

# Randomised Clinical Trial of Investigating Different Oral Hygiene Education Techniques in Children with Attention Deficit Hyperactivity Disorder

Turkyilmaz Cem<sup>1</sup>, Senirkentli Güler Burcu<sup>2\*</sup>, Alaaddinoglu Emine Elif<sup>1</sup> and Tirali Resmiye Ebru<sup>2</sup>

<sup>1</sup>Baskent University Faculty of Dentistry, Department of Periodontology, Ankara, Turkey

<sup>2</sup>Baskent University Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, Turkey

\*Corresponding author: G Burcu Senirkentli, Baskent University Faculty of Dentistry, Department of Pediatric Dentistry, 11. sok No:26 Bahcelievler, 06490 Ankara Turkey, Tel: 00905066376301; Fax: 00903122152962, E-mail: gburcubostanci@yahoo.com

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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 44 children, including 22 ADHD and 22 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) in children is characterized by disturbance of activity and attention, hyperkinetic conduct disorder and other hyperkinetic disorders [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 [2-5]. It has been reported that (13.2%) of males and (5.6%) of females are found to suffer from ADHD [5]. In general, the onset of ADHD symptoms became noticeable during primary school. However, half of the cases reported an early onset which is below the age of four [1]. The children with ADHD have symptoms like making careless mistakes, being disorganized, having difficulty in listening, following instructions and socialising, 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. For improved behaviour management, the appointments can be set early in the morning when children are least fatigued and most attentive besides; colourful and highly stimulating educational materials were suggested for these children. Simplification and repetition of instructions numerous times will also help to facilitate patient cooperation [10].

Performing oral hygiene procedures needs high motor skills and need the motivation of patient's as well as recognition of the disease and the knowledge of various preventive measures [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 [12]. 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. The null hypothesis is that self-educational manuals will help to improve the oral hygiene status of the patients.

## Subjects and Methods

This study was supported and approved by Baskent University Medical Research and Ethics Committee (D-KA 08/08). This was an equal randomization study that performed in the Baskent University Department of Pediatric Dentistry. The primary outcome considered was the Silness & L oe 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. 22 children with ADHD and 22 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 (Figures 1 & 2). 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 & L oe Gingival Index (GI) at baseline from all of the teeth. One examiner collected the data who was not informed about the oral hygiene education procedure applied. 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.

