Assessment of the periodontal health and community periodontal index in the Army of Serbia

Procena periodontalnog zdravlja i periodontalnog indeksa kod pripadnika Vojske Srbije

Vladan Kovačević*, Marko Milosavljević†, Nemanja Rančić‡§, Dragana Daković*§

*Clinic for Dental Medicine, ‡Center for Clinical Pharmacology, Military Medical Academy, Belgrade, Serbia; †Department of Dentistry, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia; §Faculty of Medicine of the Military Medical Academy, University of Defense, Belgrade, Serbia

Abstract

Background/Aim. Promotion of oral health in military population is not only a significant component of general health, but also of the military readiness and represents the strategic orientation of each country. The basic task of military dentistry is to provide oral health of military personnel and to enable their operational readiness at the optimal level. The aim of the study was to assess the periodontal condition in Serbian military population using the community periodontal index of treatment needs (CPITN), and the influence of general life habits and local risk factors on periodontal health. **Methods.** This prospective cross-sectional pilot study was conducted on 101 examinees at the mean age of 38.94 ± 11.63 years who had dental check-ups at the Dental Clinic of the Military Medical Academy in Belgrade. All the categories of military personnel aged 20–64 years were divided into five groups. The frequency distribution of general and local factors on periodontal health, oral hygiene index, and the assessment of the mean number of sextants by CPITN compared to age were examined. **Results.** The examinees at the age of 51–60 years had the best oral hygiene index (0.95 ± 0.65), whereas the oldest population had the worst (1.63 ± 0.42). Only one person (5.6%) at the age group of 51–60 years had a completely healthy periodontium. Observed in relation to the age groups, the mean values of sextants increased linearly, but in general population, the most frequent CPITN categories were in sextant with the periodontal pockets 4–5 mm (score 3). **Conclusions.** Compared to the results from other countries shown by the World Health Organization, the periodontal condition in our examinees is below the average. The appropriate preventive program preparation and its implementation are needed, including primarily the appropriate training on oral hygiene, as well as education based on periodontal disease prevention and treatment.

Key words:
oral health; oral hygiene; periodontal index; military personnel; serbia.

Apstrakt

Uvod/Cilj. Unapređenje oralnog zdravlja kod vojnih lica nije samo deo opšteg zdravlja, već isto tako i vojna spremnost, a predstavlja i strategijsku orijentaciju svake zemlje. Osnovni cilj vojne stomatologije jeste da obezbedi oralnu higijenu vojnog personala i omogući njihovu operativnu spremnost na optimalnom nivou. Cilj studije bio je da se proceni stanje parodoncijuma pripadnika Vojske Srbije koristeći *Community Periodontal Index of Treatment Needs* (CPITN), kao i uticaj osnovnih životnih navika i lokalnih oralnih faktora rizika na parodontalno zdravlje. **Metode.** Urađena je prospektivna pilot studija preseka kod 101 ispitanika prosečne starosti $38,94 \pm 11,63$ godina, koji su pregledani u Klinici za stomatologiju Vojnomedicinske akademije u Beogradu. Svi ispitanici bili su starosti 20–64 godina i podeljeni u pet grupa. Ispitivana je učestalost distribucije opštih i lokalnih faktora na parodontalno zdravlje, indeksa oralne higijene, kao i procena srednjeg broja sekstanata pomoću CPITN u odnosu na godine starosti. **Rezultati.** Ispitanici starosti 51–60 godina imali su najbolji indeks oralne higijene ($0,95 \pm 0,65$), dok su najstariji imali najlošiju ($1,63 \pm 0,42$). Samo je jedan (5,6%) ispitanik starosti 51–60 godina imao zdrav parodoncijum. Posmatrano prema starosnim grupama, srednje vrednosti sekstanata linearno su se povećavale, a na nivou cele populacije najveća vrednost CPITN bila je kod ovih sa parodontalnim džepovima dubine 4–5 mm (skor 3). **Zaključak.** U odnosu na rezultate iz drugih zemalja prema podacima Svetske zdravstvene organizacije, stanje parodoncijuma kod naših ispitanika je ispod proseka. Zbog toga je neophodno implementirati i preduzeti preventivni program, uključujući osnovnu obuku iz oralne higijene, kao i obrazovanje iz prevencije i lečenja oboljenja parodoncijuma.

