

# Dental Caries Experience and Tobacco Use in 19-year-old Croatian Army Recruits

Tomislav Badel<sup>1</sup>, Ivana Savić Pavičičin<sup>2</sup>, Andreja Jelinić Carek<sup>3</sup> and Sanja Šegović<sup>4</sup>

<sup>1</sup> University of Zagreb, School of Dental Medicine, Department of Removable Prosthodontics, Zagreb, Croatia

<sup>2</sup> University of Zagreb School of Dental Medicine, Department of Dental Anthropology, Zagreb, Croatia

<sup>3</sup> University of Zagreb, School of Dental Medicine, Department of Fixed Prosthodontics, Zagreb, Croatia

<sup>4</sup> University of Zagreb, School of Medicine, Department of Restorative Dentistry and Endodontics, Zagreb, Croatia

## ABSTRACT

*The aim of this study is to investigate caries prevalence and smoking habit in the population of 19-year-old Croatian male recruits. Dental examination of 505 male recruits was conducted in 2001 in the military centre in Koprivnica. Caries status was described by the FS-T (Filled and Sound Teeth) index and DMFT (Decayed, Missing and Filled Teeth) index. Mean DMFT scores were 7.32 and FST 23.56. There was a significant statistical difference in comparison of smoking habits depending on the reason to visit the dentist ( $p=0.001$ ). The subjects who do not smoke tobacco have less decayed teeth (DT index with  $p<0.001$ ), and more teeth with fillings and/or sound teeth (FT with  $p=0.005$  and FST with  $p=0.004$ ). There is no statistically significant difference for the DMFT ( $p=0.657$ ) and MT ( $p=0.703$ ). In conclusion, it showed that FS-T is a more appropriate index for describing variation in the population with higher caries experience. In the population of Croatian recruits, there were an astonishing 58.6% of smokers.*

**Key words:** dental caries, DMFT, epidemiology, FS-T, recruits, smoking

## Introduction

Caries is a dental disease with permanent influence on dental status and the main factor responsible for tooth loss<sup>1</sup>. At the end of the 20<sup>th</sup> century, through preventive measures from the youngest age, caries prevalence decreased, Marthaler<sup>2</sup> reported. Contrary to that, a recent article from 2009 written by Bagramian et al.<sup>3</sup> reported that there is a lack of successful public health strategies on the global level with an increase in dental caries as a consequence. From the socio-economic point of view, contemporary Croatia is a transitional country, which has consequences on oral health of adolescents' population<sup>4,5</sup>.

Military recruits were researched in many countries worldwide from the aspect of general population oral health or from the specific view of professional soldiers<sup>6–13</sup>.

Oral health is related to cigarette smoking which is included in various dental diseases (eg. periodontal diseases, caries and tooth loss, gingival recession) and oral diseases, such as cancer and precancer lesions<sup>1,14,15</sup>. Even

exposure to environmental tobacco smoke might be associated with an increased prevalence of dental caries<sup>16–18</sup>.

This study investigated the caries experience and smoking habit in the population of 19-year-old Croatian male recruits.

## Subjects and Methods

The dental examination of the sample of 505 19-year-old male recruits was performed during 2001 in the dental outpatient office of the military centre in Koprivnica, North-west Croatia. The potential risk factors of caries were taken into account: the living areas (rural, urban), reason to visit the dentist per year, and smoking habit in recruits' sample.

Recruits were examined by standard dental instruments including Kuhn probe, with a mouth mirror and with the aid of a dental chair light. The following indices were used to describe the caries experience: De-

cayed, Missing and Filled Teeth (DMFT) and the Filled and Sound Teeth (FS-T) index. Clinical diagnostic criteria for dental caries included lesions with cavitation (D<sub>2-4</sub>)<sup>19-21</sup>. Wisdom teeth were not examined.

Statistical analysis of data was processed by means of program package STATISTICA for Windows, Release 5,5 A (StatSoft, Inc (1999). Tulsa, OK: StatSoft,Inc., 2300 East 14th Street, Tulsa, OK). Differences were considered statistically significant at values of 0.05.

