

Evaluation of the Greene-Vermilion Index (OHI-S) of Two Groups of 4- to 6-Year-Old Children After Administration of an Oral Hygiene Solution and Gel

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Abstract

Aim: To evaluate the index (OHI-S) of two groups of children from 4 to 6 years of age after application of solution and gel for oral hygiene.

Material and Methods: Object of observation – N= 300 children from the city of Varna aged 4 to 6 years, distributed equally in standardized age groups, with the same number of boys and girls. They were divided into two groups for determination of OHI-S(PLI) of Greene-Vermilion for 1 - control group (N=91), against determination of OHI-S(PLI) of Greene-Vermilion for 2 - study group with Oroben(Aboca) fluid and gel (N=209). The study was conducted at the Faculty of Dental Medicine, Varna, 2021, with informed consent from each parent. The choice of children is random. All carious (d), missing (m) and filled teeth (f) are recorded. The presence of plaque after staining on the respective surfaces of the representative teeth was recorded. The STATISTICA 10.0 package specialized for statistical analyzes was used.

Results: The results of the t-test for statistical significance of the difference between the mean values of OHI-S(PLI) were measured after 8(weeks) and showed that OHI-S (PLI) = 1.590 for the control group versus OHI-S(PLI) = 0.723 for the study group with Oroben. A statistically significant difference was found in the mean values for OHI-S(PLI) as $p\text{-level}=0.0000001<0.05$ i.e. the hypothesis of equality of means is rejected at a significance level of 0.05.

Conclusions: The variables dft and OHI-S(PLI) influence one another directly and proportionally and also depend on the age factor of the patients.

Keywords: OHI, DMFT/DMFS, Dental caries, Primary teeth

Introduction

According to Anderson and Elliott, healthy enamel is resistant to acid dissolution, but with prolonged exposure to acids, it weakens and demineralization progresses in the subsurface layer of enamel, following the direction of enamel prisms at a constant rate.¹ Enamel demineralization can be improved by controlling the oral microbial biofilm on the tooth surface,^{2,3,4} dietary modification and mineralization with fluoride and remineralizing therapy and proper diet.^{5,6,7} On the surface of the tooth,⁸ demineralization is the first sign of the caries lesion.^{9,10} Early lesions that are limited to the enamel do not require restoration, except in cases of fracture after deepening and the presence of cavitation of the lesions. The results of an oral hygiene study performed

by the authors are the presence and amount of dental plaque (AI-Anezi and Harradine plaque index), as well as the total number of gingival bleeding sites (Bleeding on Marginal Probing Index). Oral health and its psychosocial factors were measured using a digital questionnaire. At 6-week follow-up, the authors found that the intervention resulted in a significant reduction in gingival bleeding (B = -3.74; 95% CI -6.84 to -0.65) and an increase in the use of fluoride mouthwash (B = 1.93; 95% CI 0.36 to 3.50). At the 12-week follow-up, plaque accumulation (B = -11.32; 95% CI -20.57 to -2.07) and the number of plaque-covered surface areas (B = -6.77; 95% CI -11.67 to -1.87) had a decrease significantly more in the experimental group than in the control group. The researchers found that adolescents with fixed orthodontic appliances needed immediate

improvement in their oral hygiene when usual care was combined with a mobile application that provided oral health education and ongoing training.¹¹

Aim: To assess the OHI-S index (PLI) of two groups of children aged 4 to 6 years after administration of oral hygiene solution and gel.

Methodology

Criteria for inclusion of children: clinically healthy, without general and systemic diseases, without diseases such as gingivitis and stomatitis; accompanied by parents who regularly visit our clinic at the University Medical-Dental Center in the city of Varna.

1.1. Epidemic of caries on teeth and surfaces - dmft.

1.2. Dental caries and oral hygiene status in the examined children.

(OHI-S) and correlation with reversible and irreversible caries lesions.

Dental status. Object of observation - a total of 300 children from the city of Varna aged 4 to 6, distributed equally in standardized age groups, with an equal number of boys and girls. From them, we divided into two groups for determination of OHI-S (PLI) for 1 - control group (N=91), against determination of OHI-S (PLI) for 2 - study group with Oroben (Aboca) liquid and gel (N=209). Patients - children aged 4 to 6 years use Oroben gel for hygiene in the morning and evening after brushing their teeth with a brush and paste for eight months, and children over 6 years of age use Oroben water for oral hygiene in the morning and evening after brushing their teeth with a brush and pasta for eight months. The follow-up examinations were carried out as follows: initial status, follow-up examination after 4 weeks and follow-up examination after 8 weeks, and recording the result after oral hygiene performed by the children in the clinic with a brush and paste for their age.