Ključne reči:
usta, zdravlje; usta, higijena; periodontalni indeks; kadar, vojni; srbija.

Correspondence to: Nemanja Rančić, Center for Clinical Pharmacology, Military Medical Academy, Belgrade, Serbia. University of Defence, Crnotravska 17, 11 002 Belgrade, Serbia. Phone: +381 63 852 4443. E-mail: nece84@hotmail.com

Introduction

Promotion of oral health in military population is not only a significant component of general health, but also of the military readiness and represents the strategic orientation of each country. The basic task of military dentistry is to provide oral health of military personnel and to enable their operational readiness at the optimal level [1].

Good oral health of military personnel could reduce the number of urgent dental interventions and absence from military activities, contributing to the security of whole military formation [2]. Various general factors such as nutritive state, smoking, use of alcohol, oral hygiene, stress, etc, make a basic foundation of the most common risk factors [3] which have an important role in dental disease prevention [4]. The primary task of the World Health Organization (WHO) is the collection of epidemiological data related to oral health and morbidity. Periodontal diseases, including gingivitis and periodontitis are considered one of the most common diseases in total population and if they are not treated, they can cause teeth loss [5]. Contrary to gingivitis, where a key role has dental plaque which is the main cause, the occurrence of periodontitis is more complex, because it includes not only microorganisms from subgingival dental plaque, but also the host immune response.

Periodontal health data in Europe [6], as well as in military population [7–9] are nowadays largely available in literature, whereas the frequency of periodontal diseases among Serbian military personnel and a long-term trend of periodontal health among them have never been examined before. Current asseessment of periodontitis among military personnel could establish the foundation to promote periodontal health, develop preventive strategies and establish a periodontitis treatment plan and program.

Data on the community periodontal index of treatment needs (CPITN) [10], which are kept in the WHO bank, include examination data from more than 50 countries. They show a significant presence of periodontal disease in population (5–20%) in non-industrial countries [11]. The WHO CPITN is a practical and significant procedure for assessing periodontal treatment needs in one community [12], and it is used in many studies for these purposes [7, 13].

The aim of this study was to collect data related to the experiences of periodontal disease, lifestyle, habits, oral hygiene and periodontal indicators which should assess the frequency and possible risk factors of periodontitis among military personnel in Serbia. Besides, the aim is to study the realtionship between periodontal state and independent sociodemographic variables as well as to compare periodontal condition of this study group with the population in similar studies of other countries, including their military personnel [8].

Data on periodontitis frequency, influence and severity could help in presenting the importance of this disease and its consequences. These data can be used as guidelines for a practical periodontal preventive program and projection of periodontal disease treatment in our country, both for military personnel and general population.

Methods

In the prospective cross-sectional study, 101 subjects were examined at the Clinic for Dental Medicine of the Military Medical Academy in Belgrade.

The study lasted for 60 days (March – April 2014) and comprised all the categories of military personnel, both males and females at the age of 20–64 years. This study included all examinees who came to the Clinic in order to have some dental intervention (convenience sample). Excluding criteria of the study were: totaly edentulous patients, pregnacy, systematic infections of oral cavity, and neuropsychological diseases. Including factors were: status of military personnel, and sufficient number of teeth in the upper and lower jaw ($\geq$ 20). After being informed on the reasearch by their dentist, all examinees signed a volunteer Consent Form (CF) for participation in the study. A positive opinion on the ethics of the study was given by the Ethical Committee of the Military Medical Academy (May 23, 2012).

The study consisted of a close-ended survey that was filled in by a subject, and clinical examination carried out by a periodontist.

The survey contained 21 questions related to: general habits of patients (diet, consumption of carbonated drinks, simple sugars, alcohol, smoking); personal habits in oral hygiene (frequency of teeth brushing, duration of teeth brushing, the use of dental floss, interdental brushes and mouthwashes); personal opinion about the impact of oral and dental diseases on overall health status.

A specialist's examination included clinical examination of teeth and periodontium with a periodontal probe (WHO guidelines), and the dental mirror.

