

Protocol of dental biofilm control employed by the discipline of primary healthcare at the Federal University of Ceara, Brazil

Protocolo de controle de biofilme dental utilizado na disciplina de Atenção Primária a Saúde da Universidade Federal do Ceará

Luiza Maria Dias **FIRMEZA**¹  0000-0002-5147-8253

Eugenira Ferreira **SILVA**¹  0000-0001-5966-9110

Maria Renir **CAMPOS**¹  0000-0002-9362-7309

Antônio Sergio **LUZ E SILVA**¹

Walda Viana Brígido de **MOURA**¹  0000-0002-6639-4108

Ana Karine Macedo **TEIXEIRA**¹  0000-0001-5923-1813

ABSTRACT

Objective: The objective of the study was to investigate the effectiveness of a protocol of dental biofilm control designed based on an active learning strategy. **Methods:** A cross-sectional study was carried out with secondary data. The sample consisted of 42 patient records. Information about the patient's knowledge, perception of oral health, and motor coordination was collected before and after the implementation of the protocol. The plaque index was used to evaluate the oral hygiene level of the patients. **Results:** At the first evaluation, the results of knowledge and perception were better than the ones of motor coordination. It was also observed a significant increase in the satisfactory percentages for the use of toothbrush and dental floss when comparing the first to the final evaluation. Moreover, there was a significant decrease in the plaque index through the appointments. There were no significant differences in the decrease of plaque index when comparing different genders and ages. However, there was a greater increase of satisfactory scores regarding oral health habits among men and younger age group. **Conclusions:** There was a significant reduction in the plaque index and an increase in the adoption of satisfactory health habits through the appointments. Although the decrease in plaque index was significant, it was still high, suggesting the need for a higher number of follow-up appointments to reinforce oral health habits.

Indexing terms: Clinical protocols. Dental plaque. Health education.

▼ ▼ ▼ ▼ ▼

¹ Universidade Federal do Ceará, Faculdade de Farmácia, Odontologia e Enfermagem, Departamento de Clínica Odontológica. Rua Monsenhor Furtado, 1273, Rodolfo Teófilo, Fortaleza, CE, Brasil. Correspondence to: LMD Firmeza. E-mail: <luizafirmeza@gmail.com>.

▼ ▼ ▼ ▼ ▼

How to cite this article

Firmeza LMD, Silva EF, Campos MR, Luz e Silva AS, Moura WVB, Teixeira AKM. Protocol of dental biofilm control employed by the discipline of primary healthcare at the Federal University of Ceara, Brazil. RGO, Rev Gaúch Odontol. 2022;70:e20220008. <http://dx.doi.org/10.1590/1981-8637202200082020055>

RESUMO

Objetivo: o objetivo do estudo foi avaliar a efetividade de um protocolo de controle de biofilme dental embasado em uma metodologia ativa de educação em saúde. **Métodos:** Foi realizado um estudo transversal com dados secundários. A amostra foi composta por 42 fichas clínicas de pacientes. Coletaram-se informações sobre conhecimento e percepção de saúde bucal, assim como habilidade motora do paciente no início e ao final da aplicação do protocolo. Utilizou-se o índice de placa dental para avaliar a saúde bucal. **Resultados:** Observou-se que, na avaliação inicial, os construtos de percepção apresentaram melhores resultados quando comparado aos construtos que avaliavam habilidade motora. Ao comparar os resultados obtidos na avaliação inicial e na final foi verificado aumento significativo de porcentagens satisfatórias no uso da escova e do fio dental. Além disso, houve redução significativa da média percentual do índice de placa ao longo das visitas registradas no protocolo. Não houve diferença significativa na redução do biofilme de acordo com gênero e idade, no entanto, observou-se maior evolução de porcentagens satisfatórias referentes a hábitos de saúde bucal entre homens e no grupo de menor faixa etária. **Conclusão:** Conclui-se que houve redução significativa dos índices de biofilme e maior incorporação de hábitos satisfatórios ao longo das consultas do protocolo. Apesar da redução significativa da média percentual do índice de placa, essa ainda se apresentou alta, sugerindo a necessidade de se incorporar um maior número de visitas e reforçar as ações de educação em saúde, para se obter resultados mais efetivos.

Termos de indexação: Protocolos clínicos. Placa dentária. Educação em saúde.

