

COMPARATIVE STUDY ON THE EVALUATION OF BACTERIAL PLAQUE REMOVAL EFFICIENCY BY AIRFLOW AND PROFESSIONAL POLISHING

Carina Balcoş, Iulia Saveanu, Dana Budala, Loredana Hurjui, Ramona Feier*, Adina Armencia*, Sorana Rosu

University of Medicine and Pharmacy "Grigore T. Popa" - Iași, Faculty of Dental Medicine, Department of Surgery

*Corresponding author. E-mail: dr.ramonafeier@yahoo.ro, oanaarmencia@yahoo.com

Introduction: Bacterial accumulation on the dental surfaces is the main cause of oral pathology of both hard and soft tissues such as caries, gingivitis and periodontitis. Regular mechanical removal of the bacterial plaque is considered essential for preventing and stopping the progression of periodontal disease. The aim of the study was to evaluate comparatively the efficiency of bacterial plaque removal from dental structures by two methods: airflow and professional brushing. **Material and methods:** The study was made of 20 subjects who presented at the Dental Medicine Faculty, Prevention Discipline, of University of Medicine and Pharmacy Iasi for dental services. The study consisted in a questionnaire of 10 items regarding oral hygiene habits, a clinical evaluation and removal of the bacterial plaque by professional scaling and brushing. The data were recorded by clinical examination performed by a single examiner who evaluated quantitatively and qualitatively the presence of the bacterial plaque through the Quigley-Hein plaque index, the O'Leary index and the API (Approximal Plaque Index) index, but also the oral hygiene index. OHI (Oral Hygiene Index). The following steps consisted in two stages after initial evaluation: professional brushing and the reassessment of the bacterial plaque indices, and stage two, airflow followed by the reassessment of the bacterial plaque indices. The collected data was statistically analyzed using SPSS 16. and the mean, standard deviation, standard error, and paired t-test were calculated to obtain evidence based on scientific interpretation. **Results:** The results showed significant results between the two measures of professional cleaning especially when it comes to evaluation of the O'Leary index and the API index, the values for the second stage of treatment, the airbrush, being significantly decreased. There are differences between the OHI index and also Quigley Hein, but not in such an important degree, this being explained by the evaluated sites for plaque identification that are more easily cleaned by professional polishing. As suspected the highest difference was in API index, which is only another statement of how difficult is to properly clean the interproximal spaces. **Conclusion:** Periodic monitoring of the presence of the bacterial plaque through the established oral hygiene and bacterial plaque indices is an important method in the primary prevention of dental caries. However professional cleaning is mandatory at least once per year if not every six months, scaling combined with polishing and air flow has proven to be the golden standard for oral hygiene.

Keywords: oral health education, professional polishing, air-flow

Introduction

Bacterial accumulation on the dental surfaces is the main cause of gingivitis and periodontitis and regular mechanical removal of the bacterial plaque is considered essential for preventing and stopping the progression of periodontal disease. The oral cavity is colonized by a complex microbiota that grows and lives as diverse biofilms on all mucosal and dental

surfaces (1). Authors have shown that a single-time, self-performed manual brushing is often insufficient and known to leave biofilms behind in retention sites, such as fissures, interproximal spaces, and gingival margins (2). Despite all the potential effects of routine scaling techniques (3), they still remain an integral part of periodontal therapy. The ultimate goal of professional scaling is the complete removal of stains and dental plaque; however, the use of

traditional cleaning gum and abrasive paste is often a laborious, long-lasting and inefficient process in the complete removal of supragingival deposits, especially in inaccessible interdental areas and around fixed orthodontic appliances (4). Routine dental brushing done at home, regularly with abrasive paste and bleaching paste, although it works, is still non-existent in inaccessible areas. With the advent of several scaling methods, airflow (APP) appears to have more promising results, not only on supragingival scaling but also on subgingival bacterial plaque removal (5)

Although there is clear evidence of the effectiveness of APP on routine scaling, it is not used so much by professional practitioners (6). Even though APP has proven effective in rapidly removing plaque and stains, causing much less hypersensitivity, better access to pits and fissures, very few studies have compared its effectiveness with prophylactic paste (CPR) (7,8). The aim of the study was to evaluate comparatively the efficiency of bacterial plaque removal from dental structures by two methods: airflow and professional brushing.

