Smoking and Other Factors Influencing the Oral Health of Lithuanian Army Recruits

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The aim of our research was to determine the prevalence of smoking among Lithuanian army recruits and how smoking and other factors affect oral health. The findings of our research showed that 70% of recruits smoke. The analysis of the research findings showed that smoking had a negative effect on oral hygiene. Especially smoking was harmful with respect to periodontal tissues. The periodontal lesions were more prevalent and severe among recruits who smoked. Smokers had a higher Community Periodontal Index of Treatment Needs index than nonsmokers. The analysis of the research findings showed that the state of oral health was related to other factors, such as oral hygiene, age, and education. It was determined that the oral hygiene of males living in the countryside and having poorer education was worse than that of males living in the city. Their status of periodontal tissues was worse, and they had more decayed and untreated teeth. The findings of the logistical regression analysis showed that poor education and living in the country, irregular tooth brushing, poor oral hygiene, and smoking were the most important factors related to a great number of untreated decayed tooth surfaces.

Introduction

A high prevalence of periodontal diseases and dental caries among young people causes considerable concern to the dentists and scientists all over the world. The goal of the scientific research was to identify the factors influencing the status of periodontal tissues and the intensity of dental caries. One of these factors is smoking. That was why determining smoking as a harmful habit among people was very important.

The analysis of the research findings in Canada showed how prevalent smoking among army recruits was.

Many investigators all over the world proved the harm of smoking to general health. Several studies demonstrated that army soldiers who smoked were more likely to sustain injuries during training and occupational activities. The harm of smoking to the oral health is obvious. Smoking worsens oral hygiene, and the teeth of the smokers are more overgrown with supragingival and subgingival calculus. These findings were confirmed by research from foreign authors. According to the 1997 findings of Muller et al., young men who smoke 20 or more cigarettes per day have a 14 times higher risk of developing advanced periodontitis than nonsmokers.

In addition to smoking, there are many other factors influencing oral health. The majority of scientific works confirm that one of the etiological factors of periodontal diseases is poor oral hygiene. Poor oral hygiene also influences the formation of dental caries and the growth of their intensity. The density of dental caries directly depends on age. However, the structure of the intensity of dental caries and the extent of the lesions of periodontal tissues may be influenced by a whole range of other factors, including social factors. Many authors highlight the influence of place of residence and education of the examined individuals on the status of their periodontal tissues. Young men with poorer education had more untreated decayed teeth, their oral health was worse, and the lesions of their periodontal tissues were more severe. Although due to prophylaxis the morbidity with dental decay significantly decreased in various countries, it still remains considerable among young men of lower social status and with poorer education.

Methods

Six hundred eighteen Lithuanian army recruits were examined. They were chosen by random selection. The age of men varied from 17 to 30 years. Dental examination and questionnaires were used in the examination. The participants were asked about their place of residence, education, smoking habits, and the frequency of tooth brushing.

Clinical examination was performed on a dental chair, using dental probe, mirror, and a periodontal probe to determine the CPI (Community Periodontal Index of Treatment Needs) index in accordance with the protocol recommended by the World Health Organization.

Oral hygiene was evaluated using the Oral Hygiene Index, simplified (OHI-S) (Green-Vermillion). The OHI-S index consists of two components: plaque index (DI) and calculus index (CI). OHI-S = DI + CI (*calculus = mineralized plaque).

There were examined vestibular surfaces of 16, 11, 26, and 31 teeth and lingual surfaces of 36 and 46 teeth. If there was no first molar, the second molar was examined, if there was no central incisor, the lateral incisor was examined. The criteria of the plaque index (DI) are as follows: 0—no plaque present; 1, soft plaque covering not more than one-third of the tooth surface; 2, soft plaque covering more than one-third, but less than two-thirds of the tooth surface; and 3, soft plaque covering more than two-thirds of the tooth surface. The criteria of the calculus index (CI) are: 0, no calculus present; 1, supragingival calculus covering not more than one-third of the tooth surface; 2, supragingival calculus cover more than one-third, but less than two-thirds of the tooth surface and some subgingival calculus; and 3, supragingival calculus covers more than two-thirds of the tooth surface and subgingival calculus is present.
The sum of scores is divided into six (the number of examined teeth).

The periodontal status was evaluated using the Community Periodontal Index of Treatment Needs (CPTN, 1982; World Health Organization) index. The status of periodontium was evaluated by points. Community Periodontal Index (CPI) codes and Treatment Needs are described in Table I.

Dental caries were determined using the DMF index (decayed, filled, extracted). The index was recommended by Klein and co-authors in 1938. DMF-T (teeth) and DMF-S (surfaces) indexes were used.

