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Assessment of oral health of the Serbian Armed Forces members

Procena oralnog zdravlja pripadnika Vojske Srbije

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Abstract

Background/Aim. Oral health is an integral part of general health. The state of oral health greatly affects the psychological and physical condition of patients. The aim of study was to determine oral health among the Serbian Armed Forces members. **Methods.** This prospective cross-sectional pilot study was conducted on 648 examinees at the mean age of 34.47 ± 8.14 years who had dental check-ups. All the categories of military personnel aged 18–64 years were divided into five groups. Assessment of oral health was obtained by clinical examination and the personal perception of oral health obtained by fulfilling the questionnaire "Oral Health Questionnaire for Adults" of the World Health Organization. The results obtained by processing questions from the questionnaire were compared with the data of clinical examination. **Results**. The average value of the the Decayed, Missing and Filled Teeth (DMFT) index was 10.55 ± 4.79; the mean value of decayed teeth per participant was 2.00 ± 2.55, and on average, each respondent was missing 3.21 ± 3.35 teeth. Based on data obtained from the questionnaire, 39.4% of the participants smoked cigarettes. The majority of subjects (58.3%) brushed their teeth regularly two or more times a day. Oral health as poor was assessed by 18.9% of the participants. Participants who brush their teeth less than twice a day evaluated their oral health as poor 3.08 times more often compared to those who brush their teeth more than twice a day. **Conclusion**. The self-assessment of poor oral health significantly failed when compared with a high value of DMFT which means that only a small percentage of participants evaluated their oral health objectively.

Key words:
adults; dmf index; military personnel; oral health; serbia; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Oralno zdravlje je sastavni deo opšteg zdravlja. Stanje oralnog zdravlja značajno utiče na psihološko i fizičko stanje pacijenata. Cilj studije bio je da utvrdi stanje oralnog zdravlja pripadnika Oružanih snaga Srbije. **Metode.** Studija preseka obuhvatila je 648 ispitanika, životnog doba 34,47 ± 8,14 godina, koji su imali stomatološki pregled. Sve kategorije vojnih lica starosti od 18 do 64 godine podeljene su na pet grupa. Procena oralnog zdravlja dobijena je kliničkim pregledom i ličnom percepcijom oralnog zdravlja dobijenom ispunjavanjem upitnika „Upitnik za oralnu zdravstvenu zaštitu odraslih" Svetske zdravstvene organizacije. Rezultati dobijeni obradom pitanja iz upitnika upoređeni su sa podacima kliničkog pregleda. **Rezultati.** Prosečna vrednost indeksa karijes, ekstrakcija, plomba (KEP) iznosila je 10,55 ± 4,79; prosečna vrednost karijesnih zuba po ispitaniku bila je 2,00 ± 2,55, a svakom ispitaniku nedostajalo je prosečno 3,21 ± 3,35 zuba. Na osnovu podataka dobijenih iz upitnika, 39,4% ispitanika su bili pušači. Većina (58,3%) ispitanika redovno je prala zube, dva ili više puta dnevno. Oralno zdravlje kao loše procenilo je 18,9% ispitanika. Ispitanici koji su prali zube ređe od dva puta dnevno procenili su svoje oralno zdravlje kao loše 3,08 puta češće u poređenju sa onima koji su prali zube dva i više puta dnevno. **Zaključak**. Samoprocena lošeg oralnog zdravlja značajno podbacuje u poređenju sa visokim vrednostima KEP indeksa, što znači da je samo nizak procenat ispitanika objektivno ocenio svoje oralno zdravlje.

Ključne reči:
odrasle osobe; dmf indeks; vojni kolektiv; usta, zdravlje; srbija; ankete i upitnici.

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Introduction

Oral health is multifaceted and includes several abilities – to speak, smile, smell, taste, touch, chew, swallow, and conveys a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex. It is a fundamental component of health and physical and mental well-being. It reflects the physiological, social, and psychological attributes that are essential to the quality of life [1]. Oral illnesses and disorders may have a negative impact on the individuals' life.

Nowadays, numerous studies deal with the oral health condition measured by the the Decayed, Missing and Filled Teeth (DMFT) index, but there is a significantly smaller number of studies dealing with self-assessment of oral health made by patients themselves. Clinicians when examining oral health measure the caries index, such as the number of carious, extracted and filled teeth. These indices may indicate the severity of oral problems. However, the perception of oral health has to be reported by patients themselves [2].