Material and method

The study was made on 20 subjects, dental students, at the Prevention Discipline, Dental Medicine Faculty, U.M.F Iași. Before starting the study, the subjects received the necessary information and signed an informed consent.

The criteria for inclusion in the study were the following:

- Cooperating subjects,
- Subjects without general health conditions,
- Subjects should have more than 30% of the surface covered with bacterial plaque,

- Subjects have not received antibiotic treatment in the last 6 months,

- Subjects have not received professional scaling or brushing in the last 3 months.

The data were recorded by clinical examination performed by a single examiner who evaluated quantitatively and qualitatively the presence of the bacterial plaque through the Quigley-Hein plaque index, the O'Leary index and the API (Approximal Plaque Index) index, but also the oral hygiene index OHI (Oral Hygiene Index).

The study stages consisted of:

- Removal of the bacterial plaque by professional scaling and brushing; In the first stage, before the initial assessment of oral health, a questionnaire with 10 items regarding general data and the methods of hygiene used was applied for each study participant.

- Stage 1 –at one month after scaling is performed the evaluation of the bacterial plaque, followed by the professional brushing and reassessment of the bacterial plaque indices;

- Stage 2 –at 2 months after scaling, the bacterial plaque indices are evaluated and then the bacterial plaque removed using the airflow followed by the reassessment of the bacterial plaque indices.

All stages of this study were conducted by a single operator. All information collected for all three stage intervals were statistically analyzed (SPSS 16.) with a 95% confidence.

Results:

The 20 subjects (9 women and 11 men) had an average age of 25.55 years (minimum 24 years and maximum 27 years) students in the third year of the Faculty of Dental Medicine in Iași. Most of the subjects

(80%) came from the urban area. Regarding the distribution of the subjects according to the demographic factors, the results indicate that the majority of the subjects are from the urban area (77.5%), 67 subjects (84%) have a high socio-economic level (in terms of parental socio-economic status) and 13 subjects (16.3%) have an average socio-economic status.

The first step of the evaluation was the questionnaire regarding general health

data, oral health data, previous treatments, and specific oral health habits. All respondents declared excellent general health, previous dental visits, 35% many years ago, 25% last year and 40% have visited the dentist in the current year. The main reason of the visit was dental pain, for 50% of the patients, other reasons being caries treatment (15%), prosthodontic treatment (15%), annual control (15%) and extractions (5%) (Fig. 1).

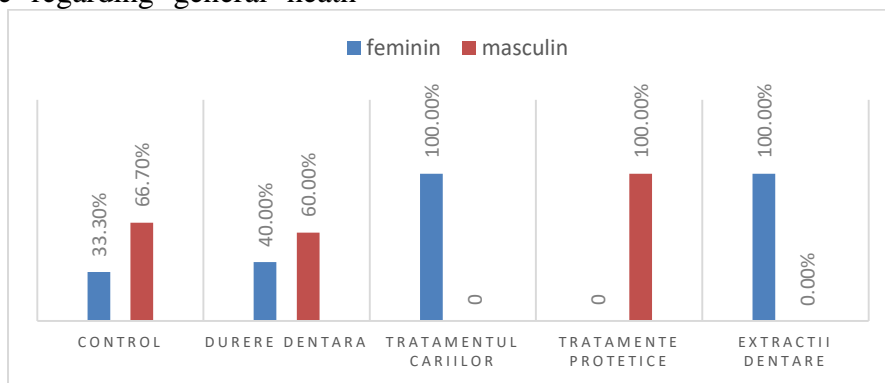


Fig.1 Reasons for dental visit

Regarding the evaluation of sanogenous knowledge and attitudes, it is observed that 75% of the subjects perform the daily brushing 2 times / day while only 25% of the subjects perform the dental brushing once / day. Female subjects from the urban environment perform the brushing 2 times / day in a greater proportion than the male subjects.

