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Determinants of smoking and smoking cessation among health professionals in Serbia: A cross-sectional study

Faktori pušenja i prestanka pušenja među zdravstvenim radnicima u Srbiji: rezultati studije preseka

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Abstract

Background/Aim. Bearing in mind a high smoking prevalence in Serbia (34% in adult population; men 38%, women 30%) and leading role of health professionals in intervention and prevention, a cross-sectional study was performed smong the representative sample of health professionals in Serbia. The aim of the study was to identify predictors of smoking and smoking cessation prior to the total smoking ban in November 2010. **Methods.** In this nationwide study, 3,084 physicians and nurses from 4 types of institutions and four geographical regions were selected and 2,282 included (response rate 74.0%). Data were collected using a self-administered structured questionnaire. Standard statistical methods were used to calculate prevalence rates, and multivariate logistic regressions to evaluate independent predictors of smoking pattern. Risks were expressed as odds ratios (OR) which represent approximation of relative risks of exposed persons with 95% confidence intervals (95% CI). **Results.** We found a high smoking prevalence of 38.0%, the same for women and men (37.8% and 37.6%, respectively; $p = 0.138$), higher among nurses (41.7%) than physicians (29.1%) ($p = 0.000$), as well as among those employed in general hospitals (42.6%) and institutes of public health (43.8%) ($p = 0.000$). Significantly increased risk of being an ever or current smoker was noticed for nurses (OR = 1.75, 95% CI 1.42–2.14; and OR = 1.91, 95% CI 1.52–2.40, respectively), those employed in general hospitals (OR = 1.37, 95% CI 1.09–1.73 and OR = 1.40, 95% CI 1.09–1.79, respectively), and with worse self-estimated health (OR = 1.15, 95% CI 1.02–1.30; and OR = 1.17, 95% CI 1.02–1.34, respectively). Intentions to quit smoking or to reduce the number of cigarettes were more frequent in women (OR = 1.51, 95% CI 1.01–2.27) and participants who worse evaluated their health (OR = 1.74, 95% CI 1.39–2.18). **Conclusion.** High smoking prevalence in health professionals could be a barrier for the full implementation of smoking ban in health institutions in Serbia. Smoking cessation programs at workplaces, formal education in smoking cessation techniques, and better Law enforcement by health administrations should be implemented.

Key words:
smoking; smoking cessation; prevalence; physicians; nurses; health; legislation

Apstrakt

Uvod/Cilj. Zbog visoke prevalencije pušenja u Srbiji (34% odraslih; 38% muškarci, 30% žene) i vodeće uloge zdravstvenih radnika u prevenciji i odvikavanju od pušenja, sprovedena je studija preseka na reprezentativnom uzorku zdravstvenih radnika u Srbiji Cilj rada bio je utvrđivanje faktora pušenja i prestanka pušenja među zdravstvenim radnicima pre stupanja na snagu zakona koji je zabranio pušenjem na javnim i radnim mestima, 2010. godine. **Metode.** Za studiju je izabran reprezentativni uzorak od 3 084 lekara i medicinskih sestara iz 4 vrste zdravstvenih ustanova u Srbiji. U istraživanju je učestvovalo 2 282 zdravstvenih radnika (stopa odaziva 74,0%). Korišćen je struktuirani upitnik koji su ispitanici sami popunjavali. Korišćene su standardne statističke metode za računanje stopa prevalencije i multivarijantna logistička regresija za procenu nezavisnih prediktora pušenja i prestanka pušenja. Rizik je izračunat kao unakrsni odnos (UO) koji predstavlja približnu vrednost relativnog rizika izloženih osoba sa 95% intervalima poverenja (95% IP). **Rezultati.** Rezultati su pokazali visoku prevalenciju pušenja (38,0%), sličnu

