

## Evaluation of an Educational Program for Children with High Risk of Caries

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*The goal of this study was to evaluate a 15-month educational program designed to children. The sample consisted of 60 six-year olds, randomly assigned into control and experimental group. The control consisted of tooth brushing training, once a year. The experimental group received intensive individual tooth brushing training every three months and guidance on oral health. Initially, both groups were assessed using plaque, gingival, dmfs and DMF-S indexes every three months. In the control, no statistically significant difference was observed for plaque and gingival indexes. The experimental group showed a statistically significant reduction in mean values for two indexes. The caries indexes showed no statistically significant difference. The proposed educational program developed was efficient in reducing gingival and plaque indexes as well caries incidence.*

**Key words:** Dental caries, preventive dentistry, dental education; dental plaque

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### INTRODUCTION

Periodontal disease and dental caries are still considered priorities in oral health, affecting people all over the world.<sup>1,2</sup> Biofilm is the most important etiological factor for the development of such diseases<sup>3</sup>; therefore, the periodical removal of biofilm using fluoridated dentifrice plays an important role in the prevention of oral health related diseases.

Education focusing on dental practice is essential for the success of an oral health community strategy. Motivation is usually defined as a factor that urges people to act according to their interests.<sup>4</sup> Clinically, motivation means to obtain the collaboration of patients to achieve a good performance, changing their own behavior. However, the motivation is still a challenge for professionals, since it is a difficult task to keep patients motivated for a long time.<sup>5</sup> Therefore, patients should be constantly motivated to improve their oral conditions.

Learning about the beginning and progression of biofilm-re-

lated diseases has been developed in the last decades. Thus, the implementation of intensive educational programs, primarily applied to high-risk groups, seems to be a good strategy.

Ranging from 60 to 90%, occlusal caries is more prevalent in school children.<sup>6,7,8,9</sup> Moreover, enamel on teeth in eruption is much more susceptible to caries when compared to that exposed to oral environment for a longer period of time, because of a higher quantity of carbonate present in erupting teeth. Hygiene is also a challenge for children age 6-7 years when their first permanent molars are in eruption. Thus, these factors require adequate education planning emphasizing preventive methods effective in controlling and reducing disease progression.

Continued education and motivation for oral health are relevant approaches in community dentistry to control biofilm-related diseases. Thus, the aim of the present study was to evaluate a 15-month educational program for 6-year olds with high risk of caries.

### METHODS

This project was approved by the Ethical Committee in Research at Piracicaba Dentistry School/UNICAMP (State University of Campinas) in agreement with Resolution 196/96 from the national Committee of Health Department, Brazil. The schools granted permission for the study and informed consent was obtained from the parents.

Plaque Index was firstly used to calculate the number of children. Estimation of sample size was based on an expected mean difference of 0.3 between groups with a standard deviation of 0.3. Assuming a power of 0.8, the sample size was 15 children in each group. However, considering that loss to follow up in longitudinal studies is common, the sample size was doubled to 30 children per group.

All the volunteers were selected from a community dental

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program, which was supported by three institutions from Piracicaba/Brazil (University of Campinas, Belgo Foundation and Piracicaba City Hall). Firstly, children aged 6, came from 10 state schools, were previously selected, identified and listed. After that, those children (n=167) were examined in relation to experience of caries- dmf<sup>f10</sup> and caries activity<sup>11</sup>, in order to identify those with high-risk of caries. Children showing severe fluorosis, hypoplasia, systemic alteration, fixed orthodontic apparatus, were excluded. Finally, 60 volunteers both gender with high-risk of caries were selected, and a raffle was made to allocate volunteers randomly for the control (n=30) and experimental (n=30) groups.

All the volunteers were submitted to a dental treatment, including fillings, extractions and pulpotomies.

Control group received a supervised toothbrush in groups once a year. Professional fluoride applications (1 minute 1.23% APF) were also accomplished by a dental hygienist, immediately after treatment.

Experimental group: children received an intensive and structured educational program, including lectures and group discussion, considering topics related to concepts of health promotion. Individual supervised toothbrush was carried out using a specific technique developed for this age.<sup>12</sup> The technique consists of modifying the angle of toothbrush in order to improve plaque removal mainly on permanent molars in eruption time. Group discussions were divided into 4 lectures held during the first month of the program. Each lecture lasted 30 minutes with the participation of 10 students. Multimedia interface was used. A puppet play was performed to stimulate health education. Every 3 months, children participated in supervised toothbrush sessions, reinforcement of health promotion concepts, and other activities involving sports, arts, and plays.

