# A Comparison of Periodontal Health Status in Smoker, Former Smoker and Non-Smoker Patients

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**Objective:** The aim of this case-control study was to assess the smoker, former smoker and non-smoker patients' periodontal status. **Methods:** The study was based on a clinical examination of 80 patients (46 female, 34 male) from Tirgu-Mureş, aged between 16 and 78 years, who were questioned about their smoking habits and oral hygiene. Patients were classified in four groups: non-smokers, former smokers, occasional- and active smokers. The clinical examination evaluated the dental calculus index, papilla bleeding index, Community Periodontal Index of Treatment Needs (CPITN), probing depth and gingival recession. Statistical analysis was performed using Pearson's chi-square test.

**Results:** Statistically significant association between active smokers and non-smokers was found comparing the mean values of the papilla bleeding index and of the depth of periodontal pockets (p=0.0001). No statistically significant differences between active- and non-smokers were found regarding the dental calculus index (p=0.5483). Most of the active smokers (55%) and occasional smokers (65%) smoke less than 5 years. 60% of the active smokers and 35% of the occasional smokers tried to quit smoking.

**Conclusions:** In our study, most of the typical indicators for periodontal disease showed significantly increased values in investigated smokers compared to non-smokers. The results call for relevant measures for smoking prevention and cessation in Tirgu-Mureş

Keywords: tobacco smoking, smoking habits, periodontal health status, periodontal indexes

Received: 29 November 2012

# Introduction

West European epidemiological data suggest that 80–85% of the middle-aged adult population has either healthy gums, either gingivitis, or mild-to-moderate chronic periodontitis. Barely 10–15% suffers from severe attachment loss due to periodontal disease [1,2].

Miyazaki, analyzing data from 100 epidemiological surveys of nearly 50 countries, found that regardless of a country's economic and social level of development and the geographic location, approximately 10–15% of the adult population is suffering from severe periodontal disease [3].

The situation is similar in our country. Epidemiological surveys in Romania show that 15% of the population is suffering from moderate to severe periodontitis [4].

The fact, that the proportion of the really severe periodontits in each country is approximately the same and does not show an improving trend, seem to indicate that next to oral hygiene other risk factors could play a major role in the apparition of destructive periodontitis.

The WHO organized a group of experts to examine and advice on the epidemiology, etiology and prevention of periodontal disease [5]. The World Health Organization recommends that countries adopt certain strategies for improving oral health [6]. Over the last decades several countries have provided Community Periodontal Index of Treatment Needs (CPITN) data to be stored in the World Health Organization's Global Oral Health Databank [7,8]. The CPITN Databank revealed that the lowest score of periodontal health (CPITN score 4) was limited to between 10 and 15% of the adult population worldwide [9,8]. National public health programs should incorporate oral health promotion and disease prevention based on the common risk factors approach.

The aim of present survey was to determine the periodontal health status of Romanian adults, to compare periodontal status of smokers versus non-smokers living in Tîrgu Mureş and to provide a baseline for monitoring the effectiveness of future interventions.

# Material and method

Eighty patients from Tîrgu Mureş were clinically examined: 46 women and 34 men, aged between 16 and 78 years. We included in the present survey patients who were treated in our practice between August–September 2012 and excluded the ones matching the following criteria:

- systemic illnesses;
- patients under treatment for chronic disease;
- patients with aggressive marginal periodontitis;
- patients who received periodontal treatment in the last 2 years;
- totally edentulous patients;
- pregnant patients.

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Fig. 1. Periodontal pocket depth measurement with Williams' probe (own casuistry)

Patients were divided into four major groups: 1. nonsmokers – NS (n=20), 2. former smokers – FS, who quit smoking for at least 3 months (n=20), 3. occasional smokers – OS (n=20) and 4. active smokers – AS (n=20).

We clinically examined each patient and data were recorded in their periodontal sheet. The following parameters were recorded: calculus index and Mühlemann's papilla bleeding index, gingival recession (given in millimeters), the width of the attached gingival (given in millimeters), pocket depth (given in millimeters after probing) (Figure 1), periodontal indices and CPITN. The calculus index scores were: 0 = no calculus, 1 = supragingival calculus on the cervical third of the surface, 2 = supragingival calculus on two-thirds of the surface and subgingival not continuously calculus areas, 3 = supragingival calculus on more than two-thirds of the tooth surface and subgingival continuous calculus layer.

