RESEARCH ARTICLE

Oral Health of Children and Adolescents with Attention Deficit Hyperactivity Disorder

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Abstract

Aim: The aim of the study was to evaluate the oral health conditions of children and adolescents with attention deficit hyperactivity disorder (ADHD).

Materials and methods: Two groups were selected: a test group comprising 51 individuals with ADHD and a control group with 50 individuals without ADHD, with ages ranging from 7 to 14 years. Through an intraoral clinical examination, the numbers of decayed, missing, and filled teeth (DMFT index), the visible plaque index (VPI), the gingival bleeding index (GBI), bruxism, and dental traumatism were verified. A questionnaire confirmed oral hygiene supervision.

Results: In the test group, the average DMFT index was 3.41 while it was 2.52 in the control group ($p = 0.405$). The VPI in the test and control groups was 36.84% and 24.54%, respectively ($p = 0.004$). The GBI was 8.37% for the test group and 4.94% for the control group ($p = 0.012$). The DMFT index when supervised the oral hygiene by those responsible in comparison with the nonsupervision was 1.89 and 4.31, respectively, in the test group, and 1.71 and 2.94, respectively, in the control group.

Conclusion: These data suggest that children and adolescents with ADHD present with worse oral health conditions and need greater attention from dental professionals and those responsible for their diet and oral hygiene.

Clinical significance: Attention deficit hyperactivity disorder needs a special attention. This research brings this important issue focus on oral health.

Keywords: Attention deficit hyperactivity disorder, Behavior, Caries, Children, Oral health.

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Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most common chronic diseases in pediatrics. It is considered as the most frequent behavioral disorder in school-age children,[1–4] showing a prevalence of 5% and occurring two times more often in boys than girls.[1]

The classical triad of ADHD symptoms is characterized by lack of attention, hyperactivity, and impulsiveness.[1,5,6] There are three types of ADHD characterized by symptoms: predominantly inattentive, predominantly hyperactive-impulsive, and the combined form in which the two forms manifest themselves equally.[1,7]

There is no biological marker or laboratory test to confirm the diagnosis. The evaluation includes detailed anamnesis, comprehensive physical examination, functional evaluation of development, clinical criteria in diagnostic manuals such as DSM-IV or ICD 10, and classifying scales for parents and teachers: SNAP-IV, Conners Scale, and Vanderbilt Scale, among others.[1,8–10] The etiology of ADHD remains unclear, although it is known to be multifactorial, with genetic, biological, environmental, and psychosocial factors.[1,6,7]

Children with ADHD need more support with regard to oral hygiene and eating habits.[11–13] They must be examined more frequently, between dental examinations to prevent the progression of caries disease due to their oral health behavior. On the other hand, adolescents with the disorder have a significantly higher prevalence of caries and a higher level of gingival inflammation.[11,12] Individuals from a group with ADHD showed higher prevalence of parents reporting toothache, bruxism, bleeding gums, and oral trauma as well as differences in the numbers of restored or decayed dental surfaces.[14]

Children with ADHD, even when medicated, present a high risk for dental trauma due to their hyperactivity and impulsiveness. Prevention is possible provided the pediatrician and the entire staff attending the child encourage parents to frequently consult the pediatric dentist to diagnose dental trauma and offer a preventive treatment.[15] Children with histories of recent dental trauma have higher baselines in the hyperactivity/impulsiveness scale.[16]

Another concern is with childhood obesity, which has increased each year with its comorbidities: oral health problems are the most relevant clinical comorbidities, and ADHD is the psychological comorbidity.[17]

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Materials and Methods

This study was approved by the Research Ethics Committee of Positivo University, Curitiba, Brazil, according to opinion no. 221.795.

Informed consent forms were obtained from the parents or guardians of the children taking part in the research. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The main objective was to characterize the oral health conditions of children and adolescents with ADHD. The specific objectives were to measure the decayed, missing, and filled teeth (DMFT) index, visible plaque index (VPI), and gingival bleeding index (GBI) and note the presence of bruxism or dental traumatism. The influences of medication and oral hygiene supervision provided by parents or guardians were also recorded.

The study was a comparative, observational and cross-sectional study, similar to others in ADHD.[18,19] The cross-sectional design resulted in limitations on data interpretation. Longitudinal studies would be preferable to elucidate the possible association between ADHD and oral health.[18]

Two groups of individuals were selected with ages ranging from 7 years to 14 years. The first group included 51 children and adolescents with ADHD, while the second group was composed of 50 individuals without the disorder. The exclusion criterion included having been diagnosed with a neuropsychiatric disorder other than ADHD or using medication similar to those used in other neurological treatment.

The data were collected by a single calibrated examiner, through intraoral clinical examination and recorded in individual clinical records. Each subject's parents or guardians also answered a short questionnaire consisting of open-ended and specific questions.

The results obtained for each group included in this study were subjected to statistical analysis to assess the data distribution. In each statistical test, a significance level of 0.05 was adopted and the tests were carried out using the Statistica 7.0 software (Statsoft, 2004).

