STUDENTS’ TRAINING IN THE EVALUATION OF ORAL HYGIENE WITH MICROBIOLOGICAL TESTS

I. Casado Gómez¹, J.F. Martín Morales¹, E. Descalzo Casado², P.T. Romero-Lastra¹, A.A. Domínguez Gordillo¹, B. Bravo González¹, C.M. Arías Macías³, M.C. Sánchez Beltran¹, M.A. Llama Palacios¹, A. O’Connor de Oliva¹, M. Romero Martín¹

¹Universidad Complutense de Madrid (SPAIN)
²Hospital Universitario Clínico San Carlos Madrid (SPAIN)
³Universidad San Pablo-CEU Madrid (SPAIN)

Abstract

Periodontal disease and dental caries are worldwide diseases of high prevalence that, in addition to having a negative impact on the quality of life of those who suffer from them, cause serious systematic complications and high health costs. The dental plaque or dental biofilm is identified as an etiological factor common to both processes. Its proper control easily avoids it. Therefore, it is important that the dentistry student becomes familiar from the beginning of his/her training with the strategies of identification and effective removal of the mentioned plaque.

The general objective of Educational Innovation Project No. 34 awarded for the course 2018/19 by Universidad Complutense de Madrid –Spain- for the subject Prevention and Public Health that we taught has been the following:

1. Raise awareness in the students already from the first year of their degree on the high prevalence of oral diseases.
2. Training in the identification of microbiological components of plaque by means of crops; in the assessment of saliva and in the effective teeth brushing.

Both these points are a fundamental experience for themselves, to divulge in their close environment and as future professionals

Methodology:

The students who agreed to participate were provided with bibliography and key words to be expanded with their own research and complemented with what they learned in lectures about Oral Microbiota and Effective Brushing Methods. In small groups we headed to the faculty’s Research Laboratory where they learned the necessary work protocols in microbiology. One session, after rinsing with deionized water without brushing and without prior notice to them, the students were taken samples of their own dental plaque with sterile swab in the interproximal area of the canine and first right lower premolar in right-handed students and first left lower premolar in left-handed students. The sample was transported in vial with RTF solution to the laboratory where dilutions were performed for inoculum in Agar-Blood plate and incubation in anaerobiosis at 37°C with reading after 7 and 15 days.

As well, the students assessed with paraffin gum their volume of saliva at both rest and after stimulation. They assessed afterwards their saliva’s pH and buffer capacity. Stimulated saliva was also used for wetting Sides (CRT-bacteria®) for Streptococcus Mutans and Lactobacillus, that were also incubated at 37°C. To finalize, students received an UltraCompact 0.01 brush provided by Colgate® with which they brushed their teeth. After this, they repeated the whole experiment to evaluate the effectiveness of their brushing.

Results and Conclusions:

Students appreciated diversity of colonies grown from their dental plaque. In 30% of the cases (before the brushing) there were Parvomonas, Pigmented Black, S. mutans. After their brushing a 92% of the students could verify a reduction of colonies in the sample. All students understood with ease the scientific basis of the experiment and are able to disclose the effective tooth brushing to their family and friends. We therefore consider this experience for students of Ciencias de la Salud (Health Sciences) relevant and useful for their learning

Keywords: oral biofilms, oral health, epidemiology, risk factor, periodontal diseases, dental caries, S. mutans, salivary flow, teeth brushing.
1 INTRODUCTION

In the group of diseases with the highest worldwide prevalence dental caries and periodontal diseases highlight from the rest. These, in addition to oral problems and negative effect in the quality of life of those who suffer from them, can cause systemic complications, tombs and high health costs [1, 2].

To face this, the Community Health Education is one of the strategies of public health for its prevention. In the Degree of Dentistry, along with the clinical training, already from the first course of the degree, students receive learn about prevention and receive training for hygienic habits and healthy lifestyle, as well as proper training as future health educators in oral health[1,3,4]

Dental plaque is "a complex bacterial community organized and adhered to oral tissues in evolution and continuous growth, if not controlled"[4-6]. Initially invisible, it can be visualized by different means: As an example, laboratory cultures demonstrate their "living nature" and complement their usual identification by staining with biological dyes such as Gentian Violet, Erythrosin, etc

This bacterial plaque, or Dental Biofilm, is clearly associated with serious conditions of the mouth such as dental caries or periodontal diseases among others, and it can generate chronic inflammatory processes in different locations of the body and/or disseminate through the circulatory system embolizing organs[1,7-10].

Along with general culture media such as blood agar, selective media for the growth of Streptococcus M. and Lactobacillus, components of dental plaque which are actively involved in the development of the dental caries[4,11,12], are available in the dental clinic.

In order for students to assimilate that these diseases starred by plaque can be prevented by effective tooth brushing from the first course of Dentistry in the Subject Prevention and Public Health, an Innovation Educational Project was requested for the academic year 2018-2019 that was granted by the Vice-rectorship of Quality of Universidad Complutense de Madrid (UCM).

