

The effect of attention deficit hyperactivity disorder on children brushing habits, plaque index, and caries indices in children

Berna Kuter¹, Burcu Kanmaz²

¹ Izmir Democracy University, Faculty of Dentistry, Department of Pediatric Dentistry, Izmir, Turkey

² Izmir Democracy University, Faculty of Dentistry, Department of Periodontology, Izmir, Turkey

Correspondence:

Dr. Berna KUTER
Department of Pediatric Dentistry,
Faculty of Dentistry
Izmir Democracy University, Izmir,
Turkey.
E-mail:berna.kuter@idu.edu.tr

Received: 5 June 2020

Accepted: 18 November 2020

Abstract

Aim: The purpose of this study was to evaluate the effect of attention deficit hyperactivity disorder on children's caries indices, plaque scores, and brushing habits in children aged 5-17 years.

Methodology: A total of 100 children (39 children with attention deficit hyperactivity disorder and 61 healthy children) were included in the study. The plaque index, decay-missed-filled primary tooth (dmf-t) index, and decay-missed-filled permanent tooth (DMF-T) index values were evaluated by clinical examination. The plaque was evaluated using the Silness and Loe Plaque Index. Patient forms were examined to evaluate brushing habits.

Results: When the survey data was examined, the number of healthy children who brushed their teeth was higher than that of children with attention deficit hyperactivity disorder ($p < 0.05$). The dental visit and dental treatment rates were similar in both groups ($p > 0.05$). There was no significant difference between the two groups in terms of plaque index and dmf-t and DMF-T scores ($p > 0.05$).

Conclusion: Children with attention deficit hyperactivity disorder were observed to neglect oral care routines more than their healthy counterparts; however, this did not affect plaque and caries index values.

Keywords: attention deficit hyperactivity disorder, dental caries, dental plaque score, oral health

Access Online



DOI:

10.5577/intdentres.2021.vol11.no2.8

How to cite this article: Kuter B, Kanmaz B. The effect of attention deficit hyperactivity disorder on children brushing habits, plaque index and caries indices in children. Int Dent Res 2021;11(2):109-13. <https://doi.org/10.5577/intdentres.2021.vol11.no1.8>

Introduction

Attention deficit hyperactivity disorder (ADHD) is a common childhood disorder characterized by inattention and hyperactivity (1, 2). Other symptoms include difficulty in sustaining attention on tasks/homework, learning difficulties, school failure, and poor peer relationships. Basic symptoms are defined as moving too much or with over-mobility;

carelessness, impulsivity, and restlessness by the International Classification of Diseases (ICD-9) classification of the World Health Organization (WHO) (3). It is accepted to be a neurological disorder caused by more than one unknown factor (4). It can be seen with or without hyperactivity. It is believed that smoking and using alcohol during pregnancy, problems before, during, and after birth, toxins, and genetic factors are causes of ADHD (4). Children with ADHD

(CADHD) are unable to complete responsibilities, perform daily activities, and maintain attention to homework and play (1).

The accumulation of bacterial biofilm increases the probability of caries and periodontal diseases (5). Tooth brushing is fundamental to prevent the occurrence of these periodontal problems (6). Oral health education programs that incorporate supervised brushing and the use of toothpaste with fluoride are effective in children (7). However, oral hygiene education for CADHD is complex for both family and dentists (8, 9). It is also difficult for children to follow instructions due to their reduced attention. The dentist should make great efforts to communicate with these patients and to instruct in oral hygiene (9).

Some studies show that dietary supplements, artificial dyes, and artificial sweeteners may be related to attention deficit behavior disorders (10). In the literature (11), it is stated that reducing the intake of the child's cariogenic diet can be a treatment method. Therefore, the purpose of the present study is to evaluate the effect of ADHD on caries indices, plaque scores, and toothbrushing habits of children aged 5-17 years.

Materials and Methods

A total of 100 children aged 5-17 years (39 CADHD and 61 healthy children) were included in this retrospective study. Children who used medication for any systemic diseases were excluded from the study in order not to affect the study results. Full accordance with ethical principles was achieved, including the World Medical Association, revised in 2013. An ethical clearance certificate was obtained from the Institutional Ethical Committee of the İzmir Democracy University (ethical code 2020/09-6). The oral examinations of the children were performed with a dental mirror and a dental probe, considering the principles of the WHO. The plaque index, decay-missed-filled primary tooth (dmf-t) index, and decay-missed-filled permanent tooth (DMF-T) index values were evaluated from clinical examination records. The plaque was scored using the Silness and Loe Plaque

Index (11) in Ramfjord index teeth (12). The medical and dental histories of all individuals were reviewed. Patient brushing habits were also evaluated.

