

# Factors influencing the health of periodontal tissue and intensity of dental caries

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## SUMMARY

Having examined 613 of young men whose average age was 21 year, we determined that the most common diseases they had were periodontal diseases (97.2 percent) and dental caries (99 percent). The aim of our work was to find out the factors influencing the status of periodontal diseases and structure of dental caries intensity.

The analysis of the research findings showed that the state of periodontal tissues had direct connection with oral hygiene. The CPITN index of the young men whose oral hygiene is bad appeared to be much higher than that of the men whose oral hygiene is good. Smoking has a negative effect on the periodontal health. Besides, it was determined that the oral hygiene of the men living in the country and having a poorer education was worse than that of the men living in the city.

Smoking and living in the country has no influence on the intensity of dental caries. The intensity of dental caries rises with age. But the whole range of factors influencing the structure of dental caries index (DMF-S) was determined. According to our findings, the number of the decayed tooth surfaces depended on the education, living place, oral hygiene and smoking habits of the young men. The findings of the logistical regression showed that poor education and living in the country, irregular teeth brushing, satisfactory and bad oral hygiene, and smoking are the most important factors connected with a great number of untreated decayed tooth surfaces.

**Key words:** oral hygiene, smoking, education, periodontal diseases, dental caries

## INTRODUCTION

Great prevalence of periodontal diseases and dental caries among young people causes considerable concern of the dentists and scientists all over the world [11, 17, 24, 27, 29, 30]. The goal of the scientific research was to find out the factors influencing the status of periodontal tissues and intensity of dental caries. The majority of scientific works confirm that one of the etiological factors of periodontal diseases is bad oral hygiene [12, 20, 21, 22, 28]. More and more new works appear proving the harm of smoking to the health of periodontal tissues [4, 13, 14, 15, 26]. Bad oral hygiene also influences the formation of dental caries and the growth of its intensity [6, 32, 25 35]. The intensity of dental caries directly depends on age [34]. But the structure of dental caries intensity and the extent of periodontal tissues lesions may be influenced by the whole range of other factors including also social factors. Many authors highlight the influence of living place, education of the examined to the status of their periodontal tissues state [3, 8, 9, 10, 11]. The young men with poorer education have more untreated decayed teeth, their oral health is worse and the lesions of their periodontal tissues are more serious [23, 31, 34]. Although due to prophylaxis the morbidity with dental decay significantly decreased in various countries, still it remains considerable among the young men of lower social status and with poorer education [1, 2].

The aim of our research was to determine the factors influencing the state of periodontal tissues and structure of dental caries intensity.

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## METHODS AND MATERIALS

618 young men 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 residence, education, smoking, habits, how often they brushed their teeth.

Clinical examination was performed on a dental chair, using dental probe, mirror and the periodontal probe to determine the CPITN index.

Oral hygiene was evaluated by OHI-S index (Green-Vermillion). The OHI-S index consists of 2 components: the debris (plaque) index (DI) and the calculus index (CI).  $OHI-S = DI + CI$ .

Vestibular surfaces of the 16; 11; 26; 31 and lingual surfaces of 36 and 46 teeth were examined. If the first molar was not present, the second molar was examined, in case if the central incisor was absent, the contra-lateral central incisor was examined.

### The criteria of plaque evaluation:

0 – no plaque;  
1 – soft plaque, which covers 1/3 of the tooth surface;  
2 – soft plaque, which cover more than 1/3, but less than 2/3 of the tooth surface;  
3 – soft plaque covers more than 2/3 of the tooth surface.

### The criteria of calculus evaluation:

0 – no calculus;  
1 – supragingival calculus, which covers 1/3 of the tooth surface;  
2 – supragingival calculus, which covers 1/3-2/3 of the tooth surface;  
3 – supragingival calculus, which covers more than 2/3 of the tooth surface.

The sum was divided by 6 (the number of the examined). The evaluation of OHI-S index:

Oral hygiene	Points
Perfect	0
Good	0,1 – 1,0
Satisfactory	1,1 – 2,0
Bad	2,1 – 6,0

The dental caries was determined by 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.

The periodontal status was evaluated by CPITN (WHO) index (Community Periodontal Index of Treatment Needs, 1982). The status of periodontium was evaluated by points. The description of the CPITN index:

Code	The description of condition
Code 0	Healthy periodontal tissues
Code 1	Bleeding on gentle probing
Code 2	Supragingival and/or subgingival calculus
Code 3	Shallow pockets up to 4-5 mm
Code 4	Deeper pockets from 6 mm

The statistical analysis was performed using SPSS 10.0 for Windows, where t stands for 'test' and chi for 'square analysis'. The significance was accepted at the  $p < 0.005$ . Using method of logistical regression we found out which of the features had the major influence on dental caries's formation on dental surface.