INTRODUCTION

The dental biofilm mediates conditions such as caries and periodontal disease. Thus, biofilm control should be one of the main oral health promotion measures adopted by dentists [1]. Moreover, the adhesion of patients to programs of dental biofilm control is essential to prevent the onset and progress of oral diseases [1].

Biofilm control programs must be based on motivational education strategies that stimulate the patients to improve their self-care. In this scenario, the patients should be informed about the role of the biofilm as an etiologic agent of diseases, how the biofilm is formed, and how it can be removed. However, dentistry still has traditional treatment approaches, which are historically based on protocols vertically transmitted to the patients, whose role is only to follow the clinician dental hygiene recommendations.

The education process becomes more effective when it is based on a pedagogical practice that allows participation and dialogue than when knowledge is passively acquired [2]. Moreover, education should be based on perceptions that arise from one's personal experiences, empowering those learning to change themselves and their environment. Under this light, the teaching and learning process should not be based on the transference of an imposed knowledge once such practice could be ineffective in stimulating behavioral changes [3].

The adoption of a protocol of biofilm control might lead to changes in oral health habits, guiding the patient to better control of the dental biofilm. In these cases, the educational process needs to be based on problem-based learning to guarantee efficacy in promoting changes in health behaviors and attitudes. Under this light, the Coordination of Family Development of the Federal University of Ceara in Brazil adopted a protocol of dental biofilm control that is based on the active participation of patients during the health education process. The protocol was employed by the dental professors of the discipline of primary healthcare of the Faculty of Pharmacy, Dentistry, and Nursing.

The protocol used in this study is based on active learning methodologies, which consider the reality, previous knowledge, and experiences of the patients. Such a protocol aims to make the patients recognize their oral health problems and incorporate positive self-care practices [4]. In this protocol, the patient sets the goals for dental biofilm reduction, acting as a protagonist.

Therefore, this study aimed to evaluate the effectiveness of a protocol of dental biofilm control used in the dental clinics of the Coordination of Family Development (CFD) of the Federal University of Ceara, in Brazil.

METHODS

This is a cross-sectional study performed with the dental records of patients treated with a protocol of dental biofilm control at the CDF clinic from 2016 to 2017. Eighty-seven records were found, yet only 42 were completed filled and, thus, selected.

The protocol of dental biofilm control used in this study is a novel approach developed by professors at the Federal University of Ceara and by dentists of the CDF clinic. The protocol consists of four-week follow up appointments. At the first appointment, a diagnostic evaluation of the patient's oral health perception was performed, as well as the motivation, motor coordination, and plaque index were checked.

Based on the first appointment, the clinician and patients developed a plan to control the dental biofilm. During all four appointments, the patients received education reinforcement and practiced supervised dental hygiene. If the patients was a child, the treatment plan was shared with the parents. Toothbrushes, dental floss, figures, and demonstrative macro-models were used for the educational activity.

At the diagnostic evaluation, initially, the patients observed their oral cavity in a mirror, recognizing the structures that compose their mouth. In the sequence, a plaque index assessment was performed using plaque disclosing agents. Annotations were made regarding the faces with the disclosed plaque and the O'Leary index was calculated [5,6]. The index was calculated at all dental appointments.

The O'Leary index identifies the percentage of dental surfaces in which the dental plaque was present and disclosed by the disclosing agents. After performing the dental plaque disclosure, the clinician conducted an oral examination of the oral cavity with the aid of a dental mirror to identify the dental surfaces in which the dental plaque was present. All information was saved in the patient's records, and at the end of the dental appointment, the plaque index was calculated. The index consists of the ratio between the number of dental surfaces with disclosed dental plaque and the total number of dental surfaces. The result of this ratio multiplied by 100 generates a percentage value.

After the biofilm disclosing at the diagnostic evaluation, the patients observed their oral cavity again and looked at where the biofilm was accumulated. In the sequence, the patients brushed and flossed their teeth with the supervision of the clinician, who identified the difficulties of the patient in performing dental hygiene. After the first appointment, a plan was developed for the other following visits to the dentist, which included dental biofilm disclosing, supervised oral hygiene, and other clinical procedures needed. At the fourth dental appointment, all criteria evaluated at the first evaluation were examined again to verify how the patients evolved in their self-care.

All variables analyzed at the first and last dental appointments are present in four constructs of the protocol, and each item can be scored as satisfactory or non-satisfactory.