The objectives and activities for each lecture were the following:

**Lecture 1-** Mouth: its components, general functions and importance. Objectives: to describe tooth anatomy and identify different functions; to identify differences between dentitions; to identify and recognize the importance of first permanent molars.

**Lecture 2-** The most common oral diseases (dental caries and periodontal diseases), their causes and consequences. Objectives: to present and identify differences between sound and carious teeth and healthy and sore gums; to know etiological factors of caries and periodontal diseases.

**Lecture 3-** How to prevent oral diseases: foods and hygiene. Objectives: to describe the influence of foods concerning plaque accumulation and development of caries and periodontal diseases; to identify cariogenic foods; to inform good habits for oral health.

**Lecture 4-** A puppet play and individual supervised toothbrush. Objectives: to practice and correct toothbrush technique.

The calibration process (theoretical discussions, training and calibration exercises), lasting sixteen hours, was performed after the clinical training phase. Reproducibility (Gold standard versus experimental phase examiner) was analyzed using Kappa statistics. During the experimental phase, reexaminations were conducted in 10% of the sample. Intra- and inter-examiner errors showed K values above 0.75.

Two different dentists, calibrated by a benchmark examiner,

experienced in epidemiological surveys, conducted the clinical examinations and they not have known the group assignment. In this double-blind study, WHO instructions<sup>10,13</sup> were used for caries evaluation of deciduous (dmfs) and permanent dentition (DMF-S). Active enamel lesions were recorded

Gingival tissue conditions of deciduous teeth were evaluated by using the Gingival Index<sup>14</sup> and Plaque Index.<sup>15</sup> In case of absence of any of those teeth, a permanent tooth was considered.

The exams were carried out in schoolyards under natural light, using a plane buccal mirror and a ball-ended probe. A portable air compressor was used to dry the teeth. Supervised toothbrush, lectures and educational activities were conducted in specific places into the school. Clinical evaluations were repeated every three months.

Mann Whitney test was used to compare the inter-group differences, while Friedman test was used to calculate intra-group differences in relation to Plaque and Gingival Indexes. Caries incidence was analyzed using Q-square test.

**RESULTS**

Plaque and Gingival indexes were used to evaluate oral hygiene parameters and the effectiveness of the proposed educational program. Different evaluation periods were established as follows: baseline, 3, 6, 9, 12 and 15 months as described in tables 1 and 2.

Control showed no statistical difference among evaluation periods concerning the Plaque index (Table 1). The experimental group showed a statistically significant difference between base-

**Table 1:** Plaque Index (median) according to time and study group.

| Evaluation time (months) | Study group |              |
|--------------------------|-------------|--------------|
|                          | Control     | Experimental |
| Initial                  | 1.29        | 1.33         |
| 3                        | 1.13        | 0.95         |
| 6                        | 0.96        | 0.85         |
| 9                        | 0.83        | 0.79         |
| 12                       | 0.92        | 0.66**       |
| 15                       | 0.93        | 0.60**       |

\*\* - Statistically significant differences (Mann Whitney, p<0.05) between groups

Braces indicate no statistically significant differences- Friedman test, p>0.05. Intragroup analysis.

**Table 2:** Gingival Index (median) according to time and study group

| Evaluation periods<br>(months) | Study group |              |
|--------------------------------|-------------|--------------|
|                                | Control     | Experimental |
| 0                              | 0.16        | 0.16         |
| 3                              | 0.22        | 0.09 **      |
| 6                              | 0.16        | 0.08 **      |
| 9                              | 0.16        | 0.08 **      |
| 12                             | 0.16        | 0.08 **      |
| 15                             | 0.12        | 0.00 **      |

\*\* - Statistically significant differences (Mann Whitney,  $p < 0.05$ ) between groups  
 Braces indicate no statistically significant differences- Friedman test,  $p > 0.05$ . Intragroup analysis.

line and 6, 9, 12 and 15-month evaluation periods; however, no difference was observed between 3 and 6-month, and between 6 and 9-month evaluations. After the 12-month evaluation, a statistical inter-group (control and experimental) difference was observed.

During all evaluation periods, no statistical difference was observed for control regarding Gingival Index (Table 2). However, the experimental group showed a statistically significant difference between baseline and the other periods. There was no statistical difference after 9-month evaluation. After 3-month evaluation, a statistical inter-group difference was observed.