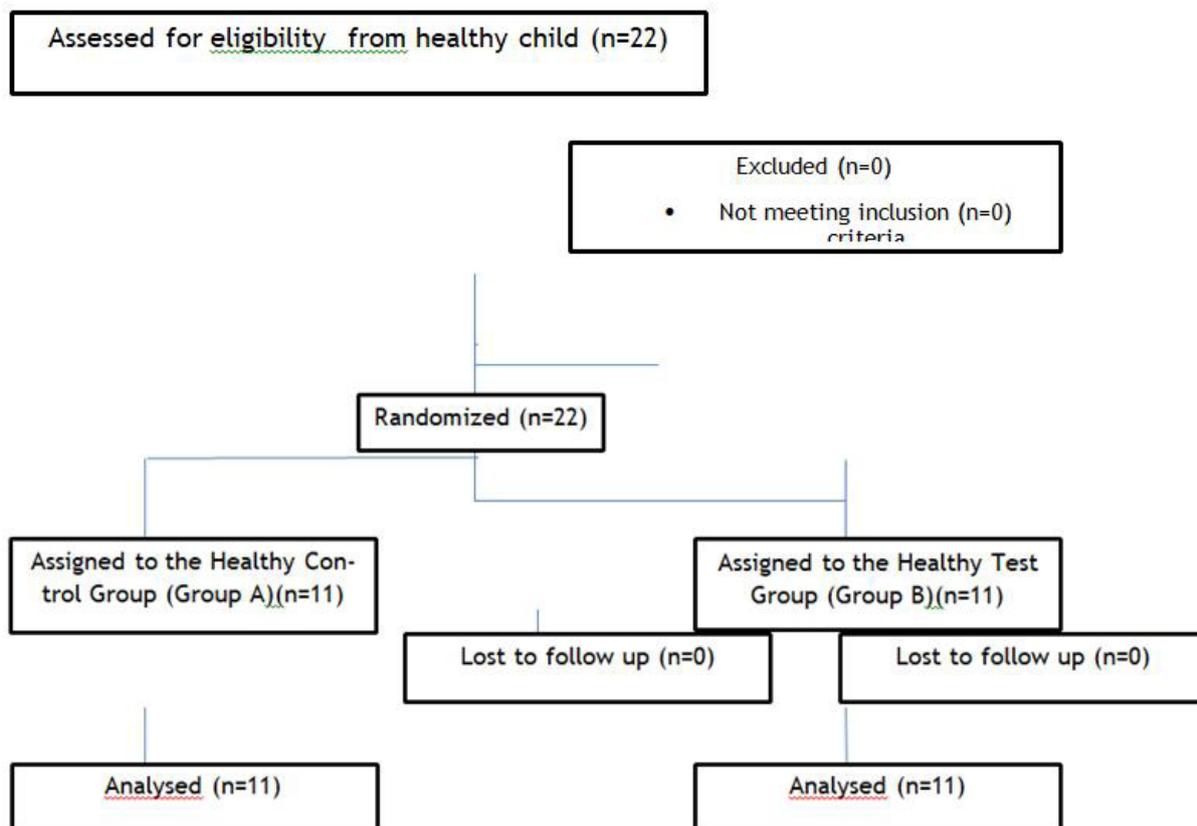


Figure 1: Flow diagram for guiding included participants for healthy children

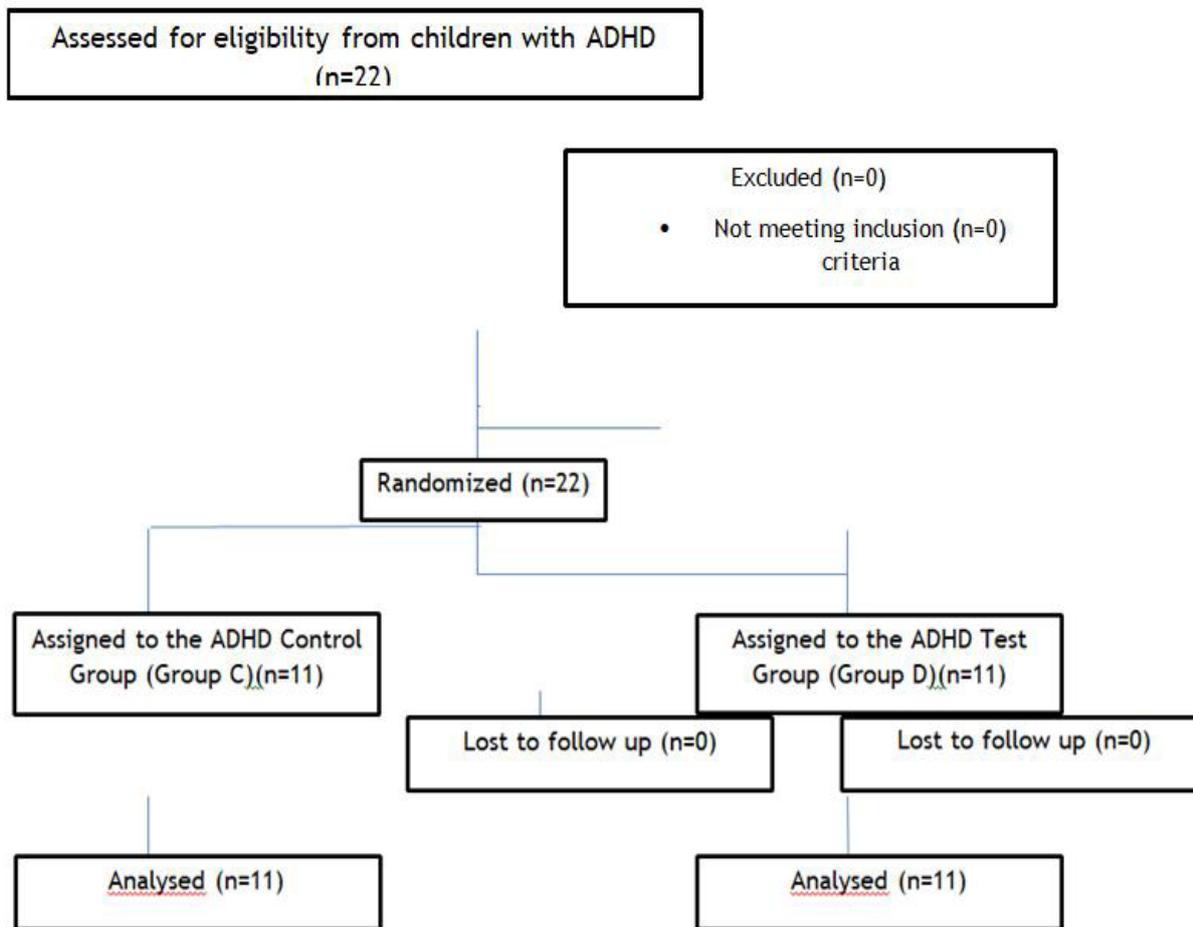


Figure 2: Flow diagram for guiding included participants for children with ADHD

The results were averaged (mean±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 (90,90%) and 2 females (9,09%), while there were 12 males (54,54%) and 10 females (45,46%) in the healthy children group. Mean age was 13 years (minimum 11, 25 – maximum 14, 39).

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 (Figure 3) ( $p < 0,05$ ).

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 (Figure 3) ( $p < 0,05$ ).

Groups	Baseline	1.week	1.month	3.months
Healthy Control (A)	3.29±0.61 <sup>aA</sup>	2.64±0.45 <sup>bA</sup>	2.81±0.46 <sup>bA</sup>	2.93±0.50 <sup>aA</sup>