Test differences of the DMFT index and FS-T index in subgroups (living area, visit the dentist) of the subjects with range of values were examined by means of variance analysis. Comparison between living area of recruits with smoking habit and reason to visit the dentist during a year was performed by chi-square test. Test differences of the DMFT index depending on smoking habit of the recruits were examined by means of variance analysis.

Two examiners performed all the examinations. Their training and calibration were arranged at this military centre during two weeks by examining the same group of 50 recruits. Cohen’s kappa was used to determine the interexaminer agreement between two dentists. There were two dental examinations taken into account for the interexaminer agreement assessment, independently in dental chairs in the dental outpatient office of the military centre. For intraexaminer reproducibility the main author of this study examined the same group of recruits again a week later.

**Results**

Reliability for clinical examination was tested and the interexaminer (Kappa score 0.85) and intraexaminer (Kappa score 0.92) agreement was found to be very good.

The mean ( $\bar{X}$ ) values for the DMFT and FS-T indices for the examined 505 Croatian recruits are shown in Table 1. It can be seen that by using the FS-T index there was a greater number of recruits with absolute maximal values compared to the DMFT index. There are 3.15 decayed teeth (DT), 1.29 extracted and/or missing teeth (MT), and 2.88 teeth with fillings (FT). A statistically significant difference was found for FS-T index for each recruit’s area of living: FS-T was higher for urban recruits ( $\bar{X}$  24.79±3.51) than for rural recruits ( $\bar{X}$  22.99±4.28). This is consistent with the minimal value 12 for FS-T index of urban recruits, and the significantly higher value of minimal value 1 for rural recruits. DT index is significantly higher (variance analysis) in rural (3.56) than in urban recruits (2.28) with p<0.001.

Only 92 (18.2%) recruits visited the dentist regularly during a year. There are significant differences for both DMFT and FS-T indexes (Table 1). Recruits who regularly visit have  $\bar{X}$  value 8.40±4.60 for DMFT, and 25.03±3.17 for FS-T index. Opposite to that, recruits who irregularly visit the dentist have  $\bar{X}$  value 7.08±4.88 for DMFT, and 23.23±4.25 for FS-T index.

**TABLE 1**  
TEST DIFFERENCES OF THE DMFT INDEX AND FS-T INDEX IN SUBGROUPS (LIVING AREA, VISIT THE DENTIST) OF THE SUBJECTS WITH RANGE OF VALUES, BY MEANS OF VARIANCE ANALYSIS

	$\bar{X}$ , SD	minimum / maximum value (% of the subjects)		urban/rural	visit the dentist regularly/irregularly
DMFT	7.32±4.85	0 (9.3%)	28 (5.0%)	p=0.158 NS	p=0.018
FS-T	23.56±4.13	1 (0.2%)	28 (16.8%)	p<0.001	p<0.001

SD – standard deviation;  $\bar{X}$  – mean value; NS – not significant

**TABLE 2**  
COMPARISON BETWEEN LIVING AREA OF RECRUITS WITH SMOKING HABIT AND REASON TO VISIT THE DENTIST DURING A YEAR

Variables	rural (N,%)	urban (N,%)	total (N,%)
Smoking – yes	205 69.3%	91 30.7%	296 100.0%
Smoking – no	140 67.0%	69 33.0%	209 100.0%
Visit the dentist –regularly	50 54.3%	42 45.7%	92 100.0%
Visit the dentist – irregularly	295 71.4%	118 28.6%	413 100.0%
Total	345 68.3%	160 31.7%	505 100.0%