After clinical examination of teeth, the following indices were determined: soft debris index according to Green Vermillion (DI-S) by which it determines the presence of soft debrison of the buccal and lingual surfaces of the three representative teeth of the lower and upper jaw, scoring being on the scale of 0–3 [14]; simplified calculus index (CI-S) by which it determines the presence of calculus of the three representative teeth of the lower and upper jaw, scoring being on the scale of 0–3 [14]; oral hygiene index (Simplified Oral Hygiene Index – OHI-S) which is the sum of the first two indices DI-S i CI-S [14]; to evaluate the state of the periodontium and the needs for therapy, CPITN was used, which was recommended by experts of the WHO. Examination was conducted by using a periodontal probe on the sextants, scoring being on the scale of 0–4. In each sextant, all teeth should be cheked, and only the highest value, for each sextant is scored and recorded [10].

Statistical analysis of the data was done with the statistical software package, IBM SPSS Statistics version 19. All variables were presented as frequency of certain categories, while statistical significance of differences were tested by the χ^2-test. Continuous variables were summarized as means and standard deviations. The normality of the data was assessed using Kolmogorov-Smirnov test. significance of a difference between continual variables with three and more groups was tested by nonparametric Kruskal-Wallis analysis. A relation-

ship between variables was tested by Pearson's or Spearman's coefficient of correlation. All the analyses were estimated at $p < 0.05$ level of the statistical significance.

Results

A total of 101 subjects (78 males and 23 females) were included in the study, and the mean age of this population was 38.94 ± 11.63 years. Most of them (67.3%) were married. More than half of the subjects (63.4%) in this study had a high school education and 31.7% of them had the bachelor degree. Their demographic data are shown in Table 1.

Table 1
Sociodemographic characteristics of the participants in the study

Characteristics of the patients	Values
Gender, n (%)	
male	78 (77.2)
female	23 (22.8)
Age (years), x̄ ± SD (min-max)	38.94 ± 11.63 (21–64)
Marital status, n (%)	
married	68 (67.3)
single	32 (32.7)
Educational attainment, n (%)	
primary school	2 (2.0)
high school	64 (63.4)
higher school	3 (3.0)
faculty	32 (31.7)

x̄ – mean; SD – standard deviation.

For the purpose of showing the relationship of ages and other parameters as well as for the subsequent discussion, the category of military population was divided into five groups according to age (Figure 1).
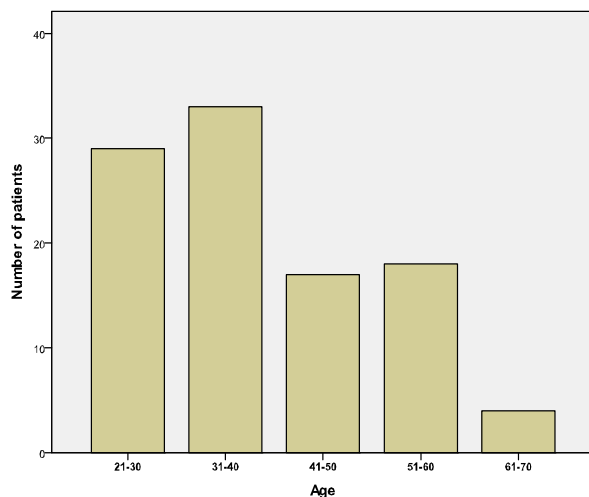

Fig. 1 – Distribution of the examinees by age.

Table 2 shows general habits of the subjects that could affect the periodontal health of the military population. Out of the total number of subjects, 69 (68.3%) were non-smokers. Smokers smoked cigarettes on the average for 6.38 ± 5.23 years. More than half of them (59.4%) consumed alcohol. Only five of the subjects consumed alcohol more than once a week. They consumed carbonated drinks

in large amounts (74.3%), and almost all the subjects (91.1%) consumed sugar. Only a small number (6.9%) of subjects used fast food, while most of them (91.1%) had their meals at home. They usually used snacks several times a day (75.2%).