Healthy Test (B)	3.16±0.50 <sup>aA</sup>	2.58±0.53 <sup>bA</sup>	2.62±0.69 <sup>bA</sup>	2.63±0.77 <sup>bA</sup>
ADHD Control (C)	3.05±0.45 <sup>aA</sup>	2.47±0.41 <sup>bA</sup>	2.67±0.41 <sup>aA</sup>	2.87±0.31 <sup>aA</sup>
ADHD Test(D)	3.04±0.54 <sup>aA</sup>	2.28±0.47 <sup>bA</sup>	2.47±0.49 <sup>bA</sup>	2.65±0.45 <sup>bA</sup>

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

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

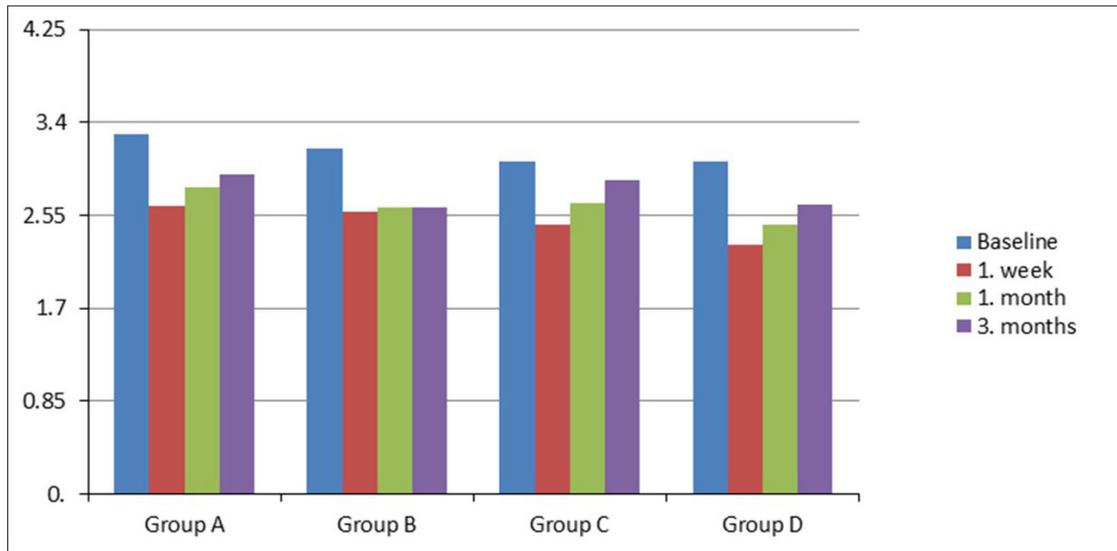


Figure 3: Comparison of the mean values of plaque index scores

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). At the end of three months, gingival index values were observed a return to the baseline averages in all groups (Figure 4).