The objectives of the project were that students acquired the appropriate skills in:

a) Aware the student, from the first year of the Degree, about the high prevalence of oral diseases.

b) Refer, among the microorganisms that make up the oral microbiota, some of those responsible for the most prevalent conditions such as dental caries or periodontal diseases causing pain, infections, dental losses or inflammatory conditions at the systemic level.

c) Objectively detect the presence of germs of the oral microbiota by means of their identification with microbial culture prior to their mechanical control by means of effective toothbrushing.

d) Training in techniques of mechanical control of the dental plate by means of effective dental brushing

e) Verify after brushing, with new culture, the effectiveness of the trained technique in the mechanical control of said plate.

f) Measurement of pH, buffer capacity and salivary volume at rest and stimulated.

g) Reinforce, with this demonstration, the habit of a correct hygiene in students and as a basis for their experience as future professionals and agents of oral health education.

2 METHODOLOGY

a) At the beginning of the subject, the students were invited to participate in the Project, those who consented 30% male and 70% female, distribution equivalent to the total of enrolled students of the subject- were summoned to a meeting to specify the development and the program of activities to be developed. They were also given keywords and bibliographical documentation to expand what they learned in class on oral microbiota and on effective brushing methods (Fig. 1).
b) Students were divided into groups and were taught works protocols in microbiology in the Research Laboratory of the faculty. One day in the faculty clinics, without prior notice, they were taken, after a rinse with deionized water and without previous dental brushing, samples of their own dental plaque with sterile swab (deltalab Eurotubo®) in the interproximal area between the canine and first right lower premolar in right-handed students and left in left-handed students. The samples were transported in vial with RTF solution to the laboratory, where dilutions were performed for inoculum in Agar-Blood plate (Trypticasein Soy Agar W/5%SH®), and incubation in anaerobiosis (jar DON WHILTLEY®) at 37ºC /99º F SELECTA® stove with reading after 7 and 15 days. (Fig.2).

c) After incubation at 37º C / 99º F in a stove, we proceeded to visualize, counting colonies and comparing the growth before and after tooth brushing.

d) Presentation of the corresponding frequencies and statistical averages.
3 RESULTS

Below are described remarkable findings of the project:

1 100% of the participating students answered correctly the questions about the components and transcendence of oral microbiota, dental biofilm and the prevalence of oral conditions related with them.

2 The distinct groups observed the different colonies grown both in the general agar-blood culture medium and in the specific agar-carrier CRT® bacteria directly and with Kyowa® binocular magnifying glass (Fig. 2) and (Fig. 4.)

3 They learned to identify and count bacterial colonies grown from the different inocula of biofilm sampled in them.

4 In the Laminocultives of S. mutans, 87.5% had <10^5 Colony Forming Units (CFU / ml saliva) and 12.5% had > 10^5 CFU / ml saliva. In Lactobacillus Laminocultures, 75% had <10^5 CFU / ml saliva and 25% had > 10^5 CFU / ml saliva (Fig. 4). Findings higher than 10^5 CFU of mutans streptococci and /or lactobacilli per milliliter of saliva indicate a high caries risk. No differences were found in the colony count between males and females in this group of dentistry students.

5 The oral microbiota detected in blood agar, in general, has included habitual microflora. Furthermore, in 15% of the cases colonies of negropigmentados (Porphyromons, gingivalis,
Prevotella intermedia) and 25% Parvimonas micra have been identified; Fusobacterium nucleatum (photo) was found more frequently, and colonies of β-hemolytic germs were also visualized (Fig 5).

Figure 5. Identification of some of the bacterial colonies found in dental plaque.

6 The blood agar culture of the corresponding inocula obtained after brushing showed, in 92%, a significant reduction of the presence of colonies, thus the students can check the effects of brushing when it is effective. (Fig. 6).
Figure 6. Bacterial colonies of sample obtained before tooth brushing (B) and Reduction of the number of the bacterial colonies in the sample obtained after toothbrushing (A).

Among the evaluated salivary parameters, they verified how in stimulated saliva the average of pH (\(\bar{x}\)) as well as the salivary volume in milliliters / minute (ml / min) increased after masticatory stimulation (Table 1), finding the values average of both variables as much in rest saliva as in stimulated saliva within normal limits [1]. Regarding buffer capacity, 25% presented a normal-high capacity, while in 75% it was low.

Table 1. Average values of pH and salivary volume at rest and after masticatory stimulation

<table>
<thead>
<tr>
<th></th>
<th>Resting saliva</th>
<th>Stimulated saliva</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\bar{x}) (minimum – máximo)</td>
<td>(\bar{x}) (minimum – máximo)</td>
</tr>
<tr>
<td>pH</td>
<td>7,1 (6,0 - 7,6)</td>
<td>7,78 (7,4 – 8,0)</td>
</tr>
<tr>
<td>Salivary volume</td>
<td>0,63 (0,25 - 1,0)</td>
<td>2,4 (1,8 - 3,2)</td>
</tr>
</tbody>
</table>

4 CONCLUSIONS

This experience of educational innovation on hygienic control of dental biofilm has been positive in the evocation of received knowledge, has reinforced the technique of brushing, making it conscious and effective in the participating group, has allowed students to check changes in salivary parameters based on physiomechanical stimuli related to chewing, has facilitated its dissemination among its contacts, and has also trained the educational task in oral health which can help to prevent these oral diseases, contributing to improve the public health of the population.

ACKNOWLEDGEMENTS

To the Vice-Rectorship of Quality Of UCM, to the Research Laboratory of Dentistry Faculty of UCM and to Colgate Palmolive Spain S.A, Madrid.

REFERENCES