Table 2
Incidence of the major factors influencing oral health in the studied subjects

Factor influencing oral health	Values
Smoking, n (%)	
no	69 (68.3)
yes	32 (31.7)
How many years of smoking? (x̄ ± SD)	6.38 ± 5.23
Consuming alcohol, n (%)	
no	41 (40.6)
yes	60 (59.4)
more times *per* week	5 (5.0)
more times *per* month	15 (14.8)
rarely	40 (39.6)
Consuming carbonated drink, n (%)	
no	26 (25.7)
yes	75 (74.3)
every day	11 (10.9)
more times *per* week	26 (25.7)
more times *per* month	14 (13.9)
rarely	24 (23.8)
Consuming sugars, n (%)	
no	8 (7.9)
yes	92 (91.1)
missing	1 (1.0)
every day	22 (21.8)
more times *per* week	33 (32.7)
more times *per* month	25 (24.8)
rarely	12 (11.9)
Nutrition, n (%)	
feeding at home	92 (91.1)
fast food	7 (6.9)
missing	2 (2.0)
Snack, n (%)	
onse a day	22 (21.8)
more times *per* day	76 (75.2)
missing	3 (3.0)

x̄ – mean; SD – standard deviation.

In the examined military population, especially in the younger age (21–30 and 31–40 years), more than a half of them (66.3%) brushed their teeth several times a day. Only two (2%) brushed their teeth less than once a day. In addition, most of them (89.1%) brushed their teeth for longer than 1 minute. Only 27.7% used dental floss, mouthwash (25.7%), and interdental brushes (18.8%). There was a significant difference in the use of interdental brushes between the age groups ($p = 0.009$, Table 3). Most of them changed toothbrushes after four (27 patients) or five (28 subjects) months. Half of the examined population confirmed that their gums bleeded when brushing [50 (49.5%)], and 38 (37.6%) of them had tooth sensitivity to certain stimuli. Half of the subjects had a regular dental check-ups, while the other half visited a dentist only when they felt pain in the oral cavity. Indeed, almost all (99.0%) the subjects agreed that oral diseases can affect general health (Table 3).

Distribution of examinees according to age and habits/attitudes important for oral health

Habits/attitudes for oral health	Total, n (%)	Age distribution					$p*$
		21–30, n	31–40, n	41–50, n	51–60, n	61–70, n	
How long do you brush your teeth?							
longer than 1 minute	90 (89.1)	27	29	16	15	3	0.661
less than 1 minute	11 (10.9)	2	4	1	3	1	
Do you use dental floss?							
no	73 (72.3)	23	22	10	14	4	0.334
yes	28 (27.7)	6	11	7	4	0	
Do you use mouthwash?							
no	75 (74.3)	21	25	13	12	4	0.724
yes	26 (25.7)	8	8	4	6	0	
How often do you brush your teeth?							
once a day	30 (29.7)	10	7	5	5	3	
several times during the day	67 (66.3)	18	24	11	13	1	0.703
every other day	2 (2.0)	1	1	0	0	0	
reare	2 (2.0)	0	1	1	0	0	
Do you use interdental brushes?							
no	82 (81.2)	28	27	13	10	4	0.009
yes	19 (18.8)	1	6	4	8	0	
How often do you change your toothbrush?							
once a month	6 (5.9)	2	1	2	0	1	
two months	18 (17.8)	7	5	1	4	1	
three months	16 (15.8)	6	7	2	0	1	
four months	27 (26.7)	6	7	6	7	1	0.414
five months	28 (27.7)	7	11	4	6	0	
half year	1 (1.0)	0	0	1	0	0	
missing	5 (5.0)	1	2	1	1	0	
Do you feel pain in the teeth to hot, cold and sweet?							
no	61 (60.4)	15	19	12	13	2	
yes	38 (37.6)	13	14	5	5	1	0.652
missing	2 (2.0)	1	0	0	0	1	
How many times a year visit the dentist?							
just when you feel the pain	44 (43.6)	14	16	7	5	2	
periodic reviews	56 (55.4)	15	16	10	13	2	0.606
missing	1 (1.0)	0	1	0	0	0	
Do you agree that the diseases of the oral region affect the overall health?							
no	1 (1.0)	0	0	1	0	0	0.288
yes	100 (99.0)	29	33	16	18	4	

*χ^2 test.

