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AGGREGATION OF PLAQUE DISCLOSING AGENT IN A DENTIFRICE

INCORPORAÇÃO DE EVIDENCIADOR DE PLACA BACTERIANA A UM DENTIFRÍCIO

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ABSTRACT

Dental plaque removal is an important issue in health promotion. Toothbrushing is one of the main methods employed for such purpose, since it can prevent dental caries by means of the fluoride present in the dentifrice. Dentifrices might contain plaque disclosing agents and thus allow dental plaque observation. The aim of this study was to assess whether utilization of a plaque disclosing agent interfered with plaque removal among adolescents, as well as the difference between utilization of erythrosine tablets and dentifrices containing plaque disclosing agent. The sample was composed of 62 students from Piracicaba, SP, Brazil, aged 12 to 14 years old, divided into 3 groups: G1 or control group (toothbrushing without plaque disclosure); G2 (plaque disclosing with an erythrosine tablet and toothbrushing) and G3 (toothbrushing with dentifrice containing plaque disclosing agent). After toothbrushing, disclosure of the remaining dental plaque was performed in all groups with a fuchsin tablet and measured through the Simplified Oral Health Assessment Index (OHI-S), in two stages with a 2-month interval between them. The analysis of variance (ANOVA) showed that there was no difference in the OHI-S index between the groups ($p>0.05$), however the G3 displayed a higher proportion of students with plaque reduction (23%) than G2 (21%), besides the smallest difference in the mean remaining dental plaque. There was no difference between groups; however, it was suggested that the dentifrice with plaque disclosing agent had positive results in relation to the erythrosine tablet, even though the small sample size may have interfered with the results, indicating the need of complementary studies.
UNITERMS: Dental plaque; Plaque disclosure; Toothbrushing; Plaque disclosing dentifrice.

RESUMO

Na promoção de saúde, a remoção da placa bacteriana é um fator importante e um dos métodos que incentivam sua remoção, é a escovação dentária, podendo-se prevenir a cárie dental através do íon flúor dos dentifrícios. Estes podem conter evidenciadores, possibilitando a visualização da placa bacteriana. Assim, avaliou-se o uso de evidenciadores na remoção de placa bacteriana em adolescentes, e se houve diferença entre pastilhas de eritrosina e dentifrício contendo evidenciador. A amostra foi de 62 escolares de Piracicaba- SP, entre 12 e 14 anos, dividida em 3 grupos: o G_1 como grupo controle (escovação dental sem prévia evidenciação de placa); o G_2 (evidenciação de placa com pastilha de eritrosina e escovação dental) e o G_3 (escovação com dentifrício contendo evidenciador de placa). Após a escovação, evidenciou-se a placa remanescente com pastilha de fucsina nos 3 grupos, medida pelo Índice de Higiene Oral Simplificado (IHOS), sendo realizada em 2 fases, com intervalo de 2 meses. Segundo a Análise de Variância (ANOVA), não houve diferença no índice IHOS entre os grupos ($p>0,05$). Entretanto, o G_3 apresentou maior proporção de escolares onde houve diminuição do IHOS (23%) em relação ao G_2 (21%) e menor diferença nas médias de acúmulo de placa. Não houve diferença entre os grupos, entretanto, sugere-se que o dentifrício com evidenciador de placa tenha resultados positivos em relação à pastilha de eritrosina, apesar da amostra ter sido pequena e poder ter interferido, havendo necessidade deste resultado ser melhor explorado.
UNITERMOS: Placa bacteriana; Evidenciador de placa bacteriana; Escovação dentária; Dentifrício com evidenciador de placa bacteriana.

INTRODUCTION

Prevention of dental caries and periodontal disease with health promotion have been the main goals of Dentistry, since the dental plaque is a common and predominating factor leading to loss of teeth both because of dental caries and periodontal disease. Dental plaque requires some days to become "mature" and thus might develop in individuals with poor oral hygiene[5].

On the other hand, toothbrushing may provide proper control of plaque accumulation and therefore is the primary measure for the control of caries and periodontal disease[2], either in individual or population level[12].