The scores for papilla bleeding index were: 0 = no bleeding, 1 = spot bleeding after 20–30 seconds following the probing, 2 = after probing more bleeding points on the marginal gingiva, 3 = after probing the inter-dental triangle is filled with blood, 4 = heavy bleeding after probing.



Fig. 2. Comparison of the papilla bleeding index (PBI) between the different groups (NS: non-smoker group, FS: former smoker group, OS: occasional smoker group, AS: active smoker group).

The CPITN scores were: 0 = healthy, 1 = gingival bleeding, 2 = dental calculus, 3 = shallow pocketing of 4–5 mm, 4 = deep pockets of 6 mm or more.

Clinical examination was performed in natural and artificial light with mirror, dental probe and Williams' periodontal probe (Figure 1). Clinical data on oral and periodontal health status were collected according to WHO methods and criteria [10]. Clinical examination was performed following the approval of the Ethics Committee of the University of Medicine and Pharmacy of Tîrgu Mureş. The patients were informed and their written consent was obtained. After the clinical examination the patients were questioned about their smoking habits and oral hygiene.

The findings are presented as contingency tables. The CPITN and other periodontal health indices were computed according to the recommendations of WHO.

Data were statistically analyzed in GraphPad (InStat) program using Pearson's chi-square test.

#### Results

The mean value of calculus index in the active smokers group was 0.87, in occasional smokers it was 0.66, in former smokers 0.63 and in non-smokers 0.27.

No statistically significant association between the study groups was found during the statistical analysis of the mean of the calculus index (p = 0.5483).

For papilla bleeding index (Figure 2) it was found in active smokers the mean value of  $1.39 (\pm 1.223)$  and in the non-smokers group  $0.23 (\pm 0.5147)$ .

Comparing the average values of the papilla bleeding index after Mühlemann, a statistically significant association was found between active smokers and non-smokers (p = 0.0001, RR = 2.05, 95%CI = 1461–4277) and also between occasional smokers and non-smokers group values (p = 0.0028, RR = 2.25, 95%CI = 1.29–3.925).

There was a statistically significant association in the mean depth of periodontal pockets (Figure 3) of active smokers and the values of non-smokers (p < 0.0001, RR = 6, 95%CI = 2.092–17.21) and between the values of non-



Fig. 3. Comparison of the mean value of the periodontal pockets' depth of different groups (NS: non-smoker group, FS: former smoker group, OS: occasional smoker group, AS: active smoker group).



Fig. 4. The period of tobacco consumption by the members of the smokers group (OS: occasional smoker group, AS: active smoker group).

smokers and occasional smokers group (p = 0.0005, RR = 5, 95%CI = 1709–14,632).

The largest gingival retraction found in active smokers was 7 mm, in occasional smokers 6 mm, in former smokers 6 mm and in the case of non-smokers was 4 mm, respectively.

No statistically significant association was found comparing the mean values of gingival retractions of investigated study groups.

The mean of the highest CPITN index values was 2 in non-smokers, 2.7 in former smokers, 2.95 in occasional smokers and 3.55 in active smokers.

Fifty-five per cent of the active smokers and 65% of the occasional smokers smoked about  $\leq 1-5$  years, and 30% of all smokers (20% of the active smokers and 10% of the occasional smokers) were living with this vicious habit for 10–20 years (Figure 4).

Thirty per cent of the former smokers had smoked 1–5 years and 10% of this group reported smoking for more than 20 years.

Regarding the smoking cessation attempts it was found that 60% of the active smokers and 35% of the occasional smokers have tried to quit smoking. In both groups the majority were male.

Most of the male subjects quitted smoking more than 1–5 years prior to the study. Most of the investigated women quitted smoking a few months prior to the study.

With respect to the date when the last dental scaling was performed, the results revealed that most of the nonsmokers and occasional smokers received a year prior to the study this type of treatment, while 40% of the active smokers six months prior to the study.

