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Original Article

Dental caries status and related factors in children with Attention Deficit and Hyperactivity Disorder

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Abstract

Aim: It was aimed to investigate the caries status and etiological factors of children with Attention Deficit and Hyperactivity Disorder (ADHD), who are reported to have high consumption of cariogenic food and insufficient oral hygiene habits.

Materials and Methods: 7-12 year-old children who are newly diagnosed with ADHD and beginning medication (Group 1), who are under medication for a long time (≥6 months) for ADHD (Group 2) and the control group (Group 3) without any diagnosis or drug use are included in the study. The questions about tooth-brushing habits, consumption frequency of sugar added fruit juice, carbonated beverage, fresh fruit, acidic food (chips, biscuits, etc.) were asked. Dental caries prevalence, presence of dental plaque and gingival health status were measured by DFT/dft (decayed-filled tooth number), DFS/dfs (decayed-filled tooth surface number), OHI (oral hygiene index) and MGI (modified gingival index), respectively. The differences between the groups were statistically analysed with the Kruskal-Wallis, and Man Whitney U Test.

Results: It was determined that the majority of children in all groups had irregular toothbrushing habits. Daily or every other day consumption of cariogenic foods and beverages were found to be higher in the Group 1 and 2, the highest DFT/dft values were in Group 2 and the highest DFS/dfs values in Group 1, but the differences were not statistically significant ($p > 0.05$). OHI values in Group 2 were found to be statistical significantly higher than in Group 3 ($p=0.000$). MGI values were found to be significantly higher in Group 2 than in Group 1 ($p=0.011$) and Group 3 ($p=0.001$).

Conclusion: Children with ADHD have similar brushing and nutritional habits with healthy children, but they are appear to be at significantly higher risk for oral hygiene and gum disease. They have also higher caries prevalence, although the differences were not statistically significant.

Keywords: Attention deficit and hyperactivity disorder; ADHD; dental caries prevalence; eating habits; oral hygiene habits

INTRODUCTION

Attention Deficit and Hyperactivity Disorder (ADHD), which is the most common childhood-onset behavior disorder (1) affecting approximately 5-10% of children and adolescents, is reported to be among the most common diagnoses in patients admitted to child and adolescent psychiatry clinics in Turkey and all over the world (2-4). It is eight times more common in boys than in girls (5) and the prevalence of ADHD has reached the highest level in boys between the ages of 6-9 and in girls during adolescence (6).

ADHD patients who exhibit behaviors that are not appropriate for their chronological age and whose functional skills are 25-30% lower than their peers (7), are reported also unable to perform daily routine activities such as brushing teeth effectively and regularly (8-11). In addition, it has been stated that the number of meals consumed daily and the consumption of acidic and sugar added foods and beverages are higher in hyperactive children than their healthy peers (8-13). Furthermore, according to the data in the literature about that the psychostimulants used in ADHD treatment may have side effects threaten dental health such as dry mouth and appetite changes (10,14). On the other hand, psychostimulant drug treatment has been reported to cause a marked decrease in the symptoms of the disease and positive behavioral changes in 75% of children with ADHD (15). As a result of these data obtained, it was thought that these children with ADHD may be in the high risk group in terms of dental caries and should be examined in detail seperately as those who are not medicated yet and who are under long-term medication.

In this clinical study about the oral health status of children with ADHD, it is aimed to investigate the dental caries

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status and its etiological factors such as eating habits, oral hygiene behaviors and associated gingival health. The hypothesis that medicated or nonmedicated children with ADHD exhibited a higher prevalence of dental caries than children without ADHD is tested, as well.

MATERIALS and METHODS

Prior to the study, approval was obtained from the Clinical Research Ethics Committee of the Suleyman Demirel University Faculty of Medicine (Date:05.11.2014, No: 173) and consent was obtained from all pediatric patients and their parents.

Children between the ages of 7-12 who applied to the Child and Adolescent Psychiatry Clinic of Faculty of Medicine, and medicated with psychostimulant drugs with the diagnosis of ADHD, and had dental health problems and/ or wanted to have dental examination are evaluated in the study.

There are three groups included in the study: children who are newly diagnosed with ADHD and beginning methylphenidate use (Group 1), children who are under medication with methylphenidate for a long time (≥6 months) for ADHD (Group 2) and the control group (Group 3) without any diagnosis or drug use.