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među muškarcima (37,6%) i ženama (37,8%) (p = 0,138), višu među medicinskim sestrama (41,7%) nego lekarima (29,1%) (p = 0,000), kod zaposlenih u opštim bolnicama (42,6%) i zavodima za javno zdravlje (43,8%) (p = 0,000). Rizik da se bude pušač bilo kad u životu ili trenutno značajno je bio povišen kod medicinskih sestara (UO = 1,75, 95% IP 1,42–2,14 i UO = 1,91, 95% IP = 1,52–2,40), kod zaposlenih u opštim bolnicama (UO = 1,37, 95% IP 1,09–1,73, i UO = 1,40, 95% IP 1,09–1,79) i kod ispitnika koji su lošije procenili svoje zdravlje (UO = 1,15, 95% IP 1,02–1,30; i UO = 1,17, 95% IP 1,02–1,34). Namera da se prekine s pušenjem ili da se smanji broj popušenih cigareta bili su češći kod žena (UO = 1,51, 95% IP 1,01–2,27) i kod ispitanika koji su lošije procenili svoje zdravlje (UO = 1,74, 95% IP 1,39–2,18). **Zaključak.** Visoka zastupljenost pušenja među zdravstvenim radnicima predstavlja prepreku za punu primenu zakona u zdravstvenim ustanovama u Srbiji. Potrebno je sprovoditi programe odvikavanja od pušenja na radnim mestima, metode odvikavanja od pušenja uključiti u program redovnih studija zdravstvene struke, a uprave zdravstvenih ustanova trebalo bi da efikasnije sprovode zakon.

Ključne reči:
pušenje; pušenje, prestanak; prevalenca; lekari; medicinski tehničari; zdravlje; zakonodavstvo.

Introduction

According to the latest available data adult smoking prevalence in Serbia is still high with a total prevalence rate of smoking 33.6% (38.1% among men, and 29.9% among women) [1]. Data on smoking prevalence and smoking practice among health professionals are limited. A study of employees at institutes of public health in Serbia from 2006 indicated a high smoking prevalence among all employees (43.9%), among physicians (31.1%) and among nurses (48.1%) [2]. A similar high percentage of smokers among medical staff was reported in some Balkans countries and Tunisia [3–6], which is higher than in some high-income countries, where smoking prevalence among physicians and nurses has been substantially reduced in the last decades [7–16]. The 2006 Global Health Professional Survey of students of health sciences in Serbia reported the percentage of current smokers of 34.7% among medical students, 33.8% among students of nursing schools, 29.3% among pharmacy students, and 28.5% among dental students, showing that women smoke more than men in all groups [17].

Smoking prevalence rates and attitudes toward tobacco control policies among health professionals can play an important role in overall public health policy implementation [18]. Medical staff are on the frontline in the primary health care battle and their interventions can be especially effective in helping patients to quit smoking. On the other hand, smoking among health professionals can substantially undermine efforts to reduce smoking and to convince the general population not to smoke.

The aim of this study was to assess the smoking prevalence among health professionals employed in the public health sector of the Republic of Serbia, to identify factors affecting their smoking pattern, and to understand predictors of smoking cessation before the total smoking ban in health institutions that went into effect in November 2010.

Methods

The nationally representative sample was selected among physicians and nurses from four types of national health service institutions (primary health care centers; general hospitals; institutes, clinics or centers within the university teaching hospitals; and public health institutes), and four regions, i.e., Vojvodina (northern part of Serbia), Belgrade, Central Serbia and at the part of Kosovo and Metohia with predominantly Serbian population.

A stratified two-fold random cluster was applied. Sample size was based on the number of physicians (including dentists, and pharmacists) and nurses employed with the National Health Service obtained by the Serbian Institute of Public Health on the July 1, 2009 (20,217 physicians, and 48,613 nurses). In this study we included 20 health institutions. All the physicians and nurses present at work on the day of survey were eligible for the study. The questionnaire was anonymous and no personal data on participants were available.

Fifteen study coordinators were selected among health professionals previously engaged in the tobacco control activities. We provided written instruction and one-day training regarding the purpose and procedures of the study.