The average index value of soft plaque (DI-S) was 0.73 ± 0.32, where the minimum value was present in the age group of 51–60 years (0.65 ± 0.35), and in the age group of 21–30 years (0.67 ± 0.33), but most prominent value was among the oldest one (0.93 ± 0.32) (Table 4). A similar relationship between the age groups was present in the dental calculus index (CI-S). Dental plaque was the most prevalent in the oldest population (0.70 ± 0.17) and the least frequent in the population aged 51–60 years (0.29 ± 0.37). Since the OHI-S is the sum of the previous two indices, the subjects aged 51–60 years had the best oral hygiene (OHI-S = 0.95 ± 0.65), while the oldest population had the worst oral hygiene (OHI-

S = 1.63 ± 0.42). However, the differences between the three indices in relation to population groups were not statistically significant (Table 4).

When the mean values of sextants and percentage of people with CPITN category in line with the age groups were observed (Tables 5 and 6), only 5.6% of subjects in the group at the age of 51–60 years had a completely healthy periodontium (score 0) which was 1% of all the examined subjects. In other age groups, nobody had a healthy periodontium.

Regarding the other categories (Table 6), the mean values of CPITN (score 1–4) grew linearly in the age group of 21–30 years (0.72 ± 0.19, 1.22 ± 0.38, 2.04 ± 0.35, 2.65 ± 0.61), in

Distribution of oral index ($\bar{x} \pm$ SD) among the participants in the study depending on their age

Oral indices	Age (years)					Total	$p*$
	21–30`	31–40	41–50	51–60	61–70		
DI-S	0.67 ± 0.33	0.77 ± 0.31	0.79 ± 0.30	0.65 ± 0.35	0.93 ± 0.32	0.73 ± 0.32	0.190
CI-S	0.46 ± 0.45	0.45 ± 0.44	0.51 ± 0.47	0.29 ± 0.37	0.70 ± 0.17	0.44 ± 0.43	0.218
OHI-S	1.13 ± 0.65	1.23 ± 0.64	1.31 ± 0.60	0.95 ± 0.65	1.63 ± 0.42	1.18 ± 0.64	0.213

$\bar{x}$ – mean; SD – standard deviation; DI-S – Soft debris index, according to Greene Vermillion; CI-S – Simplified Calculus Index; OHI-S – simplifed oral hygiene index; * – Kruskal-Wallis analysis.

Table 5

The average value of the community periodontal index of treatment needs (CPITN) in the examinees of different age groups

CPITN	Age groups (years)					Total	p*
	21–30	31–40	41–50	51–60	61-70		
0	-	-	-	0.00 ± 0.00	-	0.00 ± 0.00	-
1	0.72 ± 0.19	0.67 ± 0.00	0.75 ± 0.35	0.42 ± 0.35	-	0.65 ± 0.26	0.686
2	1.22 ± 0.38	1.32 ± 0.45	1.14 ± 0.55	0.83 ± 0.00	-	1.24 ± 0.42	0.712
3	2.04 ± 0.35	2.18 ± 0.42	2.37 ± 0.29	2.15 ± 0.52	2.12 ± 0.40	2.15 ± 0.41	0.420
4	2.65 ± 0.61	2.62 ± 0.39	2.99 ± 0.49	3.61 ± 0.22	3.50 ± 0.00	2.90 ± 0.56	0.032
Average	1.84 ± 0.71	1.99 ± 0.67	2.18 ± 0.93	2.01 ± 1.12	2.58 ± 0.85	2.00 ± 0.82	0.538

Note: results are given as mean ± standard deviation (SD); CPITN: 0 – healthy; 1 – bleeding observed, directly or by using mouth mirror, after sensing; 2 – calculus felt during probing but all the black area of the visible; 3 – pocket 4 or 5 mm (gingival margin situated on black area of probe); 4 mm – pocket > 6 mm (black area of probe not visible); *Kruskal-Wallis analysis.