The inclusion criteria for patients in Groups 1 and 2 were that they did not have any systemic diseases other than ADHD and no medication other than psychostimulant drugs. The control group was made up of children in the same age group as study groups (Groups 1 and 2) who applied to our Pediatric Dentistry Clinic for routine dental examinations and treatments. In all groups, children with compliance level that can cooperate with the dentist for clinical evaluations are included.

For all children; the anamnesis forms prepared in accordance with the criteria of "Oral Health Examinations-Basic Methods 5th Edition" published by the World Health Organization (WHO) in 2013 (16) were filled by the same dentist. In the evaluation of oral hygiene habits; the questions about frequency of tooth-brushing (3 times a day /2 times a day /once a day /2-3 times a week / once a week /none), type of toothpaste (adult / child) and type of brushing strokes (vertical / horizontal / circling), in the evaluation of nutritional habits; questions about consumption frequency of sugar added fruit juice, carbonated beverage, fresh fruit, acidic food (chips, biscuits, etc.), milk and milk products and tea-coffee with five options (more than 2 times a day/ 2 times a day/ once a day/ 2-3 times a week/ once a week) were asked to patients and their parents.

Oral and dental examinations of the children were performed by the same examiner, with a dental mirror and sond under the reflector light, in accordance with the criteria of "Basic Methods of Oral Health Examinations 5th Edition" published by WHO in 2013 (16). The dental caries prevalence, presence and amount of dental plaque and gingival health status were measured by indexes. DMFT (number of decayed, missed, filled permanent teeth) and dmft (number of decayed, missed, filled primary teeth) indexes were used in measuring the number of teeth affected by caries and its consequences. DMFS (number of decayed, missed, filled permanent teeth surface) and dmfs (number of decayed, missed, filled primary teeth surface) indexes were used to measure the number of tooth surfaces affected by caries and its consequences. Since all the children in the study are in the mixed dentition period, m = missing tooth scores are not included in the indexes, because of the teeth that are not in the mouth may also have dropped physiologically. The Simplified Oral Hygiene Index (OHI) (17) was used to evaluate the presence and amount of dental plaque including 4 different scores as 0 (initial plaque accumulation), 1 (plaque accumulation that has reached 1/3 of the crown), 2 (plaque accumulation that has reached 2/3 of the crown), and 3 (plaque accumulation that has exceeded 2/3 of the crown). and to evaluate the gingival health status the Modified Gingival Index (MGI) consisting of five different scores as 0 (healthy gingiva), 1 (mild inflammation, discoloration and swelling in a region of the gingiva), 2 (mild inflammation in each area of the gingiva.), 3 (moderate inflammation in the gingiva and the gingiva is red and edematous) and 4 (severe inflammation in the gingiva, marked redness, swelling and spontaneous bleeding are observed) was used (18).

All the dental examinations and measurements of the children participating in the research were performed by the same examiner and intra-examiner consistency level was substantial (kappa value: 0.806).

Statistical Analysis

Nominally classified data were recorded to the IBM SPSS (version 20) program. Since the findings obtained did not meet the prerequisites of the parametric tests, the differences between the groups were determined using the Kruskal-Wallis Test, and the differences between the genders were with the Man Whitney U Test. As a result of the Kruskal Wallis test, the difference between the medians of the groups was determined using Bonferroni-Dunn Test. The differences are shown on the medians in Latin letters

RESULTS

A total of 118 children (n=36, n=41, n=41, respectively in groups) were included in the study. The mean age of the children examined is 8.81±1.83 in Group 1, 9.07±1.44 in Group 2 and 8.78±1.38 in Group 3. The male/female ratio of the children in the study was 4.92, there was no statistically significant difference between the groups in terms of gender distribution ($p> 0.05$) and no statistically significant difference was found between the genders in any of the parameters evaluated in the study ($p> 0.05$).

It was determined that the majority of children in all groups had irregular toothbrushing habits, the rate of use of special toothpaste for children was higher in the Group 1 and Group 2 than in the Group 3, and the most

preferred brushing stroke in all groups was 'horizontal'. The data about the tooth brushing habits of the children participating in the study are given in Table 1.