Total number of primary teeth registered since the first examination - 5900.

Total number of carious lesions registered from the first examination - 759 /reversible and irreversible/, on teeth and surfaces.

Methodology: Dental status is assessed and recorded according to WHO criteria. Data on dental caries and oral hygiene are obtained through a single examination. The examination is carried out with an observation, after drying the teeth. A visual diagnostic method is applied. Lesions d1a, d1b, d2 and d3 and d4

are diagnosed. Initial diagnostic threshold d1a, d1b are visible lesions, with 5 seconds drying and without drying, respectively, with a preserved surface layer, defined as active or inactive. All carious (d), missing (m) and obturated teeth (f) are recorded. An epidemiological oral health assessment card was used to record the oral status of the children for the needs of the study. It includes a short passport part, the status of the teeth, registration of the level of oral hygiene, caries risk assessment and characterization of caries lesions present.

Monitoring units: primary teeth and surfaces with/without carious lesions, active carious lesions at diagnostic threshold level d1a.

Observational signs: carious, filled or carious primary tooth/surface. The presence of at least one carious lesion/surface. Diagnostic criteria: Activity criteria - d1a, d1b carious lesions under the plaque, located on the tooth surface, with loss of shine and smoothness of the enamel, poor oral hygiene; Criteria for positioning d1a, d1b lesions - with smooth surfaces, with shine and clear borders. Diagnostic scale - codes:

d1a - white enamel lesion visible with drying

d1b - white enamel lesion visible without drying.

d2 - white enamel single cavitated lesion or lesion with several small cavitations

d3 and d4 – lesion in the dentin without and with involvement of the pulp

A – active caries lesions (d1a, d1b, d2)

NA – inactive carious lesions (d1a, d1b, d2)

Reversible carious lesions - (d1a, d1b, d2)

Irreversible carious lesions - d3 and d4. We excluded non-carious lesions and hypomineralized lesions from the study.

1.3. Dental caries and oral hygiene status in the examined children

Oral hygiene status. The Greene-Vermilion Index (OHI-S, PLI) was used to determine the level of oral hygiene. The presence of plaque after staining on the respective surfaces of the representative teeth was recorded.

Research methodology. The Greene-Vermilion index (OHI-S, PLI) was determined for the representative teeth (55, 51, 65 and 71 - vestibular, 75 and 85 lingual). The sum of the surface scores divided by the number of surfaces to be tested is the tooth score, from 0-3.

Indicators studied: Based on the value of OHI (PLI), children are divided into three groups, according to the degree of plaque accumulation: 0.1-1.1 - good oral hygiene; 1.1-2.0 - satisfactory oral hygiene; 2.1-3.0 - poor oral hygiene.

The relative shares of children, broken down by group, according to the values of the Greene Vermillion OHI-S(PLI) index: 0-1; 1,1-2; 2.1-3.

Place of observation: The study was conducted at the Faculty of Dental Medicine, Varna, 2021, with permission and informed consent from each parent. The choice of children is random. The methods are performed by specialists in pediatric dentistry. Data registration: in the statistical maps.

Statistical data processing methods

For statistical analysis of the data, a specialized package for statistical analyzes was used StatSoft, Inc., STATISTICA manual (Software system for data analysis STATISTICA 10.0, 2010. For the purposes of the present study, the following statistical methods were applied: 1. Descriptive statistical analysis - the frequency distribution of the considered signs, broken down by research groups, the average values and standard deviations, 95% confidence intervals of changes in the average values, is presented in tabular form. For a visual presentation of the results, the histograms corresponding to the frequency distributions were built; 2. Student's test (t-criterion) for two independent samples - to detect a statistically

significant difference in the average values of the studied factors in control and experimental groups; 3. Analysis of variance (ANOVA) - in order to establish the presence/absence of influence of two or more factors on the average values of the investigated characteristics [K.Prodanova, Lectures Notices in Statistics, TU-Sofia, 2008, p. 1-117]. 4. Poisson regression analysis - in order to build an adequate statistical model describing the dependence of the values of number of caries d3+d4, dft and dfs on various explanatory variables and factors such as age, OHI-S(PLI), studied group that used Orobén(Aboca) hygiene liquid or not, as a control group and others.

The choice of Poisson regression rather than linear is necessary because the values of the dependent variable are integers. The found analytical dependence /function/ allows to predict the values of the dependent variable at given values of the explanatory variables.

