

# Comparison of Dental Flossing and Oral Health Status among Dental Students and High School Students

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## ARTICLE HISTORY

Received: March 4, 2018  
Accepted: March 31, 2018

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## ABSTRACT

**Background:** Along with brushing, using dental floss is an important part of tooth cleaning. This adjunctive method helps remove the bacterial plaque mainly from the interdental area and from the gingival sulcus. The **aim of the study** was to compare the correct and incorrect methods of using dental floss among students from different high schools and students from the Faculty of Dentistry. **Material and methods:** A total number of 96 young adults with a mean age of 21 years (range 18–25 years) were admitted in the study, being divided into three groups: students from Baia Mare (Group 1), students from Odorheiu Secuiesc (Group 2), and the control group consisted of students from the Faculty of Dental Medicine from Tîrgu Mureș (Group 3). The students were invited to complete a questionnaire regarding the use of dental floss. In the second part of the study, a total number of 30 students (10 students from each group) were examined using the Williams periodontal probe, a dental mirror, and a dental probe, and the following parameters were recorded: the papilla bleeding index (PBI), the tartar index (TI), and the DMF-S index. **Results:** The lowest gingival bleeding during brushing was observed in Group 3 ( $p = 0.0070$ ). The majority of people who regularly use dental floss were in Group 3 ( $p < 0.0001$ ). There were no significant differences between groups regarding gender in the use of dental floss: Group 1 ( $p > 0.9999$ ), Group 2 ( $p = 0.3358$ ), and Group 3 ( $p = 0.3303$ ). **Conclusions:** Regarding the used periodontal indices (TI, PBI), the highest peak was achieved by students from Group 2, and the lowest values were recorded among students from Group 3. The DMF-S index was the highest among students from Group 1 and lowest among students from Group 3.

**Keywords:** dental floss, Williams periodontal probe, papilla bleeding index, DMF-S

## INTRODUCTION

In oral hygiene, it is argued that for the complete removal of the bacterial plaque it is not enough just to perform a proper brushing. Along with brushing, using dental floss is also an important part of tooth cleaning.<sup>1–3</sup> This adjunctive method helps remove the bacterial plaque mainly from the interdental area and from the gingival sulcus. In addition to the benefits that dental floss can offer, it can cause a series of traumas at the level of the periodontium, due to vicious habits.<sup>4,5</sup>

The aim of the present paper was to present and compare the correct and incorrect methods of using dental floss among students from different high schools and students from the Faculty of Dentistry. By including the incorrect method of using dental floss, we analyzed its harmful effect on the tissues of the periodontium.

## MATERIAL AND METHODS

Our study aimed to detect the use of dental floss and to determine the degree of oral hygiene among young adults from several areas. A total number of 96 students with the mean age of 21 years (range 18–25 years) participated in this study. Depending on the provenance environment, the study population was divided into three groups: the first group consisted of 25 students in the twelfth grade from the “Németh László” Theoretical High School in Baia Mare, the second group was formed by 42 twelfth grade students from the “Tamási Áron” Theoretical High School in Odorheiu Secuiesc, and the third group included 29 sixth-year students from the Faculty of Dental Medicine in Tîrgu Mureş.

An anonymous questionnaire on oral hygiene was performed in this regard, which included:

- general questions (gender, age, provenance);
- questions about the frequency of dental medical consultations (questions 1 and 2);
- questions about the used brushing techniques (questions 3–7);
- questions about the use of dental floss (questions 8–18);
- questions about certain vicious habits such as smoking (questions 19–21);
- questions about certain signs and symptoms in the oral cavity (question 22).

After questioning the young adults, they have been trained regarding the effective techniques of combating bacterial plaque by various methods: electric brushing, dental floss, interdental brush, mouthwash.

In the last phase of the study, 30 individuals (10 individuals from each group) were randomly selected from those who use dental floss. These subjects underwent an oral dental examination at natural and artificial light at their high school or faculty, conducted with a standard examination kit consisting of: a plane dental mirror (Shanghai Neo-Medical Co. Ltd, Shanghai, China), a dental probe (Shanghai Neo-Medical Co. Ltd, Shanghai, China), and a Williams periodontal probe (Rite-Dent, Hialeah, FL, USA). The oral-dental status of the individuals was recorded, and various indices were

calculated on the dental formula: the Mühlemann papillary bleeding index (PBI), the tartar index (TI) (given that most of the individuals were after breakfast, it was not possible to measure the plaque index), and the DMF-S index.