To obtain data on sex, age, occupation, type of health institution, years of employment, self-estimated health (very bad = 5, bad = 4, neither bad nor good = 3, good = 2, and very good = 1), sick-leave in previous year (yes/no), and tobacco use we constructed a self-administered questionnaire with 19 questions. Smoking means smoking cigarettes because the use of other tobacco products (e.g., pipes, cigars, shisha, etc) is very rare in Serbia. The participants were classified as current smokers, ex-smokers or never smokers. Current smokers were those who currently smoke regularly (every day) or occasionally (at least one day per week). We obtained the total number of cigarettes smoked daily and the number of cigarettes smoked at work for regular smokers, total number of cigarettes smoked in previous week and separately at work for occasional smokers, and the duration of smoking. For former smokers we obtained information on the year when they quit smoking, and the duration of smoking.

Categorical variables were presented as the numbers and percentages of subjects, and compared by chi square test and relative risks. Continuous variables were described by means and standard deviations and compared using one-way ANOVA with Bonferroni *post-hoc* pairwise comparisons. Prevalence rates are represented with its estimates and 95% confidence intervals (95% CI). We also calculated quit ratios

by dividing the number of former smokers with the number of ever smokers. Multivariate logistic regressions were used to evaluate independent predictors (sex, age, occupation, region, occupational setting, perception of health status, and sick leave during the last year) of smoking, smoking cessation and future intentions with smoking and were reported as odds ratios (OR) and 95% CI. Statistical analysis was performed with SPSS 19.0, a significance level of $p < 0.05$.

Results

The study included 3,084 individuals; out of them 2,282 completed the questionnaire yielding an overall response rate 74%, slightly higher for nurses (76.4%) than for physicians (68.9%). More women participated than men (1,831 and 418, respectively) reflecting the demographics of health employees in Serbia (Table 1); data on sex were missing for 33 participants. The overall smoking prevalence was 38%, similar among women (37.8%) and men (37.6%). Smoking prevalence was significantly higher among nurses (41.7%) than among physicians (29.1%) ($p = 0.000$), in the region of Kosovo and Metohia (46.8%), and at public health institutes (43.8%) and general hospitals (42.6%) ($p = 0.000$). Self-estimated health was the worst in former smokers ($p = 0.029$), while no difference was noticed on sick leave in previous years among different smoking categories ($p = 0.122$).

The quit ratio for all participants was 26.8 ± 1.4, for nurses 24.8 ± 1.4 and somewhat higher for physicians 32.8 ± 2.7.

The smokers on average smoked almost a package *per* day (17.7 cigarettes), men significantly more (23.9) than women (16.2), and physicians more (19.3) than nurses (17.3) (Table 2). The average number of cigarettes smoked daily was higher in Kosovo and Metohia with predominantly Serbian population (19.6) and in Central Serbia (19.0), and among health care workers in general hospitals (19.3) and public health institutes (18.4). About one third of daily number of cigarettes was consumed at work (6.2). The average duration of smoking was 17.6 years, and it was longer for men (20.0 years) than women (17.0 years).

A little more than a half of all the participants thought that they had a problem with smoking at work (55.3%), with no statistically significant difference regarding sex, occupation, type of health institution and region. One third of all participants would like to quit smoking, similarly for men and women. However, more men than women would like to continue smoking unchanged while more women would like to reduce the number of cigarettes smoked ($p = 0.03$). Significantly more physicians would like to quit (40.3%) than nurses (32.3) ($p = 0.02$).

We conducted four separate multivariate analyses to examine factors of being ever, current and former smoker compared to never smoker, as well as current compared to former smoker (Table 3). Multivariate logistic regression models showed that ever or current smoking was significantly associated with the similar factors – occupation, territory, type of health institutions, and self-estimated health. Women were less likely to be ever smokers (OR = 0.74), but nurses were more likely to be ever or current smokers (OR = 1.75 and OR = 1.91, respectively). A significantly elevated risk for ever and current smoking was observed for health professionals from Kosovo and Metohia with predominantly Serbian population (OR = 1.37, and OR = 1.45, respectively), and those employed in general hospitals (OR = 1.37, and 1.40, respectively). Worse self-estimated health was a significant factor for ever and current smoking (OR = 1.15, and OR = 1.17, respectively), while sick-leave was associated only with smoking cessation (OR = 0.70). Factors influencing smoking cessation were also sex (women were less likely to stop smoking, OR = 0.64), and occupation (nurses more often quit smoking, OR = 1.43).