As supplementary means 35% of the students use of the dental floss. Female subjects in the urban area use dental floss more as compared to male subjects. 11 respondents (55%) stated that they have “bleeding associated with brushing”, 81,8%

being male respondents in comparison to only 22,2% female respondents, 90% of them use fluoride paste, 35% use also mouthwash, most of them being males from urban residence. Regarding professional dental cleaning 70% of them had in the past scaling and 80% had professional dental polishing. Regarding dietary habits 45% of the respondents eat sweets in-between meals and 45% declared themselves as smokers.

In terms of objective clinical evaluation for the OHI index in the first stage, before and after professional cleaning showed significant decrease from a mean of 0.94 to a mean of 0.49 (Tab.1, fig.2)

Table 1. First stage result before and after professional polishing

| | Test Value = 0 | | | | | |
|---|----------------|----|-----------------|-----------------|---|-------|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Indicele OHI inainte de periajul profesional | 11.502 | 19 | .000 | .949 | .78 | 1.12 |
| Indicele OHI final, dupa periajul profesional | 3.593 | 19 | .002 | .493 | .21 | .78 |

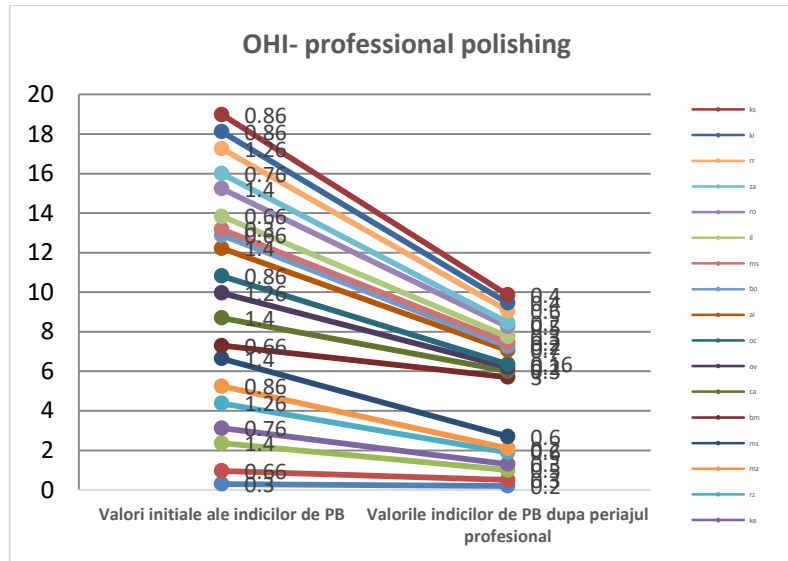
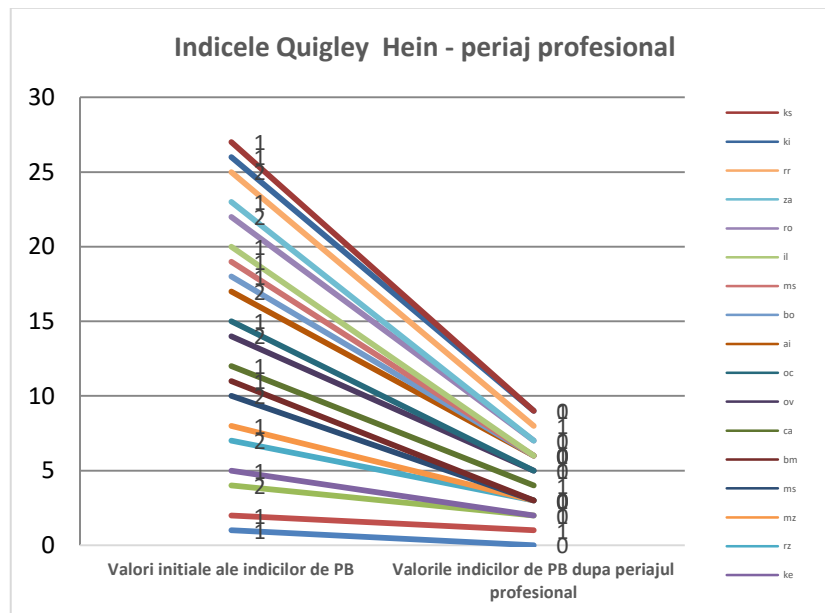


Fig.2 Professional polishing OHI index evaluation for the patients-stage 1

From the analysis of the results (fig.3), it shows that the average values of the Quigley Hein index have registered also a downward trend starting from an initial value of 1.16 and reaching the last stage to a value of 0.82.