Information on caries prevalence, oral hygiene status and periodontium condition are very important for establishing priorities and determining the type of preventive measures, as well as the provision of necessary services and treatment [3].

It is commonly accepted that oral diseases can have different effects on people and their life quality. Dental diseases cause pain, discomfort, and affect functions such as chewing, speech and smiling. The results of various studies show that dental treatments may improve the life quality. Medical practice has also recognized an increasing importance of oral health assessment made by patients themselves. However, in dental literature there is only a few data concerning oral health condition assessed by patients themselves. Therefore, this is a possible field for future research, which should focus on the self-assessment of life quality; this would be a secondary, or even primary measure in assessing the health condition [4].

Military members represent a pillar of security and safety for the whole country; therefore, their general health is of exceptional importance. The aim of this study was to examine the relationship between the oral condition measured through the DMFT index and the perception of oral health reported by the Serbian Armed Forced (SAF) members themselves.

Methods

The study was conducted as a cross-sectional observational study. It is adapted to the Strengthen Reporting of Observational Studies in Epidemiology (STROBE) [5]. The study was approved by the Ethics Committee of the Military Medical Academy in Belgrade, Serbia (No. 1/ 15 - 17). The study was conducted in the period 2016–2017, in accordance with the Helsinki Declaration [6]. Each subject voluntary participated and was informed about the type of research and the process of data collection. For determination of oral health of SAF members, calculation of adequate sample size, based on population prevalence of carious lesions was needed. According to data presented by Frencken et al. [7], 2017, prevalence of untreated cavitated, dentine carious lesions in Central Europe in 2010 was 47% (0.47). Based on this data, with the test power of 80%, alpha probability of 0.05 and expected error of 5%, the calculated number of participant was at least 383. The study included 655 randomly selected professional members of the Serbian Army. The criteria for entering the study were that the subject was over 18 years old and younger than 64 and a professional member of the SAF. The exclusion criteria from the study were the professional status of a civilian employee in the SAF, presence of systemic diseases and acute symptoms of dental diseases. According to these criteria the study seven persons were excluded. The final sample consisted of 648 subjects. All selected subjects from the sample filled in the questionnaire and were clinically examined.

Clinical examination

All participants were subjected to a basic dental clinical examination in accordance with criteria recommended by the World Health Organization (WHO) [8]. Clinical examination was carried out by two trained and interconnected examiners in dental offices where SAF officers perform their duties. All participants were examined with standard dental diagnostic tools (dental mirrors, dental probe, artificial lighting, dental chair). The parameter used to assess oral health was DMFT index [9]. Clearly visible lesions with dental cavity formed on the surface of teeth were registered as dental caries, while changes in transparency and initial demineralization of the enamel with intact surface, without cavitation, were registered as healthy teeth [10].

All participants were divided into five groups according to age: I – 18–24 years (n = 84), II – 25–34 years (n = 260), III – 35–4 years (n = 211), IV – 45–54 years (n = 91) and V – 55–64 years (n = 2).

Based on the DMFT value and the Petersen [11] categorization (2004), all participants were divided into four groups: very low index value (< 5), low index value (5–8.9), moderate index value (9–13.9) and high index value (> 13.9).

Questionnaire

The Oral Health Questionnaire for Adults of the WHO was used in this study [8]. The questionnaire consisted of 16 questions designed to gather important socio-demographic characteristics, oral health habits (frequency of tooth brushing, the use of aids for maintaining oral hygiene), self-assessment of oral health, habits in nutrition, and smoking habits.

Statistical analysis

In case of continuous data, variables were presented as mean value ± standard deviation, or mean value followed by confidence intervals. Some of the variables were presented as frequency of certain categories, while statistical signifi-

cance of differences was tested with the χ^2 test. All variables were tested for normal distribution by the Kolmogorov-Smirnov test. In according to the result of this test, the statistical significance of differences was tested using the *t* test or Mann-Whitney *U* test (two group comparison). In case of multi-group comparison, the Kruskal-Wallis test (*post hoc* Mann-Whitney test) was applied.