## RESULTS AND DISCUSSION

618 young men participated in our research. Their average age was 21 year. The men were divided into two age groups: 17 to 20 year and 21 year and senior. The examined participants lived in different regions of Lithuania, the regions of Klaipeda and Kaunas. Regarding to the living place, we divided the men into three groups: living in a city, country and the district centre. According to our findings, the majority of the examined men were the residents of country and district center (Table 1). In the course of the research it was determined that the recruits were poorly educated. The most recruits (60.2 %) did not have secondary education, 28.2 percent had secondary education and 10.1 percent had special secondary education. Comparing the education of those living in the city with those living in the country, it is obvious that the men who live in the city are more educated (Table 2).

The findings of the epidemiological researches showed great prevalence and intensity of dental caries and periodontal tissues diseases. Having done the analysis of periodontal tissues, we determined that 97.2 percent of the examined men suffered from the lesions periodontal tissues of lower or higher degree. The most common dental disease among the examined participants was dental caries. Its prevalence reaches 99.0 percent. The average (DMF-T) number of the decayed teeth of the examined participants is 9.1 (4.5). The dental caries prevalence and intensity of tooth surface is even bigger. The average (DMF-S) findings of decayed tooth surfaces are 17.9 (12.3).

The periodontal status was evaluated by CPITN index. According to the CPITN index, the most frequent periodontal lesions are gum bleeding on probing, which was determined to 77.5 percent of the young men. 74.9 percent recruits from Finland also suffered from gum bleeding, it reaches 66.4 percent among Russian recruits.

During the research more serious periodontal lesions: subgingival and supragingival calculi, pockets up to 4-5 mm, were determined. 62 percent of the examined were determined to have subgingival and supragingival calculi. There were recruits who had calculi in all sextants (7.8 percent), and the calculi covered not only vestibular and oral surfaces, but also occlusion surfaces. Less frequent lesions among the examined were pathological pockets up to 4-5 mm. 23 percent of the young men suffered from them. 1.8 percent of the examined had deeper than 6 mm pockets.

Our findings concerning the periodontal health of the participants are similar to the findings of Shutenhaus S. (1996) about the periodontal health of the recruits of Germany [33]. While analyzing the material of the research we tried to determine the factors, connected with periodontal pathology and dental caries intensity. The analysis of the CPITN index showed that there were some factors influencing the extent of this index. Firstly we noticed the direct connection between CPITN index and oral hygiene (Table 3).

The results given in the third table apparently indicate that the participants with perfect and good oral hygiene have significantly smaller CPITN index, i.e. 0.2 (0.2) and 0.6 (0.3) than those with bad oral hygiene, i.e. 2.0 (0.6) ( $p < 0.001$ ). It proves once again that bad oral hygiene and microbial scurf are an important factor of the risk of periodontal diseases. The research of other authors proved the same [Lang W. et. Al., 1994; Loe H., 1993; Milciuviene S., Sadunaite K., 2000]. It was also determined that CPITN index was negatively affected by smoking. According to our findings, the CPITN index of the recruits who smoke is significantly bigger (1.5 (0.7)) than that of those who do not smoke (1.2 (0.8)) ( $p < 0.001$ ) (Table 4).

Besides the teeth of the smoking young men are more overgrown with supragingival and subgingival calculi. The smoking recruits had meanly 2.3 (2.1) sextants overgrown with calculus, those who did not smoke had only 1.4 (1.7) ( $p < 0.001$ ). These findings coincide with the findings of Axelson O. (1998) and Grossi S.G., stating that smoking people suffer from periodontal diseases more often and more severely [4, 14]. The periodontal status was analyzed considering the place of residence of the subjects. The CPITN index of the young men living in the country 1.6 (0.7) is significantly bigger than that of those living the city 1.2 (0.7) ( $p < 0.001$ ) (Table 5). Similar findings were estimated while exploring the connection between oral hygiene and residence place. The worse periodontal status of the young men living in the country is influenced by their bad oral hygiene. We also compared the periodontal status of the examined having different education. It was determined that the CPITN index of the participants with a primary and uncompleted secondary education (1.6 (0.7)) is significantly