The constructs that compose the protocol are as follows: 1. self-perception of the oral cavity (Does the patient perceive their outer and inner teeth surfaces and interproximal spaces?); 2. Dental plaque disclosing and index (Does the patient perceive the surfaces with dental plaque? Does the patient perceive the dental plaque location? Does the patient observe the relationship between dental plaque and periodontal disease - bleeding and dental calculus?); 3. Toothbrush use (Does the patient perform adequate cleaning movements when brushing? What toothbrushing technique does the patient use? Fones, Stillman, Bass? Does the patient clean the crowded teeth and those teeth with giroversion? Where does the patient store the toothbrush? Does the patient brush his or her teeth after eating and before sleeping? How much time does the patient spend brushing?); 4. Does the patient floss his or her teeth with an adequate amount of dental floss? Does the patient insert the dental floss in the inter-proximal faces and gingival sulcus correctly? Does the patient perform the cleaning movements with the dental floss correctly? Does the patient use the dental floss at an appropriate frequency (one time a day)?

The data were analyzed using SPSS version 20. Descriptive analysis of the data was also performed. Chi-square test was used to compare the dependent variable (plaque index) to the independent variables (gender, age, oral health self-perception, quality of the dental plaque disclosing, dental floss, and toothbrush use). McNemar test was used to compare the results of the diagnostic evaluation to the ones of the final dental appointment. Student's T-test was used to compare the plaque index through the four dental appointments.

To perform the data analysis, the age of the patients was categorized according to the median age of the study (11 years old). Thus, the patients were classified as being 11 years old or less, or older than eleven years old.

To evaluate how the plaque index of the patients evolved through the dental visits according to the sociodemographic variables, the differences between the plaque indexes of the appointments were calculated. This

subtraction was performed as follows: plaque index of the first minus the plaque index of the second appointment; plaque index of the second minus the plaque index of the third appointment; plaque index of the third minus the plaque index of the fourth appointment; and plaque index of the fourth minus the plaque index of the first dental appointment.

The prevalence ratio was calculated with a 95% confidence interval and a significance level set at 5%. The project was approved by the Ethics Committee of the Federal University of Ceara, Brazil (2.583.157).

RESULTS

Forty-two out of the 87 dental records of patients treated with the protocol of dental biofilm control at the CDF were included in this study. All the records included were correctly filled, including the register of the plaque index.

Twenty-six (61.9%) records out of the 42 records were filled by students of the discipline primary healthcare, and the other 16 (38.1%) were filled by students of the discipline academic training in public health services. Twenty-three (54.8%) of the 42 records were of male patients, while 16 (45.2%) were of female patients. The mean age of the patients was 15 years old, yet 50% of them aged 11 years old or less.

At the diagnostic evaluation, it was observed that most of the criteria evaluated in the self-perception construct had satisfactory scores (self-perception of the mouth and dental plaque index). An exception was the criterium that analyzed the patient perception between dental plaque and periodontal health. On the other hand, higher percentages of non-satisfactory scores were found for the construct that evaluated toothbrush and dental floss use, and motor coordination. The use of dental floss was the criterion with worse performance (table 1).

Table 1. Distribution of the protocol items with satisfactory and non-satisfactory scores at the diagnostic and final evaluations. Fortaleza, 2018.

	Non-satisfactory at the diagnostic evaluation		Satisfactory at the diagnostic evaluation		Satisfactory at the final evaluation		p-value
	n	%	n	%	n	%	
Perception of the relationship between dental plaque and periodontal disease	23	67.6	11	32.4	19	67.9	0.021
Perception of the teeth surfaces	11	26.2	31	73.8	30	93.8	0.07
Perception of the inter-proximal spaces	14	33.3	28	66.7	30	93.8	0.07
Perception of the surfaces with dental plaque	05	11.9	37	88.1	31	96.9	1.00
Perception of the sites with dental plaque	08	19.0	34	81.0	30	93.8	0.125
The patient knows the characteristics of an appropriate toothbrush	25	59.5	15	37.5	25	83.3	0.008
The patient knows the amount of toothpaste needed to brush	25	59.5	17	40.5	28	84.8	0.003
Toothbrushing technique used	27	65.9	14	34.1	18	58.1	0.035
The patient cleans the crowded teeth	29	78.4	08	21.6	19	61.3	0.001
The patient cleans the tongue	20	47.6	22	52.4	30	90.9	0.004
Toothbrushing frequency	23	65.7	12	34.3	19	67.9	0.013
Time spent on Toothbrushing	22	68.8	10	31.3	23	82.1	<0.001
Movements of dental floss insertion	35	83.3	07	16.7	15	45.5	0.013
The patient is able to localize the dental floss within the gingival sulcus	36	85.7	06	14.3	15	45.5	0.013
Dental floss movement (surrounding the tooth)	35	83.3	07	16.7	20	60.6	0.001
Frequency of dental floss use	29	85.3	05	14.7	13	43.3	0.022

A significant increase in the number of patients who satisfactorily presented oral healthcare when comparing diagnostic and final evaluation ($p < 0.05$). Factors related to the perception of dental plaque and periodontal disease, dental surface, and interproximal space, as well as factors evaluated in the constructs "use of toothbrush" and "dental floss" also had a significant increase (table 1).