Table 6

Distributions of the examinees n (%) according to the community periodontal index of treatment needs (CPITN) value and age

CPITN	Age (years)					Total	p*
	21–30	31–40	41–50	51–60	61–70		
0	-	-	-	1 (5.6)	-	1 (1.0)	
1	3 (10.3)	1 (3.0)	2 (11.8)	2 (11.1)	-	8 (7.9)	
2	6 (20.7)	9 (27.3)	3 (17.6)	1 (5.6)	-	19 (18.8)	0.593
3	15 (51.7)	16 (48.5)	6 (35.3)	11 (61.1)	3 (75.0)	51 (50.5)	
4	5 (17.3)	7 (21.2)	6 (35.3)	3 (16.7)	1 (25.0)	22 (21.8)	
Total	29 (100)	33 (100)	17 (100)	18 (100)	4 (100)	101 (100)	

Note: results are give as number (%) of examinees; CPITN – community periodontal index of treatment needs; 0 – healthy; 1 – bleeding observed, directly or by using mouth mirror, after sensing; 2 – calculus felt during probing but all the black area of the visible; 3 – pocket 4 or 5 mm (gingival margin situated on black area of probe); 4 – pocket > 6 mm (black area of probe not visible); *χ^2-test

the age group of 31–40 years (0.67 ± 0.00, 1.32 ± 0.45, 2.18 ± 0.42, 0.39 ± 2.62) and in the age group of 41–50 years (0.75 ± 0.35, 1.14 ± 0.55, 2.37 ± 0.29, 0.49 ± 2.99). The age group of 51-60 years, except having a sextant with the score of 0 (5.6%), had a gingivitis (11.1%), and calculus (5.6%) only in a small percentage. However, there were more sextants with periodontal pockets of 4 or 5 mm (2.15 ± 0.52), i.e. 61.1% of the subjects, and the periodontal pockets of more than 6 mm (3.61 ± 0.22), or 16.7% of the subjects. The oldest group (61–70 years) did not have sextants with gingivitis and calculus (scores 2 and 3 respectively), but only the presence of periodontal pockets in 75.0%, and 25% of the cases, respectively (Tables 5 and 6).

The only significant difference between the groups was recorded between the mean values of the sextants in the fourth category of CPITN (p = 0.032) (Table 5).

Figure 2 shows the distribution of CPITN categories by sextants in relation to the total number of subjects. Thus, the category (score) 3 dominated in the sextant of the both sides of the upper and lower jaw, that is, most patients had periodontal pockets of 4 mm and 5 mm. On the upper front teeth, gingivitis and calculus were most frequent, while calculus (score 2) was the most prevalent on the lower front teeth. In total, the most common CPITN category had periodontal pockets of 4 mm and 5 mm (score 3).
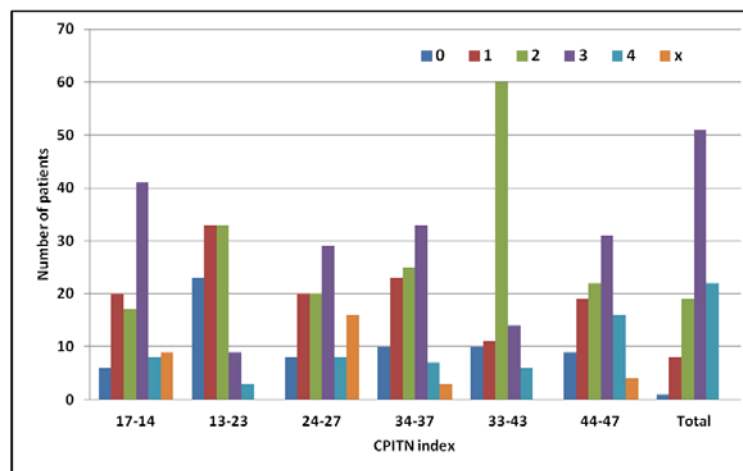

Fig. 2 – Distribution of the community periodontal index of treatment needs (CPITN) by sextants in relation to the total number of examinees
0 – healthy; 1 – bleeding observed, directly or by using mouth mirror, after sensing; 2 – calculus felt during probing but all the black area of the visible; 3 – pocket 4 or 5 mm (gingival margin situated on black area of probe); 4 – pocket > 6 mm (black area of probe not visible); x – missing teeth, consequently in those sextant did not have CPITN.

