

Clinical investigation of the effects of oral health education in children with Down Syndrome

Şükriye Türkoğlu Kayacı¹, Onur Gezgin^{2*}

¹ Health Sciences University, Faculty of Dentistry, Department of Pediatric Dentistry, Istanbul, TR

² Baskent University, Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, TR

* Corresponding Author: Onur Gezgin E-mail: onur_gezgin@hotmail.com

ABSTRACT

Objective: The objective of this study is to evaluate the effects of oral health education, which includes parents on children with Down Syndrome (DS).

Material and Methods: The present study included 35 children with DS. Oral hygiene education was given through a program that included parents. The oral hygiene and periodontal health status of all the children were clinically assessed using clinical index measurements such as Bleeding on Probing (BOP), Gingival Index (GI) and Plaque Index (PI) at the baseline, 1st month, 3rd month and 6th month after oral health education programme. Statistical analyses were performed.

Results: All the mean PI, GI and BP measurements showed a statistically significant decrease according to the baseline mean values ($p < 0.05$). Moreover, oral hygiene education, in which parents are involved, the fact that the clinical measurements on the posterior teeth are higher than on the anterior teeth. Results clearly indicate the difficulty of brushing on the posterior teeth in children with special needs.

Conclusion: Oral health education has been determined to be rather effective on all clinical measurements. Scientific studies and educational programs in which sufficient information is provided to parents about oral health should be encouraged.

Keywords: Genetics, Pediatric Dentistry, Public Health, Down Syndrome

INTRODUCTION

Poor oral health can cause pain, trouble eating, sleep disturbance, and lack of self-esteem, all of which can significantly impact a person's quality of life (1). Individuals with Down syndrome also have many oral and dental problems, especially periodontal problems that affect their quality of life (2).

Compared with the general population, individuals with DS are more likely to be affected by periodontal diseases and therefore must maintain good oral hygiene habits. (3). Due to the high incidence of active infections and previously treated periodontal diseases, controlling plaque formation becomes critical in individuals with DS. Oral health cannot be achieved and protection against periodontal diseases cannot be ensured unless plaque formation is controlled (4).

Allison et al. (5) showed that 51.4% of DS children under 8 years of age were not supported to brush their teeth daily. It supports the view that hand skills are limited, and this has an effect on oral hygiene (6). Therefore, children need help from their parents when brushing their teeth (7).

Although the importance of dental care in preventing periodontal diseases in individuals with DS is well known, there is limited literature on the effects of brushing on clinical indices through programs in which the parents are also included.

The present study aimed to investigate the effects of education on clinical periodontal indices during a 6-month follow-up period by administering oral hygiene education to children with DS via a program that included their parents.

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MATERIAL and METHODS

The present study included 35 (18 boys, 17 girls) children with DS who were referred to the Department of Paediatric Dentistry at the Faculty of Dentistry. The Ethics committee approved the study protocol (meeting No. 2016/004). Prior to study initiation, detailed verbal and written information was provided to the parents of all the included children. All the parents read the informed consent forms and provided their written consent for participation in the study. All children's detailed medical histories were obtained from their parents, and the data were recorded on their respective anamnesis forms. Written consultations were requested from the doctors of all children, and treatment was completed as per the recommendations relayed in these consultation reports. Special education centers were visited and interviews were conducted to determine children eligible for inclusion in the study after referral to our clinic. Children with DS, their families, and their instructors at the special education centers they attended—whom we could reach the first visit, were provided with information regarding the prevalence of oral hygiene, periodontal diseases, and susceptibility of children with DS to periodontal diseases. The survey questions prepared for the parents of the children included in the study are presented in **Table 1**.

The The Decayed, Missing, and Filled Teeth (dmf-t/DMF-T) values of all the teeth were calculated and recorded in the index forms prepared for the patient. The oral hygiene and periodontal health status of all the children were clinically assessed using clinical index measurements, such as bleeding on probing (BP), GI (GI, Löe and Silness), and PI (Pi, Löe and Silness), at six points of each tooth in the mouth as distobuccal, midbuccal, mesiobuccal, distopalatal, midpalatal, and mesio-palatal, except for the third molar tooth, using a Williams-type probe (diameter, 0.5 mm).

Oral hygiene education was performed with models and practices with parents. All the measurements were performed at 4 different time points: baseline, 1 month, 3 months, 6 months after education.

Statistical Analysis

The study data were recorded using Microsoft Office Excel 2016. All statistical analyses were performed using SPSS 20.0 (SPSS Inc. Chicago, USA) software. The mean plaque index (PI), gingival index (GI), and bleeding on probing (BP) values at baseline and 1-, 3-, and 6-months post-treatment were separately calculated and analyzed using the Friedman test. The Wilcoxon test was used to compare the effects of the treatment on the clinical measurements of anterior and posterior teeth and to calculate whether there was a difference between the parameters.