DMF-T describes the total number of teeth with present and previous caries experience, including untreated caries (the D component), extracted (missed) teeth due to caries (the M component), and treated (usually filled) caries (the F component).

The statistical analysis was performed using SPSS 10.0 for Windows (SPSS, Chicago, Illinois), where represents test and represents square analysis. The significance was accepted at 0.005. Using the method of logistical regression, we determined which of the factors had the major influence on the formation of dental caries on the dental surface.

Results

Six hundred eighteen young men participated in our research. Their average age was 21 years. The men were divided into two age groups: 17–20 years and 21 years and older. The examined participants lived in different regions of Lithuania, the regions of Klaipeša and Kaunas. According to the place of residence, we divided the men into three groups: those living in a city, in the countryside, and in district centers. According to our findings, the majority of the examined men were residents of the countryside and district centers. In the course of the research, it was determined that the recruits were poorly educated. The majority of recruits (60.2%) did not have secondary education, 28.2% of them had secondary education, and 10.1% of the subjects had special secondary education. Comparing the education of those living in the city with those living in the countryside, it was obvious that the men who lived in the city were more educated.

The data on smoking among Lithuanian army recruits were not satisfactory. Many of the young men smoked daily (62.3%) and 8% of the participants smoked sometimes. Nonsmokers made up 29.7% of all participants. There was no difference in smoking frequency between recruits living in the city and in the country. According to our findings, young men who had a higher education smoked less. As shown in Table II, as many as 72.9% of the recruits who had primary and uncompleted secondary education smoked daily, whereas only 49.2% of the recruits who had secondary and special secondary education were smokers.

From the questionnaire we found that the participants started smoking early, approximately since they were 16.5 years old. As many as 46.6% of the participants started smoking earlier than at the age of 16 years. The harm of smoking to oral health was dependent on for how long and how intensively the recruits smoked. Our findings showed that Lithuanian army recruits smoked often and a lot. As demonstrated in Table III, 34.1% of the recruits smoked 10 to 20 cigarettes per day, and one-half of the young men (49.8%) smoked as many as 20 to 40 cigarettes per day.

While analyzing the influence of smoking to oral health, we found that there was a direct relationship between them. Oral hygiene was negatively affected by smoking, which especially stimulated the overgrown sextants with supragingival and subgingival calculus. The recruits who smoked had more sextants overgrown with calculus. Recruits who smoked daily had calculi

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<thead>
<tr>
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<th>Description of the Condition (CPI)</th>
<th>TN</th>
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</tr>
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<tbody>
<tr>
<td>0</td>
<td>Healthy</td>
<td>I</td>
<td>Oral hygiene instructions</td>
</tr>
<tr>
<td>1</td>
<td>Bleeding on probing</td>
<td>II</td>
<td>Oral hygiene instructions, scaling</td>
</tr>
<tr>
<td>2</td>
<td>Pockets up to 4–5 mm</td>
<td>III</td>
<td>Oral hygiene instructions, scaling and root planning, complex treatment</td>
</tr>
<tr>
<td>3</td>
<td>Deepers up to 4–5 mm</td>
<td></td>
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Factors Influencing Oral Hygiene Health  

in 2.3 (2.1 SD) (average) sextants and nonsmokers only in 1.4 (1.8 SD) sextants ($p < 0.001$). Young men who smoked a lot had a significantly higher OHI-S compared to nonsmokers (Table IV).

Having analyzed the periodontal tissue status, the CPITN index was determined. This index gives a good opportunity to compare changes in periodontal tissues and their relationship with various influencing factors. According to our findings, the CPITN index of the recruits was 1.4 (0.7 SD). The higher the mean of this index was, the worse the status of periodontal health. Table V presents the association between periodontal status and oral hygiene.

As shown in Table III, the CPITN index of the recruits with perfect (0.2 (0.2 SD)) or good (0.6 (0.3 SD)) oral hygiene was significantly lower than the CPITN index of the examined recruits with poor oral hygiene (2.0 (0.6 SD), $p < 0.001$).

The analysis of periodontal tissue showed a direct relationship between the CPITN index and smoking. As demonstrated in Table VI, the CPITN index in the recruits who smoked was significantly higher (1.5 (0.7 SD)) than that in those who did not smoke (1.2 (0.8 SD), $p < 0.001$). During the research we also investigated other factors influencing oral health.