Our results generated from the final multivariate logistic regression analysis showed that women more often had intention to quit smoking compared to men (OR = 1.51) (Table 4). Significant difference was noticed neither for age, type of health institution nor for region and sick leave in the previous year. Those respondents who wanted to quit or reduce the number of cigarettes smoked had worse self-estimate of their health (OR = 1.74).

Discussion

In this representative cross-sectional study among health professionals from the National Health Service in Serbia, we found a high smoking prevalence of 38.0%, nearly the same for women and men. This prevalence is higher than for the general adult population in Serbia based on the data from 2006 (33.6%) and much higher than for adult women population (29.9%) [1]. High smoking prevalence among women has been recorded in many countries in the last decade, mostly due to the changed social role of women, work stress and aggressive tobacco marketing targeting especially women [19, 20].

We also found a considerable difference in smoking prevalence between physicians and nurses, with more nurses smoking than physicians. This has been reported in many other studies [3, 12, 15, 21–23], and is consistent with results from the Serbian national survey indicating higher smoking prevalence among women with college education [24]. The fact that about 30% of the physicians and more than 40% of nurses smoke may have an unfavorable impact on attempts to provide counseling to the patients regarding smoking cessation. It certainly is not a good starting point for the introduction and compliance with the new law totally banning smoking in health institutions in Serbia. Surprisingly, we observed the highest percentage of smokers in public health institutes, which are primarily preventive institutions that deal with healthy life styles of the population, similarly to the findings from 2006 [2].

Smoking prevalence among physicians (29%) was lower than what was recorded for the general population (33.7%), and more than a half physicians have never been smokers. However, this seems to be a pretty high percentage for individuals who know the health risks and have some responsibility for counseling the public regarding smoking.

Tabele 1

Prevalence rates (PR) of smoking status in the population of health professionals and its subgroups

Variable	Total	Current smoker	Ex-smoker	Never smoker	*p*
Participants (n), [PR†]	2,282	866 [38.0; 36.0–39.9]	305 [13.4; 12.0–14.8]	1,111 [48.7; 46.6–50.7]	
Sex‡ n (%)‖, [PR†]					
men	418 (18.6)	157 (18.5) [37.6; 32.9–42.2]	68 (22.6) [16.3; 12.7–19.8]	193 (17.6) [46.2; 41.4–51.0]	
women	1,831 (81.4)	692 (81.5) [37.8; 35.6–40.0]	233 (77.4) 12.7; 11.2–14.3]	906 (82.4) 49.5; 47.2–51.8]	0.138
Age (years), x̄ ± SD	41.8 ± 9.8	41.5 ± 9.6	42.6 ± 9.4	41.8 ± 10.0	0.204
Years of employment, x̄ ± SD	18.4 ± 9.8	18.5 ± 9.7	19.2 ± 9.5	18.0 ± 9.9	0.167
Occupation, n (%)‖, [PR†]					
physicians	683 (29.9)	199 (23.0) [29.1; 25.7–32.6]	94 (30.8) 13.8; 11.2–16.4]	390 (35.1) 57.1; 53.4–60.8]	
nurses	1,599 (70.1)	667 (77.0) [41.7; 39.3–44.1]	211 (69.2) 13.2; 11.5–14.9]	721 (64.9) 45.1; 42.7–47.5]	0.000
Region, n (%)‖, [PR†]					
Vojvodina	762 (33.4)	266 (30.7) [34.9; 31.5–38.3]	111 (36.4) 14.6; 12.1–17.1]	385 (34.7) 50.5; 47.0–54.1]	
Belgrade	523 (22.9)	216 (24.9) [41.3; 37.1–45.5]	60 (19.7) 11.5; 8.7–14.2]	247 (22.2) 47.2; 42.9–51.5]	
Central Serbia	591 (25.9)	194 (22.4) [32.8; 29.0–36.6]	79 (25.9) 13.4; 10.6–16.1]	318 (28.6) 53.8; 49.8–57.8]	
Kosovo & Metohia	406 (17.8)	190 (21.9) [46.8; 41.9–51.7]	55 (18.0) 13.6; 10.2–16.9]	161 (14.5) 39.7; 34.9–44.4]	0.000
Settings, n (%)‖, [PR†]					
primary health centre	882 (38.7)	302 (34.9) [34.2; 31.1–37.4]	112 (36.7) 12.7; 10.5–14.9]	468 (42.1) 53.1; 49.8–56.4]	
general hospital	721 (31.6)	307 (35.5) [42.6; 39.0–46.2]	101 (33.1) 14.0; 11.5–16.6]	313 (28.2) 43.4; 39.8–47.0]	
university hospitals	293 (12.8)	88 (10.2) [30.0; 24.8–35.3]	47 (15.4) 16.0; 11.8–20.3]	158 (14.2) 53.9; 48.2–59.7]	
public health institutes	386 (16.9)	169 (19.5) [43.8; 38.8–48.8]	45 (14.8) 11.7; 8.4–14.9]	172 (15.5) 44.6; 39.6–49.5]	0.000
Self-estimated health, x̄ ± SD	2.18 ± 0.73	2.22 ± 0.77	2.24 ± 0.78	2.14 ± 0.68	0.029
Sick-leave in previous year – Yes, n (%)‖, [PR†]	380 (16.9)	134 (15.6) [35.3; 30.4–40.1]	63 (20.7) 16.6; 12.8–20.3]	183 (16.8) 48.2; 43.1–53.2]	0.122

