Prevalence of periodontal diseases in North Herzegovina

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ABSTRACT

Aim To investigate effects of smoking on periodontal tissue and the occurrence of periodontal disease in the population of North Herzegovina.

Methods The study included 800 persons of 20-49 years of age (400 smokers and 400 non-smokers), inhabitants of Prozor-Rama Municipality, Bosnia and Herzegovina. Periodontal condition assessment was made by the Community Periodontal Index of Treatment Needs index (CPITN) at representative teeth: 16, 17, 21, 26, 27, 36, 37, 31, 46, and 47. Statistically significant difference between non-smokers and smokers was tested by χ² test with the level of significance set at p=0.05.

Results The prevalence of healthy periodontal tissues was lower in smokers than in non-smokers, 25 (6.3%) and 36 (9%), respectively. The prevalence of gingival bleeding, calculus, shallow and deep periodontal pockets was higher in smokers than in non-smokers, although it was not significant. There was a risk between occurrence of deep periodontal pockets and smoking (RR=2). A total of 64 (8%) participants needed only instructions on proper oral hygiene, 654 (81.8%) prophylaxis and initial treatment, while 21 (2.6%) needed complex periodontal treatment.

Conclusion Obtained results indicate a high need of preventive measures and the improvement of oral health in the population of North Herzegovina.

Keyword: nicotine, nonsmokers, smokers, periodontium, Prozor-Rama
INTRODUCTION

According to the World Health Organization estimations, about one million people a year die of smoking (1,2). There are many harmful effects of tobacco and tobacco products on human health, and they depend on the way of smoking and a length of smoking period. The main health effects caused by smoking are diseases of cardiovascular system, respiratory diseases, including cancer, especially lung, throat and oral cancer (3-6). Smoking is a risk factor for a number of systemic diseases and it has a negative impact on all organs and organic systems in human body (7). Smokers may have various changes in mouth because tobacco smoke contains about 4000 different toxins (8). Higher prevalence and progression of periodontal diseases are caused by disturbed immune response (9,10). Development of periodontal diseases is also influenced by toxic effect of nicotine (11). Beside chemical components, tobacco smoke contains radioactive components and tar in different concentrations (12). Smoking causes reduced supply of oxygen into gum tissue, facilitating the development of pathogenic bacteria in mouth that influence the incidence of periodontal diseases (13). Research shows that there are about 19 known cancerous substances in cigarettes (14). Cigarette smoke contains significant concentration of bensopyren which has cancerous and mutagenic components that cause incomplete oxidation of organic substances (15). Harmful effect of smoking on health is especially associated with nitrosamines in tobacco smoke and chemical reactions between nicotine and various oxides and nitrogen that occur during smoking (16).

More studies prove that periodontal infection caused by bacteria that exist in dental plaque is more common in smokers since more than 350 bacterial species live in the mouth, and it is well known that 20 of them cause periodontal disease (17). When plaque is formed on teeth surface, in gingival and periodontal tissue, inflammatory and immune response occurs, following destruction of complex supportive tissue because of formation of periodontal pockets and loss of alveolar bone. Epidemiological studies point out a significant role of smoking for periodontal disease onset, but that prevalence of the disease in smokers depends on a number of cigarettes smoked daily, as well as duration of the smoking habit and age when a person started smoking (18-20). Periodontal diseases and loss of teeth are significantly higher in smokers than in non-smokers, and plaque is thicker as well (21). A number of young people becoming tobacco addicts is increasing. According to the National Survey on Drug Use in 2007, 68 million people use tobacco, and more than 3.5 million adolescents are tobacco addicts at the age between 12 and 17. In Bosnia and Herzegovina 40% of adults are active smokers, and 50% primary school pupils in the Federation of BiH are about to start smoking (22).

This study examined harmful effects of smoking on periodontal disease, stage of periodontal disease and treatment necessity among population of Prozor-Rama Municipality.

EXAMINEES AND METHODS

This prospective study was conducted at the Health Care Center of Prozor-Rama in 2009 and included 800 persons or 8.79% out of 9,100 inhabitants in Prozor-Rama Municipality. The sample was chosen from the Census in Gornja Rama, Donja Rama and the town of Prozor. The first respondent was randomly selected, and then every tenth name from the list was chosen. Each person had to meet criteria related to age.