Additionally, a significant reduction in the biofilm index means was observed in the protocol during all dental appointments (1st, 2nd, 3rd, 4th, 5th). The first appointment presented the biofilm index mean of 89.63%, which reduced to 81.85% in the second appointment ($p < 0.001$), a 73.71% biofilm index mean was reached upon the third appointment ($p < 0.001$), which decreased to 67.51% in the fourth dental assessment ($p = 0.023$). A statistically significant difference was observed by comparing the biofilm index mean in the first appointment (89.36%) to the last one (67.51%) ($p < 0.001$).

At the diagnostic evaluation, the means of biofilm index for men and women were 92.18% and 86.54%, respectively ($p = 0.12$). At the final dental appointment, these means reached 66.26% for men and 69.03 for women ($p = 0.67$). In both situations, no significant difference between genders existed.

When the evolution of the biofilm index was evaluated concerning gender, males and females showed a significant reduction of this parameter in between most of the dental appointments, except between the 3rd and 4th, for both groups ($p > 0.05$) (table 2). However, the decrease in biofilm indexes along the dental assessments did not statistically differ if both genders were compared (table 2).

Furthermore, when the patient's evolution from the first to the last dental appointment was compared to gender, it was observed a significant increase of satisfactory percentages referred to knowledge, and motor coordination among male, but not among female individuals (table 3).

Table 2. Evaluation of the dental plaque index differences through dental appointments according to the patient's gender. Fortaleza, 2018.

	Mean difference between the plaque indexes of female patients	p-value	Mean difference between the plaque indexes of male patients	p-value	Mean difference between plaque indexes of male and female patients	p-value of the plaque indexes differences when comparing female to male patients
1 ^a minus 2 ^a plaque index evaluation	6.37 (8.93)*	0.006	8.94 (14.74)*	0.008	5.12	0.185
2 ^a minus 3 ^a plaque index evaluation	6.36 (9.35)*	0.008	9.60 (12.95)*	0.002	0.40	0.912
3 ^a minus 4 ^a plaque index evaluation	4.76 (11.89)*	0.98	7.37 (20.54)*	0.099	3.38	0.529
1 ^a minus 4 ^a plaque index evaluation	17.50 (18.44)*	0.001	25.92 (23.67)*	<0.001	8.90	0.188

Note: *Standard-deviation

Table 3. Comparison of items with satisfactory or non-satisfactory scores at the diagnostic and final evaluations according to the patient's gender. Fortaleza, 2018.

	Diagnostic evaluation Satisfactory n (%)	Final evaluation Satisfactory n (%)	p-value
Perception of the relationship between dental plaque and periodontal disease			
Male	5 (27.8)	12 (85.7)	0.031
Female	6 (37.5)	7 (50.0)	0.625
Toothbrushing technique			
Male	5 (22.7)	9 (56.3)	0.016
Female	9 (47.4)	9 (60.0)	0.727

1 of 2

Table 3. Comparison of items with satisfactory or non-satisfactory scores at the diagnostic and final evaluations according to the patient's gender. Fortaleza, 2018.

	Diagnostic evaluation Satisfactory n (%)	Final evaluation Satisfactory n (%)	p-value
Toothbrushing technique			
Male	5 (22.7)	9 (56.3)	0.016
Female	9 (47.4)	9 (60.0)	0.727
The patient cleans the crowded teeth			
Male	4 (19)	11 (61.1)	0.031
Female	4 (25)	8 (61.5)	0.063
The patient cleans the tongue			
Male	10 (43.5)	17 (94.4)	0.002
Female	12 (63.2)	12 (86.7)	0.687
The patient stores the toothbrush in an appropriate place			
Male	8 (42.1)	16 (94.1)	0.008
Female	13 (72.2)	13 (92.9)	0.250
Toothbrushing frequency			
Male patients	5 (23.8)	12 (85.7)	0.002
Female	7 (50)	7 (50)	1.00
Movement of dental floss insertion			
Male	3 (13.0)	9 (50.0)	0.039
Female	4 (21.1)	6 (40.0)	0.375

Regarding the age, when comparing individuals under 11 years old to the ones above this age, a significant reduction of the biofilm indexes was observed between most of the dental appointments except between the third and fourth assessments for those under 11 years old (p=0.199) (table 4). Besides, no significant difference between groups existed when the degree of reduction of the biofilm index was compared between the dental appointments (table 4).