Results

In total, 101 children and adolescents were evaluated, 51 from the test group and 50 from the control group. In the test group, 34 (67%) were male and 17 (33%) were female, with an average age of 11 ± 2 years. In the control group, 30 (60%) were male and 20 (40%) were female, with an average age of 12 ± 1 years.

In the evaluation of oral indices, no statistically significant differences between the groups were found with regard to the DMFT index ($U = 1154.5$; $p = 0.405$). However, children with ADHD had a significantly higher percentage of sides involved over the total possible sides when compared to the control group in the VPI ($U = 827.0$; $p = 0.004$). A similar result was obtained with the GBI in which the values were significantly higher among children with ADHD when compared to the control group ($U = 919.5$; $p = 0.012$) (Table 1).

In the fractures variable, the frequencies were statistically equivalent between the groups with seven (14%) children with ADHD and four (8%) children from the control group having fractures ($\chi^2 = 0.853$; $p = 0.356$). With regard to bruxism, the frequencies were also statistically equivalent, with 13 children from each group, 25% and 26%, respectively ($\chi^2 = 0.003$; $p = 0.953$), presenting with bruxism. In the oral hygiene supervision analysis, both groups showed the same frequencies of supervision by those responsible for the children with 19 (37%) children from the test group and 17 (34%) children from the control group reporting appropriate supervision ($\chi^2 = 0.117$; $p = 0.733$) (Table 1).

Table 1: Means ± standard deviations of the oral indices (*p* value referring to the Mann–Whitney *U* test) and absolute and relative frequencies (%) of fractures, bruxism, and oral hygiene supervision variables (*p* value referring to the Chi-square test for *k* proportions) between ADHD and control groups

	ADHD	*Control*	*p value*
DMFT	3.41 ± 3.68	2.52 ± 2.61	0.405
VPI	36.84 ± 20.50	24.54 ± 20.72	0.004*
GBI	8.37 ± 10.51	4.94 ± 7.38	0.012*
Fractures	7 (14%)	4 (8%)	0.356
Bruxism	13 (25%)	13 (26%)	0.953
Oral hygiene supervision	19 (37%)	17 (34%)	0.733

*Statistical significance, $p < 0.05$

In the evaluation of oral indices regarding oral hygiene supervision by parents or guardians, the DMFT index did not reveal statistically significant differences between the groups (Kruskal–Wallis: $H = 8.86$; $p = 0.115$). The values were 1.89 with supervision and 4.31 without supervision in the ADHD group and 1.71 with supervision and 2.94 without supervision in the control group. Similarly, there were no statistically significant differences between the groups on the VPI or GBI variables ($p > 0.05$) (Table 2).

A closer analysis of the ADHD group showed that there were no statistically significant differences ($p > 0.05$) between children receiving or not receiving medical treatment on the DMFT, VPI, and GBI indices or in relation to the frequency of fractures (Chi-square: $\chi^2 = 0.057$; $p = 0.811$). With regard to the frequency of bruxism, there were statistically significant differences between the groups, with higher frequency of bruxism among those being prescribed medication (Chi-square: $\chi^2 = 4.028$; $p = 0.045$) (Table 3).

Discussion

ADHD is one of the most common behavioral disorders in children with an increasing prevalence worldwide. It is often confused with other neurological disorders; therefore, it is important for pediatric dentists to know how to identify and manage these children adequately with respect to their dental health.[20]

The selection of patients for this study included the ages of 7–14 years, when the symptoms of ADHD are most evident. The test group showed double the number of males in relation to females, according to the literature, which shows this proportionality.[1]

In this study, the data showed a higher degree of oral indices in the ADHD group compared to the control group. The differences found in DMFT are in agreement with previous reports that children and adolescents with ADHD are more prone to caries.[12,21]

The oral health conditions in children with ADHD diagnosis show higher amounts of DMFT. In addition to poor oral hygiene, a higher incidence of dental caries in individuals with ADHD may also be attributed to an increase in the consumption of sugar. Health professionals must be aware that these children are at greater risk of caries.[19,22,23]

For VPI, the differences between the groups reached statistical significance with 36.84% in the test group and 24.54% in the

Table 2: Means ± standard deviations and medians of oral indices among children from the ADHD and control groups in relation to oral hygiene supervision by parents or guardians

	ADHD				*Control*			
	With oral hygiene supervision (n = 19)		*Without oral hygiene supervision (n = 32)*		*With oral hygiene supervision (n = 17)*		*Without oral hygiene supervision (n = 33)*	
	Mean ± SD	*Median*	*Mean ± SD*	*Median*	*Mean ± SD*	*Median*	*Mean ± SD*	*Median*
DMFT	1.89 ± 2.45	1	4.31 ± 4.02	3.5	1.71 ± 1.99	1	2.94 ± 2.82	2
VPI	33.85 ± 16.41	27.96	38.62 ± 22.65	38.51	23.59 ± 24.38	23.77	24.39 ± 18.89	22.22
GBI	6.30 ± 6.05	3.6	9.60 ± 12.37	6.9	5.19 ± 6.83	0.0	4.82 ± 7.75	0.0