Calculations of relative risk ratios and their 95% confidence intervals were conducted to determine association between potential risk factors and outcomes (fair/poor oral health). For that purpose, the most promising independent variables were incorporated into binary logistic regression analyses (univariate analysis).

Differences between groups were considered significant at $p < 0.05$. Complete statistical analysis of the data was conducted with the statistical software package, SPSS Statistics 18 (Chicago, Illinois, USA).

Results

The average age of 648 participants (558 men and 90 women) was 34.47 ± 8.14 years. Female subjects were younger than men which was statistically significant (t = 8.13; $p < 0.001$). Nearly two-thirds (63.7%) of participants had secondary school education. There was no statistically significant difference in school education between men and women. More than half of the subjects (64.2%) were married.

More than a third of participants (39.4%) were smokers. Participants brushed their teeth two or more times a day (58.3%). Almost all participants (97.7%) used a toothbrush for tooth brushing; however, the dental floss was used only by 25.2% and a mouthwash solution by 29% of the participants. Regardless of the number of extracted teeth, 81.6% of the subjects had over 20 of their teeth in jaws, and 5.7% had mobile prostheses.

Concerning general health condition, 94% of participants were healthy, while 39 (6%) of them reported the existence of a chronic illness – hypertension was leading (33.3%), followed by disc herniation (15.4%).

Half (54.3%) of the study group were regularly visiting dentists, every 6 months. The most common reason for visiting a dentist was the pain and problem with teeth and mouth. The difficulty with chewing and the feeling of inconvenience due to aesthetic appearance of the teeth were the most statistically significant problems that have occurred in the last 12 months in the examined group.

The average DMFT value of the whole group was 10.55 ± 4.79. Men on average had a higher number of caries and extracted teeth compared to women (Figure 1). There was no statistically significant difference in DMFT between genders, but this difference was found between the genders in caries (z = 3.308, p = 0.001) and extracted teeth (z = 3.151, p = 0.002) that were more often observed in men, while women had statistically larger number of filled teeth (z = 2.702, p = 0.007).

Based on the DMFT value, 247 (38.1%) of the subjects had moderate index value (9–13.9), while the very low index value (< 5) had 70 (10.8%) of the participants, while low index value (5–8.9) had 151 (23.3) and very high index value (> 13–9) had 180 (27.4) of the examineers.

DMFT value was increased with age (Table 1). The smallest DMFT value had participants with faculty education, those who brush their teeth more than 2 times a day, use a mouthwash solution, visit the dentist for consultations, and nonsmokers. Except the group 5 (n = 2), there were significant differences (at least $p < 0.05$) among all other group pairs in the values of DMFT (Table 1).

When asked how they felt about their teeth condition, 18.8% of the examinaers group assessed their condition as bad and very bad. There was a statistically significant difference between men and women concerning self-assessment of their teeth (χ^2 = 6.02; p = 0.014). Men in a significantly higher percentage (20.4%) experienced their teeth condition as bad and very bad compared to women (8.9%). When we compared the DMFT values, with perception of oral health, we found that the youngest population, those who wash their teeth more than twice a day, regularly visit the dentist for consultation, and do not consume cigarettes, had good perception of oral health (Table 2).