Table 4. Evaluation of the dental biofilm index according to age. Fortaleza. 2018.

	Mean difference in biofilm index (<11 yo)	p-Value	Mean difference in biofilm index (>11 yo)	p-Value	Mean differences (Δ)	p-Value of Δ comparisons
1 st – 2 nd dental plaque disclosing	5.46 (6.58)*	0.001	10.32 (16.43)*	0.011	2.00	0.606
2 nd – 3 rd dental plaque disclosing	7.36 (13.31)*	0.017	8.99 (9.26)*	<0.001	2.50	0.486
3 rd – 4 th dental plaque disclosing	5.54 (19.59)*	0.199	6.90 (14.17)*	0.042	2.33	0.663
1 st – 4 th dental plaque disclosing	18.38 (19.59)*	<0.001	26.22 (23.48)*	<0.001	6.84	0.312

Note: *Standard deviation

When the items of the protocol were evaluated concerning age, it was observed a better evolution, in most of the items, in the group under 11 years old, with a significant increase in items classified as satisfactory from the diagnostic evaluation to the final evaluation, except for the item related to the movement of “surrounding the tooth” during flossing, in which a satisfactory performance of this movement significantly increased in both groups (p=0.039 and p=0.031) (table 5).

Table 5. Comparison of satisfactory items at the diagnostic and final evaluation according to age. Fortaleza, 2018.

	Diagnostic evaluation Satisfactory n (%)	Final evaluation Satisfactory n (%)	p-Value
The patient knows the characteristics of an appropriate toothbrush			
Up to 11 years old	7 (33.3)	4 (77.8)	0.039
>11 years old	8 (42.1)	11 (91.7)	0.219
The patient knows the amount of toothpaste need to brush			
Up to 11 years old	9 (40.9)	17 (85.0)	0.022
>11 years old	8 (40.0)	11 (84.6)	0.125
The patient cleans the crowded teeth			
Up to 11 years old	3 (15.0)	12 (63.2)	0.008
>11 years old	5 (29.4)	7 (58.3)	0.250
The patient stores the toothbrush in an appropriate place			
Up to 11 years old	7 (41.2)	17 (94.4)	0.016
>11 years old	14 (70.0)	12 (92.3)	0.125
Time spent on toothbrushing			
Up to 11 years old	7 (35)	16 (84.2)	0.002
>11 years old	3 (25)	7 (77.8)	0.125
The patient is able to localize the dental floss withing the gingival sulcus			
Up to 11 years old	3 (13.6)	10 (50.0)	0.039
>11 years old	3 (15.0)	5 (38.5)	0.375
Dental floss movement (surrounding the tooth)			
Up to 11 years old	5 (22.7)	13 (65.0)	0.039
>11 years old	2 (10.0)	7 (53.8)	0.031

At the final dental assessment, the dental biofilm index was verified among the ones who presented satisfactory and unsatisfactory results to the use of the toothbrush and dental floss. Individuals who presented a satisfactory technique ($p=0.014$) and frequency of brushing ($p=0.007$) showed a lower dental biofilm index than those who presented the unsatisfactory technique and brushing (table 6).

Table 6. Dental biofilm index according to the classification of items related to motor Skills at the final dental appointment. Fortaleza, 2018.