RESULTS

Sample of the study consisted of 35 children: 17 (48.5%) girls and 18 (52.5%) boys. The patients' general profile and demographic data analysis were analysed (**Table 2**). Their mean age was 12.37(±5.81) years. 34% of the children had no systemic diseases, 31% of them had congenital heart disease, 20% of them had hypothyroidism.

The 37% of the sample were brushing their teeth, 74% of them brushing 2-3 times in a week, 20% brushing once a day, 6% of them brushing twice or more in a day. Only 6% of them had received oral hygiene education before. 34% of them had received dental treatment before, 58% of them had dental treatment in the clinic, 42% of them were under general anaesthesia.

The mean value of the DMF-t/DMF-T indices of the 35 children with DS was found as 4.6. Patients' teeth that required treatment were treated in the clinic and under general anaesthesia. Except for the treatment sessions in the clinic or under general anaesthesia, it was determined that no secondary caries occurred through re-examination at 1-, 3-, and 6-month control visits.

All the mean PI, GI and BP measurements showed a decrease compared with the baseline mean values. This decrease was statistically significant ($p < 0.05$) (**Table 3**).

PI baseline mean values were calculated. This value differed from the mean values obtained in the treatment process's 1st, 3rd and 6th months. According to the initial values 1st month, 3rd month, 6th month values were decreased over time. It was concluded that this decrease was statistically significant ($p < 0.05$) (**Table 3**). According to the data obtained, although there was a significant decrease in the mean PI values in the 1st month, 3rd month, 6th months after the treatment compared to the baseline, the decrease in the 1st month after the onset was significantly higher than the changes in the 3rd and 6th months observed (**Figure 1**) ($p < 0.05$).

GI baseline value differed from the mean values obtained in the treatment process's 1st, 3rd and 6th months. According to the initial values 1st month, 3rd month, 6th month values were decreased over time. It was concluded that this decrease was statistically significant ($p < 0.05$) (**Table 3**). As shown in **Figure 1**, according to the data obtained, although there was a significant decrease in the mean GI values in the 1st month, 3rd month, 6th months after the treatment compared to the baseline. The decrease in the 1st month after the onset was significantly higher than the changes in the 3rd and 6th months observed ($p < 0.05$).

BP baseline mean value differed from the mean values obtained in the 1st, 3rd and 6th months of the treatment process. According to the initial values 1st month, 3rd month, 6th month values were decreased over time. It was concluded that this decrease was statistically significant ($p < 0.05$) (**Table 3**).

According to the data obtained, although there was a significant decrease in the mean BP values in the 1st month, 3rd month, 6th months after the treatment compared to the baseline, the decrease in the 1st and 3rd month after the onset was significantly higher than the changes in the and 6th months observed (**Figure 1**) ($p < 0.05$).

The effect of the oral hygiene education on the clinical measurements of anterior and posterior teeth was examined. Baseline, 1st, 3rd and 6th month's values were higher in posterior teeth than anterior teeth (**Figure 1**)

Table 1. Questions of the survey administered to the parents of children with DS included in the study

Your child's age	.....	.....	.....
Your educational status	☐ Primary School	☐ High School	☐ University
Your income level	☐ 0–5000 ₺	☐ 5000–10000 ₺	☐ >10000 ₺
Number of siblings	.....	.....	.....
Another child with DS?	☐ Yes	☐ No	
Is your marriage consanguineous?	☐ Yes	☐ No	
Does your child have a systemic disease?	☐ Yes	☐ No	
If yes, please specify	.....	.....	.....
Specify regularly used medicines	.....	.....	.....
Do you have him/her brush his/her teeth?	☐ Yes	☐ No	
Brushing frequency	☐ 2-3 times a week	☐ Once a day	☐ Twice a day
Have you had him/her receive dental treatment before?	☐ Yes	☐ No	
If yes, how?	☐ Under general anesthesia	☐ Under sedation	☐ At a Clinic
Has he/she received oral-dental education before?	☐ Yes	☐ No	

Table 2. General profile and demographic data of the patients

	N	%
Gender		
Female	17	49
Male	18	51
Your educational status		
Primary School	23	66
High School	7	20
University	5	14
Your income level		
0–5000 ₺	21	60
5000–10000 ₺	10	29
>10000 ₺	4	11
Consanguineous marriage		
Yes	2	6
No	33	94
Brushing teeth		
Yes	12	37
No	23	63
Brushing Frequency		
2–3 times a week	26	74
Once a day	7	20
Twice a day	2	6
Previous dental treatment?		
Yes	6	17
No	29	83
If yes, how?		
General Anesthesia	4	66
Sedation	1	17
Clinic	1	17
Previous oral-dental health education?		
Yes	2	6
No	33	94

Table 3. Comparison of the clinical index measurements change in the patients

Clinical indices	Baseline (Mean ± SD)	1st month (Mean ± SD)	3rd month (Mean ± SD)	6th month (Mean ± SD)	Sig.(p)*
PI	2.01±0.08	1.49±0.07 ^a	1.26±0.06 ^{ab}	1.14±0.05 ^{abc}	0,000
GI	1.95±0.02	1.58±0.06 ^a	1.27±0.05 ^{ab}	1.16±0.04 ^{abc}	0,000
BOP	0.95±0.02	0.57±0.06 ^a	0.26±0.05 ^{ab}	0.16±0.04 ^{abc}	0,000

*a, statistically difference according to initial,

*b, statistically difference according to 1. month follow-up,

*c, statistically difference according to 3. month follow-up.