Statistical analysis

All data obtained from the patients were statistically evaluated using an analysis program (SPSS Inc. version 21 IBM, Chicago, USA). The distribution of the data was confirmed by the Shapiro-Wilk normality test. Differences between the groups were determined by an independent sample t-test for the age variable, which was found to be parametric. Nonparametric data such as the plaque index, DMF-T, and dmf-t index values were determined by the Mann-Whitney U test. In nominal data, the chi-squared test was used for comparisons between groups. All analyses were performed in a 95% confidence interval, and $p < 0.05$ was determined as the significant difference threshold. At the end of the study, it was concluded that the sample size was sufficient for this study since the power analysis performed using an analysis program (G * Power: Statistical Power Analyzes for Windows, Dusseldorf, Germany) yielded over 95% power.

Results

The plaque and caries index scores of 39 CADHD and 61 healthy children aged 5-17 were evaluated in the study. In demographic data, the gender distribution and age means were found to be similar ($p > 0.05$) (Table 1). It was determined that children who did not have ADHD brushed their teeth significantly more than children with CADHD ($p < 0.05$) (Table 2). Both healthy children and CADHD did not brush their teeth regularly. All the children brushed their teeth either irregularly or not at all. Both groups had similar family monthly income, dental visit status, and dental treatment ($p > 0.05$) (Table 2). Considering the clinical examinations, no significant differences were found between the groups in plaque index, dmf-t, and DMF-T index values ($p > 0.05$) (Table 3).

Table 1. Comparison of demographic data between groups

	Attention deficit hyperactivity disorder group n=39	Healthy group n=61	Test statistic value	p value
Age (years) (mean.± SD)	11.54 ± 2.07	12.64 ± 2.92	-1.804	0.071
Gender (n) (boy/girl)	9/30	20/41	0.472	0.492

Table 2. Survey data comparison between groups

	Attention deficit hyperactivity disorder group n=39	Healthy group n=61	Test statistic value	p value
Family monthly income (n) (low/mid/high)	9/24/6	25/32/4	2.101	0.350
Status of seeing the dentist (n) (yes/no)	24/15	45/16	0.789	0.499
Status of dental treatment (n) (yes/no)	12/27	24/37	0.335	0.755
Toothbrushing Habits (n) (none/irregular)	15/24	7/54*	5.744	0.017

* p<0.05 statistically significant difference between groups

Table 3. Clinical data comparison between groups

	Attention deficit Hyperactivity disorder group n=39	Healthy group n=61	Test statistic value	p value
Plaque Index (1-5)	1.50±0.65	1.17±0.68	-0.785	0.435
dmf-t Index (median(Q1-Q3))	1.00(0.00-5.50)	3.00(1.00-5.00)	-1.016	0.309
DMF-T Index (median(Q1-Q3))	2.00(0.50-3.50)	0.50(0.00-3.25)	-0.290	0.772

dmf-t: decay-missed-filled primary tooth

DMF-T: decay-missed-filled permanent tooth

* Unless otherwise stated, values in the table were given as mean±SD

Discussion

ADHD, which is the most common and frequently diagnosed childhood behavioral disorder, is more common in boys than girls (13,14). These children are in the high-risk group in terms of oral and dental health and are included in the patient group that needs special attention in pediatric dentistry due to behavioral problems caused by this disorder (15,16). It has been reported that they are in the high caries risk group because they are not able to perform effective tooth brushing and therefore do not perform ideal oral hygiene and do not have ideal dietary habits (17). ADHD is accompanied by hyperactivity in some children and is recommended drug treatment by physicians (9). Amphetamine, one of the recommended medications for this disorder, causes gum growth, and

methylphenidate and dexamphetamine cause severe atypical caries (9,10). Additionally, these types of medications cause dry mouth, and these children are more susceptible to caries due to increased consumption of sugary foods and beverages (9,10). Children who used any medications were not included in the present study to prevent the side effects from influencing the study results.