	Dental Biofilm Index (DBI)	p-Value
Toothbrushing technique Satisfactory	60.2 (22.4)	0.014
Unsatisfactory	75.9 (17.4)	
Cleaning of crowded teeth		0.085
Satisfactory	62.4 (22.3)	
Unsatisfactory	74.3 (16.4)	
Tongue brushing		0.453
Satisfactory	66.4 (21.8)	
Unsatisfactory	76.8 (6.7)	
Toothbrush storage		0.619
Satisfactory	66.8 (22.4)	
Unsatisfactory	67.7 (0.3)	
Toothbrushing time		0.954
Satisfactory	68.3 (18.7)	
Unsatisfactory	61.8 (30.3)	
Dental floss length		0.479
Satisfactory	65.6 (22.19)	
Unsatisfactory	75.0 (14.01)	
Frequency of toothbrushing		0.007
Satisfactory	59.06 (23.1)	
Unsatisfactory	80.48 (9.4)	

DISCUSSION

This study revealed that dental healthcare behaviours were deficient at the first dental appointment, being the worst results regarding the use of dental floss. Similar findings were found by independent studies in which most of the participants did not use dental floss nor have previous knowledge about it [4,7,8].

After being exposed to the protocol employed in this study, the participants improved in oral healthcare habits, especially regarding brushing and flossing, as well as the reduction of the biofilm index. Other studies also demonstrated the positive impact of educational processes in oral healthcare on behaviours and oral health indexes, such as dental biofilm index, gingival bleeding, and frequency of dental brushing and flossing [5,8].

The protocol compliance increased the number of individuals whose frequency of brushing was satisfactory in this study. Dental brushing is an efficacious method to control the dental biofilm, which in turn is the etiological factor of most oral diseases. Many studies point out a negative association between dental brushing and caries [9-11]. Concerning the use of dental floss, all the evaluated items improved, including the frequency of use, a factor that has been positively associated with low indexes of dental biofilm [7,12].

In this sense, the frequency of dental brushing can be emphasized as a determiner for dental biofilm reduction in this study, corroborating with another study [12]. Nonetheless, the absence of association between dental biofilm index and oral healthcare frequency reported in another study [12] supposedly implies that a higher frequency does not necessarily reflect better quality of oral health care.

In this study, the reduction of the biofilm indexes along the protocol occurred without a significant difference regarding gender, as well as at the end of the treatment, in which biofilm index means did not differ regardless of gender. However, men made a significant improvement in dental healthcare habits, which was not observed among their female counterparts. This likely indicates that, albeit the dental biofilm indexes were at similar levels in both genders, the changes regarding knowledge and habits in oral healthcare were higher among male participants.

This finding could be associated with the fact that female individuals present more preventive behaviours toward oral healthcare and self-care, use healthcare services more frequently, and they are more interested in oral healthcare issues than males [5,12]. These behaviours could have accounted for female individuals' better knowledge of oral healthcare, as well as female patients having better motor coordination performance in oral healthcare tasks since the beginning of the protocol. This scenario could explain why no significant increases were observed among female participants when the items of the protocol were compared between the last and first dental appointments.

However, since some studies reported that male individuals presented poorer oral health care habits and seek less for healthcare services than their female counterpart [5,12], the protocol employed might have had a different meaning to males compared to females, being more meaningful and allowing male patients to gain knowledge concerning oral healthcare, as well as promoting more behavioural changes.

This suggests that the dental biofilm reduction among females was more associated with an increase in motivation, whereas for male patients the reduction appeared to be more associated with actual behavioural changes.

In the group of participants under 11 years old, greater changes in oral healthcare habits from the first to the last dental appointment. This finding could be related to the fact that younger age group had a greater participation, during the protocol, of the responsible adults, who also acquired knowledge of oral healthcare and positively reinforced favourable oral healthcare habits in the everyday life of the participants.

This finding could be associated with the fact that children are more prone to acquire knowledge during schooling, they are more agreeable to learn, and they do it rapidly, which could have fostered much greater changes in habits observed in the group under 11 years old.

Most of the population presents difficulty in complying with behavioural changes in oral healthcare in the long-term. Thus, alternative educational processes have been proposed to replace traditional ones that limit themselves to mere oral hygiene instructions, given that educational interventions by traditional oral healthcare have little and

temporary effects on the dental biofilm accumulation, do not affect dental caries indexes, and promote short-term behavioural changes [13,14]. Innovative educational programs such as the pair-led oral healthcare education and motivational interview technique were associated with the best outcomes in oral healthcare (lower dental biofilm indexes and improvement to oral self-care skills and abilities) when compared to traditional processes [15,16].

The proposed protocol differs from traditional models, which solely transfer knowledge from professionals to patients, allowing the dialogue between the folk and scientific knowledge, respecting and valuing the former without the dominance of one over the other [17,18]. This protocol also allows more interaction between patients and professionals, given that individuals perform their oral care and professionals supervise and guide them if necessary. Besides, the focus on the patients' self-perception when they observe their mouth and associated structures with the aid of a mirror, seeing the evidenced biofilm adhered to the oral structures, and realize the relationship between the biofilm and oral diseases; this helps them perceive the actual dimension of their issues and allow for a better comprehension of this process. This leads to the realization that their oral healthcare greatly depends on self-care and the dentist is only the means of achieving this purpose [1].