Table 3: Means ± standard deviations, medians of oral indices, and absolute and relative frequencies (%) for the fractures and bruxism variables among children from the ADHD group with regard to the use of drug ($n = 51$)

	Medicated individuals n = 27		*Non-medicated individuals n = 24*		
	Mean ± SD	*Median*	*Mean + SD*	*Median*	*p value*
DMFT	3.44 ± 3.95	2	3.38 ± 3.44	2	–
VPI	33.95 ± 18.84	31.57	40.10 ± 22.17	41.31	–
GBI	9.02 ± 2.64	6.5	7.64 ± 7.67	6.9	–
Fractures	4 (15%)		3 (13%)		0.811
Bruxism	10 (37%)		3 (13%)		0.045*

*Statistical significance, $p < 0.05$

control group, respectively ($p = 0.004$). The dental community raises concerns regarding oral health in children with ADHD. Due to attention problems and difficulty staying focused on what they are doing, children with ADHD may be unable to perform regular routine activities such as tooth brushing effectively. Significantly, higher levels of bacterial plaque were observed in the ADHD group than in the control group. Oral health professionals must be aware of this condition, since preventive measures are recommended.[23–25]

Regarding GBI, the values were 8.37% for the test group and 4.94% for the control group, presenting statistical significance ($p = 0.012$). The results of a study by Blomqvist et al.[12] showed that adolescents with ADHD present more gingival inflammation when compared to age-matched individuals belonging to the control group.

Dental professionals and parents need to be aware of the increased susceptibility of oral diseases in children with ADHD. The behavioral characteristics of children with the disorder and their influences on oral health suggest the need to develop and implement specific strategies for the prevention and treatment of their oral diseases.[14]

In the present study there were no differences between the groups in relation to dental fractures; however, this is another concern for individuals with ADHD. Attention deficit hyperactivity disorder is a predisposing factor for dental traumatic and soft tissues injuries. It is essential for child psychiatrists and pediatric dentists to be aware of this aspect of the disease to be able to identify, treat, and prevent dental problems earlier. Once the knowledge gap between both professions is filled, collaboration will certainly serve to improve care for children with ADHD.[26,27]

There were no differences for bruxism observed among the groups analyzed in this study, despite the literature reporting a higher incidence of bruxism in children with ADHD[18] mainly through the psychiatric comorbidity of the oppositional defiant disorder.[28]

The importance of oral hygiene supervision by the parents or guardians of the child, observed in other studies,[19] was also evidenced in this research, which highlights a similar role for prevention in both the ADHD and control groups. The data obtained for the DMFT indices were 1.89 with oral hygiene supervision and 4.31 without supervision in the ADHD group and 1.71 with oral hygiene supervision and 2.94 without supervision in the control group. These data highlight the importance of proper supervision to prevent dental problems in the entire pediatric population as a whole.

The results of a study conducted by Paredes et al.[29] identified that the highest percentage of caries-free children was found among those who had adult supervision or assistance while brushing their teeth. In their study, Moimaz et al.[30] found that when the parents were responsible for brushing children's teeth or they were brushing their teeth along with the child's, the number of caries-free individuals was quite high.

The data obtained on medication showed similar numbers for the DMFT index, VPI, and GBI as well as for frequency of dental fractures when comparing medicated and nonmedicated children. This was not observed in relation to bruxism, in which there was a higher incidence when using medication ($p = 0.045$). This is in agreement with the studies that report the relation between the use of medicines for the ADHD (methylphenidate) and bruxism.[31,32]

Patients using medication of choice for the treatment of ADHD (methylphenidate) may be induced to the obsessive–compulsive disorder[33] and are more likely to report dental problems.[34] The diet and appetite of the child with hyperactivity and inattention may be changed by the use of medication, which tends to contribute toward an increased risk of caries.[22] Hidas et al.[21] showed that medicated children could perform the assignment of effectively brushing their teeth better than nonmedicated children, which may influence the evaluation of the risk of caries in nonmedicated patients with ADHD.

Proper preventive dental care for children with ADHD, especially when from a low socioeconomic status, seems to be of paramount importance for the prevention of dental caries.[35,36] The treatment of ADHD must be conducted interdisciplinarily, with several different professionals working as a team and willing to provide guidance for parents and teachers.

Dentistry should be included in the care of children with ADHD through stronger communication between pediatrics, neuropediatrics, and psychiatry with pediatric dentistry. The professionals who conduct the medical treatment and psychiatric follow-up of the children must educate parents and guardians about the increased needs of preventive dental care in children with ADHD.[15,25,36]

Conclusion

We conclude that children and adolescents with ADHD present worse oral health conditions and require greater attention from the dental professionals and greater monitoring from parents or guardians on their diet and oral hygiene.

Clinical Significance

Attention deficit hyperactivity disorder needs a special attention. This research bring this important issue focus on oral health.

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