The periodontal status was analyzed considering the place of residence of the subjects. The CPITN index of the recruits living in the countryside (1.6 (0.7 SD)) was significantly higher than that of those living in the city (1.2 (0.7 SD), $p < 0.001$). We also compared the periodontal status of the examined men with different levels of education. It was determined that the CPITN index of the participants with primary and uncompleted secondary education (1.6 (0.7 SD)) was significantly higher than the index of the examined having secondary and special secondary education (1.2 (0.7 SD)).

The aim of our work was also to determine the factors influencing the index of the intensity of tooth decay. We explored its dependence on age and place of residence. The influence of tooth brushing and smoking on the index of the intensity of tooth decay was determined. The index of the intensity of tooth decay was not influenced by the place of residence, smoking habits, or education of the Lithuanian military recruits. These findings were mostly influenced by the age of the examined men. DMF-T of an age group of 21 years and older (DMF, 10.2 (4.6 SD)) was significantly higher than that of the recruits from ages 17 to 20 years (8.7 (4.3 SD), $p < 0.001$). When analyzing the dependence of the DMF-S index of the intensity of tooth decay on the factors indicated above, it was noticed that the index was rising with age. It was also determined that the index of the intensity of tooth surface decay in the participants living in the countryside (20.4 (14.0 SD)) was significantly higher than that in the participants living in the city, whose DMF-S was only 15.9 (12.4 SD, $p < 0.001$). The index of the intensity of decayed tooth surfaces was not influenced by the level of education and smoking, but it was positively influenced by the frequency of tooth brushing. Tooth brushing influenced the DMF-S index more positively ($p < 0.01$) than the DMF-T index ($p < 0.05$). The findings concerning the frequency of tooth brushing were subjective. They depended on whether the subjects gave correct answers to this question. Therefore the index of oral hygiene showed the influence of the intensity of dental caries more precisely. The findings of the intensity of tooth decay in the young men studied having perfect and good oral hygiene were compared with the findings on the recruits having satisfactory and poor oral hygiene (DMF-T and DMF-S indexes) (Table VII).

The findings given in Table V show that the participants with perfect and good oral hygiene had a significantly lower DMF-T index of the intensity of tooth decay. The index of the intensity of dental surface decay (DMF-S) in the recruits with good oral hygiene also differed a lot from that in the recruits with poor oral hygiene. Not only the influence of some factors to the index of the intensity of tooth decay, but also the way these factors influenced particular components of the indexes were analyzed. According to our findings, the mean number of decayed and untreated teeth (D) in the examined recruits living in the countryside (10.6 (9.2 SD)) was much higher than that in those living in the city (7.1 (6.7 SD), $p < 0.001$). The young men who smoked, did not brush their teeth, and had poorer education had more untreated teeth. The mean of their decayed dental surfaces was 10.5 (9.2 SD), 11.7 (8.7 SD), and 10.3 (8.9 SD), respectively. The mean of the decayed dental surfaces of the recruits who did not smoke, brushed their teeth often, and had secondary or special secondary education was 5.6 (6.2 SD), 6.1 (6.6 SD), and 6.6 (7.3 SD), respectively ($p < 0.001$).

Applying binary logistic regression analysis (Enter method), the relationship of factors (age, education, place of residence, tooth brushing, index of oral hygiene, smoking) with caries of dental surfaces was assessed. The proportion of the possibility to have nine and more decayed dental surfaces (nine was the average DS number of the participants) was calculated. The possibility to have nine and more decayed dental surfaces in the young people living in the countryside and having primary and unfinished secondary education was one and a half times higher than that in the young men living in the city and having better education. The probability

### TABLE V

<table>
<thead>
<tr>
<th>Oral Hygiene According to OHI-S</th>
<th>N = 318</th>
<th>Kaunas Region CPITN (1.4 (0.74))</th>
<th>N = 295</th>
<th>Klaipeda Region CPITN (1.48 (0.73))</th>
<th>N = 613</th>
<th>Total CPITN (1.44 (0.74))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>2.0 (0.2)</td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>55</td>
<td>33</td>
<td>88</td>
<td>1.3 (0.6)</td>
<td>6 (0.3)</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>1.3-3.0</td>
<td>132</td>
<td>132</td>
<td>264</td>
<td>1.3 (0.6)</td>
<td>6 (0.3)</td>
</tr>
<tr>
<td>Poor</td>
<td>3.1-6.0</td>
<td>123</td>
<td>126</td>
<td>249</td>
<td>2.0 (0.6)</td>
<td>6 (0.3)</td>
</tr>
</tbody>
</table>

*F = 94; df = 3; p < 0.001*  

$F = 110.4; df = 3; p < 0.001$  

$F = 199.1; df = 3; p < 0.001$
Factors Influencing Oral Hygiene Health

Discussion

The analysis of our research findings showed that oral health was influenced by smoking. This harmful habit was widespread among Lithuanian army recruits. As many as 70% of all recruits smoked and had started smoking at a young age. For example, recruits of the Spanish army started smoking at approximately 16.5 years ago. Sixty-five percent of them smoked 10 cigarettes per day and more. However, our recruits smoked more intensively: 34.1% smoked from 10 to 20 cigarettes per day and as many as 49.8% smoked from 20 to 40 cigarettes per day.