### 1. The Mühlemann PBI was calculated as follows:

- 0 – normal appearance, no bleeding at the probing;
- 1 – punctual bleeding, 20–30 seconds after probing, one single bleeding point;
- 2 – line/points, 20–30 seconds after probing, a fine bleeding line or multiple bleeding points at the marginal gingiva;
- 3 – triangle – immediately after probing, the interdental triangle is filled with blood;
- 4 – drop/mass bleeding; immediately after probing, a drop of blood flows down, covering tooth or gum portions.<sup>6</sup>

$$\text{PBI} = \Sigma \text{Index value} / \Sigma \text{dental area (buccal and oral)}$$

### 2. Tartar index (TI) values:

- 0 – absence of tartar;
- 1 – supragingival tartar on less than 1/3 of the dental surface; absence of subgingival tartar;
- 2 – supragingival tartar on less than 2/3 of the dental surface; small tartar islands in the subgingival area;
- 3 – supragingival tartar on more than 2/3 of the dental surface; a continuous deposit of tartar in the subgingival area.<sup>6,7</sup>

### 3. DMF-S (Decayed, Missing, Filled/Surface) index:

On each dental surface the following parameters were analyzed: the occurrence of obturations or caries (1 point); extracted teeth as well as root remnants (4 points for frontal, 5 points for lateral teeth); and crowns (3 points). The DMF-S index is calculated as the sum of the received number of points. A higher DMF-S index reflects a more precarious oral-dental status.<sup>8</sup>

Statistical analysis and data processing was conducted using the GraphPad InStat software with the ANOVA, Kruskal-Wallis, and Mann-Whitney tests. The statistical significance of the study was set at an alpha coefficient of 0.05.

## RESULTS

### A. Results of the questionnaire

Students from Group 1 (51.8%) present to the dental



**FIGURE 1.** Gingival injury during dental flossing in case of a 24 years old patient (own casuistry)

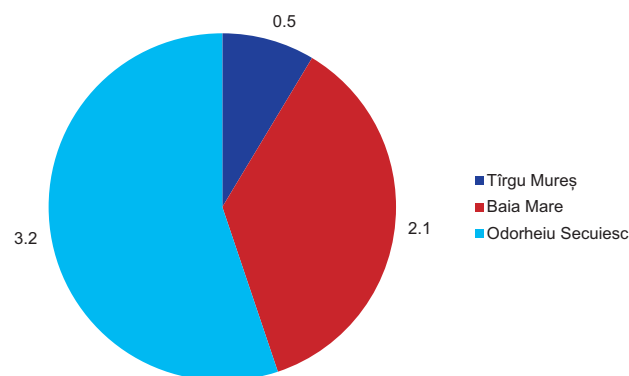
medical follow-up every 6 months, in a higher percentage compared to those from Group 2 (22.22%) and Group 3 (25.92%).

Most of those who brush just once a day were students from Group 2, and most of those who brush three times a day were from Group 3.

Regarding the presence of gingival bleeding during brushing, statistically significant differences were found between groups ( $p = 0.0033$ ), especially between Group 2 and Group 3 ( $p < 0.01$ ), most individuals from Group 2 having noticed bleeding. The lowest gingival bleeding was observed among students in Group 3 ( $p = 0.0070$ , 95% CI 0.0324–0.2532, 0.3238–0.7106).

Regarding the use of dental floss, there were statistically significant differences ( $p < 0.0001$ ) between the groups, especially between Group 1 and Group 3 ( $p < 0.0001$ , 95% CI 0.0343–0.1943, 0.5930–0.9242), and between Group 2 and Group 3 ( $p < 0.0001$ , 95% CI 0.0666–0.3144, 0.5930–0.9242). In both cases, the majority of subjects who regularly use dental floss were the students of Group 1.

Regarding gender, there were no significant differences in the use of dental floss in any of the lots: Group



**FIGURE 2.** The mean value of the papilla bleeding index (PBI) between groups (n = 30)

1,  $p > 0.9999$ ; Group 2,  $p = 0.3358$ ; Group 3,  $p = 0.3303$ . In all three groups, the majority uses dental floss after brushing.

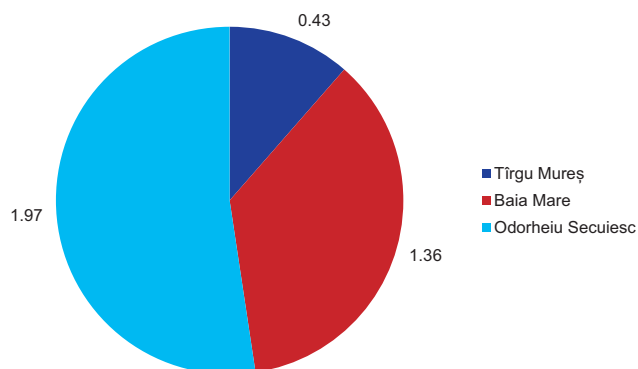
Most individuals from Group 3 have injured their gums several times during flossing in comparison to Group 2 ( $p = 0.0001$ , 95% CI 0.0195–0.1148, 0.3956–0.7768) (Figure 1).

The majority of dental students from Group 3 (81.81%) use a 30 cm long dental floss, and they rank first. They are also the first to use 20 cm (53.84%) dental floss, followed by those from Group 2 (30.76%), the last place being occupied by the students from Group 1 (15.38%).