**Table 1.** Distribution of the subjects according to their place of residence.

Place of residence	Kaunas region (n=315)	Klaipeda region (n=295)	The whole contingent (n=611)
City	36.2 %	42.4%	39.0%
Country	36.5 %	55.6%	45.5%
District center	27.3%	2.0%	15.0%

$\chi^2 = 78.1$ ;  $df = 2$ ;  $p < 0.001$

**Table 2.** Education of the subjects according to the place of residence.

Education	Kaunas region (n=315)			Klaipeda region (n=295)			Total (n=610)		
	City (n=114)	Country (n=115)	District center (n=86)	City (n=125)	Country (n=164)	District center (n=6)	City (n=239)	Country (n=279)	District center (n=92)
	%	%	%	%	%	%	%	%	%
Primary and not completed secondary	58.8	81.7	33.7	41.6	76.2	100	48.8	78.5	38.0
Secondary and special secondary	41.2	18.2	66.3	8.4	23.8	0	50.2	21.5	62.0

**Table 3.** Means of CPITN index which depend on oral hygiene.

Oral hygiene according to OHIS	N=318	Kaunas region CPITN (1.41(0.74))	N=295	Klaipeda region CPITN (1.48(0.73))	N=613	Total CPITN (1.44(0.74))
0 perfect hygiene	8	0.3(0.2)	4	0	12	0.2(0.2)
0.1-1.29 good hygiene	55	0.6(0.4)	33	0.6(0.3)	88	0.6(0.3)
1.3-3.0 satisfactory	132	1.3(0.6)	132	1.2(0.6)	264	1.3(0.6)
3.1-6.0 poor	123	1.9(0.6)	126	2.1(0.5)	249	2.0(0.6)
		$F=94$ ; $df=3$ ; $p<0.001$		$F=110.4$ ; $df=3$ ; $p<0.001$		$F=199.1$ ; $df=3$ ; $p<0.001$

**Table 4.** Means of CPITN index according to smoking habits

Smokes	Kaunas KPC CPITN (1.41±0.74)	Klaipeda KPC CPITN (1.48±0.73)	Total CPITN (1.44±0.74)
Daily	1.5±0.7	1.7±0.7	1.6±0.7
Sometimes	1.3±0.6	1.1±0.5	1.1±0.5
Has never smoked	1.2±0.8	1.1±0.7	1.2±0.7
Smoked, but has given up	1.1±0.8	1.3±0.8	1.2±0.8
	$F=5.7$ ; $df=3$ ; $p<0.001$	$F=15.7$ ; $df=3$ ; $p<0.001$	$F=18.97$ ; $df=3$ ; $p<0.001$

**Table 5.** Means of CPITN according to the place of residence.

Place of residence	Kaunas KPC CPITN (1.41±0.74)	Klaipeda KPC CPITN (1.48±0.73)	Total CPITN (1.44±0.74)
City	1.2±0.7	1.2±0.7	1.2±0.7
Country	1.5±0.7	1.7±0.7	1.6±0.7
District centre	1.4±0.8	1.5±0.5	1.4±0.8
	$F=7.35$ ; $df=2$ ; $p<0.001$	$F=15.7$ ; $df=2$ ; $p<0.001$	$F=21.3$ ; $df=2$ ; $p<0.001$

**Table 6.** Means of CPITN index according to education.

Education	Kaunas KPC CPITN (1.41±0.74)	Klaipeda KPC CPITN (1.48±0.73)	Total CPITN (1.44±0.74)
Primary and not completed secondary	1.6±0.7	1.6±0.7	1.6±0.7
Secondary and special secondary	1.2±0.7	1.2±0.7	1.2±0.7
	$p<0.001$	$P<0.001$	$p<0.001$

bigger than the index of the examined having secondary and special secondary education (Table 6). The results of the research of the examined living in Kaunas and Klaipeda regions are analogous. Consequently the forms of periodontal lesions of the subjects living in the city and having better education are not as serious as those of the subjects living in the country and having poorer education.