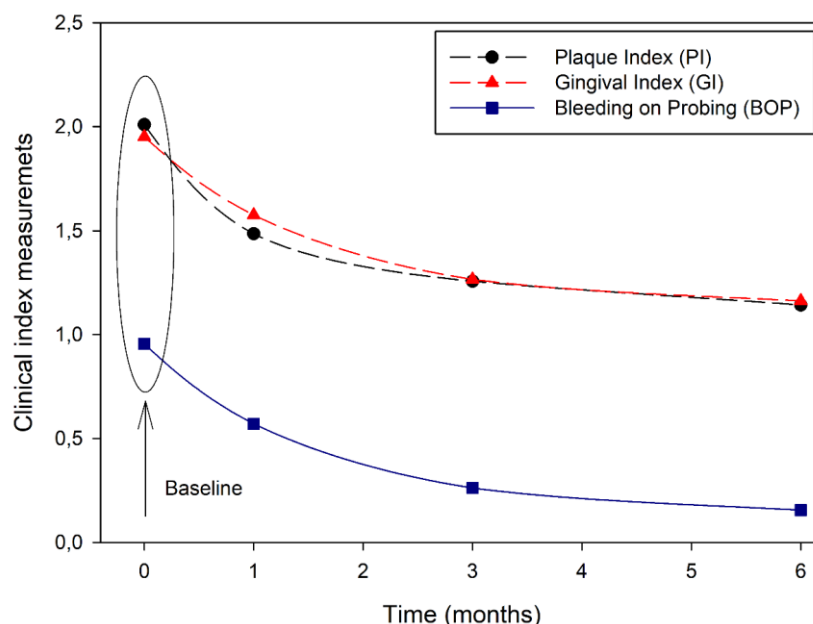


Figure 1. Clinical index measurements

DISCUSSION

When compared with the general population, individuals with DS have a higher prevalence of early-onset periodontitis and edentation. (8). This condition is linked to delays in the development of motor functions and thus the inability to maintain oral hygiene (9). As well as this higher prevalence, plaque control plays a key role in protecting individuals with DS against periodontal disease, and these individuals have poor oral hygiene (10). Hence, prevention of periodontal diseases and protection of natural dentition is considered extremely important in children with DS.

The reason behind the increased incidence of periodontal diseases in individuals with DS is not completely clear. Several studies suggested that multiple factors are involved. For example, the increased prevalence of the disease may be related with impaired immune system features, such as decreased neutrophil and monocyte chemotaxis, impaired neutrophil phagocytosis, decreased T lymphocyte count, and immature T lymphocytes (9-12). Furthermore, an association with the oxidative burst capacity of granulocytes and monocytes, suppressed chemotaxis, and impaired oxidative metabolism and immunity relations have been reported (13). Several genetic polymorphisms of IL-1 (IL-1A +4845, IL-1B +3954, and IL-1RN +2018) have also been associated with the loss of periodontal attachment in individuals with DS. also reported an association with reduced CD4+/CD8+ ratio and the resulting changes in immune system regulation and function (14).

Apart from systemic factors, local factors are also reportedly involved. Factors such as macroglossia, malocclusion, tooth morphology, bruxism, and loss of normal chewing function may also have a role. Controlled brushing, good dental care, and protective measures helped improve the periodontal condition (15).

Periodontitis have a diagnostic and therapeutic challenge process. Gingival bleeding on probing is one of more promising diagnostic predictability test (15).

In a study, they reported the rate of bleeding on probing decreased from 85.2% to 69.8% after 6 months educational-therapy, (16), however it is reduced from 95% to 15% after 6 months in the present study.

Some studies reported that periodically provided preventive periodontal care effectively stops disease progression (11,17). Contrarily, some other studies reported that preventive programs cannot prevent the destructive effects of periodontal diseases and that the progression of the disease cannot be suppressed (18-20). The present study, concluded that plaque control can be achieved and that the onset and progression of periodontal diseases can be prevented at an early age through regular control visits to children with DS who cannot effectively maintain their oral hygiene.

In this study, baseline, 1st, 3rd and 6th months clinical index measurements were higher in posterior teeth than anterior teeth. The oral hygiene education, which included parents, was effective in this special healthcare group. However, the results show that posterior teeth are more difficult to clean, and care should be taken by patients.

CONCLUSION

As a result, similar to their general health, the oral health of children with DS, who also have considerable general health problems, is not sufficiently taken care. Thus, long-term participation in follow-up studies is not sufficiently achieved. In our opinion, scientific studies and activities wherein parents are provided sufficient information should be encouraged to gain oral health.

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Ethical approval: All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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