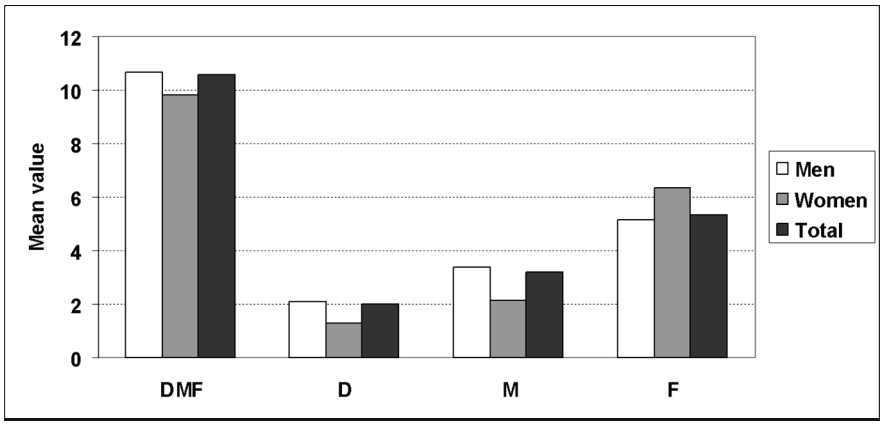

Fig. 1 – Mean values of the Decayed-D, Missing-M and Filled-F Teeth (DMFT) index regarding gender. DMFT in total (mean 10.55; SD 4.79); DMFT men (mean 10.67); DMFT women (mean 9.83); D (decayed teeth in total) – mean 2; SD 2.55; men (mean 2.11); women (mean 1.30); M (missing teeth in total) – mean 3.21; SD 3.35; men (mean 3.38); women (mean 2.16); F (filled teeth in total) – mean 5.33, SD 3.72; men (mean 5.16); women (mean 6.32). SD – standard deviation.

Table 1
Oral health status using the Decayed, Missing and Filled Teeth (DMFT) index according to participants' characteristics

Parameters	DMFT		Probability
	mean	95% CI	
Age at examination (years)			
18–24 (n = 84)	7.76	6.74 – 8.9	
25–34 (n = 260)	9.88	9.32 – 10.49	
35–44 (n = 211)	11.45	10.80 – 12.03	$\chi^2 = 61.98$; $p < 0.001$*
45–54 (n = 91)	12.87	12.00 – 13.82	
55–64 (n = 2)	14.50	11.00 – 18.00	
Education			
primary school	10.50	8.63 – 12.38	
secondary school	10.76	10.31 – 11.23	$\chi^2 = 2.50$; $p = 0.285$
faculty or more	10.18	9.53 – 10.8	
Brushing frequency			
< 2 times/day	11.18	10.60 – 11.78	$z = 2.875$; $p = 0.004$
> 2 times/day	10.10	9.59 – 10.61	
Use to clean teeth			
oral floss	10.15	9.50 – 10.82	$z = 0.844$; $p = 0.377$
fluoride mouth rinses	9.76	9.18 – 10.41	
Usual reason for dental visit			
relief of pain	11.36	10.82 – 11.90	$z = 3.552$; $p < 0.001$
consultation/advice	9.23	8.37 – 10.18	
Tobacco smoking			
yes	11.05	10.49 – 11.69	$z = 1.909$; $p = 0.056$
no	10.23	9.93–10.71	

***except for group aged between 55 and 64 years (n = 2), there are significant differences (at least $p < 0.05$) among all others pairs of groups.**
n = number of participants; CI – confidence interval.

Table 2
Perception of oral health (teeth) status by participants (both sexes)

Parameters	Excellent/very good/good/average		Bad/very bad	
	%	95% CI	%	95% CI
Age at examination (years)				
18–24	91.7***	84.5–96.4	8.3	3.6–15.5
25–34	85.0	80.4–89.2	15.0	10.8–19.6
35–44	79.1	73.9–84.8	20.9	15.2–26.1
45–54	65.9	56.0–75.8	34.1	24.2–44.0
55–64	50.0	0.0–100.0	50.0	0.0–100.0
Education				
primary school	62.5	25.0–87.5	37.5	12.5–75.0
secondary school	78.7	74.6–82.6	21.3	17.4–25.4
faculty or more	86.3*	81.9–90.7	13.7	9.3–18.1
Brushing frequency times/day				
< 2	71.1	65.2 76.7	28.9	23.3–34.8
> 2	88.4***	85.2–91.5	11.6	8.5–14.8
Use to clean teeth				
oral floss	89.0^{ns}	84.0–93.3	11.0	6.7–16.0
fluoride mouth rinses	85.6	80.3–90.4	14.4	9.6–19.7
Usual reason for dental visit				
relief of pain	74.9	69.8–80.0	25.1	20.0–30.2
consultation/advice	89.1**	83.2–95.0	10.9	5.0–16.8
Tobacco smoking				
yes	74.1	68.6–79.2	25.9	20.8–31.4
no	85.8***	82.7–89.3	14.2	10.7–17.3

***$p < 0.05$; ** $p < 0.01$; ***$p < 0.001$ *vs* corresponding subcategory/ies; CI – confidence interval.**
All comparisons are made within (excellent/very good/good/average) parameters.

