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PREVALENCE OF TOBACCO SMOKING AND ELECTRONIC CIGARETTE USE AMONG THE HIGH SCHOOL STUDENTS IN NOVI SAD

PREVALENCIJA PUŠENJA DUVANA I ELEKTRONSKIH CIGARETA MEĐU UČENICIMA SREDNJIH ŠKOLA U NOVOM SADU

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Summary

Introduction. Smoking is the leading preventable cause of mortality in the world. The World Health Organization estimates that annually more than seven million lives are lost worldwide due to smoking-related diseases. The aim of the study was to examine lifetime use of tobacco and electronic cigarettes, using patterns in the last 30 days, and to determine cigarette availability among the first grade high school students in Novi Sad. **Material and Methods.** The cross-sectional study was conducted among the first grade public high school students in Novi Sad. The study sample included 1.067 participants (587 girls and 480 boys), born in 2002. The survey used the questionnaire of the European School Project on Alcohol and other Drugs. **Results.** Of the examined sample, a total of 40.1% of high school students in Novi Sad have at least tried smoking cigarettes during their lifetime, girls significantly more often (p=0.001). With no gender difference, 20% of students smoked at least one cigarette in the month preceding the survey. Every seventh student (13.9%) tried their first cigarette at the age of 13 or younger, girls significantly more often (p=0.001). A little less than one fifth of the examinees (18.4%) tried electronic cigarettes. In the month preceding the survey, every twelfth examinee used electronic cigarettes (8.1%). **Conclusion.** Monitoring the prevalence of tobacco use in young people, especially new tobacco products, indicates the need for continuous and intensive activities in the field of health promotion with implementation of effective tobacco control measures.

Key words: Smoking; Electronic Nicotine Delivery Systems; Adolescent; Students; Schools; Tobacco Use; Adolescent Behavior

Sažetak

Uvod. Pušenje je vodeći uzrok mortaliteta u svetu koji se može prevenirati. Svetska zdravstvena organizacija je procenila da se na svetskom nivou godišnje izgubi više od sedam miliona života usled razvoja bolesti koje su povezane sa pušenjem. Cilj rada bio je da se ispita upotreba duvana i elektronskih cigareta u toku života i u poslednjih 30 dana, kao i dostupnost cigareta među učenicima prvih razreda srednjih škola i gimnazija u Novom Sadu. **Materijal i metode.** Istraživanje predstavlja studiju preseka sprovedenu na uzorku učenika prvih razreda državnih srednjih škola u Novom Sadu. Analizirani su podaci koji se odnose na ispitanike koji su rođeni 2002. godine, odnosno ukupno 1 067 ispitanika, od toga 480 mladića (45%) i 587 devojaka (55%). Kao instrument istraživanja korišćen je *European School Project on Alcohol and other Drugs* upitnik. **Rezultati.** Ukupno 40,1% učenika prvog razreda srednjih škola u Novom Sadu u toku života probali su da puše cigarete, značajno više devojke (p = 0,001). Bez razlike u odnosu na pol, 20% učenika je popušilo bar jednu cigaretu u mesecu koji je prethodio istraživanju. Svaki sedmi učenik (13,9%) probao je da puši cigarete sa 13 godina ili manje, značajno više devojke (p = 0,001). Nešto manje od petine ispitanika (18,4%) u toku života probalo je elektronske cigarete, a u mesecu koji je prethodio istraživanju, svaki dvanaesti ispitanik je koristio elektronske cigarete (8,1%). **Zaključak.** Praćenje prevalencije korišćenja duvana kod mladih, naročito novih duvanskih proizvoda, ukazuje na potrebu stalnog intenziviranja aktivnosti u oblasti promocije zdravlja a istovremeno i dosledne primene efikasnih mera kontrole duvana.

