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## Investigating different oral hygiene education techniques in children with attention deficit hyperactivity disorder: A randomised clinical trial

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### Abstract

**Purpose:** Attention-deficit/hyperactivity disorder (ADHD) is among the most common behavioural disorders of childhood. There is few published reports in the dental literature have focused on ADHD and its dental implications and also oral hygiene habits. The study was conducted to determine oral hygiene and plaque scores of children suffering from attention deficit hyperactivity disorder (ADHD) and was compared with healthy children by using oral hygiene education techniques with or without self-educational manuals.

**Subjects and Methods:** A total of 50 children, including 25 ADHD and 25 non-ADHD children were included in the study. They were divided into two sub-groups that included different oral hygiene programs. For the first sub-group only recommendations about oral hygiene practices were made, for the second sub-group recommendations were supported with self-educational manuals. The subjects were then examined at the end of 1 week, 1 month and 3 months.

**Results:** This study demonstrated that Plaque Index scores evaluated for different evaluation periods; a statistically significant decrease was found for the test groups for both ADHD and non-ADHD but Gingival Index values were reached to the baseline averages in all groups from baseline to the third month.

**Conclusions:** These results showed that approaches like as supporting materials, encourages the maintenance of long-term acquisition of oral hygiene habits. But further studies are necessary that performed in ADHD children.

**Keywords:** Attention- deficit/hyperactivity disorder (ADHD), tooth-brushing, oral health promotion

### Introduction

Attention-deficit hyperactivity disorder (ADHD) is one of the most common neurobiological disturbances that develop in childhood. It is a disorder, which can be manifested in the preschool and early school years. The main characteristics of ADHD include: impetuous, hyperactivity, behavioural and emotional deficits and inattention. There are subtypes of ADHD, which include: the inattentive, the hyperactive/impulsive, and the combined type [1]. ADHD is the most common neuropsychiatric disorder in children affecting approximately 7.8% to 9.5% of the population from all socioeconomic and cultural levels. The worldwide prevalence in children  $\leq 18$  years has been estimated at 5.3% in a systematic review of 102 studies from all continents, with a majority from North America and Europe [2-5]. The children with ADHD have symptoms like making careless mistakes, being disorganized, having difficulty in listening, following instructions and socializing, completing tasks in a prolonged time, being restless, speaking out of turn or being impatient, playing quietly and experiencing negative life events [6, 7].

The dentist should be aware that children with ADHD are at higher risk for caries due to their features of inattentiveness and hyperactivity which causes a worse oral health condition and oral hygiene attitudes [8, 9]. Because of the behavioural characteristics of children with ADHD, it is difficult to gain their attention and keep them seated in the dental chair and control their activities during any dental treatment.

Thus, pediatric dentists should be aware of the situation to set an appropriate treatment plan [10, 11].

For improving oral hygiene and gingival health; the use of self- educational manuals and audiovisual aids are always recommended. Few studies have compared the relative effectiveness of these various modes of delivery of oral hygiene messages [22]. This study aims to determine oral hygiene and plaque scores of children suffering from attention deficit hyperactivity disorder (ADHD) and healthy children by using oral hygiene education techniques with or without self-educational manuals.

### Subjects and Methods

This study was performed in our department. The primary outcome considered was the Silness & Loe Plaque Index (PI). A sample size of 11 subjects in each group had excellent power (>99%) to detect a difference of 0.25 improvement in PI between test and control groups with  $\alpha = 0.05$  at a standard deviation 0.4. 25 children with ADHD and 25 children not diagnosed [According to Diagnostic and Statistical Manual of Mental Disorders-fourth edition (DSM-IV)] ADHD between 12-15 years of age with all socio-economic levels were included to the study. Patients with systemic diseases and other neuropsychological problems were excluded.

The intended procedures explained to the parents of the children and asked to sign the consent form if in agreement before inclusion in the study. Both the healthy and ADHD children (ADHD-C) were divided into two sub-groups used simple randomization (coin-tossing method) that included different oral hygiene programs. In one group, oral hygiene procedures like brushing, using dental floss were explained only to the children and Bacterial Plaque was shown by staining. In the second group, the instructions were explained to both children and their parents. As a reminder, the second group also received posters, brochures, stickers and tooth logos. Groups were constituted as follows;

**Group A:** Healthy Control-Only verbal recommendations were made.

**Group B:** Healthy Test- Recommendations were supported with self-educational manuals.

**Group C:** ADHD Control- Only verbal recommendations were made.

**Group D:** ADHD Test- Recommendations were supported with self-educational manuals.

Oral hygiene status determined by Quigley Hein (QH)'s Turesky modification Plaque Index and Silness & Loe Gingival Index (GI) at baseline from all of the teeth. The subjects were then examined at the end of 1 week, 1 month and 3 months. At each examination, the plaque and gingival scores were recorded. At the end of the first week and 1 month, oral hygiene motivations were repeated for both groups.

The results were averaged (mean  $\pm$  standard deviation) for each parameter. One-way ANOVA test was used to evaluate the data. The differences between the groups compared using Paired-samples t-test with the significance  $p < 0.005$ .

### Results

The ADHD group consisted of 20 males (80%) and 5 females (20%), while there were 15 males (60%) and 10 females (40%) in the healthy children group. Mean age was 13.5 years.