The goal of our work was to determine the factors influencing the index of the decayed teeth intensity. We explored its dependence on age and residence place. The influence of teeth brushing and smoking upon the index of the decayed teeth intensity was determined. The findings given in the seventh table show that the index of the decayed teeth intensity is not influenced by the place of residence, smoking habits and education of the Lithuanian military recruits. These findings are mostly influenced by the

age of the examined. DMF-T of an age group of 21 and more (DMF – 10.2 (4.6)) is significantly bigger than that of the recruits from 17 to 20 years old (8.7 (4.3)) ( $p<0.001$ ). While analyzing the dependence of DMF-S index of the decayed teeth intensity on the factors indicated above, it was noticed that the index is rising with years. It was also determined that the index of the decayed teeth surfaces intensity if the participants live in the country (20.4 (14.0)) is significantly bigger than that of the participants living in the city whose DMF-S is only 15.9 (12.4)) ( $p<0.001$ ) (Table 8). The index of the decayed teeth surface intensity was not influenced by the education and smoking but it was positively influenced by frequency of teeth brushing. DMF-S index is more positively ( $p<0.01$ ) influenced than DMF-T index ( $p<0.05$ ) by teeth brushing. The findings concerning the frequency of teeth brushing are subjective. They depend on whether the subjects give correct answers to this question. Therefore the index of oral hygiene shows the influence of dental caries intensity more precisely. The findings of the decayed teeth intensity of the young men having perfect and good oral hygiene were compared with the findings of the recruits having satisfactory and bad oral hygiene (DMF-T and DMF-S indexes) (Table 9).

The findings given in the ninth table shows that the participants with perfect and good oral hygiene have significantly smaller DMF-T index of the decayed teeth intensity. The index of the decayed dental surface intensity (DMF-S) of the recruits with good oral hygiene also differ a lot from that of the recruits with bad oral hygiene. These findings are confirmed by researches of foreign authors [Burt B. A., 1998; Bedi R. et al., 1992; Hyman J.J., 1983]. Not only the influence of some factors to the index of the decayed teeth intensity, but also the way these factors influenced particular components of the indexes. According to our findings the average of decayed and untreated teeth (D) of the examined living in the country (10.6 (9.2)) is much bigger than that of those living in the city (7.06 (6.7)) ( $p<0.001$ ). The young

men, who smoke, do not brush their teeth and have poorer education have more untreated teeth. The average of their decayed dental surfaces is 10.3 (8.9), 10.5 (9.2) and 11.7 (8.7). The average of the decayed dental surfaces of the recruits who do not smoke, brush their teeth often and have secondary or special secondary education is 6.6 (7.3), 5.6 (6.1) and 6.1 (6.6) ( $p<0.001$ ).

Applying binary logistic regression analysis (Enter method) the connection of factors (age, education, living place, teeth brushing, index of oral hygiene, and smoking) with caries of dental surface was assessed. The proportion of the possibility to have nine and more decayed dental surfaces (9 was the average DS number of the participants). The possibility to have nine and more decayed dental surfaces of the young people living in the country and having primary and unfinished secondary education was one and a

**Table 7.** Means of DMF-T index of intensity of dental caries according to some particular factors.

Place of examination	DMF-T	Age (year)		Place of residence		Education		Teeth brushing		Smoking							
		17-20	21 and >	City	Country	District centre	Primary and not completed secondary	Secondary and special secondary	More often than 1 time per day	1 time per day	Not every day	Does not clean	Daily	Sometimes	Does not smoke	Smoked but has given up	
<b>Kaunas region</b> (n=318)	9.3(4.6)	8.9(4.4)	9.8(4.8)	9.1(4.2)	9.4(4.1)	9.4(4.1)	9.3(4.6)	9.2(4.5)	9.5(4.2)	8.1(3.9)	9.9(4.8)	9.5(4.8)	9.7(4.5)	9.2(4.2)	8.4(4.8)	8.3(3.9)	
<b>Klaipeda region</b> (n=295)	8.9(4.4)	7.3(3.7)	10.5(4.5)	8.5(3.9)	9.4(4.8)	7.8(2.1)	8.9(4.4)	9.0(4.5)	9.3(3.7)	8.3(4.1)	9.1(4.5)	9.9(4.9)	8.7(4.5)	9.6(2.9)	9.2(4.8)	9.6(4.1)	
<b>Total</b> (n=613)	9.1(4.5)	8.3(4.2)	10.2(4.6)	8.8(4.3)	9.4(4.5)	9.3(4.9)	9.1(4.5)	9.1(4.5)	9.4(4.0)	8.2(3.9)	9.5(4.7)	9.7(4.8)	9.2(2.3)	9.5(3.4)	8.8(4.8)	8.9(4.0)	
		p<0.001								df=4; F=2.6; p<0.03							
		p<0.001								df=4; F=2.6 p<0.03							