Table 3
Factors associated with perception of fair/poor oral health (univariate model)

Parameters	RR	95% CI		*p*
		lower	upper	
Age at examination (years)				
18–24	1.0	–	–	–
25–34	1.941	0.834	4.520	0.124
35–44	2.898	1.249	6.727	0.013
45–54	5.683	2.341	13.797	< 0.001
55–64	11.000	0.619	195.521	0.102
Education				
primary school	3.794	0.863	16.676	0.078
secondary school	1.712	1.096	2.674	0.018
faculty or more	1.0	–	–	–
Brushing frequency				
< 2 times/day	3.084	2.047	4.647	< 0.001
> 2 times/day	1.0	–	–	–
Use to clean teeth				
oral floss				
no	2.183	1.277	3.732	0.004
yes	1.0	–	–	–
fluoride mouth rinses				
no	1.552	0.974	2.473	0.064
yes	1.0	–	–	–
Usual reason for dental visit				
relief of pain	2.741	1.384	5.425	0.004
consultation/advice	1.0	–	–	–
Tobacco use				
yes	2.101	1.411	3.129	< 0.001
no	1.0	–	–	–

RR – relative risk; CI – confidence interval.

Univariate logistic regression analysis showed that subjects aged 45 to 54 years compared to the youngest category of subjects, 5.68 times more often evaluated their oral health as bad, while those with secondary school, compared to those with faculty diploma 1.71 times more often evaluated their oral health as bad (Table 3). Participants who brush their teeth less than twice a day 3.08 times more often evaluated their oral health as bad compared to those who brush their teeth more than twice a day. The subjects who usually visit dentists to remove pain 2.74 times more often evaluated their oral health as bad than those who visit dentists for consultations and advice. Finally, participants who do not use dental floss compared to those who use it, 2.18 times more often evaluated their oral health as bad (Table 3).

Clinical examination of our participants found that 27.8% had a very high DMFT value (> 13.9), while only 18.9% of them self-assessed their oral health as bad. Comparing subjects with a very high DMFT value with subjects who assessed their oral health as bad, there was a statistically significant difference in the self-assessment of bad oral health and high values of DMFT ($\chi^2 = 14.02$; $p < 0.001$).

Discussion

In Serbia, there is still no data on oral health of military population. This is the first study in the SAF that describes the applicability of the WHO oral health questionnaire in the military population and compare it with clinical finding. Oral health has two dimensions: one is its physical status in terms of number of teeth, dental caries and periodontal status, and the other one is how an individual experiences his/her oral health. Both dimensions are necessary for the overall characterization of oral health [12]. Therefore, our study had a task to determine the DMFT index, factors that affect oral health and the self-assessment of oral health by individuals. The use of indices that measure the impact of oral health on life quality is becoming more and more necessary in dental practice, because based on the obtained information the needs for treatment are determined, the decision on the type of dental treatment is made and the effectiveness of the applied therapeutic procedures is assessed. Oral health greatly affects the quality of life of individuals, both in psychological, functional and aesthetic terms [13].

The aim of our study was to determine the oral health condition expressed through the DMFT index and to determine its relationship with the perception of oral health condition, satisfaction with oral health and necessary treatment among the SAF members. We made a comparison between the clinically measured oral health condition and the self-assessment of oral health by the SAF members. In our study, the average value of the DMFT index for professional members of the SAF was 10.55 ± 4.79. This is slightly more than the DMFT value in the Iranian

Armed Forces (9.67) [14], Jordan (8.69) [15], and Malaysia (8.15) [16]. The average value of the DMFT in the youngest age group was 7.76 (6.74–8.9), which is similar to the values of young Croatian soldiers aged 19 (7.32) [17].

Unlike our results, the average number of teeth extracted in members of the Croatian Armed Forces was significantly higher, 2.3 in recruits and 5.1 in professional military members [18]. On the other hand, the average number of teeth extracted in the Danish Armed Forces was 0.02 to 0.5, which was considerably less than our results showed [19]. Difference in the results can be explained by very young profile of Danish participants. This confirms the age influence on the number of extracted teeth. The greater number of teeth extracted in the Croatian Armed Forces compared to our Armed Forces can be explained by the fact that, in our study, there were 90 women who had less extracted teeth compared to men. In our study, on average, women lacked 2.16 teeth, while this number was significantly higher in men (3.35).