Differences in the mean values of Plaque index (PI) scores of the tested groups were non-significant for the same evaluation periods (Table 1) ( $p > 0.05$ ). When the changes in plaque index in different evaluation periods were evaluated, a statistically significant decrease was found for all the groups in the first week ( $p < 0.05$ ).

PI values in the first months compared with baseline were found to be lower in all groups except the Control ADHD group (Table 1). For Group C and Group A (Control groups), a return to baseline plaque scores was observed in the third month. However in the test groups, plaque index scores showed significantly lower than baseline values ( $p < 0.05$ ).

**Table 1:** The mean values of plaque scores in the examined periods

Groups	Baseline	1.week	1.month	3.months
Healthy Control (A)	3.32 $\pm$ 0.61aA	2.71 $\pm$ 0.45bA	2.67 $\pm$ 0.46bA	2.85 $\pm$ 0.50aA
Healthy Test (B)	3.19 $\pm$ 0.50aA	2.43 $\pm$ 0.53bA	2.45 $\pm$ 0.69bA	2.54 $\pm$ 0.77bA
ADHD Control (C)	3.55 $\pm$ 0.45aA	2.34 $\pm$ 0.41bA	2.71 $\pm$ 0.41aA	2.91 $\pm$ 0.31aA
ADHD Test(D)	3.01 $\pm$ 0.54aA	2.12 $\pm$ 0.47bA	2.23 $\pm$ 0.49bA	2.42 $\pm$ 0.45bA

\*Different letters indicate significant difference. Capital letters indicate differences in vertical direction. Lower case letters indicate differences in horizontal directions

When the changes in gingival index scores were evaluated for different periods; a statistically significant decrease was found for only ADHD test group (Group C) from baseline to the

first week. The same result was valid for the evaluations made in the first month (Table 2).

**Table 2:** The mean value of gingival scores in the examined periods

Groups	Baseline	1.week	1.month	3.months
Healthy Control (A)	1.01 $\pm$ 0.51aA	0.73 $\pm$ 0.20aA	1.01 $\pm$ 0.37aB	0.96 $\pm$ 0.26aA
Healthy Test (B)	0.75 $\pm$ 0.45aA	0.79 $\pm$ 0.58aA	0.56 $\pm$ 0.38aA	0.69 $\pm$ 0.43aA
ADHD Control(C)	0.79 $\pm$ 0.26aA	0.73 $\pm$ 0.20aA	0.69 $\pm$ 0.31aA	0.81 $\pm$ 0.18aA
ADHD Test(D)	0.81 $\pm$ 0.44aA	0.55 $\pm$ 0.32bA	0.59 $\pm$ 0.35bA	0.71 $\pm$ 0.43aA

### Discussion

Recently, the correlation between systemic diseases and oral health care are under evaluation all over the world, especially in developing countries. These diseases can be pre-vented by improving general health and hygiene habits in early childhood.

In general, oral hygiene and gingival health situation are assessed with the presence of bacterial dental plaque

concerning the amount and rate of bleeding pockets [13]. For the prevention of oral soft and hard tissues from disease, their surface layers must be intact without bacterial plaque. Several studies showed that verbal recommendations about oral hygiene practices have extremely limited effectiveness [14, 15]. Thus, the dentists should focus on patient education and motivation in oral hygiene techniques. It was recommended that improving interpersonal communication skills must

become an integral part of the dental hygiene curriculum to obtain better motivation and feedbacks from patients.

ADHD is the most common behavioural disorders in school-age children [2]. Despite the relatively high prevalence of the disease, there is limited evidence regarding its association with oral health. The present study was undertaken to assess the effectiveness of behaviour change and motivation techniques in children with ADHD. In the current study; the initial PI and GI values did not differ significantly between the groups in healthy and ADHD children. This is similar to Chau *et al.* findings [16]. The reason for this might be the inclusion of the study that children with ADHD who are already under medical treatment.

The reason for ADHD control group's first month PI values not showing a lot of change could be the incorporation of ADHD symptoms and oral hygiene practices not occur as expected. But it was not possible to make a comparison with other studies because there isn't any other study performed in ADHD children that observes periodontal status. In our study, the changes in PI scores were evaluated for different evaluation periods; and a statistically significant decrease was found for all of the groups from baseline to the first week. This result is similar to other studies [17-19]. The results of the test groups' PI values were lower than baseline values for the third month. These results showed that approaches like giving reminders would encourage the maintenance of long-term acquisition of oral hygiene habits as shown in different studies [20-21]. Unfortunately in all groups, GI values were reached to the baseline averages at the third month. This result can be interpreted as only short-term behavioural modification can be achieved in oral-hygiene habits. So, the null hypothesis was partially rejected.

The clinical implications of this study were that using self-educational manuals are effective for recovery and maintenance of dental hygiene for the 3 months. Long-term studies are needed to assess the effectiveness of behaviour change methods for both the children suffering from attention deficit hyperactivity disorder (ADHD) and healthy children. And also further investigations can be done to determine the effects of different socio-economic levels to oral hygiene behaviour change.

## Conclusion

It was shown that using self-educational manuals are effective for recovery and maintenance of dental hygiene. But self-educational manuals have short-term behavioural modification on oral-hygiene habits. By looking at these results for all groups; to maintain good oral hygiene habits, self-education system application can be continued, and the importance of frequent dentist visits in increasing motivation and maintaining oral hygiene habits has reappeared.

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