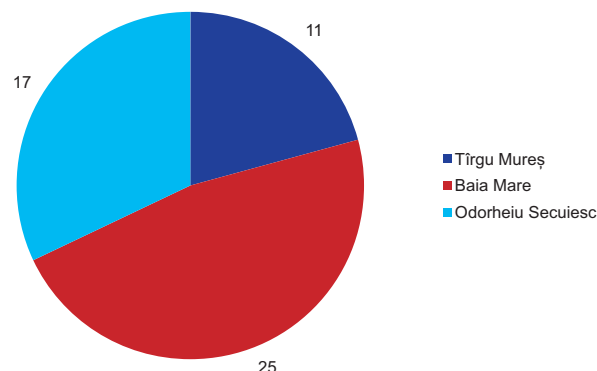
Regarding the direction of the movements performed during dental floss hygiene, most subjects of Group 3 use vertical movement. The difference was statistically significant among groups ( $p < 0.0001$ ).

Most people in different lots change the floss sequence between different groups of teeth, the difference between lots being extremely statistically significant ( $p < 0.0001$ ).

Most people in different groups use dental floss due to:



**FIGURE 3.** The mean value of the tartar index (TI) between groups (n = 30)



**FIGURE 4.** The mean value of the DMF-S index (Decayed, Missing, Filled/Surface) between groups (n = 30)

- the interdental retention of food ( $p = 0.0001$ ), the difference being statistically significant between Group 2 and Group 3 ( $p = 0.0161$ , 95% CI 0.0195–0.1118, 0.1915–0.5671) and between Group 1 and Group 3 ( $p = 0.0288$ , 95% CI 0.0425–0.1226, 0.1915–0.5671);
- the sensation of cleanliness of the teeth ( $p < 0.0001$ ), the difference being statistically significant between the students of Group 2 and Group 3 ( $p = 0.0026$ , 95% CI 0.0491–0.2842, 0.3956–0.7768) and between the students of Group 1 and Group 3 ( $p = 0.0005$ , 95% CI 0.0425–0.1226, 0.3956–0.7768).

Regarding the frequency of dental floss use during a week there were no statistically significant differences between groups ( $p = 0.1373$ ).

Of the symptoms reported in the oral cavity, the first three places were occupied by: gingival inflammation ( $p < 0.05$ ), gingival bleeding ( $p < 0.0001$ ), and halitosis ( $p = 0.0325$ ).

## B. The results of the clinical examination

Of the total of 96 individuals (25 from Baia Mare, 42 from Odorheiu Secuiesc, and 29 from Tîrgu Mureş), 59 subjects (12 from Baia Mare, 19 from Odorheiu Secuiesc, and 28 from Tîrgu Mureş) used dental floss. To standardize the study, out of these 59 subjects, 10 were randomly selected from each group to undergo a complete dental examination. The results of the examination are shown in Figures 2, 3, and 4.

## DISCUSSIONS

A similar study was conducted in India in 2010, which aimed to assess the dental practitioners' attitude towards the use of dental floss. The results showed that 98% of dentists knew that dental floss was used to remove the bacterial plaque from the interdental space, 46% believed that while removing the bacterial plaque, the tooth will be polished, while 27.1% thought it had a gum massage effect. More than 80% of the responders have argued that the use of dental floss reduces gingival inflammation, 74.5% of dentists responded that modern brushing can remove interdental plaque just like dental floss, and 62.4% stated that dental floss had a traumatic effect on the interdental papilla, their results being similar to the results of the present study. Seventy-eight percent believed that dental floss should be used daily. Twenty percent of dentists agreed that using toothbrush and toothpaste is not enough to remove the bacterial

plaque; 89% of dentists believe that there is a great lack of information and knowledge among patients about the use of dental floss.<sup>9</sup>

The results of the present paper were influenced by the amount of information received about dental floss and oral hygiene. It was shown that students in Group 3 (from the Faculty of Dental Medicine in Tîrgu Mureş) were better informed, this being the reason why their attitude towards oral hygiene was better. Subjects from Group 3 also flossed for a longer period of time because they were more familiar with the correct flossing technique. For these reasons, a short presentation of the benefits of dental floss was made for all subjects from Group 1 and Group 2.

## CONCLUSIONS

Regarding the periodontal indices used in the present paper (TI, PBI), the highest peak was achieved by the students of Group 2, and the lowest values were recorded among students from Group 3 (dentistry students). The DMF-S index was highest among students from Group 1 and lowest among students from Group 3. Most individuals were brushing twice a day, the brushing time being 3 minutes in most cases. The students from Group 3 also flossed for a longer period of time compared to students from the other two groups. Gum damage during dental flossing was significantly higher in Group 3 than in the other two groups. The interdental retention of food particles seems to be the major reason for using dental floss. The major disturbing symptom noticed in the oral cavity was the inflammation of the gingiva.

## CONFLICT OF INTEREST

Nothing to declare.

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