Having compared oral hygiene indexes of nonsmokers and smokers, we determined that oral hygiene in nonsmokers was significantly better (OHI = 2.2 (1.2 SD)) compared to the smokers’ oral hygiene (OHI = 2.9 (1.0 SD), p < 0.001). These data confirmed the opinion of foreign scientists about the influence of smoking on oral hygiene. Poor oral hygiene was shown by subgingival and supragingival calculus. According to our data, recruits who had a significantly higher average number of sextants with calculus compared to nonsmokers. These findings coincide with the findings of Zambon et al., proving that smoking is a risk factor for the accumulation of plaque and calculus.

According to our findings, the periodontal tissues were mostly influenced by oral hygiene. It was determined that the CPITN index of the participants with excellent or good oral hygiene was significantly lower (0.2 (0.2 SD), 0.6 (0.3 SD)) than the index of the participants with excellent or good oral hygiene was significantly lower (0.2 (0.2 SD), 0.6 (0.3 SD)) than the index of the participants with excellent or good oral hygiene was significantly lower (0.2 (0.2 SD), 0.6 (0.3 SD)) than the index of the participants with excellent or good oral hygiene was significantly lower (0.2 (0.2 SD), 0.6 (0.3 SD)) than the index of the examined men with poor oral hygiene (2.0 (0.6 SD), p < 0.001).

These data were confirmed by Lithuanian and foreign scientists who were analyzing the relationship between oral hygiene and periodontal status. It was important to examine how often and how intensively recruits smoked, since those who smoke sometimes develop periodontal diseases only 2 times more frequently, and those who smoke very intensively develop periodontal disease 7.28 times more often than nonsmokers. Having analyzed our data on the periodontal status of Lithuanian army recruits, we determined that smoking had a direct relationship to the prevalence of periodontal diseases. These findings coincide with the findings of Axelsson et al., and Grossi et al., stating that individuals who smoke suffer from periodontal disorders more often and more severely. According to our data, smoking did not have much influence on the prevalence and the intensity of dental caries, but it had a great influence on the structure of the intensity of dental caries. Recruit smokers had significantly more decayed dental surfaces than those of the participants who did not smoke. This showed that smokers did not pay enough attention to their oral health and maybe even to general health.

The findings by foreign researches showed that a large num-

### Table VI

<table>
<thead>
<tr>
<th>Smoking Habits</th>
<th>Kaunas Region CPITN (1.41 (0.74))</th>
<th>Klaipėda Region CPITN (1.48 (0.73))</th>
<th>Total CPITN (1.44 (0.74))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>1.5 (0.7)</td>
<td>1.7 (0.7)</td>
<td>1.6 (0.7)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>1.3 (0.6)</td>
<td>1.1 (0.5)</td>
<td>1.1 (0.5)</td>
</tr>
<tr>
<td>Has never smoked</td>
<td>1.2 (0.8)</td>
<td>1.1 (0.7)</td>
<td>1.2 (0.7)</td>
</tr>
<tr>
<td>Smoked, but have given it up</td>
<td>1.1 (0.8)</td>
<td>1.3 (0.8)</td>
<td>1.2 (0.8)</td>
</tr>
</tbody>
</table>

F = 5.7; df = 3; p < 0.001  
F = 15.7; df = 3; p < 0.001  
F = 18.97; df = 3; p < 0.001

### Table VII

<table>
<thead>
<tr>
<th>Oral Hygiene (OHI-S)</th>
<th>DMF-T (N = 613)</th>
<th>DMF-S (N = 613)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect</td>
<td>9.0 (4.7)</td>
<td>15.8 (8.8)</td>
</tr>
<tr>
<td>Good</td>
<td>8.0 (3.7)</td>
<td>14.1 (8.2)</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>8.9 (4.5)</td>
<td>17.4 (13.2)</td>
</tr>
<tr>
<td>Poor</td>
<td>9.7 (4.7)</td>
<td>19.8 (12.4)</td>
</tr>
</tbody>
</table>