Groups	Baseline	1. week	1. month	3. months
Healthy Control (A)	1.06±0.51 <sup>aA</sup>	0.79±0.20 <sup>aA</sup>	1.03±0.37 <sup>aB</sup>	0.91±0.26 <sup>aA</sup>
Healthy Test (B)	0.80±0.45 <sup>aA</sup>	0.76±0.58 <sup>aA</sup>	0.65±0.38 <sup>aA</sup>	0.77±0.43 <sup>aA</sup>
ADHD Control(C)	0.84±0.26 <sup>aA</sup>	0.72±0.20 <sup>aA</sup>	0.85±0.31 <sup>aA</sup>	0.84±0.18 <sup>aA</sup>
ADHD Test(D)	0.93±0.44 <sup>aA</sup>	0.60±0.32 <sup>bA</sup>	0.65±0.35 <sup>bA</sup>	0.76±0.43 <sup>aA</sup>

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

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

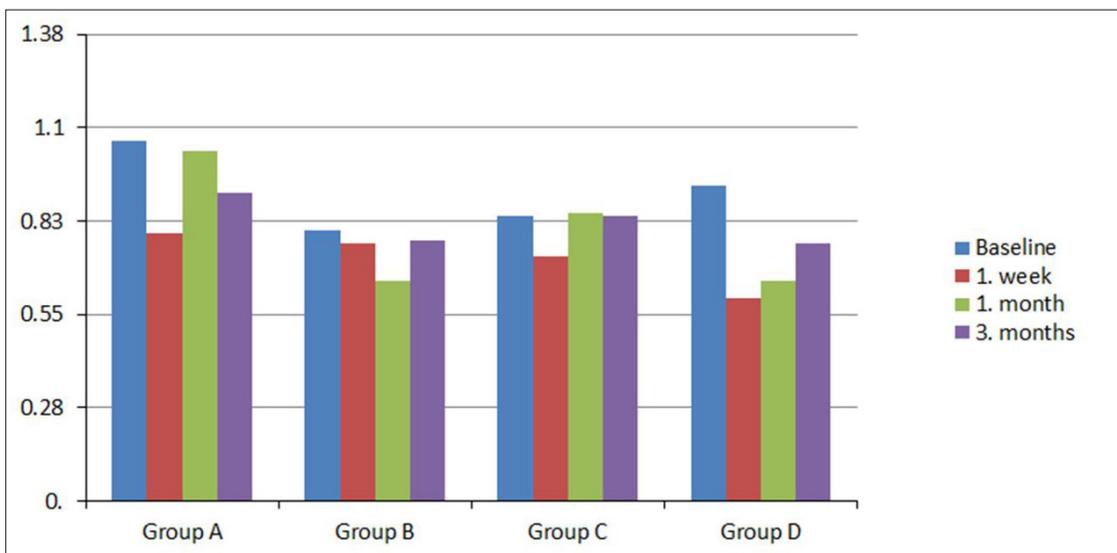


Figure 4: Comparison of mean values of gingival index scores

## 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. Thus, the dentists should focus on patient education and motivation in oral hygiene techniques.

Several studies showed that verbal recommendations about oral hygiene practices have extremely limited effectiveness [14,15]. 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 [15].

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's findings [16]. The reason for this might be the inclusion of the study that children with ADHD who are already under medical treatment.

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 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. 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 dentist should repeat the motivational procedures frequently, especially in conjunction with visual and tactile reminders.

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.