It was observed that the functional skills of CADHD were 25-30% less than their peers (18); therefore, they couldn't perform activities such as toothbrushing effectively (19, 20). Hidas et al. reported that the frequency of toothbrushing of CADHD was the same as other peer children; however, their plaque scores were higher (21). It has been stated that this result may be due to an ineffective and inadequate toothbrushing or giving wrong information about brushing by their

parents. CADHD have more difficulty with learning and performing motor skills (22). Motor coordination problems affect daily activities such as toothbrushing skills (23). It was observed that CADHD were not statistically different from healthy children in terms of plaque index scores. Because, both CADHD and healthy children did not regularly brush their teeth.

It is unclear whether the factors associated with CADHD, such as poor diet and poor oral hygiene, are risk factors for dental caries. Some studies have been shown that CADHD consumed more sugar and sugary beverages than their peers and also that their parents of CADHD were rewarded with more sugar (3, 20). Furthermore, the literature is inconclusive concerning dental caries prevalence of CADHD. Some researchers reported that the caries scores of healthy children and CADHD were similar (16, 17, 24). Some studies showed higher caries scores of CADHD than those of healthy children (25). No difference was observed between the CADHD and healthy children in terms of caries scores in this study.

A comprehensive evaluation of oral hygiene, nutritional habits, anamnesis from the parents of CADHD are of great importance in terms of ensuring oral and dental health (20). It is important to improve their oral hygiene by reducing the consumption of sweetened food and informing them about it (20).

Although it was stated that the dental anxiety level was not higher in this group of children, 15% of children who applied to private clinics for dental treatment were reported to be children with attention deficit problems (26, 27). One of the most challenging aspects of dental treating of CADHD could be behavioral management because of the inability to focus on the treatment and difficulty in establishing communication (6, 8, 28). That all instructions are simple and repeated numerous times are recommended (27). It was stated that 'Tell-Show-Do' was effective because it was focusing their attention on the procedures. It was also shown that it would be more appropriate to prefer multiple short-term sessions rather than a long and single session (2, 8, 9). It is recommended regular follow-up appointments because of the challenging to treat and susceptibility to dental caries (28). The fissure sealant applications, fluoride treatments, oral hygiene education, and dietary advice are very important to prevent dental caries in the CADHD (25).

Conclusions

Dentists need to learn about the oral health and behavioral status of CADHD and the strategies required for successful dental care in their dental practices due to the high prevalence of CADHD in the population. It was determined that CADHD neglected oral care more than healthy counterparts in the study. However, it was observed that these deficiencies in toothbrushing did not affect the plaque and caries index values.

Ethical Approval: Ethics committee approval was received for this study from İzmir Democracy University in accordance the World Medical Association Declaration of Helsinki, with the approval number: 2020/09-6.

Peer-review: Externally peer-reviewed.

Author Contributions: Conception - B.K.; Design - B.K., B.Ka.; Supervision - B.K.; Materials - B.K., B.Ka.; Data Collection and/or Processing - B.K., B.Ka.; Analysis and/or Interpretation - B.Ka.; Literature Review - B.K., B.Ka.; Writer - B.K.; B.Ka.; Critical Review - B.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Rowland AS, Lesrsce CA, Abramowitz AJ. The epidemiology of attention-deficit/ hyperactivity disorder (ADHD): A public health view. *Ment Retard Dev Disabil Res Rev* 2002;8:162-70.
2. Waldman HB, Swerdloff M, Perlman SP. Behavior: You may be treating hyperactivity disorder in your dental practice. *J Dent Child* 2000;67:241-5.
3. Blomqvist M, Holmberg K, Fernell E, Dahllof G. A retrospective study of dental behavior management problems in children with attention and learning problems. *Eur J Oral Sci* 2004;112:406-11. ([Crossref](#))
4. Thapar A, Cooper M, Jefferies R, Stergiakouli E. What causes attention deficit hyperactivity disorder? *Arch Dis Child* 2012;97:260-265. ([Crossref](#))
5. Axelsson P, Nystrom B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries and periodontal disease in adults. Results after 30 years of maintenance. *J Clin Periodontol* 2004;31:749-57. ([Crossref](#))
6. Han K, Park JB. Association between oral health behavior and periodontal disease among Korean adults. *Th Korea national health and nutrition examination survey. Medicine (Baltimore)*. 2017;96:e6176. ([Crossref](#))
7. Curnow MM, Pine CM, Burnside G et al. A randomized controlled trial of the efficacy of supervised toothbrushing in high caries-risk children. *Caries Res* 2002;36:294-300. ([Crossref](#))
8. Friedlander AH, Friedlander IK, Yagiela JA, Eth S. Dental management of the child with developmental dyslexia. *J Dent Child* 1994;61:39-45.
9. Hasan AA, Ciancio S. Relationship between amphetamine ingestion and gingival enlargement. *Pediatr Dent* 2004;26:396-400.
10. Broadbent JM, Ayers KMS, Thomson WM. Is attention-deficit hyperactivity disorder a risk factor for dental caries? *Caries Res* 2004;38:29-33. ([Crossref](#))
11. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964;22:121-35. ([Crossref](#))
12. Ramfjord, S. P. Indices for prevalence and incidence of periodontal disease. *Journal of Periodontology* 1959;30:51-9. ([Crossref](#))
13. Wolraich ML, Hannah JN, Pinnock TY, Baumgaertel A, Brown J. Comparison of diagnostic criteria for attention deficit hyperactivity disorder in a county-wide sample. *J Am Acad Child Adolesc Psychiatry* 1996;35:319-24. ([Crossref](#))