F = 3.65; df = 3; p < 0.01  
F = 5.11; df = 3; p < 0.01

### Table VIII

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nine or More Surfaces with Carious Lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>1.050 (0.987–1.117)</td>
</tr>
<tr>
<td>Education</td>
<td>1</td>
</tr>
<tr>
<td>Secondary and special secondary</td>
<td>1.587 (1.064–2.265)</td>
</tr>
<tr>
<td>Primary and not completed secondary</td>
<td>1.587 (1.064–2.265)</td>
</tr>
<tr>
<td>Place of residence</td>
<td>1</td>
</tr>
<tr>
<td>City</td>
<td>1.542 (1.048–2.270)</td>
</tr>
<tr>
<td>Countryside and district center</td>
<td>1.542 (1.048–2.270)</td>
</tr>
<tr>
<td>Tooth brushing</td>
<td>1</td>
</tr>
<tr>
<td>1 time per day and more often</td>
<td>2.616 (1.732–3.953)</td>
</tr>
<tr>
<td>Not every day and do not clean</td>
<td>2.616 (1.732–3.953)</td>
</tr>
<tr>
<td>Oral hygiene</td>
<td>1</td>
</tr>
<tr>
<td>Perfect and good</td>
<td>2.223 (1.174–4.210)</td>
</tr>
<tr>
<td>Satisfactory and poor</td>
<td>2.223 (1.174–4.210)</td>
</tr>
<tr>
<td>Smoking habits</td>
<td>1</td>
</tr>
<tr>
<td>Do not smoke, sometimes, smoked but have given it up</td>
<td>2.293 (1.523–3.451)</td>
</tr>
<tr>
<td>Daily</td>
<td>2.293 (1.523–3.451)</td>
</tr>
</tbody>
</table>

* Odds ratio significance, p < 0.05.
Our data confirmed this opinion. Young men living in the countryside and having poor education had significantly worse oral status. They had significantly more untreated teeth, deeper periodontal lesions, and their oral hygiene was worse.

Conclusions and Implications for Practice

Our study showed that the majority (70%) of Lithuanian army recruits smoked. Smoking is equally prevalent among the inhabitants of urban and rural areas, but smoking is significantly less common in individuals with higher education levels.

The analysis of the obtained findings showed that smoking was negatively associated with oral hygiene status, the OHI in individuals who smoked was lower, and their teeth were more frequently covered with subgingival and supragingival calculi. Smoking also influenced the occurrence of periodontal tissue damage. The obtained findings showed that the CPITN was significantly higher in army recruits who smoked than in nonsmokers. If the most common oral disorder among Lithuanian army recruits is gum bleeding, the periodontal damage among smokers is more common and deeper.

In addition to smoking, oral health is also influenced by other factors, especially by poor oral hygiene, which in turn is conditioned by a number of other factors, including the social ones.

We found that recruits with excellent and good oral hygiene had a significantly lower CPITN index compared to recruits with poor oral hygiene. We also determined that the condition of periodontal tissues was poorer among inhabitants of rural areas and individuals with lower levels of education. This probably is influenced by poorer oral hygiene in recruits coming from the rural areas as well as their lower education levels. Smoking and irregular tooth brushing were significantly more common among recruits with lower levels of education, which resulted in poorer oral hygiene among inhabitants of rural areas.

Oral hygiene influences not only the condition of periodontal tissues, but also has a significant impact on the intensity of tooth decay. Our findings showed that recruits with excellent and good oral hygiene had fewer decayed teeth and dental surfaces. The intensity of decay of dental surfaces is also influenced by other factors, such as age, place of residence, education, and smoking. This study showed that the mean number of decayed and untreated teeth was significantly higher in recruits from rural areas compared to that in recruits from the urban areas. The findings of logistic regression analysis showed that poor education, living in rural areas, irregular tooth brushing, low oral hygiene index, and smoking were the most important factors associated with high numbers of untreated decayed teeth.

The findings on poor oral conditions in Lithuanian army recruits show insufficient motivation for dental care and treatment and possibly reflect these young people’s attitudes to health in general.

The facts that 50.7% of all recruits did not brush their teeth daily, 11.6% did not brush their teeth at all, 70% of the recruits were smokers, and the majority of them visited the dentist only in case of toothache show the recruits’ irresponsible approach to their oral health. For this reason, we think that recruits and soldiers need a prepared and implemented prophylactic program, including the development of oral hygiene skills, anti-smoking policy, and education concerning regular treatment of dental and oral diseases. The program should promote a healthy way of life, healthy nutrition, and physical activity.

References