Table 1. Tooth brushing habits data of the groups

Habits	Group 1 (%)	Group 2 (%)	Group 3 (%)
Tooth brushing frequency			
None	11.1	17.1	17.1
Rarely	69.4	68.3	56.1
At least once a day	19.4	14.6	26.8
Type of toothpaste			
Children	66.7	60.9	36.5
Adult	25	21.9	46.3
Type of tooth brushing strokes			
Circling strokes	8.3	2.4	9.7
Horizontal strokes	44.4	41.4	43.9
Vertikal strokes	30.5	26.8	17.0

The answers to the questions asked to the parents about the types and frequency of snack foods consumed by the children were evaluated separately in each group. Daily or every other day consumption of sugar added fruit juice, carbonated beverage and acidic foods (chips, biscuits, crackers) were found to be higher in the Group 1 and 2 compared to the control group, but the differences were not statistically significant (p> 0.05).

Table 2. Nutritional habits data of the groups

Snacks	Frequency of consumption	Group 1 (%)	Group 2 (%)	Group 3 (%)
Sugar added fruit juice	Once a day	16.6	9.7	12.1
	2-3 times a week	11.1	24.3	14.6
	Once a week	47.2	29.2	51.2
Carbonated beverage	Once a day	8.3	9.7	4.8
	2-3 times a week	8.3	26.8	9.7
	Once a week	41.6	17	24.3
Acidic food	Once a day	11.1	4.8	2.4
(chips, biscuits, etc.)	2-3 times a week	27.7	24.3	24.3
	Once a week	33.3	46.3	48.7
Fresh fruit	At least once a day	69.4	75.6	87.8
Milk and milk products	At least once a day	66.6	87.8	70.7
Tea-coffee	At least once a day	58.3	53.6	46.3

The nutritional habits data of the children in all groups are given in Table 2. The highest DFT/dft values were measured in Group 2 and the highest DFS/dfs values in Group 1, but the differences were not statistically significant (p> 0.05). Mean DFT/dft and DFS/dfs values of the groups are shown in Table 3.

OHI values of the children in Group 2 were found to be statistical significantly higher than in the Group 3 (p=0,000). MGI values were found to be significantly higher in children in Group 2 than in Group 1 (p=0.011) and Group 3 (p=0.001). Mean OHI and MGI values of the groups are shown in Table 3.

Table 3. Mean DFT, dft, DFS, dfs, OHI and MGI values of the groups

Index	Group 1 (mean±SD)	Group 2 (mean±SD)	Group 3 (mean±SD)	p value*
DFT	1.89±1.80	2.29±1.63	2.00±1.97	0.516
dft	2.06±2.04	2.71±2.36	2.59±3.01	0.435
DFS	4.50±3.18	3.98±3.03	3.73±2.41	0.552
dfs	7.11±5.84	6.51±5.33	5.27±3.79	0.535
OHI	0.79±0.45 ^{ab}	1.01±0.45 ^{a}	0.60±0.47 ^{b}	0.000
MGI	0.46±0.49 ^{a}	0.80±0.60 ^{b}	0.39±0.42 ^{a}	0.001

SD: Standart Deviation; DFT:Number of decayed and filled permanent teeth; dft: Number of decayed and filled primary teeth; DFS: Number of decayed or filled permanent tooth surfaces; dfs: Number of decayed or filled primary tooth surfaces. OHI: Oral Hygiene Index; MGI: Modified Gingival Index.*p<0.05 indicates statistical significant difference. The values indicated by different superscript small letters show statistical significant difference

DISCUSSION

Within the scope of this study, oral hygiene behaviors, nutritional habits, dental caries prevalence, presence of dental plaque and gingival health status of the pediatric patients who have been diagnosed with ADHD and have been under psychostimulant therapy that we frequently encounter in pediatric dentistry clinics in recent years were examined. All the necessary blood and urine analyses of the patients who refer to child and adolescent psychiatry clinics and diagnosed with ADHD are performed before and after prescribing drugs and precautions are taken according to results. But although these drugs are known to have side effects that threaten oral and dental health such as dry mouth or hiposalivation, it is not yet a routine to refer these patients to a dentist to evaluate the current oral health status, risk factors and for the salivary analysis before and during drug use. In this research, the dental health, nutrition and oral hygiene habits of children with ADHD who are not medicated yet and children with ADHD who have been under psychostimulant therapy for a long time have been examined separately. Thus, it

was evaluated whether the side effects of the drugs and the positive behavioral changes provided by the drug treatment caused a difference between the groups in terms of the parameters examined or not. From this point of view, the findings of the study indicate that there is no significant difference in medicated children with ADHD and who have not yet started medication in terms of tooth decay and consumption of cariogenic food and beverages, but in terms of brushing frequency, oral hygiene and gum health the medicated children with ADHD reveals a more negative picture.