**Table 8.** Means of intensity of decayed surfaces according to some particular factors.

Place of examination	DMF-S	Age (year)		Place of residence		Education		Teeth brushing		Smoking							
		17-20	21 ir >	City	Country	District centre	Primary and not completed secondary	Secondary and special secondary	More often than 1 time per day	1 time per day	Not every day	Does not clean	Daily	Sometimes	Does not smoke	Smoked but has given up	
<b>Kaunas region</b> (n=318)	16.6(10.9)	15.7(10.4)	18.1(11.8)	15.2(11.1)	18.5(10.9)	16.0(10.5)	17.1(11.3)	15.7(10.2)	16.4(10.1)	13.1(7.4)	18.7(12.2)	16.6(9.4)	17.9(11.7)	17.3(10.6)	14.1(9.1)	112.6(7.5)	
<b>Klaipeda region</b> (n=295)	17.9(12.3)	13.8(8.2)	24.2(15.4)	16.4(9.8)	21.6(16.7)	15.2(5.8)	19.6(13.3)	18.8(14.1)	19.0(10.0)	17.8(13.8)	19.3(13.6)	22.8(14.8)	19.2(13.9)	18.5(8.6)	20.1(15.3)	19.4(11.8)	
<b>Total</b> (n=613)	17.8(12.3)	14.9(9.6)	21.7(14.3)	15.9(10.4)	20.4(14.0)	15.9(10.3)	18.4(12.4)	17.2(12.3)	17.5(10.1)	15.2(10.9)	18.9(12.9)	19.7(12.7)	18.5(12.8)	18.1(9.2)	16.9(12.7)	15.3(9.9)	
		p<0.05								df=4; F=4.97; p<0.001		df=3; F=3.67; p<0.01					
		p<0.001		p<0.01		df=2; F=10.2 p<0.001				df=4; F=3.3 p<0.01							

**Table 9.** Means of intensity indices of decayed teeth according to oral hygiene.

Oral hygiene (OHI-S)	DMF-T (n=613)	DMF-S (n=613)
Perfect 0	9.0(4.7)	15.8(8.8)
Good 0.1-1.29	8.0(3.7)	14.1(8.2)
Satisfactory 1.3-1.29	8.9(4.5)	17.4(13.2)
Bad 3.1-6.0	9.7(4.7)	19.8(12.4)
<i>F=3.65; df=3; p&lt;0.01</i>		<i>F=5.11; df=3; p&lt;0.01</i>

half time bigger than that of the young men living in the city and having better education. The expectation to have nine and more decayed dental surfaces of the participants who did not brush their teeth daily and whose oral health was satisfactory and poor was as big as that of those who brushed their teeth everyday and whose oral health was good. Smoking increased the possibility to have decayed teeth 2.293 times (Table 10).

## CONCLUSIONS

1. Periodontal status is negatively influenced by smoking and bad oral hygiene. The CPITN index of the examined with perfect and good oral health is significantly smaller than CPITN index of the smoking examined with bad oral hygiene.

2. The young people living in the country have significantly deeper periodontal lesions and their oral health is worse in comparison with the recruits living in the city.

3. The intensity of dental caries of older recruits is significantly bigger than that of younger recruits.

4. The number of decayed dental surfaces depended on education, living place, oral hygiene and smoking. The findings of logistical regression showed that poor education, living in the country, irregular teeth brushing, satisfactory and bad

**Table 10.** Odds ratio to have 9 and more teeth surfaces with carious lesions according age, education, place of residence, teeth brushing, oral hygiene and smoking.

Depended samples	9 and more surfaces with caries lesion
<b>Age</b>	1,050(0,987-1,117)
<b>Education</b>	
Secondary and special secondary	1
Primary and not completed secondary	<b>1.587(1.064-2.265)*</b>
<b>Place of residence</b>	
City	1
Country and district center	<b>1.542(1.048-2.,270)*</b>
<b>Teeth brushing</b>	
1 time per day and more often	1
Not every day and does not clean	<b>2.616(1.732-3.953)*</b>
<b>Oral hygiene</b>	
Perfect and good	1
Satisfactory and bad	<b>2.223(1.174-4.210)*</b>
<b>Smoking</b>	
Does not smoke, sometimes, smoked but has given up	1
Daily	<b>2.293(1.523-3.451)*</b>

\* odds ratio sig. ( $p < 0,05$ )

oral hygiene index and smoking are the most important factors connected with a big number of untreated dental decayed teeth.

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