The same downward trend was recorded in the case of the O`Leary bacterial plaque indicator, at which the initial value was 47.33%, at the intermediate stage the value was 45.85%, which in the end reached 37.92% (fig.4).



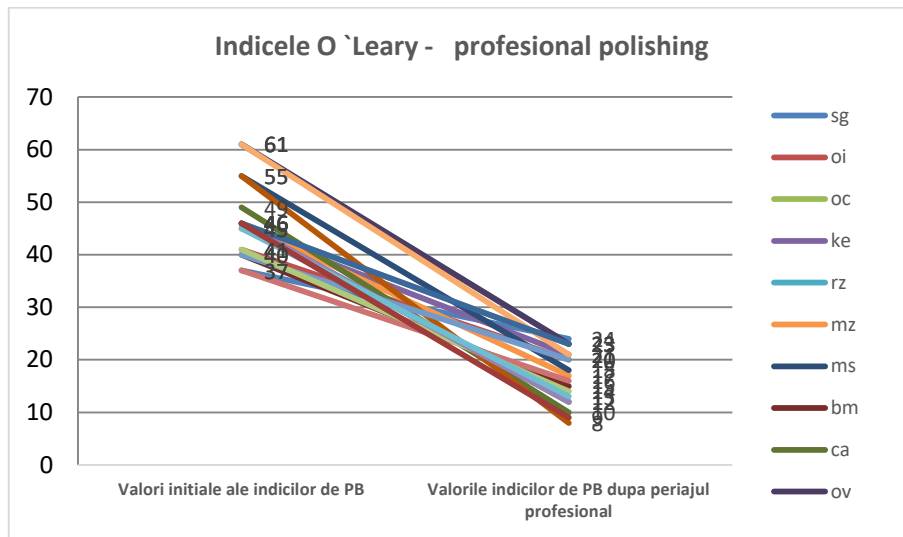


Fig.4 O'Leary index stage 1

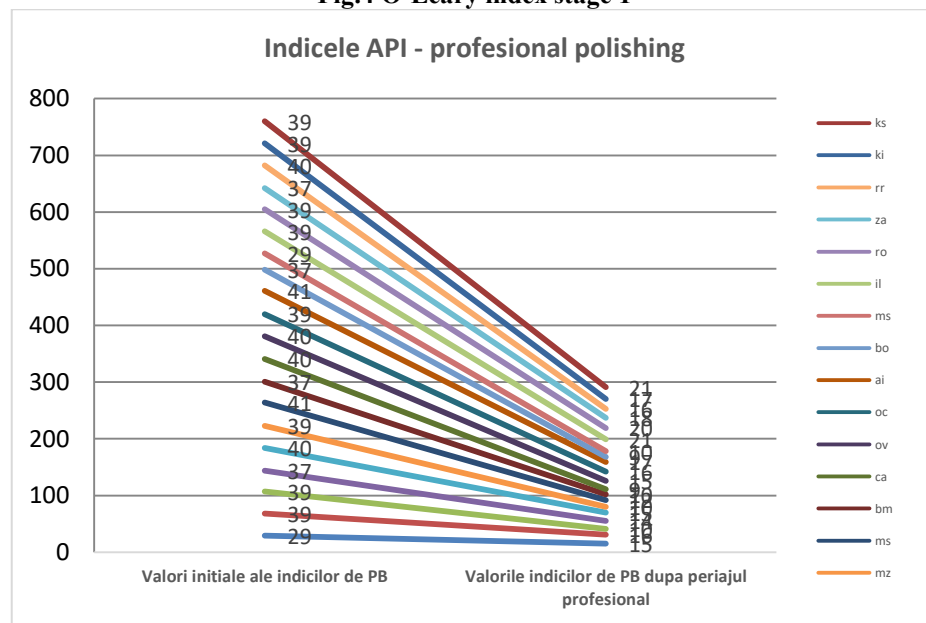


Fig.5 API index stage 1

However, regarding the evolution of the API index, an increase of values from the initial to the intermediate stage is observed from 38.33% to 39.85% and then a decrease of the value up to 33.48% (fig. 5). Following the analysis, we observe a decrease in the values of oral hygiene