N – number of recruits

**TABLE 3**  
TEST DIFFERENCES OF THE DMFT AND FS-T INDEX DEPENDING ON SMOKING HABIT OF THE MEAN VALUE RECRUITS AND STANDARD DEVIATIONS FOR CARIES FREQUENCY BY MEANS OF VARIANCE ANALYSIS

smoking	N	DMFT	DT	MT	FT	FS-T
yes	296	7.41±5.08	3.58±3.45	1.31±1.99	2.51±3.33	23.11±4.41
no	209	7.21±4.52	2.56±2.79	1.25±1.76	3.41±3.79	24.19±3.62
total	505	7.32±4.85	3.15±3.23	1.29±1.90	2.88±3.55	23.56±4.13
Probability statistical test		p=0.657 NS	p<0.001	p=0.703 NS	p=0.005	p=0.004

N – number of subjects; NS – not significant

In comparison between living area (rural, urban) with smoking habit there is no difference (chi-square test=0.292, df=1, p=0.589); however there is a significant statistical difference (chi-square test=0.10.142, df=1, p=0.001) depending on reason to visit the dentist per year (Table 2).

The subjects who do not smoke tobacco have fewer decayed teeth (DT index), and more teeth with fillings and/or sound teeth (FT and FS-T indexes). There is no statistically significant difference for the DMFT and MT indexes (Table 3).

Two way analysis of variance (ANOVA) confirmed independent statistical significance for: DT index with the subjects' area of living and smoking habit (p=0.025). The value for FS-T index is on the border of statistically significant difference (p=0.05).

## Discussion

Many researches over the years provided epidemiologic data about smoking, influence on health and general measures for cessation and prohibition in public areas<sup>22–34</sup>. Epidemiological data from Croatia suggesting that preventive actions and public health interventions are needed to reduce the smoking prevalence (according to Samardžić et al.<sup>25</sup> 24–33% in men, and 10–21% in women, depending on region, in 2003) and thus improve health of the population<sup>28–30</sup>. Samardžić et al.<sup>25</sup> found more prevalence of heavy smoking depending on gender (male), age (35–64), and socioeconomic factors.

Špalj et al.<sup>1</sup> compared the urban and rural population of dental patients regarding the reason of tooth loss. Decay of teeth was the main reason for tooth extraction (55% in rural and 57% in urban patients). In our study there was no significant difference for MT index. In the young population, such as recruits aged 19, it is not expected that chronic periodontitis related to nicotine could be a significant reason for tooth loss<sup>10,13</sup>. Dietary and oral hygiene habits can be expected in urban adolescents as well, for example in Croatia and Italy<sup>35–37</sup>.

Nicotinism was recognised as a relatively negative factor for oral health, including the development and consequences of dental caries. In a 6-year longitudinal study on Swedish adolescents, significantly increased caries was found by the DMFS index (caries of Decayed

Missing and Filled Surfaces which is more specific than the DMFT index) depending on tobacco use<sup>38</sup>.

Data from study carried out by Rajić et al.<sup>4</sup> described background of contemporary transitional Croatia with direct reflection on preventive dental health system. They concluded during long-time recording of dental caries in the population of 12-year-old children that between 1968 and 1991, the DMFT index decreased from 7.0 in 1968 to 2.6 in 1991. After that, DMFT value increased to 3.5 in 1999. There were no caries free children in 1968. The highest value of caries free subjects was reached in 1991 (23%), and decreased in 1999 to 14.9% of children's sample. In our study it was found in 9.3% of recruits' sample which means that a lack of preventive measures undoubtedly increases the negative trend of caries experience in young adults. On the contrary, a longitudinal study of efficient preventive measures in Switzerland showed a continuous caries decline of 33% compared to DMFT in the year 1996 (5.34) and in the year 2006 (DMFT value reached 3.56) in recruits' population. In Swiss recruits, caries experience was increased in smokers (32.2% of examined all recruits)<sup>11</sup>.

The data about the DMFT values in populations of recruits are relatively numerous: 3.16 in Australian Navy recruits aged 17–20 years<sup>6</sup>, 6.2 in Danish recruits<sup>7</sup>, 7.5 in German recruits<sup>8</sup>, 7.14 in Italian recruits<sup>9</sup>, 10.2 in Norwegian recruits<sup>10</sup>, 3.56 in Swiss recruits<sup>11</sup>, 6.5 in United Kingdom Royal Air Force recruits<sup>12</sup>, and 6.0 in Turkish recruits. A common characteristic of these studies is that the determined DMFT values are mostly lower than those determined in our study.