***Number of participants; †Estimated prevalence rate along with its 95% confidence intervals; ‡Missing data on sex for 33 participants; ‖Vertical percentage (by the total number of participants, total number of smokers, ex-smokers and non-smokers).**

Table 2

Smoking pattern in the group of current smokers (daily and occasionally)

Variable	No of cigarettes consumed daily (0) ($\bar{x} \pm SD$)	No of cigarettes consumed daily at work (0) ($\bar{x} \pm SD$)	Duration of smoking cigarettes† (years) ($\bar{x} \pm SD$)	Smoking as a problem at work† n (%)	Future intentions†		
					Quit n (%)	Reduce n (%)	Continue n (%)
Total	17.7 ± 8.9	6.2 ± 6.1	17.6 ± 8.6	463 (55.3)	284 (34.3)	230 (27.7)	230 (27.7)
men	23.9 ± 11.2	9.9 ± 7.7	20.0 ± 9.4	89 (57.1)	53 (35.1)	45 (29.8)	53 (35.1)
women	16.2 ± 7.7	5.4 ± 5.3	17.0 ±8.4	374 (54.8)	231 (34.1)	270 (39.8)	177 (26.1)
p =	0.000	0.000	0.000	0.341		0.032	
Occupation							
physicians	19.3 ± 10.9	6.7 ± 7.8	18.4 ± 9.2	107 (54.6)	79 (40.3)	58 (29.6)	59 (30.1)
nurses	17.3 ± 8.3	6.1 ± 5.7	17.3 ± 8.4	361 (54.8)	210 (32.3)	261 (40.2)	179 (27.5)
p =	0.007*	0.243	0.114	0.514		0.022	
Region							
Vojvodina (V)	17.1 ± 8.6	4.6 ± 5.1	19.1 ± 9.2	152 (57.8)	100 (38.5)	83 (31.9)	77 (29.6)
Belgrade (B)	15.7 ± 7.7	5.3 ± 5.2	17.7 ± 8.3	107 (50.5)	67 (31.5)	89 (41.8)	57 (26.8)
Central Serbia (CS)	19.0 ± 10.7*	7.5 ± 8.3*	17.6 ± 8.0	110 (57.9)	62 (33.3)	65 (34.9)	59 (31.7)
Kosovo & Metohia (K&M)	19.6 ± 8.7*	8.5 ± 5.4*	15.0 ± 7.9	99 (52.1)	289 (34.2)	82 (43.9)	45 (24.1)
p =	0.000	0.000	0.000	0.279		0.128	
Settings							
Primary health centre (PHC)	15.8 ± 8.2	3.6 ± 4.2	17.8 ± 8.7	169 (56.1)	108 (36.6)	115 (39.0)	108 (36.6)
General hospital (GH)	19.3 ± 9.3*	7.7 ± 5.9*	17.1 ± 8.8	156 (51.5.)	112 (37.2)	104 (34.6)	112 (37.2)
University hospital (UH)	17.8 ± 9.0	6.4 ± 7.0	19.7 ± 8.5	52 (54.7)	30 (34.9)	27 (31.4)	29 (33.7)
Public health institutes (PHI)	18.4 ± 9.5*	8.5 ± 7.7*.	16.7 ± 7.7	91 (55.8)	39 (23.8)	73 (44.5)	52 (31.7)
p =	0.000	0.000	0.04	0.515		0.035	