indices compared to the values initially recorded, after explaining the Bass brushing technique, regardless of the type of brush used. Values obtained in the second stage record even more decreased mean values, showing the efficiency of this professional cleaning technique.

| | Test Value = 0 | | | | | |
|----------------------------------|----------------|----|-----------------|-----------------|---|--------|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Indicele OHI inainte de airflow | 12.066 | 19 | .000 | 1.08100 | .8935 | 1.2685 |
| Indicele OHI final, dupa airflow | 6.833 | 19 | .000 | .19500 | .1353 | .2547 |

Table 2. OHI index in stage 2

Before and after stage 2 the OHI index reveals an important decrease, from 1.08 to 0.19 (Tab. 2, fig.6) , a significant difference

from the initial OHI index record that showed only from 0.94 to 0.49 (Tab.2).

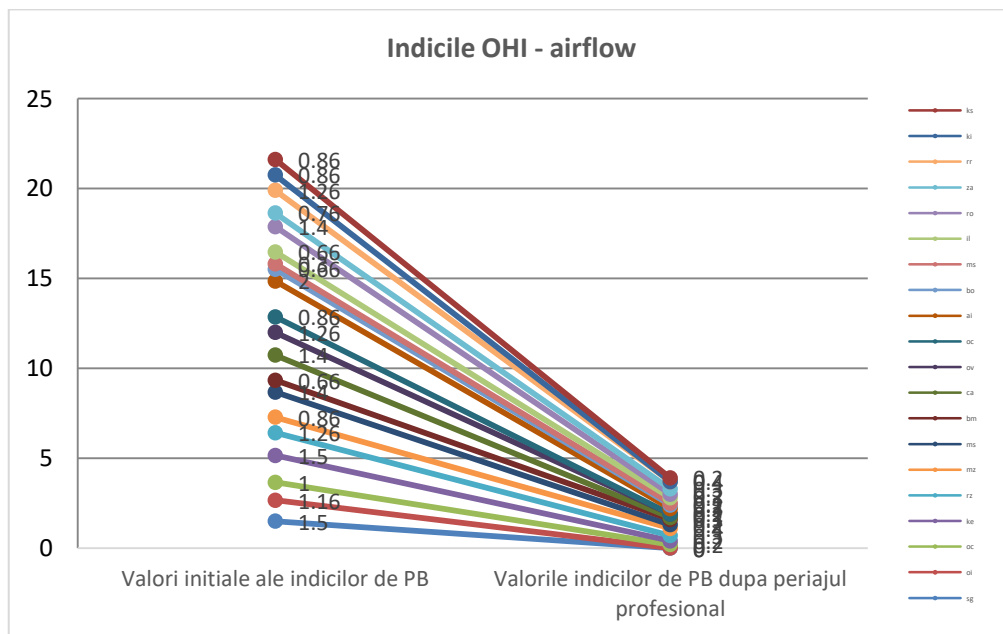


Fig. 6 OHI index in stage 2

For the Quigley Hein index stage two show also decreased values compared to the same index in stage 1, 0.41 final value recorded in

stage 1, compared to 0.25 final value recorded in stage 2 (Fig.7).