However, the poor oral hygiene, besides leading to onset of most gingival and periodontal diseases, as previously mentioned, allows progression of inflammation, so as the severity of gingivitis is usually the result of the patient's oral hygiene[5]. Thus, maintenance of oral hygiene by means of control of the accumulation of microorganisms is one of the most widely employed methods for prevention of dental caries and periodontal disease, with a relationship between the longer period of toothbrushing and the effectiveness of plaque removal, and the dentifrice containing a plaque disclosing agent is one of the methods that may improve this control[9].

The dentifrice containing plaque disclosing agent – Dent Plaque – was employed as part of one of the programs of oral health promotion, being distributed by the Ministry of Health in the year 1999 to the Health Secretariat of the State of Sao Paulo, including the Regional Health Direction of Piracicaba (DIR XV), which comprises 25 cities of the region, including Piracicaba, where this study was conducted.

However, despite the interest and application of this method when the present study was conducted, there were few studies on the composition and preventive effect of this type of dentifrice, especially among adolescents. It is known that many alterations occur during this period, including in the hygiene habits[17], with consequent difficulty to encourage toothbrushing in adolescents, therefore demonstrating the importance of indicating a method for promotion of plaque removal.

In this context, utilization of a dentifrice with a plaque disclosing agent might encourage the accomplishment of careful toothbrushing, supposedly with more attention of the individual to the stained areas, which would allow observation of dental plaque.

Thus, the aim of this study was to evaluate whether the utilization of plaque disclosing agents influences plaque removal, as well as the difference between the products analyzed, namely dentifrice containing plaque disclosing agent and plaque disclosing tablets.

MATERIAL AND METHODS

Because of the investigation in human beings, the study design was submitted to and approved by the Ethics Committee of Piracicaba Dental School/UNICAMP, and was conducted after achievement of signed consent term from the subjects' caretakers (Process n. 58/1999).

Data collection was performed from August to December 2000 on 62 students from a public school in the city of Piracicaba, Sao Paulo, Brazil, aged 12 to 14 years, who were divided into 3 groups: Group 1 (G_1) – control group, on which the students performed regular toothbrushing without plaque disclosure (n=21); Group 2 (G_2) - plaque disclosing with an erythrosine tablet before toothbrushing (n=19); and Group 3 (G_3) - toothbrushing with Dent Plaque (n=22). The students employed the same type of toothbrush and dentifrice for the accomplishment of regular toothbrushing.

After toothbrushing, plaque disclosure was performed once again in all groups with utilization of the fuchsin tablet and the Simplified Oral Hygiene Index (OHI-S)[4,14] was employed for calculation of the remaining plaque, with measurement in 2 stages, namely initial and final, with a 2-month interval between them, in order to verify whether there was plaque reduction after initial plaque disclosure. Fuchsin was utilized to allow homogeneous disclosure of the remaining plaque in both groups.

The students were provided with information on the study and then received a kit containing a toothbrush and a dentifrice for toothbrushing. It should be mentioned that no toothbrushing technique was recommended, i.e. the students performed toothbrushing as usual.

The OHI-S of Greene and Vermillion is divided in debris index (DI) and calculus index (CI), the sum of which provides the OHI-S. However, just the DI was employed in the present study, which assessed the amount of plaque on the buccal aspects of the permanent right and left maxillary first molars, permanent right maxillary central incisor and permanent left mandibular central incisor, and on the lingual aspects of the permanent right and left mandibular first molars. The mean was achieved by sum of the values of each aspect and division by 6[14].

The criteria for classification of the DI are as follows: good (from 0.0 to 0.6), regular (from 0.7 to 1.8) and poor (from 1.9 to 3.0)[14].

Data collection was carried out with aid of a dental mirror and the data were recorded in a specific form for the OHI-S. Examinations were conducted by an examiner and noted by a recorder. Intraexaminer agreement was calculated by 10% of reexaminations and provided a percent agreement of 93.6%, besides a *kappa* value of agreement of 0.85 (almost perfect agreement) [18], and such values were achieved by Table 1. The reexaminations were performed in the same day of the initial examination, however, the students were asked not to ingest foods or perform oral hygiene in the time period between both examinations.

After examination and data collection, all participants brushed their teeth for plaque removal, which was disclosed in groups G_2 and G_3. Several mirrors were available to the participants, so that they could observe the areas with poor plaque removal during routine toothbrushing. The mean time spent in toothbrushing was 1.5 minute at most.