***Statistically significant difference; 0 – daily smokers only; †daily and occasional smokers; *K/V (*p* = 0.015); *H/PHC (*p* = 0.000); *PHI/PHC (*p* = 0.000), and *PHI/UH (*p* = 0.045); *K&M/V (*p* = 0.000), and *K&M/B, (*p* = 0.000); *CS/V (*p* = 0.000), and *CS/B (*p* = 0.002); *GH/PHC (*p* = 0.000); *PHI/PHC (*p* = 0.000), and *PHI/UH (*p* = 0.045).**

Table 3

Multivariate analysis of the factors explaining different smoking pattern among employees in health institutions in Serbia

Variables	Ever *vs* never			Current *vs* never			Ex smokers *vs* never			Current *vs* ex-smokers		
	p	OR[†]	(95% CI)	*p*	OR	(95% CI)	*p*	OR	(95% CI)	*p*	OR	(95% CI)
Sex												
men[‖]												
women	0.013*	0.74	(0.59–0.94)	0.058	0.78	(0.60–1.01)	0.011	0.64	(0.46–0.90)	0.303	1.20	(0.85–1.71)
Age	0.041	1.01	(1.00–1.02)	0.123	1.01	(1.00–1.02)	0.059	1.01	(1.00–1.03)	0.339	0.99	(0.98–1.01)
Occupation												
physicians[‖]												
nurses	0.000*	1.75	(1.42–2.14)	0.000*	1.91	(1.52–2.40)	0.025	1.43	(1.05–1.95)	0.057	1.37	(0.99–1.89)
Region												
Vojvodina[‖]												
Belgrade	0.210	1.18	(0.91–1.54)	0.098	1.27	(0.96–1.79)	0.817	0.95	(0.63–1.44)	0.104	1.42	(0.93–2.16)
Central Serbia	0.255	0.88	(0.70–1.20)	0.295	0.87	(0.68–1.12)	0.447	0.88	(0.63–1.23)	0.817	1.04	(0.72–1.48)
Kosovo & Metohia	0.020	1.37	(1.05–1.78)	0.010*	1.45	(1.10–1.93)	0.695	1.08	(0.73–1.62)	0.165	1.33	(0.89–1.98)
Settings												
primary health center[‖]												
general hospital	0.006	1.37	(1.09–1.73)	0.009*	1.40	(1.09–1.79)	0.098	1.34	(0.95–1.90)	0.769	1.05	(0.74–1.50)
university hospital	0.893	1.02	(0.77–1.34)	0.613	0.92	(0.68–1.26)	0.250	1.27	(0.85–1.89)	0.220	0.76	(0.49–1.18)
institute of Public Health	0.060	1.30	(1.00–1.70)	0.051	1.34	(1.00–1.78)	0.550	1.14	(0.74–1.76)	0.622	1.12	(0.72–1.74)
Self-estimated health	0.028*	1.15	(1.02–1.30)	0.025*	1.17	(1.02–1.34)	0.188	1.14	(0.94–1.38)	0.839	1.02	(0.85–1.22)
Sick-leave in previous year												
no[‖]												
yes	0.663	1.05	(0.83–1.33)	0.698	0.95	(0.73–1.23)	0.080	1.35	(0.96–1.90)	0.050*	0.70	0.49-1.00