Discussion

The presence of risk factors in military population can significantly affect the frequency and severity of periodontal disease. This study shows that among study subjects most of them have bad habits such as the use of alcohol (59.4%), carbonated drinks (74.3%) and sugar (91.1%). However, there is a small number of non-smokers (32, 31.7%) compared to the smokers (69, 68.3%), who have approximately smoked for 6.38 ± 5.23 years. This is in accordance with the study conducted among the U.S. Army personnel, where a third of the examinees were smokers [15]. Other studies show that the incidence of smoking cigarettes is significantly higher (70%) among Lithuanian Army recruits [16]. This study shows that there is a clear relationship only between the soft debris index and the aforementioned bad habits ($r = 0.200$, $p = 0.046$).

According to the American Dental Association (ADA), the use of toothbrush and toothpaste, as well as a dental floss, is a fundamental aspect in maintaining oral hygiene [17]. Our study showed that more than a half (66.3%) of the subjects brushed their teeth more than once a day, while one-third (29.7%) brushed their teeth once a day. Almost all (89.1%) reported that they brushed their teeth for more than one minute. However, most of them did not use a dental floss (72.3%), mouthwash (74.3%), or interdental brushes (81.2%). This may be related to the wrong habits of oral hygiene, obligations at work, military activities in field conditions, fast-paced lifestyle and dietary habits.

Regardless of the fact that almost all (99%) agreed that the oral diseases affect the general health, only half (55.4%) of the subjects comes to the regular annual dental check-ups, while the other half (43.6 %) comes only when feeling pain in the oral cavity. Similar results were found in the Israel Army, where 55% of the population visited the dentist once in a year, 22% in two years and 20% in more than two years [18]. Much higher level of responsibility for oral health was present among the military population of high-income countries such as in the German Army [19].

When we looked at the values of oral hygiene (OHI-S), the oldest group of subjects aged 61–70 years (OHI-S = 1.63 ± 0.42) showed relatively poor hygiene in relation to the population aged 51–60 years (OHI-S = 0.95 ± 0.65). In addition, it was the same ratio of indices of soft layers (S-DI = $0.93 \pm 0.32 : 0.65 \pm 0.35$, respectively), and dental calculus (CI-S = $0.70 \pm 0.17 : 0.29 \pm 0.37$, respectively) of the two population groups. Apparently, the oldest study group was the least motivated, while the population aged 51–60 years showed the highest level of oral hygiene compared to other tested groups.

Among Croatian recruits, about 30% of the examinees had various degrees of gingival inflammation, whereas gingivitis was diagnosed in more that 80% among military professionals [2].

If one takes into account that half (49.5%) of our tested military population had bleeding gums when brushing their teeth, we can conclude that the technique of maintaining oral hygiene of large number of the subjects was rather inappropriate, although the adequate training on oral hygiene mainte-

nance was continuously provided as well as the educational programs on proper brushing technique and use of additional means for maintaining oral hygiene. In our study, the mean CPITN increased from the youngest group (1.84 ± 0.71) to the oldest group of subjects (2.58 ± 0.85), and the average value of CPITN in the study population was 2.00 ± 0.82.

The subjects with the perfectly healthy periodontium (score 0) belonged to the age group of 51–60 years and represented a significant minority (5.6%). In the study of the Israel military personnel, the mean value of subjects with completely healthy periodontal tissues was 1.19% [8]. The call-up soldiers group (40.95%) had a significantly higher percentage of healthy periodontal status, as well as cadets group (57.95%) in the Italian examined population [20], and military personnel in Denmark (53%) [21]. This small number of subjects in our study with a fully healthy periodontium shows that the tested population in all categories has inadequate habits in maintaining oral hygiene. Additionally, the reason of the low percentage could derive from rare visits to dental clinics, although dental care services are easily accessible to them. For this reason, it would be necessary to pay special attention to this population in terms of a continuous preventive oral hygiene program.

When it comes to gingival bleeding (score 1), its frequency among the groups was almost the same: 21–30 years (10.3%), 41–50 years (11.8%) and 51–60 years (11.1%), while it was the least prominent in the group aged 31–40 years (3%). The total mean value of sextants with gingivitis in all the groups was 0.65 ± 0.26 and ranged from 0.42 ± 0.35 (51–60 years) to 0.75 ± 12.35 (41–50 years). These values were smaller compared to other studies [13]. All the age, groups had a lower mean value of the sextants (score 1) compared to sextants with calculus (score 2) and the presence of periodontal pockets (scores 3 and 4) demonstrating that the total population showed a trend in the development of periodontal disease.