The statistical outcomes were achieved by analysis of variance (ANOVA) to verify whether there was a difference

in the OHI-S between groups, and the t test was used to check for differences in each group between the two stages, at a significance level of 5%.

RESULTS AND DISCUSSION

It should be highlighted that there were limiting factors in the accomplishment of the present study: the sample size limited the inferences, and the amount of plaque revealed by the OHI-S was low, i.e. the small amount of plaque displayed by the students may have influenced the outcomes, masking the response to the methods, in addition to the fact that some individuals in the present study participated in the initial stage but refused to take part in the final stage, thus reducing the sample size, with a percent loss to follow-up of 20.5%, having most losses occurred in G_2 (n=9), followed by G_1 (n=5) and G_3 (n=4).

However, this study pointed out the importance to evaluate methods that may promote oral health, especially among adolescents. In the case of Dent Plaque, there would be topical fluoride application[13] associated to plaque disclosure, since Medeiros[6] in 1991 mentioned the lack of attention provided to subjects aged more than 13 years, an age range not regarded as priority. This would lead to non-utilization of preventive methods, which are able to motivate the subjects for dental plaque control when properly applied.

Observation of the mean plaque index OHI-S as to the groups in the initial and final stages did not reveal any statistically significant difference ($p>0.05$). However, the group employing the Dent Plaque (G_3) presented a larger proportion of students displaying plaque reduction, compared to the group employing the plaque disclosing tablet (G_2) (Table 2).

As to the difference in the mean OHI-S in the initial and final stages, the groups displayed values with no statistically significant difference (Table 3).

As regards the criteria for classification, the result was homogeneous for the groups, being most classified as regular (Figure 1). However, G_3 was the only group maintaining good level in both time periods without any weak score, suggesting that the Dent Plaque might have contributed to maintenance of this level, even though this observation is only related to two students and therefore should be carefully interpreted.

Comparison between the Graphs in Figure 2 demonstrates that most variations occurred towards lower

TABLE 1- 10% of reexaminations of the Simplified Oral Hygiene Index (OHI-S), for calculation of *Kappa* in students aged 12 to 14 years. Piracicaba, 2000

	OHI-S codes				Total
Exam 1 / **Exam 2**	**0**	**1**	**2**	**3**	
0	3*	1	0	0	4
1	3	55*	0	0	58
2	1	0	11*	0	12
3	0	0	0	4*	4
Total	7	56	11	4	73*

Note: *values in bold in the diagonal correspond to the concordant values in both examinations

TABLE 2- Means of the OHI-S indexes in the initial (OHI-S 1) and final stages (OHI-S 2) and proportion of plaque reduction according to the groups in students aged 12 to 14 years. Piracicaba, 2000

Group	Mean OHI-S 1	Mean OHI-S 2	p (bicaudal)	Proportion of subjects displaying plaque reduction
1	1.25	1.21	0.53	0.38 (8/21)
2	1.33	1.26	0.27	0.21 (4/19)
3	1.25	1.18	0.27	0.23 (5/22)

TABLE 3- Differences of the means of the OHI-S indexes in the initial (OHI-S 1) and final stages (OHI-S 2) according to the groups in students aged 12 to 14 years. Piracicaba, 2000

Group	Sample size	Difference of the means – OHI-S 1 e OHI-S 2	p value
1	21	0.040	
2	19	0.069	0.93
3	22	0.067	

values as to the accumulation of plaque in G_3, suggesting that the method might contribute to the motivation for plaque removal, as also demonstrated in Table 2. Distribution of the sample by gender between groups comprised 14 girls in G_1, 15 in G_2 and 10 in G_3, compared to 7 boys in G_1, 4 in G_2 and 12 in G_3. Therefore, interestingly the G_3 sample included more boys, what might have masked the findings observed in case the girls brushed their teeth better than boys. However, age was homogeneous for all groups, with a mean age of 13 years in G_1, 13.26 in G_2 and 13.27 in G_3.

The disclosing ability of the tablets demonstrated to be better than the dentifrices, yet this may be assigned to the fact that the students did not present high plaque indexes, i.e. they displayed "little" dental plaque.

The results of the study conducted by Rodrigues, et al.[10] (1994), which employed the same dentifrice, were not different from those of the present study, even though the G_3 was slightly better than G_2. On the other hand, Quintanilha, et al.[8] (1989) achieved positive outcomes with a dentifrice containing plaque disclosing agent, with plaque reduction and applicability comparable to the existing methods of plaque disclosure.