The educational processes in healthcare have been centred on individuals, empowering them, and allowing more control over decisions and actions that may affect their health status [19]. To make this possible, more access to information and sanitary practices are necessary to fully promote the development of skills. Positive changes in oral healthcare behaviour such as low indexes of periodontal treatment need and high self-efficacy of tooth brushing in individuals subjected to a program focused on self-empowerment [20,21].

The healthcare information when passively passed on generates a lack of critical thinking, leading to inadequate health behaviours. The educational process becomes more effective when it renders individuals more critical and develops the autonomy and responsibility of individuals in their healthcare, increasing their awareness of the health situations and issues [22]. When patients understand the importance of healthy habits for oral health promotion and the possible consequences of deficient oral hygiene, behavioural changes are more likely to occur [6].

The protocol of this study has as a limitation the lack of observance of the quality of the dental biofilm, given that the individual might not present a reduction of the index percentage, but the quality of the biofilm could improve, which would imply in advances in the oral hygiene process. Some patients at the final dental appointment still presented an elevated biofilm index. In such cases, a higher number of follow-up visits is necessary and should be more than four weeks. Another limitation refers to the self-report character of the evaluation of some requisites, such as the frequency of tooth brushing. Yet, a reduction in the plaque index in patients who reported a frequency of satisfactory dental brushing of 3 times per day at the final dental appointment was observed, suggesting a trustable and actual self-report number.

CONCLUSION

The protocol employed in this study was effective once patients made an improvement to motor skills and significantly reduced the biofilm index. This shows the importance of an inclusive protocol that considers the active role of patients during the educational process in healthcare to promote behavioural changes and consequently improve their oral health.

Collaborators

LMD Firmeza, study design, data collection, data analysis and interpretation and manuscript writing. EF Silva, study design, data collection, data analysis and interpretation and manuscript writing. MR CAMPO, conception and design of the study, writing of the manuscript and review of the manuscript. AS Luz e Silva, conception and design of the study, writing of the manuscript and review of the manuscript. WVB Moura, conception and design of the study, writing of the manuscript and review of the manuscript. AKM TEIXEIRA, conception and design of the study, analysis and interpretation of data, writing of the manuscript and review of the manuscript.