In the control, twenty-three new caries lesions could be detected in 40 % of the children. Of the twelve children affected, two children developed enamel caries and ten developed caries in dentin. In the experimental group, eight new caries lesions could be detected in 16,6% of the children. Of the seven children af-

**Table 3:** Number of children affected (new caries lesions in enamel and dentin) according to study group.

| Study group  | Sample | Number of children affected | % of the sample | Number of new caries lesions |
|--------------|--------|-----------------------------|-----------------|------------------------------|
| Control      | 30     | 12                          | 40,0*           | 23*                          |
| Experimental | 30     | 7                           | 16,6            | 8                            |

\* Statistically significant difference between groups ( $p < 0.05$ ), Chi Square test

ected, four developed enamel caries, one dentin caries and two both enamel and dentin caries (Table 3).

There was a statistical difference between control and experimental group in relation to percentage of children affected and incidence of caries.

**DISCUSSION**

A better understanding of the etiological factors that cause dental caries and periodontal diseases has changed the surgical and restorative dentistry, as new concepts concerning health promotion have emerged.<sup>16</sup>

Although fluoride is effective in reducing caries progression, it cannot prevent caries development by itself. The major fluoride benefit is obtained through its topical action caused by the enamel-dentin reaction by maintaining a satisfactory concentration in saliva.

A wider use of fluoride dentifrice has been considered the most important factor in the reduction of dental caries prevalence in industrialized countries.<sup>17,18,19,20,21</sup>

Changes in the caries profile caused alterations in the morphology of caries lesions as well as in their distribution in the population.<sup>22</sup> The polarization phenomena of dental caries, confirmed by the development of high-risk groups, has been observed in the last decades<sup>9,2</sup>, showing to oral health professionals that the identification of these groups is extremely important for the planning of preventive procedures.<sup>23,24</sup>

Many studies have reported educational and preventive programs focusing on patients and professionals as being effective in controlling plaque, associated with fluoridated products.<sup>8,25, 9,26,27</sup>

However, it is difficult to measure the relative influence of each of these factors on the control of such diseases. Thus, further studies are needed to evaluate the real impact of continued education on health promotion.

Results showed that the educational program designed for the present study could improve oral hygiene among subjects in the experimental group. A significant reduction in Plaque index values was observed six months after baseline (experimental group), and a statistical difference was observed only after the 12-month period when compared to the control. Intra-group analysis (control) showed no statistical difference considering the periods evaluated. There was a statistically significant reduction in Gingival Index values 6 months after baseline for experimental group. A significant difference was observed between groups 3 months after baseline.

These results are in accord with those reported in previous studies showing satisfactory data in relation to Plaque index reduction<sup>28,12,24,29,26,30,31,35</sup> and Gingival index.<sup>28,32,33,29,26,34,35</sup>

However, other studies showed some contradictory results.<sup>36,8</sup> Some results have been reported as conflicting probably due to many methodological aspects, such as sample size (56–3000 volunteers), different codes used to measure oral hygiene, study length (6 months to 6 years), frequency of procedural applications (once a month, every 3 months, every 6 months, once a year), content of the educational program (oral hygiene guidance, prophylaxis, diet control), and use of different fluoride preventive methods (topical fluoride, mouthrinse, sealants). Such aspects make it difficult to compare the results found in the present study to those reported previously.

The experimental group showed a gradual reduction in gingival and plaque index values. Therefore, an educational program should be focused on the concept that continued education in dentistry contributes to changing oral habits.

Evaluation of education programs in relation to control of diseases is an important aspect to be considered. The results of the present study showed statistical differences between groups concerning caries incidence. These findings are in accord with those reported by<sup>27,12,33,9</sup> some studies<sup>32,25,26</sup> associated educational procedures with fluoride use (1.23 % APF or mouthrinse), influencing the results of the studies previously mentioned. Other authors reported no differences between groups.<sup>36,33,8,38</sup>

All the children evaluated showed high risk of caries. So, this study used a risk strategy to develop procedures concerning oral health. New caries lesions were observed in 40.0% (control) and 16.6% (experimental) of the samples (Table 3). There was a reduction in the percentage of children affected (58.5%) when both groups were compared. These results suggest that use of fluoride methods such as professional topical application, mouthrinse, varnish and sealants could be designed mainly for high-risk children. This could promote some individual and/or community benefits such as expansion of oral health services, and reduction in fluoride ingestion, clinical procedures, and financial resources.

Brazil has developed projects concerning primary health attention aiming at progressively promoting health care in public services. This is a challenge for the oral health system because more solutions are needed to change current oral health indicators, and consequently, to improve population quality of life.

In conclusion, educational procedures developed in this study could improve the oral health indicators, especially for high-risk individuals.

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