A study conducted in an Indian population in 1988[1] on a non-representative sample according to the authors, the OHI-S value at 11 years old was 0.93, similar to the present study.

According to Tomita, et al.[16] (1995), the periodical motivation as a consequence of a participative methodology led to changes in oral hygiene in 72 adolescents aged 14 to 16 years; Toassi, Petry[15] (2002) concluded that motivation reinforcement in educational and preventive programs positively influence the reduction in dental plaque and gingival bleeding. As regards the utilization of dentifrices, Parizotto, et al.[7] (2003) reported that they do not play an important role in the mechanical control of dental plaque; however, Cury[2] (2002) mentions that the subjects may feel unmotivated to brush their teeth without the dentifrice, thus reducing the time and effectiveness of toothbrushing. According to Duarte, et al.[3] (1990), plaque disclosing agents are fundamental for oral hygiene motivation. On the other hand, Saba-Chujfi, et al.[11] (1992) concluded that the direct instruction associated to video exhibition displayed the best results for the motivation of adolescents aged 12 to 16 years, yet these techniques were not employed in the present study. Despite of that, with isolated utilization of the plaque disclosing agent, the results demonstrated a tendency of Dent Plaque to motivate plaque removal when compared to the plaque disclosing tablets.

Some students reported a "bad", "bitter" or even "awful" taste of the tablets, contrarily to the dentifrice, the taste of which was regarded as acceptable by most individuals.

Thus, the studies have suggested a positive effect of methods for education and motivation to oral health, with the need of more investigations in this field, including dentifrices containing plaque disclosing agents.

CONCLUSIONS

Plaque reduction was observed in all groups, with no statistically significant difference between them.

However, it should be considered that this study employed a small sample size that did not present a high plaque index, and therefore complementary studies on the utilization of dentifrice with plaque disclosing agent are required.

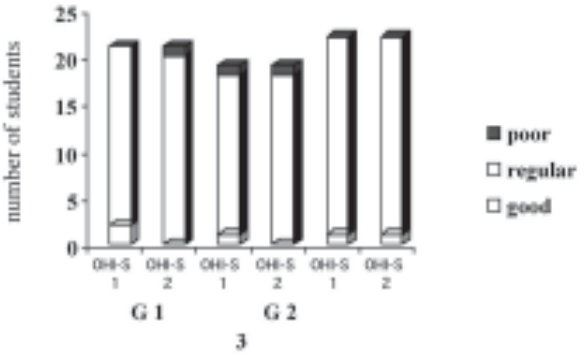

FIGURE 1- Classification of the OHI-S indexes in the initial (OHI-S 1) and final stages (OHI-S 2) according to the groups in students aged 12 to 14 years. Piracicaba, 2000

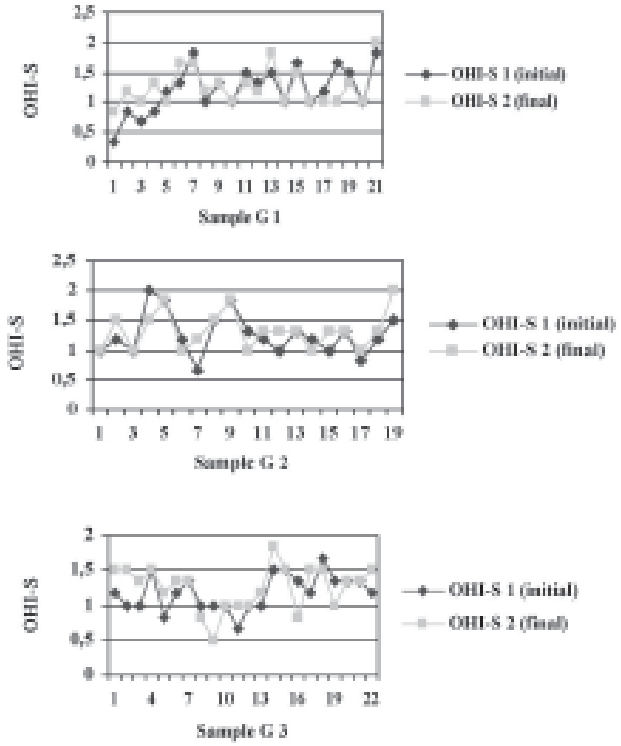

FIGURE 2- OHI-S in the initial and final stages in Groups 1, 2 and 3 (G1, G2 and G3) in students aged 12 to 14 years. Piracicaba, 2000

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REFERENCES

1- Bagramian RA, Narendran S. Oral health status, knowledge, and practices in an amish population. J Public Health Dent 1988 Summer;48(3):147-51.