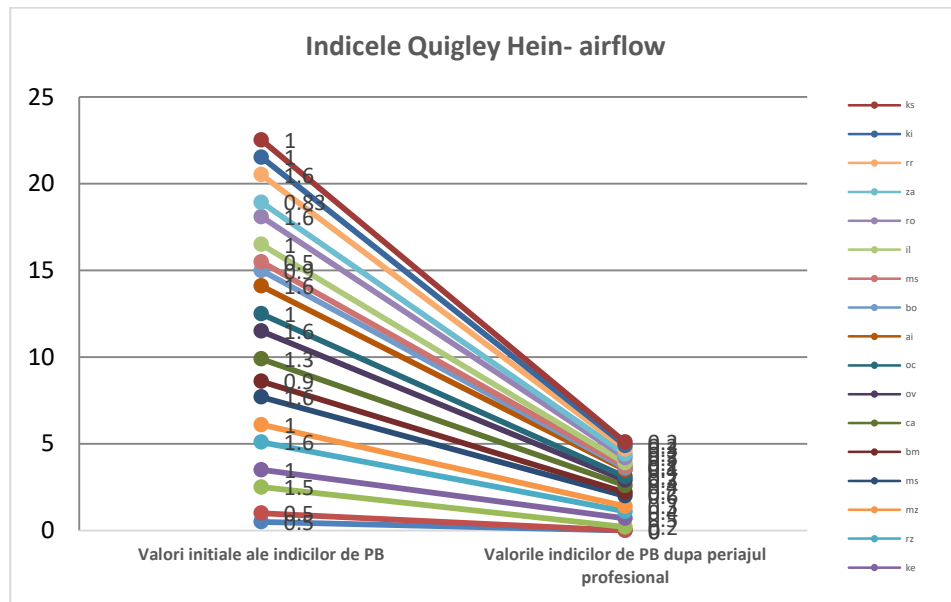


Fig.7 Quigley Hein index stage 2

For O’Leary index the final values are even more relevant, the final value for stage 1

being 17.1 in comparison to the final value for stage 2 which is only 7.3 (Fig. 4,8).

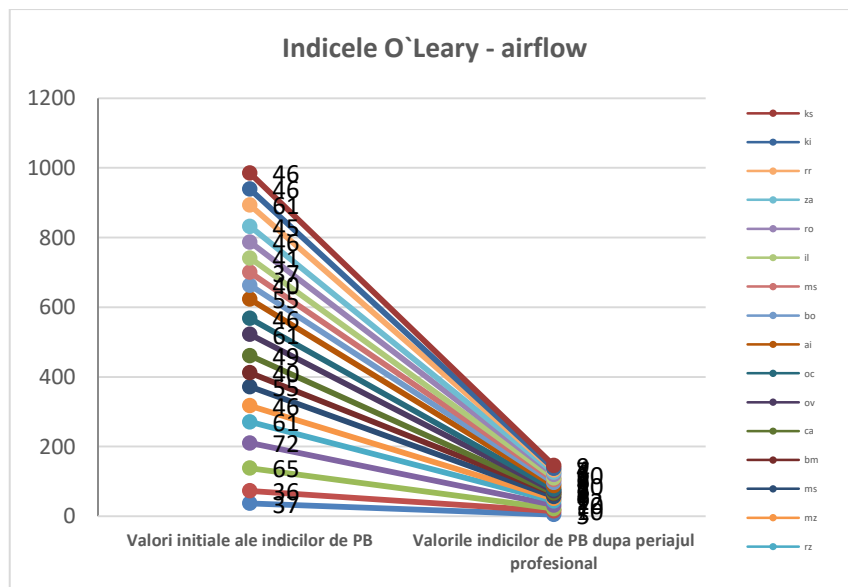


Fig.8 O’Leary index stage 2

The biggest difference registered for the final values are shown for the AHI index, for the second stage having an initial value

of 40,6 and a final value after airflow of only 3.3 (Table.3).

Table 3. AHI index stage 2

| | Test Value = 0 | | | | | |
|---------------------------------|----------------|----|-----------------|-----------------|---|--------|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Indicele API inainte de airflow | 18.609 | 19 | .000 | 40.600 | 36.03 | 45.17 |
| Indicele API dupa airflow | 11.706 | 19 | .000 | 3.30000 | 2.7100 | 3.8900 |

The difference between the first stage and the final stage for the after brushing or airflow are the highest differences recorded

in all the indexes. The API index after brushing was 14.55 (Fig. 5) and the API index after airflow was only 3.3 (Fig. 9).