REFERENCES

- Gomes VE, Silva DD. A importância do controle de placa dental na clínica odontológica. *Arq Odontol*. 2010;46(1):22-27.
- Queiroz SMPL, Moyses SJ, França BHS, Basinelli JC, Moyses ST. Paths for promoting oral health: capacitation among leaders of the Children's Pastoral Mission of the Catholic Church in Brazil. *Interface (Botucatu)*. 2010;14(34):619-632. <https://doi.org/10.1590/S1414-32832010005000012>
- Freire P. Educação como prática da liberdade. 11ª ed. Rio de Janeiro: Paz e Terra; 1980.
- Bardal PAP, Olympio KPK, Bastos JRM, Henriques JFC, Buzalaf MAR. Education and motivation in oral health – preventing disease and promoting health in patients undergoing orthodontic treatment. *Dental Press J Orthod*. 2011;16(3):95-102. <https://doi.org/10.1590/S2176-94512011000300012>
- Veiga NJ, Carvalho P, Ribeiro O, Coelho I. Oral health promotion efficiency in the control of oral biofilm. *Rev Bras Promoç Saúde*. 2014;27(1):117-123. <https://doi.org/10.5020/2433>
- Rodrigues JA, Santos PA, Baseggio W, Corona SAM, Palma-Dibb RG, Garcia PPNS. Oral hygiene indirect instruction and periodic reinforcements: effects on index plaque in schoolchildren. *J Clin Pediatric Dent*. 2009;34(1):31-34. <https://doi.org/10.17796/jcpd.34.1.n426k2862m42r67n>
- Gómez MV, Toledo A, Carvajal P, Gomes SC, Costa RSA, Solanes F, et al. A multicenter study of oral health behavior among adult subjects from three South American cities. *Braz Oral Res*. 2018;32:e22. <http://dx.doi.org/10.1590/1807-3107bor-2018.vol32.0022>
- Demiriz L, Dede FO, Ballı U. Impact of three different education methods on oral hygiene and theoretical knowledge of schoolchildren. *Pesq Bras Odontoped Clin Integr*. 2018;18(1):e3897. <http://dx.doi.org/10.4034/PBOCI.2018.181.29>
- Kumar S, Tadakamadla J, Johnson NW. Effect of toothbrushing frequency on incidence and increment of dental caries: a systematic review and meta-analysis. *J Dental Res*. 2016;95(11):1230-1236. <https://doi.org/10.1177/0022034516655315>
- Herrera MS, Medina-Solís CE, Minaya-Sánchez M, Pontigo-Loyola AP, Villalobos-Rodelo JJ, Islas-Granillo, et al. Dental plaque, preventive care, and tooth brushing associated with dental caries in primary teeth in schoolchildren ages 6–9 years of Leon, Nicaragua. *Med Sci Monit*. 2013;19:1019-1026. <https://doi.org/10.12659/MSM.884025>
- Rothén M, Cunha-Cruz J, Zhou L, Mancl L, Jones JS, Berg J, et al. Oral Hygiene Behaviors and Caries Experience in Northwest precedent Patients. *Community Dent Oral Epidemiol*. 2015;42(6):526-535. <https://doi.org/10.1111/cdoe.12107>
- Crocombe LA, Brennan DS, Slade GD, Loc DO. Is self interdental cleaning associated with dental plaque levels, dental calculus, gingivitis and periodontal disease? *J Periodont Res*. 2012;47(2):188-197. <https://doi.org/10.1111/j.1600-0765.2011.01420.x>
- Santos APP, Séllos MC, Ramos MEB, Soviero VM. Oral hygiene frequency and presence of visible biofilm in the primary dentition. *Braz Oral Res*. 2007;21(1):64-69. <http://dx.doi.org/10.1590/S1806-83242007000100011>
- Kay EJ, Locker D. Is dental health education effective? A systematic review on current evidence. *Community Dent Oral Epidemiol*. 1996;24(4):231-235. <https://doi.org/10.1111/j.1600-0528.1996.tb00850.x>
- Neves PCB, Cortellazzi KL, Ambrosano GMB, Pereira AC, Meneghin MC, Mialhe FL. The impact of motivational interviewing in reducing plaque and bleeding indices on probing in adult users of the family health strategy. *Braz Res Pediatric Dent Integr Clin*. 2015;15(1):183-196. <http://dx.doi.org/10.4034/PBOCI.2015.151.20>
- Villanueva-Vilchis MC, Aleksejūnienė J, López-Núñez B, la Fuente-Hernández J. A peer-led dental education program for modifying oral self-care in Mexican children. *Salud Pública Méx*. 2019;61(2):193-201. <https://doi.org/10.21149/9273>
- Ferreira GSS, Merlin MDV, Fenelon RO, Lemos CLS. Interface between popular education and oral health: analysis of scientific production. *Pesqui Bras Odontopediatria Clín Integr*. 2010;10(3):457-463.
- Araújo MLA, Medeiros AP, Zuculin S, Souza EG, Barros PF, Boaventura T, et al. Educação em saúde – estratégia de cuidado integral e multiprofissional para gestantes. *Rev ABENO*. 2011;11(2):8-13. <https://doi.org/10.30979/rev.abeno.v11i2.57>
- Alimoradi Z, Kariman N, Simbar M, Ahmadi F. Empowerment of adolescent girls for Sexual and reproductive health care: a qualitative study. *Afr J Reprod Health*. 2017;21(4):81-92. <https://doi.org/10.29063/ajrh2017/v21i4.9>
- Cinar AB, Freeman R, Schou L. A new complementary approach for oral health and diabetes management: health coaching. *Int Dent J*. 2018;68(1):54-64. <https://doi.org/10.1111/idj.12334>
- Cinar AB, Schou L. Impact of empowerment on toothbrushing and diabetes management. *Oral Health Prev Dent*. 2014;12(4):337-344. <https://doi.org/10.3290/j.ohpd.a32130>
- Martins AMEBL, Almeida ER, Oliveira CC, Oliveira RCN, Pelino JEP, Santos ASF, et al. Oral health literacy: a literature review. *Rev Assoc Paul Cir Dent*. 2015;69(4):328-334.

Received on: 24/4/2020

Final version resubmitted on: 18/9/2020

Approved on: 5/10/2020

Assistant editor: Luciana Butini Oliveira