Respondents were divided into two groups, 400 smokers, and 400 non-smokers at the age of 20 to 49. The study excluded all persons younger than 20 and those older than 49, and persons with diseases that could influence occurrence of periodontal diseases, such as osteoporosis, diabetes, cardiovascular diseases and persons under therapy of cyclosporine, phenytoin or calcium blockers.

Periodontal condition assessment was made by CPITN index (Community Periodontal Index of Treatment Needs) that is based on registration of intensity of inflammatory changes, calculus and depth of periodontal pockets (23). Together with instruments for routine examination, a probe with graduations in millimeters was introduced into the gingival sulcus. The following grades were determined: 0 - healthy periodontal tissue, 1 - bleeding after careful probing, 2 - supra or sub-gingival calculus or iatrogenic damage of marginal gingival edge, 3 - periodontal pocket up to 5 mm deep, 4 - periodontal pocket more than 6 mm deep.
According to CPITN index, representative teeth were examined in each respondent: 16, 17, 21, 26, 27, 36, 37, 31, 46, and 47. Based on the examination and assessment of periodontal conditions regarding mesial and distal side of each tooth, the treatment needs are determined for each respondent: stage 0 - there is no need for treatment, stage 1 - requires instructions on proper oral hygiene, stage 2 and stage 3 - require instructions on proper oral hygiene, removal of teeth plaque, correction of fillings and prosthetic devices, polishing of root canal (curettage), stage 4 - requires complex periodontal treatment, curettage and some methods of periodontal surgery. A method of determining the average number of sextants affected by bleeding of gingival sulcus, calculus, shallow and deep periodontal pockets was used in estimation of stage of periodontal diseases.

The data were statistically processed, and the results were expressed in absolute and relative frequencies (%). Statistically significant difference between non-smokers and smokers was determined by $\chi^2$ test with the level of significance set at $p=0.05$. Relative risk (RR) indicator was obtained by dividing the risk of periodontal diseases at smokers with the risk of diseases at non-smokers. The confidence interval (CI) of 95%, was used in research of correlation between smoking and periodontal diseases.

All respondents were familiar with the purpose of research and voluntarily agreed to participate. The Ethics Committee of the Health Care Center of Prozor-Rama and the Ministry of Health, Labour and Social Welfare of the Hercegovina-Neretva Canton gave their consents for the research.

RESULTS

Out of 400 smokers, only 25 (6.3%) had healthy periodontium, while 375 (93.7%) participants had various changes on periodontium, with calculus being the most common (it is found in 311 (82.9%) of smokers). In non-smokers, 36 (9%) had no pathological changes considering their periodontal tissue, while 364 (91%) of them had pathological changes of periodontium. Among periodontal diseases, calculus was the most common in the non-smoker group, and it was found in 310 (85.2%) participants. Statistically significant difference was not found between the groups regarding periodontal health ($p=0.143$), nopperiodontal diseases, e.g., changes of periodontium ($p=0.519$) (Table 1).

### Table 1. Classification of smokers and non-smokers according to periodontal condition

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Smokers</th>
<th>Non-smokers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy periodontium</td>
<td>25 (6.3)</td>
<td>36 (9.0)</td>
<td>61 (7.6)</td>
</tr>
<tr>
<td>III</td>
<td>375 (93.7)</td>
<td>364 (91.0)</td>
<td>739 (92.4)</td>
</tr>
<tr>
<td>Gingival bleeding</td>
<td>33 (8.8)</td>
<td>31 (8.5)</td>
<td>64 (8.7)</td>
</tr>
<tr>
<td>Calculus</td>
<td>311 (82.9)</td>
<td>310 (85.2)</td>
<td>621 (84.0)</td>
</tr>
<tr>
<td>Shallow periodontal pockets</td>
<td>17 (4.5)</td>
<td>16 (4.4)</td>
<td>33 (4.5)</td>
</tr>
<tr>
<td>Deep periodontal pockets</td>
<td>14 (3.7)</td>
<td>7 (1.9)</td>
<td>21 (2.8)</td>
</tr>
</tbody>
</table>

Out of 130 smokers in the age group of 20 to 29 years, 11 (8.5%) respondents had healthy and 119 (91.5%) unhealthy periodontal tissue, and calculus was the most common finding, in 98 (82.4%) smokers. In the same age group of non-smokers, 15 (10.9%) had healthy periodontium, and 123 (89.1%) had some pathological changes of periodontium. Calculus was also the most common finding in periodontal tissue, and it is present in 106 (86.2%) participants. Considering changes in periodontal tissue, no significant changes were found between the smoking and the non-smoking groups ($p=0.581$).