However, in our study, we noticed that the average number of carious teeth was smaller than the number of extracted teeth. This can be explained by the fact that in our country there is still not enough attention paid to preservation of teeth and that the subjects decide more often to have the tooth extracted, rather than to treat. In addition, our soldiers are often engaged in terrains, military exercises and have extraordinary engagements where there are no conditions for restorative and endodontic treatment; therefore, they decide on tooth removal. In addition, other factors that affect this outcome should not be neglected, such as fear of dental intervention, dental pain as well as the low level of awareness of the importance of oral health. This is confirmed by the fact that in 42.4% of participants in our study visited dentist only when pain and similar problems arise.

As for self-assessment of oral health, this study found that most of the subjects evaluated their health as good, similar to the results of studies done in Israel [20], Qatar [21], Australia [2] and Nigeria [22], but contrary to some other studies [23, 24].

Bad or very bad tooth condition was estimated by 18.9% of our army members, which is much more than results reported in the Israel Armed Forces (7.2%) [20], and similar to the results in Australia (16.2%) [2]. These results probably relate to the fact that in our culture, dental consultations and regular visits are rare, and most of the subjects visit a dentist to remove pain. In our study, as many as 42.4% of participants, as a reason for the last visit to the dentist, mentioned pain and problem with their teeth. This is probably connected to high number of extracted teeth in our study. Pain is the leading reason for the use of dental services in other regions as well [25]. Pain, according to Kim et al. [24], may lead to physical as well as functional limitation, which impacts quality of life of the affected persons invariably, which is significantly associated with poor ratings of oral health.

Findings reported in developing countries and poorly developed countries confirm that low level of education and high use of cigarettes are associated with poor oral health [26]. Also, income inequality has potential to affect both functional and social dimensions of oral health, possibly through a psychosocial pathway [27].

The results of our study also confirm the link between age, education, tooth brushing and smoking frequency with both oral health dimensions – clinical (DMFT value) and subjective oral health perceptions. The DMFT index increases with age, lower education level, tooth brushing frequency less than twice a day and smoking. The results of our study are consistent with studies in other countries. We found that 39.4% of the subjects consume cigarettes occasionally or daily, which is a significantly higher percentage compared to the Iranian Armed Forces (22.1%) [15], and similar to other European countries, Greece and Italy [28].

The study of our military population has showed that smoking was associated with poor oral health perception, as demonstrated in the study in Northern Finland [29]. A study in India confirmed that young people have better perception of oral health than older ones [30], and the results of our study also confirmed that persons aged 45–55 had a 5.68 higher risk of having a poor perception of oral health compared to the youngest age group.

In addition to oral health self-assessment of military subjects, we set criteria for assessing oral condition according to Petersen [11]. As a parameter for clinically poor oral status, we took the DMFT index value higher than 13.9. In our study, 27.78% of the subjects had the DMFT index value greater than 13.9, or clinically poor oral status. This was significantly different from the results obtained from the questionnaire, where only 18.9% of the subjects assessed their tooth condition as bad or very bad. This can be explained by the fact that people in the underdeveloped and developing countries still do not give enough attention to oral health, because they do not have a sufficiently developed awareness of its importance. It is necessary to inform the entire population about the importance of oral health and its impact on general health. This would be best achieved through preventive measures, primarily by motivation and training on the proper maintenance of oral hygiene, regular dental examinations, as well as constant monitoring and remotivation of the subjects. In this way, the number of extracted teeth would be reduced, and thus the self-assessment of oral health, as well as clinical status of the subjects, would be improved. Our study has opened up a question for future studies, to further explore interaction of other parameters with the self-assessment of oral health, as well as the clinical situation.

Conclusion

The results of our study show the absence of compliance between oral health measured by the DMFT index and oral health perception of military participants.

Therefore, we consider that further studies are needed to determine possibilities of improving synchronization of clinical findings and the self-assessment of oral health. It seems that measures of oral health perception should be somehow included when examining condition of oral health. Concerning the army personnel, we propose implementation of education on the importance of oral health through lectures, posters and electronic presentations, and introduction of a mandatory dental systematic examination of all mem-

bers of the SAF once a year, as well as sending skilled dentists to barracks where there is no organized dental service to train army personnel on proper oral hygiene maintenance, and motivate and educate them about the importance of oral health.

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