*** – Statistically significant difference; OR – odds ratio; 95% CI – 95% confidence Interval; [‖]reference group.**

Table 4

Multivariate analysis of the predictors of future intentions to quit or reduce smoking compared to intention to continue smoking unchanged among employees of health institutions in Serbia

Variables	*p*	OR	(95% CI)
Sex			
men‖			
women	0.050*	1.51	(1.01–2.27)
Age	0.846	1.00	(0.98–1.02)
occupation			
physicians‖			
Nurses	0.519	0.88	(0.59–1.31)
Region			
Vojvodina‖			
Belgrade	0.377	1.24	(0.76–2.03)
Central Serbia	0.922	1.02	(0.66–1.58)
Kosovo & Metohia	0.128	1.43	(0.90–2.28)
Settings			
primary health centre‖			
general hospital	0.286	0.79	(0.52–1.21)
university hospital	0.068	0.60	(0.35–1.04)
institute of public health	0.159	0.71	(0.44–1.15)
Self-estimated health	0.000*	1.74	(1.39–2.18)
Sick-leave in previous year			
no‖			
yes	0.094	0.69	(0.44–1.07)

*** – Statistically significant difference; OR – odds ratio; 95% CI – 95% confidence interval; ‖reference group.**

High smoking rates among physicians have been reported in some other countries, such as in Turkey, Tunisia, Pakistan, Italy, Bosnia and Herzegovina, Greece and China [3–6, 21, 25–28]. In these countries, except in Italy, there was a huge difference between men and women, with men smoking more than women. This differs substantially from high smoking prevalence among women – health professionals in our study indicating that smoking is socially acceptable and/or reflects the changing social role of women in the transitional society of Serbia. Such a high smoking prevalence among Serbian health professionals is in contrast with many countries with a longer history of tobacco control and effective enforcement of smokefree legislation (e.g., the US, Australia, Brazil or France), in which reduction in smoking rates among health professionals was followed by the reduction in general population [11, 12, 14, 29, 30]. In some of these countries, smoking prevalence in medical doctors is far below 15%, and in nurses below 20%.

The majority of smokers in our study group were regular daily smokers, only 14 (1.6%) participants were occasional smokers who smoked on average 9.7 cigarettes weekly and 4.5 cigarettes at work weekly (data not presented). This is contrary to the trend in some other countries that reported increasing number of occasional smokers in health care settings and decreasing number of regular smokers [7, 22, 23]. Among regular daily smokers, men smoke more cigarettes *per* day (23.9), smoke more at work (9.9) and have had a longer duration of smoking (20 years) than women. An interesting finding was that despite reporting lower smoking prevalence, physicians smoke more cigarettes *per* day (19.3) than nurses (17.3), which is higher than reported in some other studies [4–7, 19, 22, 23, 30], but similar to data from Bosnia and Herzegovina [3].

We found that the mean duration of smoking was 17.6 years and the mean years of employment 18.5, suggesting that becoming regular smoker for many employees coincided with the start of employment, indicating that changing their behavior and overcoming nicotine addiction won't be an easy task. However, a quarter of smokers (24.2% among physicians and 23.3% among nurses) reported that they did not smoke at work, which shows their attempt to set a good example. A little more than a half of all respondents mentioned that smoking was a problem at work, with little variation by gender, occupation, settings or region, probably because the study was performed a year before the new Law on Protection of Citizens from Exposure to Tobacco Smoke fully entered into force in November 2010. The old law (1995) that banned smoking in enclosed premises only partially restricted smoking in health institutions with a very low compliance; smoking was actually allowed almost everywhere.

There were no differences in future intentions regarding smoking cessation in men and women, with a third of all smokers wanting to quit. Compared to men women more often wanted to only reduce the number of cigarettes than to quit. Regarding occupation, physicians more frequently expressed the intention to quit, while nurses preferred to reduce the daily number of cigarettes, reported also in some studies [3, 4, 21], while in others more than a half of all smokers wanted to quit [23, 28, 30, 31].