### Table 2. Classification of smokers and non-smokers according to the age and periodontal condition

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Health condition of periodontium</th>
<th>Periodontal diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy</td>
<td>III</td>
</tr>
<tr>
<td>Smokers</td>
<td>n=130</td>
<td>n=138</td>
</tr>
<tr>
<td>Smoking status</td>
<td>11 (8.5)</td>
<td>10 (9.1)</td>
</tr>
<tr>
<td>Non-smokers</td>
<td>n=124</td>
<td>n=128</td>
</tr>
<tr>
<td>Smoking status</td>
<td>11 (8.9)</td>
<td>11 (8.7)</td>
</tr>
</tbody>
</table>

The data were statistically processed, and the results were expressed in absolute and relative frequencies (%). Statistically significant difference was determined by $\chi^2$ test with the level of significance set at $p=0.05$. Relative risk (RR) indicator was obtained by dividing the risk of periodontal diseases at smokers with the risk of diseases at non-smokers. The confidence interval (CI) of 95%, was used in research of correlation between smoking and periodontal diseases.
In the age group of 30 to 39 healthy periodontal tissue was more frequently found in non-smokers (11; 8.9%) compared to smokers (8; 5.9%), and similar to the previous age group, calculus was the most common finding in 108 (84.4%) smokers and 97 (85.8%) non-smokers. Statistically, significant difference was not found considering periodontal health dependent on smoking habits (p=0.471).

In the age group of 40 to 49, more non-smokers had healthy periodontium than smokers (10; 7.2% vs. 6; 4.5%). Calculus was the most common finding in 105 (82%) smokers and in 107 (83.6%) non-smokers. In this age group there was also no statistically significant difference considering periodontal health between smokers and non-smokers (p=0.332) (Table 2).

Values of relative risk of gingival bleeding, calculus and shallow periodontal pockets are about 1, which shows that both, smokers and non-smokers have the same chances to suffer from those diseases (Table 3). However, smokers are twice as likely to be affected by deep periodontal pockets.

**DISCUSSION**

The purpose of the research was to determine how smoking of tobacco and tobacco products affects human health. The results show that prevalence of periodontal diseases in Prozor-Rama Municipality is very high in both, smokers and non-smokers. According to the results of the present study the influence of tobacco smoke and smoking habits is not as high as it was thought to be. These results showed that smokers had more periodontal disease symptoms (shallow and deep periodontal pockets, noticeable destruction of alveolar bone) than non-smokers. The obtained results are similar to the results obtained by Računica et al. (24).

Epidemiological and clinical studies show that tobacco and its use is a risk factor for occurrence and development of periodontal disease (25-30). Study of Kinanae and Chesnutt showed that persons who stopped smoking reduced the risk of periodontal diseases, which was associated with negative impact of smoking on humoral and cellular immune reaction (31).

Our study showed that 3.1% of smokers and 4.5% of non-smokers had healthy periodontal tissue, while a large proportion of respondents had some symptoms that indicated the presence of periodontal disease. It is important to point out that calculus was found only in few older respondents (40-49 years old), significantly more represented among youth, but not statistically significant. Explanation of this could be that older respondents are more motivated in preservation of their oral health than members of younger groups. Patients’ motivation to preserve their oral health is very important in periodontal disease prevention.

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Patients’ motivation to preserve their oral health is very important in periodontal disease prevention.

Our study showed high prevalence of periodontal diseases - 8% participants needed instructions on proper oral hygiene, 81.8% needed prophylaxis and initial treatment (PROPH), and 2.6% needed a complex periodontal treatment (SPEC).

All studies in the last 20 years confirmed that, regardless any other additional factors, smoking was a high risk of periodontal diseases (32-34).

The study using the CPITN in 10320 sextants of 1720 participants showed that healing of periodontium in the highest percentage can be done in the primary dental care (21).