It is stated in the literature that ADHD is observed 8 times more in boys (5). As expected, the majority of the children in the Groups 1 and 2 consisted of male children; therefore, the Group 3 was mostly composed of male children.

In various study evaluating the oral hygiene habits of the children with ADHD, it was reported that children with ADHD could not perform oral hygiene practices regularly and effectively (8-11). It was stated that more than 90% of the children living in Sweden which is a developed country in terms of oral hygiene practices are brushing their teeth once or twice a day (19), but only half of the children with ADHD living in the same country brush their teeth daily (9). Since most healthy children do not have a regular toothbrushing habit in our country, it is thought that there is no significant difference in terms of frequency of tooth brushing between healthy children and children with ADHD in our research results. On the other hand, some researchers reported that the frequency of tooth brushing of children with ADHD is similar to that of healthy children, but their plaque scores are higher because they do not brush for a sufficient period of time (20,21). In our study results, OHI scores were found to be higher in both medicated and nonmedicated children with ADHD than in the control group, and MGI scores were significantly higher in medicated children with ADHD for a long time than in the other groups. The fact that MGI scores are higher in children who were medicated with psychostimulants suggests the possibility of the side effects of these drugs on oral soft tissues.

Another important issue that, threatens oral and dental health of children with ADHD is side effects such as dry mouth of the psychostimulants used in therapy. Some researchers stated that methylphenidate, a psychostimulant used in the treatment of ADHD, subjectively caused dry mouth (14,22), while others did not detect any effects of it on saliva flow rate (23). Furthermore, dry mouth has been associated with increased frequency of acidic beverage consumption and low oral hygiene (24). Although it was reported that the consumption of cariogenic foods and drinks in children with ADHD is more frequent than healthy ones (8,9,11-13), in the present study the frequency of consumption of sugar added and acidic beverages and foods in all the groups examined was similar. It is mentioned in the literature that besides the psychiatric treatments dietary regulation is performed in children with hyperactivity and they are advised to stay away from energetic carbohydrate-based foods and beverages (23,25,26). In accordance with the literature, it was observed in our study that parents of the children with ADHD considered and tried to implement these suggestions. The similarity of the groups in terms of consumption of cariogenic foods can be attributed to these data.

As is known, dental caries is a disease caused by the combination of many factors. Individual factors such as nutrition and oral hygiene habits, oral flora and saliva characteristics play a role in determining the caries activity. While some researchers report that DMFT/dmft scores are higher in children with ADHD than healthy ones (11,13,27,28), others have reported that children with ADHD are similar to healthy children in terms of cavitated carious lesions and dental caries sequelae (10,12,29). In our results, even the highest DFT/dft scores were in Group 2, and the highest DFS/dfs scores in Group 1, mean DFT/dft and DFS/dfs scores were statistically similar in all groups, In the anamnesis of the majority of the children in Group 1 it was recorded that they were visiting the dentist for the first time, therefore, DFS/dfs scores may be higher in this group. In addition, the fact that the children constituting the control group were selected from patients who applied to our clinic with dental treatment needs may have played a role in the absence of a significant difference between the groups in terms of dental caries prevalence.

CONCLUSION

In this study, it was concluded that children with ADHD have similar brushing and nutritional habits with healthy children, but they are appear to be at higher risk for dental plaque formation and gum disease. In addition, although the differences were not statistically significant, it was determined that dental caries prevalence in children with ADHD was more than healthy peers.

With the increase in cariogenic food consumption, it is inevitable to have a high risk of dental caries for children with ADHD which has been observed to have inadequate tooth brushing habits and topical fluoride intake, as well as due to the side effects of the drugs prescribed for the treatment of disease on the protective efficacy of saliva. It will be beneficial for dentists who are working with pediatric patients increasing their awareness about the characteristics of ADHD and the risks in terms of oral and dental health of children with ADHD. In addition, these children should be accepted among patients with special care needs, follow-up examinations and preventive applications should be carried out frequently.

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