## Acknowledgement

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## References

1. World Health Organization (WHO) (2016) The ICD-10 Classification of Mental and Behavioural Disorders. Clinical descriptions and diagnostic guidelines.
2. Ehlers V, Callaway A, Wantzen S, Patyna M, Deschner J, et al. (2019) Oral health of children and adolescents with or without attention deficit hyperactivity disorder (ADHD) living in residential care in rural Rhineland-Palatinate, Germany. *BMC Oral Health* 19: 258.
3. Lewis M (1996) *Child and Adolescent Psychiatry. A comprehensive textbook*. Fourth Edition. Philadelphia, United States of America, Lippincott Williams and Wilkins pp. 645-69.
4. Esin İS, Dursun OB, Acemoğlu H, Baykara B (2015) Psychopathology and Related Psychosocial Factors in Children with Office Discipline Referrals at School: Evidence from a Developing Country. *Community Ment Health J* 51: 867-78.
5. Perou R, Bitsko RH, Blumberg SJ, Pastor P, Ghandour RM, et al. (2013) Mental health surveillance among children — United States 2005–2011. *MMWR Surveill Summ* 62:1-35.
6. Sönmez AÖ, Kayaalp ML (2018) Comparing Attention-Deficit/Hyperactivity Disorder and Oppositional Defiant Disorder Singly and Together in Terms of Behavioral Problems, Family Conflict, and Cognitive Functions. *Sisli Etfal Hastan Tip Bul* 52: 254-61.
7. Mota-Veloso I, Soares ME, Homem MA, Marques LS, Ramos-Jorge ML, et al. (2016) Signs of attention deficit/hyperactivity disorder as a risk factor for traumatic dental injury among schoolchildren: a case-control study. *Int J Paediatr Dent* 26: 471-76.
8. Aminabadi NA, Najafpour E, Erfanparast L, Jamali Z, Pournaghi-Azar F, et al. (2016) Oral health status, dental anxiety, and behavior-management problems in children with oppositional defiant disorder. *Eur J Oral Sci* 124: 45-51.
9. Rosenberg SS, Kumar S, Williams NJ (2014) Attention deficit/hyperactivity disorder medication and dental caries in children. *J Dent Hyg* 88: 342-7.
10. Makansi N, Carnevale FA, Macdonald ME (2018) The conceptualization of childhood in North American pediatric dentistry texts: a discursive case study analysis. *Int J Paediatr Dent* 28: 189-97.
11. Albandar R (2000) Global epidemiology of oral diseases: An overview. *Periodontol* 29: 7-10.
12. Goyal S, Thomas BS, Bhat KM, Bhat GS (2011) Manual toothbrushing reinforced with audiovisual instruction versus powered toothbrushing among institutionalized mentally challenged subjects--a randomized cross-over clinical trial. *Med Oral Patol Oral Cir Bucal* 16: 359-64.
13. Vadim V Tachalov, Lyudmila Y Orekhova, Elena R Isaeva, Tatyana V Kudryavtseva, Ekaterina S Loboda, et al. (2018) Characteristics of dental patients determining their compliance level in dentistry: relevance for predictive, preventive, and personalized medicine. *EPMA J* 9: 379-85.
14. Kay E, Locker D (1998) A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health* 15: 132-44.

15. Gleber JM (1995) Interpersonal communications skills for dental hygiene students: a pilot training program. *J Dent Hyg* 69: 19-30.
16. Chau YC, Lai KY, McGrath CP, Yiu CK (2017) Oral health of children with attention deficit hyperactivity disorder. *Eur J Oral Sci* 125: 49-54.
17. Barouch K, Al Asaad N, Alhareky M (2019) Clinical relevance of dexterity in oral hygiene. *Br Dent J* 226: 354-7.
18. Soldani FA, Lamont T, Jones K, Young L, Walsh T, et al. (2018) One-to-one oral hygiene advice provided in a dental setting for oral health. *Cochrane Database Syst Rev* 10: CD007447.
19. Lees A, Rock WP (2000) A comparison between written, verbal, and videotape oral hygiene instruction for patients with fixed appliances. *J Orthod* 27: 323-8.
20. Cheng CC, Li CY, Hu YJ, Shen HC, Huang SM (2013) Effects of tooth scaling reminders for dental outpatients. *J Telemed Telecare* 19: 184-9.
21. Mohebbi SZ, Virtanen JI, Vahid-Golpayegani, MM Vehkalahti (2009) A cluster randomised trial of effectiveness of educational intervention in primary health care on early childhood caries. *Caries Res* 43: 110-8.