Among physicians and nurses, a similar percentage of former smokers (13.8% and 13.2%, respectively) was reported, 85% of whom had quit more than a year ago. The percentage of ex-smokers among health professionals (13.4%) was much lower than in the general Serbian adult population – 25% [24]. This is supported by the low quit ratios

in our study, both for physicians and nurses, lower than reported in the US or in Germany [12, 32]. Such a low percentage of former smokers was also reported in some studies that had high smoking prevalence among health professionals, such as in Tunisia and Jordan [6, 28], while higher percentage of ex-smokers has been reported more often [4, 7, 9, 12, 21, 30, 33, 34]. The multivariate analysis also showed that women were less likely to be ex-smokers compared to men, and physicians compared to nurses. Since ex-smokers rated their own health worse, we can speculate that the main reason for quitting could be already damaged health. Many other studies reported that the main reason for quitting smoking was currently bad health [29–31, 35]. Similarly, our findings indicated that a worse self-estimate of health was a predictor of future intention to quit or reduce the number of cigarettes. On the other hand, we also noticed that two third of all former smokers quit after 2003, which coincided with more intensive tobacco control activities by the Ministry of Health and its National Committee for Tobacco Prevention suggesting that the media campaigns and other related activities strengthen their motivation to quit.

Although health hazards from smoking and exposure to second hand smoke were well-known to the majority of health professionals in 2009, i.e. at the time the study was performed, an unacceptable percentage continued to smoke. We regarded this as a great obstacle to the compliance with the new law that totally banned smoking in all health institutions, including backyards and front doors. Smoking doctors and nurses are less likely to ask their patients about smoking, counsel them about smoking hazards, or actively participate in smoking cessation programs. Such a high prevalence of smoking especially among nurses, that constitute the majority of workforce in health institutions, may substantially reduce the chances of health institutions to become 100% smoke-free. Moreover, it is not easy to convince the general population to give up smoking and accept healthy life styles, when health professionals continue to smoke.

According to the opinion poll performed a year after the law went into force in 2011 by the Ministry of Health of the Republic of Serbia, public support for this law was high and stable over the time (77% in 2010, 81% in 2011 and 82% in 2012). Since 2010, out of 10,873 inspections in health institutions only a very small number of infringements of law were noted (20 cases of cigarettes or ashtrays visible, 6 cases of smoking inside health institutions, 4 cases of missing name of the responsible person and 2 cases of missing no smoking signs). Having in mind that compliance with laws in the country is generally very low, compliance with the new law in health institutions could be accepted as quite good. Smoking is not obviously apparent in health institutions, however, our survey would indicate that it must be occurring, probably in some remote offices or spaces, especially in the afternoon or evening shifts and therefore more intensive efforts to encourage compliance are required.

There are some limitations in our study. The study relied on self-reported responses from a questionnaire and smoking status was not biochemically verified. These could lead to under-reporting of smoking among health professionals. Although such a bias may occur, we do not believe that it is serious because in the time of study smoking was still regarded as "normal" behavior in Serbia. A majority of studies that evaluated the validity of self-reported smoking status found it as an acceptable method of gathering information [36–39], although not all such reports agreed [40, 41]. In addition, the questionnaire was anonymous and the confidentiality was assured. It may be, however, that the smoking rates among health care professionals are higher than indicated by our survey.

The strength of our study includes a large nationwide sample of health professionals and health institutions and geographical distribution of participants. The response rate was pretty high – 74%, higher than reported in the majority of studies on smoking among health professionals. We were able to assess the smoking prevalence in physicians and nurses across the country and evaluate their capacity to give up smoking, and thus enable better enforcement of smoking ban in health institutions.

Conclusion

Our results indicate that a high smoking prevalence among health professionals, particularly in nurses, is still considerable and could be a barrier for the full implementation of smoking ban in health institutions in Serbia. There is a need for developing and performing special smoking cessation programs for health professionals on their workplaces, as a part of workplace health promotion activities. Formal education in tobacco control and particularly in different smoking cessation methods should be a part of regular high school and university curricula, as well as later continuous education. This is also an opportunity for adoption of the evidence based clinical guidelines that will specifically target nurses and physicians. After adoption of the law that totally banned smoking in health institutions, health administration should strengthen their efforts to enforce the law.

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