There was no enough research on risks of occurrence and prevalence of periodontal diseases in

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**Table 3. Values of relative risk according to periodontal conditions**

<table>
<thead>
<tr>
<th>Periodontal conditions</th>
<th>Relative risk</th>
<th>CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gingival bleeding</td>
<td>1.065</td>
<td>0.67 – 1.70</td>
</tr>
<tr>
<td>Calculus</td>
<td>1.003</td>
<td>0.93 – 1.08</td>
</tr>
<tr>
<td>Shallow periodontal pockets</td>
<td>1.063</td>
<td>0.54 – 2.07</td>
</tr>
<tr>
<td>Deep periodontal pockets</td>
<td>2.000</td>
<td>0.82 – 4.90</td>
</tr>
</tbody>
</table>

CI, confidence interval

**Table 4. Classification of smokers and non-smokers according to the needs of treating periodontal disease**

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Total (n=800)</th>
<th>Healthy periodontium - no need for any treatment</th>
<th>Oral hygiene instructions (OHI)</th>
<th>Polishing of tooth root and curettage (PROPH)</th>
<th>Specialist periodontal treatment (SPEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smokers (n=400)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smokers (n=400)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy periodontium - no need for any treatment</td>
<td>25 (6.3)</td>
<td>36 (9)</td>
<td>61 (7.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral hygiene instructions (OHI)</td>
<td>33 (8.3)</td>
<td>31 (7.8)</td>
<td>64 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polishing of tooth root and curettage (PROPH)</td>
<td>328 (82)</td>
<td>326 (81.5)</td>
<td>654 (81.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialist periodontal treatment (SPEC)</td>
<td>14 (3.5)</td>
<td>7 (1.8)</td>
<td>21 (2.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bosnia and Herzegovina. One of the earliest investigations in 1978 showed that the prevalence of oral diseases (caries, periodontitis and malocclusion) was registered in 75% of participants. Signs of periodontal disease were found to be 51% in the group of 14 year olds, 63.5% in the age group between 35 and 44. In the age group of 25 to 44 years periodontal disease was found in 86.4% of participants (35).

Oral hygiene improvement is the primary goal. Although in available international literature smoking has been declared as a significant risk for periodontal disease development, very poor oral hygiene obviously masked pathological effects of smoking on periodontal tissues in the present study. Obtained results indicate a high need for preventive measures and a need for the improvement of oral health in both studied groups in this region.

FUNDING
No specific funding was received for this study.

TRANSPARENCY DECLARATIONS
Competing interests: none to declare.

REFERENCES
Prevalencija parodontnih bolesti u sjevernoj Hercegovini
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SAŽETAK

Cilj Istražiti štetnost pušenja kao lokalnog čimbenika na promjene parodonta (potporne strukture zuba) i nastanak parodontne bolesti među stanovnicima sjeverne Hercegovine.

Metode Istraživanje je obuhvatilo 800 osoba, u dobi od 20 do 49 godina (400 pušača i 400 nepušača), stanovnika općine Prozor-Rama u Bosni i Hercegovini. Parodontološka procjena stanja napravljena je primjenom zajedničkog indeksa potrebe tretmana (CPITN) na reprezentativnim zubima: 16, 17, 21, 26, 27, 36, 37, 31, 46 i 47. Statistički značajna razlika između nepušača i pušača utvrđena je χ² testom uz razinu značajnosti p=0,05.

Rezultati Prevalencija zdravih parodontnih tkiva bila je niža u pušača nego u nepušača, 25 (6,3%), odnosno 36 (9%). Prevalencija krvenja gingive, zubnog kamencu, plitkih i dubokih džepova bila je veća u pušača nego u nepušača, iako razlika nije bila statistički značajna. Utvrđen je veći rizik pojave dubokih parodontnih džepova kod pušača (RR=2). Ukupno 64 (8%) ispitanika trebalo je samo upute za pravilnu oralnu higijenu, 654 (81,8%) profilaksu i početno liječenje, dok je 21 (2,6%) ispitanik trebao složeni parodontni tretman.

Zaključak Dobiveni rezultati ukazuju na visoku potrebu prevencije i unapređenja oralnog zdravlja među stanovnicima sjeverne Hercegovine.

Ključne riječi: Bosna i Hercegovina, nikotin, nepušači, pušači, parodont, Prozor-Rama