When testing the respective null hypotheses of equality of means by t-test and ANOVA, $p=0.05$ was chosen as the level of significance. This is the probability of making a first-order error, namely rejecting the null hypothesis when it is true.

Results

The analysis of figure 1 shows how the mean values (marked with dots) for OHI-S(PLI) and their 95% confidence intervals (vertical sections) vary with different dft values.

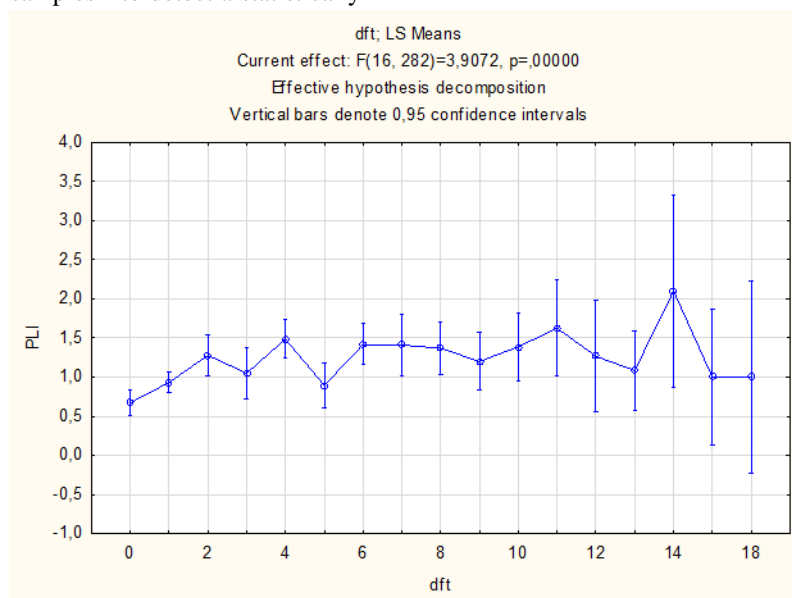


Fig. 1. Initial measurements with variations of the mean values /marked with dots/ for OHI-S, PLI and their 95% confidence intervals /vertical sections/ at the different values for dft / index determining the sum of carious and filled teeth/

The obtained p-levels are less than 0.05, which shows that the variable dft depends on the values of OHI-S, PLI and on the age factor of the children studied. Since

the dft values are integers, we apply Poisson regression, (Table1).

Table 1. Poisson regression variable dft also depends on the values of OHI-S, PLI and on the factor age of the patients - initial measurements:

dft - Test of all effects			
Distribution : POISSON			
Link function: LOG			
	Degr. of - Freedom	Wald - Stat.	p
Intercept	1	139,2957	0,0000001
OHI-S, PLI	1	32,7099	0,00000001
Age	2	248,1251	0,00000002

Student's t-test (t-test) for two independent samples. Table 2 shows the T-test for statistical significance of the difference between the mean OHI-S (PLI) values of the child patients from 4 to 6 years of age. Table 2 shows that there is a statistically significant difference in the mean values for OHI-S (PLI) as p-level=0.0000001<0.05 ie. the hypothesis of equality of means is rejected at a significance level of

0.05. The resulting T-test calculations for the statistical significance of the difference between the mean values of OHI-S (PLI) measurement after 8(weeks) showed that OHI-S (PLI) = 1.590 for control group versus OHI-S (PLI) = 0.723 for a study group with "Oroben" oral gel or mouthwash from (Aboca), Table 2.

Table 2. T-test for statistical significance of the difference between mean values of for OHI-S (PLI) measurement at 8 (eight weeks)

T-test for Independent Samples									
Note: Variables were treated as independent samples									
	Mean - Group 1	Mean - Group 2	t-value	df	p	Valid N - Group 1	Valid N - Group 2	Std. Dev. - Group 1	Std. Dev. - Group 2
OHI-S (PLI) for Control group vs. OHI-S (PLI) for Test group with Oroben (Aboca)	1,590	0,723	9,77	297	0,0000001	91	209	0,69	0,52

Analysis of variance (ANOVA). This method was used to establish the influence of the factor d1a, d1b and d2 / lesions on surfaces d0, d1a, d1b, d2, d3-d4/ on the number of cavitated dental caries d3+d4 for the temporary dentition. For this purpose, a statistical null

hypothesis of equality of the mean values of six groups of lesions is tested. Through this check, it is possible to assess how much the influence of the factor is statistically significant for the difference in means. *Statistical Hypotheses in Univariate Analysis of*