2- Cury JA. Dentifrícios: como escolher e como indicar. In: Cardoso RJC, Gonçalves EAN. Odontologia- odontopediatria e prevenção. São Paulo: Artes Médicas; 2002. v. 4, p. 281-95.

3- Duarte CA, Lascala NT, Muenchi A. Estudo clínico da influência dos evidenciadores de placa bacteriana na motivação de pacientes à higiene bucal sob supervisão e orientação direta. Rev Odontol Univ Sao Paulo 1990 Out/Dez; 4(4): 278-83.

4- Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc 1964 Jan;68:7-13.

5- Lascala NT, Moussalli N H. Higienização Bucal In: Lascala NT, Moussalli NH. Compêndio terapêutico periodontal. São Paulo: Artes Médicas; 1995. p. 240-69.

6- Medeiros UV. Aspectos gerais no controle da placa bacteriana - controle da placa bacteriana em saúde pública. Rev Assoc Paul Cir Dent 1991 mai/jun;45(3):479-83.

7- Parizotto SPCOL, Rodrigues CRMD, Singer JM, Sef HC. Effectiveness of low cost toothbrushes, with or without dentifrice, in the removal of bacterial plaque in deciduous teeth. Pesqui Odontol Bras 2003 Jan/Mar;17(1):17-23.

8- Quintanilha LELP, Lima ALP, Siqueira ES, Carvalho RA. Evidenciador de placa bacteriana veiculado por dentifrício. Odont Hoje 1989; 18:499-508.

9- Rodrigues CRMD, Moraes MF, Lascala CMM. Aspectos preventivos em odontopediatria. In: Laskala NT. Prevenção na clínica odontológica- promoção de saúde bucal. São Paulo: Artes Médicas; 1997. p. 82-102.

10- Rodrigues RMJ, Cruz RA, Campos VA. Eficiência de um dentifrício contendo eritrosina no processo de estimulação à higiene dental de crianças. Rev Bras Odontol 1994 Jan/Fev; 51(1):11-6.

11- Saba-Chujfi E, Silva ECQ, Saba MEC, Sarian R. Avaliação dos métodos de motivação/educação em higiene bucal. RGO 1992 Mar/Abr; 40(2):87-90.

12- Sheiham A. Public health aspects of periodontal diseases in Europe. J Clin Periodontol 1991 July;18(6):362-9.

13- Silva DD, Sousa MLR, Gomes VE, Cury JA. Estabilidade do flúor e da embalagem de um dentifrício evidenciador de placa bacteriana. Rev Odonto Cienc 2003 Jan/Mar; 18(39):8-12.

14- Spolsky VW. Epidemiologia das doenças gengival e periodontal. In: Carranza FA, Newman, MG. Periodontia clínica. Rio de Janeiro: Guanabara Koogan; 1997. p. 65 - 84.

15- Toassi RFC, Petry PC. Motivação no controle do biofilme dental e sangramento gengival em escolares. Rev Saude Publica 2002 Out; 36(5):634-7.

16- Tomita NE, Castro VA, Kurita LM, Lopes ES. Educação em saúde bucal para adolescentes. Uma avaliação psico-pedagógica. In: Anais da 12ª. Reunião Anual Científica da Sociedade Brasileira de Pesquisas Odontológicas – SBPqO; 1995 set. 03-06; Águas de São Pedro (SP). São Paulo: SBPqO; 1995. p. 128, resumo 254.

17- Tomita NE, Pernambuco RA, Lauris JRP, Lopes ES. Educação em saúde bucal para adolescentes: uso de métodos participativos. Rev Fac Odontol Bauru 2001 Jan/Jun; 9(1-2): 63-9.

18- World Health Organization. Calibration of examiners for oral health epidemiological surveys. Geneva: ORH/EPID; 1993.