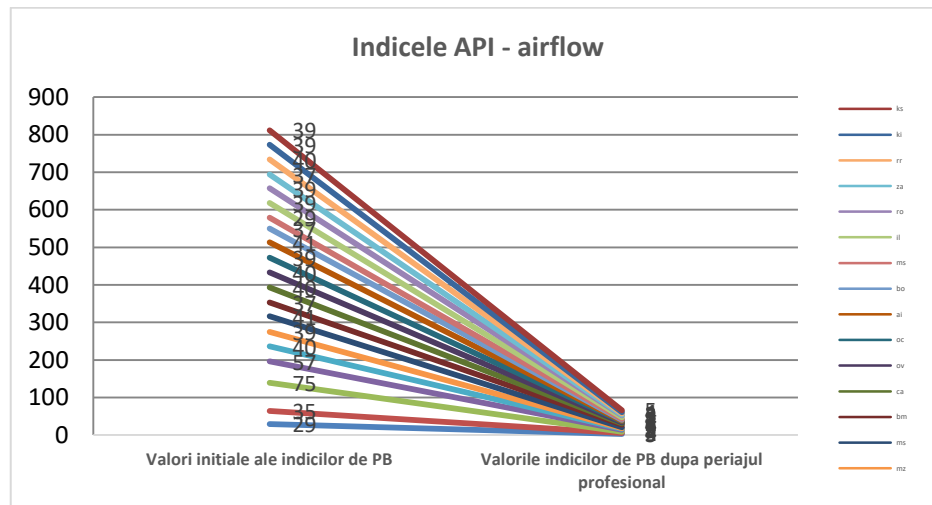


Fig.9 API index stage 2

Discussions

Knowledge of oral hygiene is considered to be essential for having homogeneous attitudes, although cross-sectional studies to date have shown weak associations between knowledge level and sanogenous behavior, but there is certainly a relationship between oral health knowledge and better oral health (8). Previous studies have shown that dental students can be unmotivated in practicing sanogenous habits (6). However when dealing with dental fear and anxiety (DFA) hygiene maintenance could be difficult as it is accompanied with consequences, as it is directly linked with poor dental health both on the short and long term (9,11).

Oral education is one of the measures to prevent oral disorders aimed at increasing the level of knowledge and motivating the use of all resources to maintain oral health within normal limits. The knowledge of the prophylaxis measures but also their implementation in practice, as well as the transmission of the message adapted to the age of the subject, have a major influence in obtaining optimal oral hygiene (10,12). Dento-maxillary anomalies, also affect oral and dental health, both physically and physiologically, other studies, regarding the oral health behaviors, revealing a strong correlation between dental visit pattern and social physique anxiety scale, shyness and sociability,

modifying oral health status and oral hygiene frequencies (13,14).

There are significant results between the two measures of professional cleaning especially when it comes to evaluation of the O'Leary index and the API index, the values for the second stage of treatment, the airbrush, being significantly decreased.

There are differences between the OHI index and also Quigley Hein, but not in such an important degree, this being explained by the evaluated sites for plaque identification that are more easily cleaned by professional polishing. As suspected the highest difference was in AHI index, which is only another statement of how difficult is to properly clean the interproximal spaces.

We expect that the level of oral knowledge in dental students will be higher compared to the level of knowledge of students from other faculties because they have access to specialized information.

Dental medicine students with a level of knowledge and correct sanogenous behavior can play an important role in individual health education or in groups (6).

Conclusions

The presence of bacterial plaque is an important factor in the occurrence of dental and periodontal disorders. Periodic monitoring of the presence of the bacterial plaque through the established oral hygiene and bacterial plaque indices is an important method in the primary prevention of dental caries. Individual and community health education is a way to reduce the risk factors involved in the occurrence of oral and dental disorders. Manual brushing is the most important method of removing the bacterial plaque. However professional cleaning is mandatory at least once per year if not every six months, scaling combined with polishing and air flow has proven to be the golden standard for oral hygiene.

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