In the smokers' group the most common complaint (Figure 5) was gingival recession followed by sensitivity to thermal stimuli, gingival bleeding and tooth mobility. The non-smokers group presented the highest proportion of sensitivity to thermal changes. Other changes such as gum bleeding, halitosis, tooth mobility and gingival recession occurred less frequently compared to smokers. Only 55% of non-smokers have noticed changes in their oral cavity,



Fig. 5. The comparison of the most common modifications noticed in the oral cavity by the non-smokers and smokers (NS: nonsmoker group, FS: former smoker group, OS: occasional smoker group, AS: active smoker group).

each member of smokers' group presented complaints, sometimes cumulative.

### Discussion

Tobacco use is a risk factor for the development of various diseases affecting the health of the human body, including the oral cavity. Tobacco can also influence and enhance the development of certain diseases [11,12].

Evaluation with laser Doppler technique has shown that the smokers' gingival blood flow is getting lower by 60– 70% during smoking compared with non-smokers. This alteration persists for 2–3 hours after smoking a single cigarette [13]. On the other hand, the research carried out by Nair et al. and Morozumi et al., showed an increase in the blood flow of the gum tissue due to the smoking cessation [14,15]. According to our findings papilla bleeding index values were much higher in smokers than in non-smokers (p = 0.0001).

While there are conflicting opinions regarding tobacco and the reaction of the vessels in the gum tissue, the clinical significance is clear. Prolonged and heavy smoking can reduce gingival bleeding, thus masking the results of commonly used test by dentists to monitor periodontal health [16,17]. Our results may be influenced by the fact that the majority of the included patients smoked less than 1–5 years.

Smokers have from 2.5 to 6 fold higher chances of developing periodontal disease as non-smokers and there is a direct correlation between the number of smoked cigarettes and the risk of developing periodontal disease [18]. This follows as well from the present work: smokers group is showing signs of periodontal disease in a far greater extent than non-smokers.

Bergstrom et al. not only found significantly increased depth periodontal pockets and alveolar bone loss in smokers, but increased tooth mobility as well [19,20]. In our study the most and deepest pockets were found in the active smokers' group, especially in those accusing gingival retraction, sensitivity to thermal stimuli, gingival bleeding and dental mobility. Other study that was performed on an isolated Greek adult population consisted of 640 individuals, aged 20 to 69 years, also showed high levels of dental plaque, dental calculus and bleeding on probing [21].

A recently made case-control study in India [22] assessed as well the influence of smoking on periodontal health. For this reason, similar to our study, periodontal status was recorded from two hundred patients aged between 25–50 years. Smokers showed an increased calculus index and an increased probing depth of 4–7 mm. Our results were in accordance with these findings.

A national survey of oral health status made in Turkey on 7833 individuals classified in age groups revealed that only half of the 15-year olds had healthy periodontal tissue and the calculus is the most frequent problem for all ages, which is evidence of poor oral health practices [8]. The present survey demonstrated the same. The reason why, in this study, it was not found statistically significant association between study groups, is that calculus accumulation was characteristic for each group. The observation of widespread calculus accumulation illustrates the necessity of a comprehensive oral hygiene program [8].

Critically, the results of the present survey may be influenced by the vast difference between ages. More circumspect selection of subjects and more research is needed regarding the effects of smoking on periodontal condition of our patients.

# Conclusions

- Data from the literature is denouncing smoking as one of the main factors favoring the occurrence of chronic marginal periodontitis.
- In this study, most of the typical indicators for periodontal disease, such as papilla bleeding index and periodontal pocket depth, showed increased values in smokers compared to non-smokers.
- No statistically significant association was found in calculus accumulation and gingival recession between the investigated groups.
- Active smokers are occupying the first- and non-smokers the last place regarding the highest mean value of the CPITN index and of the deepest periodontal pocket.
- These findings could increase the dental practitioners' motivation in raising the patients' awareness about the harmful effect of smoking on the periodontal health.
- Oral hygiene instructions and a regular dental follow-up could play a significant role in the prevention of periodontal disease.

# Acknowledgments

The authors would like to offer their special thanks to all participants involved in this survey for their cooperation.

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