Lobnik-Gomilšek<sup>39</sup> found the average DMFT index of 8.06 for military recruits in the federal republics of the former Yugoslavia. In Croatia the average DMFT value was 8.41 (DT: 3.87, MT: 1.15 and FT: 3.39). According to our results for Croatian recruits, a decline in caries of 12.9% was found (recent value is 7.32). Previous studies of Croatian recruits showed that the most common oral disease was dental caries (value 5.84), and in 2000 healthy teeth were found in only 4% of the subjects, but with better values of the investigated indices. The DMFT=6 value was lower, and the FS-T=25 value was higher<sup>40,41</sup>. The level of restored teeth (sanation index) was reached in a former study in 48.9% of recruits' teeth on average<sup>42</sup>. Sanation index was 10 in 1968, in 1991 increased to 89.7%, and decreased to 62% of investigated children's population<sup>4</sup>.

Several studies noted that FS-T index represents functional status and excludes some consequences from DMFT and its components (DT and MT)<sup>19</sup>. Conversely, DMFT includes all teeth related to caries experience. This study showed that there was significant difference between FS-T index depending on the living areas (rural, urban) and smoking habit in recruits. DMFT index is recommended by the World Health Organisation and measures the lack of functioning ability. FS-T index decreases with a rise in caries experience, and it is useful in comparing different (developed and developing) countries<sup>43,44</sup>.

New trends globally are the increase in dental caries related to dietary changes, no exposure to fluoridated drinking water and the use of bottled water, socio-economic shift in populations on the relation between rural-urban, and immigration process<sup>3</sup>. In accordance with this global trend, Hopcraft et al.<sup>6</sup> reported that in the last few years, caries increased in Australian recruits.

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## Conclusion

In this study, it was determined that in population of Croatian male recruits the DMFT value was 7.32. FS-T is a more appropriate index for describing variation in the population with higher caries experience: there was a statistically significant difference for recruits from rural living area ( $p < 0.001$ ) and in smokers ( $p = 0.004$ ). There were as many as 58.6% of smokers.

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A. Jelinić Carek

University of Zagreb, School of Dental Medicine, Department of Fixed Prosthodontics, Gundulićeva 5, 10000 Zagreb, Croatia

e-mail: acarek@sfz.hr

## ISKUSTVO DENTALNOG KARIJESA I KORIŠTENJE DUHANA U 19-GODIŠNJIH NOVAKA HRVATSKE VOJSKE

### SAŽETAK

Svrha studije bila je istražiti prevalenciju karijesa i naviku pušenja u populaciji hrvatskih muških novaka. Dentalni pregled 505 19-godišnjih novaka proveden je 2001. u vojnom centru u Koprivnici. Stanje karijesa opisano je FS-T i DMFT indeksom. Srednja vrijednost DMFT indeksa bila je 7,32 a FS-T indeksa 23,56. Postojala je statistički značajna razlika ( $p=0,001$ ) u neovisnoj usporedbi navike pušenja s razlogom zbog kojeg posjećuju doktora dentalne medicine. Ispitanici koji nisu pušili imali su manje zubi zahvaćenih karijesom (DT indeks sa  $p<0,001$ ) i više zubi s ispunima i/ili zdravih zubi (FT sa  $p=0,005$  i FS-T sa  $p=0,004$ ). Nije se pokazala statistički značajna razlika za DMFT ( $p=0,657$ ) i MT ( $p=0,703$ ) indekse. U zaključku, pokazalo se je da je FS-T indeks prikladniji indeks za opis varijacija u populaciji s većim iskustvom karijesa. U populaciji hrvatskih novaka nađeno je čak 58% pušača.