Variance with 6 Levels of Initiating Factor: Null and alternative hypothesis: $H_0 : \mu_1 = \mu_2 = \dots = \mu_6$;

H_1 :{ average values μ_i are not equal } with a level of significance $\alpha = 0,05$. μ_i - average number of caries in the group of children **from the study group with Oroben's solution and gel (Aboca)**, depending on the factor lesions on surfaces d0, d1a, d1b, d2, (non-cavitated carious lesions) and d3, d4 (cavitated carious lesions), whose values are coded into 6 groups:

- code 0 - d0 - unaffected surfaces; code 1- occlusal d1a/b; code 2- occlusal d2; code 3- occlusal d3/d4; code 4 - proximal - d1; code 5 - proximal - d2, etc.

For this purpose, the sums SS - Total sum of squares are calculated; Squared Sum between the Groups; Error sum of squares, and then the value of a statistic that has a Fisher distribution (**F**) is calculated. *If the p-level for the studied factor is less than 0.05, the null hypothesis is rejected, i.e. the factor affects the mean values of the variable under consideration.* For example, for the group of children **from the study group with Oroben**, the verification with analysis of variance for the influence of the factor lesions on surfaces d0, d1a, d1b, d2, d3/d4 (values are coded in 6 groups) on the number of caries, we get the results in Table 3.

Table 3. Dispersion analysis of children from the study group with "Oroben" on the influence of the factor caries lesions on the tooth surfaces d0, d1a, d1b, d2, d3/d4, on the number of dental caries

Univariate Tests of Significance for number of caries with cavitated lesions for the study group with Oroben(Aboca)					
Sigma-restricted parameterization					
Effective hypothesis decomposition					
	SS	Degr. of Freedom	MS	F	p
Intercept	310,3557	1	310,3557	40,17488	0,00001
Carious lesions on surfaces d1a, d1b, d2, d3/d4	216,9541	6	36,1590	4,68071	0,00033
Error	718,4359	93	7,7251		

Results of univariate analysis of variance conducted with the STATISTICA package, ANOVA module. The conclusion is that the factor carious lesions d1 and d2 affects the number of dental caries with **cavitated lesions for the studied group with Oroben (Aboca)**, /p-level 0.0003 i.e. less than 0.05/.

Discussion

In our study, the results of the T-test for statistical significance of the difference between the mean values for OHI-S (PLI) measurement after 8(weeks) showed that OHI-S (PLI) = 1.590 for control group vs. OHI-S (PLI) = 0.723 for study group with Oroben oral gel or mouthwash, (Aboca).

The scientists in their scientific studies believe that the potential consequences for the short-term and long-

term systemic health of the studied patients, demonstrate the need for targeted strategies to improve oral health in children, especially in children with Type 1 diabetes. ¹² Authors conducted a community-based study in a school that was effective in improving oral health knowledge and preventing the deterioration of brushing behavior, as well as oral hygiene practices in adolescents. Only the educational methods did not show the expected effect of improving the health of the gingiva and reducing the number of teeth and surfaces damaged by dental caries. Additional methods of administration and new more effective interventions are needed to overcome this limitation. ¹³

A combination of preventive examinations, nutritional diet, exogenous and endogenous prophylaxis, oral

hygiene, remineralizing therapy and application of sealants to the newly erupted temporary and permanent molars are introduced. In laboratory studies,^{14, 15} Orobien(Aboca) oral gel and water has been shown to reduce pain and promote healing of inflamed gingiva, small lesions of the oral mucosa due to, for example,^{16,17} dental treatment or the use of orthodontic appliances and prostheses.^{18,19} Its action is effective with the content of Resinox FP, which is a natural molecular complex composed of flavonoids, resins and polysaccharides. The complex forms an active protective film on the mucous membrane with a double action. In this way, contact with irritating agents, pathogens or external agents that hinder the natural process of tissue regeneration and healing is limited. The second action is antioxidant and protects the mucous membrane from the irritating effect of free radicals. Based on these mechanisms, the product has an indirect anti-inflammatory effect and helps tissue repair, reducing healing time. Peppermint essential oil has a refreshing effect,^{20,21,22} leaves a pleasant feeling of freshness in the oral cavity, and reduces the bad breath characteristic of gingivitis.^{23,24,25}

Conclusion








As OHI-S(PLI) index values increase, dft index values also increase. The obtained p-levels for both explanatory variables are less than 0.05, indicating that the dft variable also depends on the OHI-S(PLI) and the age factors of the studied patients.

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