa A, Sabir S. Dental caries experience and periodontal health status in a sample of autism children. Zanco J Med Sci.2018; 22(1), 73 - 81. https://doi.org/10.15218/zjms.2018.010
22. Vajawat M, Deepika PC. Comparative evaluation of oral hygiene practices and oral health status in autistic and normal individuals. J Int Soc Prev Community Dent. 2012;2(2):58-63.
23. Du RY, Yiu CKY, King NM. Oral Health Behaviors of Preschool Children with Autism Spectrum Disorders and Their Barriers to Dental Care. J Autism Dev Disord. 2019;49(2):453-9.
24. Poustka L, Brandeis D, Hohmann S, Holtmann M, Bölte S, Banaschewski T. Neurobiologically based interventions for autism spectrum disorders-rationale and new directions. Restor Neurol Neurosci. 2014;32(1):197-212.