14. Zemetkin AJ, Nordahl TE, Gross M, et al. Cerebral glucose metabolism in adults with hyperactivity of childhood-onset. *N Engl J Med* 1990;323:1361-6. ([Crossref](#))
15. Friedlander AH, Yagiela JA, Mahler ME, Rubin R. The pathophysiology, medical management and dental implications of adult attention-deficit/hyperactivity disorder. *J Am Dent Assoc* 2007;138:475-82. ([Crossref](#))
16. Chandra P, Anandakrishna L, Ray P. Caries experience and oral hygiene status of children suffering from attention deficit hyperactivity disorder. *J Clin Pediatr Dent* 2009;34:25-9. ([Crossref](#))
17. Grooms MT, Keels MA, Roberts MW, McIver FT. Caries experience associated with attention-deficit/hyperactivity disorder. *J Clin Pediatr Dent* 2005;30:3-7. ([Crossref](#))
18. Barkley RA. Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. *Psychol Bull* 1997;121:65-94. ([Crossref](#))
19. Blomqvist M, Ahadi S, Fernell E, Ek U, Dahllöf G. Dental caries in adolescents with attention deficit hyperactivity disorder: a population-based follow-up study. *Eur J Oral Sci* 2011;119:381-5([Crossref](#))
20. Staberg M, Norén JG, Johnson M, Kopp S, Robertson A. Parental attitudes and experiences of dental care in children and adolescents with ADHD-a questionnaire study. *Swed Dent J* 2014;38:93-100.
21. Hidas A, Birman N, Noy AF, et al. Salivary bacteria and oral health status in medicated and non-medicated children and adolescents with attention deficit hyperactivity disorder (ADHD). *Clin Oral Investig* 2013;17:1863-7. ([Crossref](#))
22. Karatekin C, Markiewicz SW, Siegel MA. A preliminary study of motor problems in children with attention-deficit/hyperactivity disorder. *Percept Mot Skills* 2003;97:1267-80. ([Crossref](#))
23. Fliers E, Rommelse N, Vermeulen S, Altink M, Buschgens C, Faraone S, Sergeant J, Franke B, Buitelaar J (2008). Motor coordination problems in children and adolescents with ADHD rated by parents and teachers: effects of age and gender. *J Neural Transm* 115: 211-220. ([Crossref](#))
24. Bimstein E, Wilson J, Guelmann M, Primosch R. Oral characteristics of children with attention-deficit hyperactivity disorder. *Spec Care Dentist* 2008;28:107-10. ([Crossref](#))
25. Murray CM, Naysmith KE, Liu GC, Drummond BK. A review of attention-deficit/hyperactivity disorder from the dental perspective. *N Z Dent J*. 2012;108::95-101.
26. Felicetti D-M, Julliard K. Behaviors of children with and without attention deficit hyperactivity disorder during a dental recall visit. *J Dent Child* 2000;67:246-9.
27. ten Berge M, Veerkamp JS, Hoogstraten J, Prins PJ. Childhood dental fear in the Netherlands: prevalence and normative data. *Community Dent Oral Epidemiol* 2002;30:101-7. ([Crossref](#))
28. Atmetlla G, Burgos V, Carrillo A, Chaskel. Behaviour and orofacial characteristics of children with attention-deficit hyperactivity disorder during a dental visit. *J Clin Pediatr Dent* 2006;30:183-90. ([Crossref](#))