The presence of calculus (score 2) was observed in 18.8% of the examined population in our study and it was the least present in the population aged 51–60 years (5.6%), and at the same time the mean value of sextant in the aforementioned age group was the lowest (0.83 ± 0.00). Other age groups had similar mean values of the presence of calculus. However, the percentage of calculus in our population was significantly lower than in the study by Sandoval and Puy [13]. In addition, the presence of calculus and gingival bleeding in the study by Katz et al. [8] showed that the younger generation had higher scores of these sextants, while older subjects had deeper periodontal pockets, which was not in accordance with our results.

The frequency of periodontal pockets of 4–5 mm (score 3) in the total population in our study was 50.5%, and it was also the most common sextant in our military population in relation to age, while 21.8% of the subjects had periodontal pockets greater than 6 mm (score 4), that is, a total of 72.3% of the military population had periodontal pockets of any kind.

When the presence of periodontal pockets of 4–5 mm by the age groups was observed, this score was dominant in each group, except in the age group of 41–50 (Table 6).

Our results, when compared to other countries, showed the incidence of patients with periodontal pockets of any

type to be significantly lower: 2.77% among Italian call-up soldiers and 0.35% among the cadets with periodontal pockets of 4–5 mm [20], 8% among the younger Danish military personnel [21], 10% among the Spanish military personnel [13], 14% among the American civilian population of the mean age of 30 years [22], and 19.1% in the noncommissioned personnel of the Israel Defense Force [23].

Only the values of shallow periodontal pockets in the Israel permanent force military population were similar to ours, and they were 49.9% [8], as well as in some previous reports [24].

Compared to the age groups, the mean values of sextants increased linearly, indicating that the younger population (21–30 and 31–40 years) also had a periodontal disease as well as the older age groups. Such a large percentage of periodontal pockets in the youngest examined group is a great concern. For more detailed conclusions and analysis of periodontal health, a comprehensive examination of the military population in our country is required. Based on our results, such program is already initiated.

This is the first study conducted within military population in Serbia, with the aim to assess the state of periodontal disease, and assist in the planning of oral health. From the results obtained during this study, we believe that our subjects need a proper preparation and implementation of prevention programs, especially including a relevant training in oral hygiene and education based on the prevention of the occurence and development of periodontal disease. This program should in some parts include clearly defined guidelines regarding the information related to prognosis and treatment of periodontal disease, which would be in the domain of individual optimum. The implemented program should promote healthy lifestyle, proper nutrition, cessation of smoking and use of alcohol and carbonated beverages, as well as healthy physical activity. This would further affect the improvement of psychophysical status required for certain military activities. Also, the treatment needs for the whole military population in our study suggest that, in adition to guidelines for maintaining oral health, the removal of all hard and soft tooth deposits, as well as removal of all iatrogenic factors are needed. In the worst case scenario periodontal scalling, root planing, and surgical treatment are necessary.

König et al. [6] find that more comparable and representative data are still needed to give us a clearer picture of the presence of periodontal disease in Europe, and the future challenges are to evaluate the reasons behind the differences in periodontal health in order to develop optimal prevention and treatment strategies.

Conclusion

In order to develop an oral health improvement strategy in the Serbian military population, it is necessary to collect more representative data that could later be integrated into the WHO database. Although this study was the first one in this field, a relatively small sample of the population was examined. The continuation of the study and new research should confirm or disprove these findings related to periodontal and oral health. Epidemiological studies can provide necessary information on the prevalence and incidence of periodontal disease in certain age and sex groups, indicate the possibility of prevention, appropriate treatment and reduce the incidence of periodontal disease by encouraging preventive measures through the increased activity of dental services in the field of military personnel education. Additional studies are needed because the very awareness of the subjects of the importance of oral hygiene is not sufficient, and it was not correlated well with the state of periodontal disease in the examined population.

Acknowledgements

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