Ključne reči: pušenje; elektronske cigarete; adolescent; učenici; škole; upotreba duvana; adolescentsko ponašanje

Introduction

Tobacco addiction is considered to be the most common and problematic form of addiction world-

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Abbreviations

WHO	– World Health Organization
US	– United States
FCTC	– Framework Convention on Tobacco Control
ESPAD	– European School Project on Alcohol and other Drugs

wide [1]. It is associated with a number of diseases, as one of the major risk factors for their development. Smoking is the leading cause of preventable mortality in the world. The World Health Organization (WHO) has estimated that tobacco kills more than 7 million people each year; more than 6 million of those deaths are the result of direct tobacco use, while almost 1 million deaths are the result of non-smokers being exposed to second-hand smoke [2]. The main chemical component of tobacco, present not only in cigarettes but also in other tobacco products, is nicotine. In unionized state, nicotine is readily absorbed across the epithelium of the lungs, oral mucosa, nose, and through the skin. Nicotine is responsible for tobacco dependence, but it also exerts its negative effects on a number of organs and organ systems [3]. Cigarette smoke contains more than 7,000 chemicals which include a number of toxic and carcinogenic substances (polycyclic aromatic hydrocarbons, tobacco-specific nitrosamines; aromatic amines, formaldehyde, acetaldehyde, 1.3-butadiene and benzene, as well as various metals) [4].

Although cigarettes are the most common tobacco product, alternative methods of smoking are becoming increasingly common and popular such as electronic cigarettes (e-cigarette). E-cigarettes include a diverse group of devices that allow users to inhale an aerosol, which typically contains nicotine, flavourings, and other additives [5]. According to the United States (US) Surgeon General's Report sales of e-cigarettes in the US have risen rapidly since 2007 and the prevalence of current e-cigarette use (defined as use during at least 1 day in the past 30 days) among high school students increased dramatically to 16% by 2015 [5, 6].

The World Health Organization data show that in the period from 2007 to 2015, the prevalence of smoking among young people aged 15 years declined globally from 23.5% to 20.7% [7]. Data of the National Health Survey of the Republic of Serbia from 2013 showed that 19.2% of young people aged 15 - 19 were smokers, and 34.7% of the adult population smoke daily or occasionally (37.9% men and 31.6% women) [8]. Last survey that was conducted in Serbia in order to acquire a better insight into the prevalence of smoking among young people was in 2013. The results showed that at least one of 10 students smoked cigarettes (13%), girls more often (13.3%) than boys (12.7%) [9].

The research has shown that smoking typically begins with experimental use of cigarettes and that the transition to regular smoking can occur relatively quickly, after smoking about 100 cigarettes [10]. The study of Kendler et al. has shown that early nicotine exposure directly increases the level of later nicotine dependence [11].

In response to the global epidemic of smoking, in 2003, WHO has adopted the Framework Convention on Tobacco Control (FCTC). In order to assist implementation of this document and measures within its respective jurisdictions, in 2008 the WHO announced a package of six tobacco control measures called MPOWER, an acronym that includes the following measures: Monitor, Protect, Offer, Warn, Enforce, and Raise [7]. In accordance with the FCTC, the Government of the Republic of Serbia adopted a Tobacco Control Strategy with the ultimate aim of smoking prevention, particularly among the youth, by reducing the prevalence of smoking in the minors by 1% annually [12].

Assessment of the cigarette smoking prevalence and the onset of cigarette and other tobacco products use is of the utmost importance for monitoring the progress of tobacco control measures. The aim of the study was to examine the lifetime tobacco and electronic cigarette use, using patterns in the last 30 days, and to determine availability of cigarettes among the first grade high school students in Novi Sad.

Material and Methods

This cross-sectional study was carried out in November – December 2017, among first year students of public high schools in Novi Sad as the target population. A total of 1236 students were surveyed and the sample was stratified by the type of school (gymnasium or professional school - 3 and 4 year school programs, respectively) with class as sampling unit (19 high schools, 65 classes). The students who were at school on the day of the survey filled out the questionnaires anonymously during a lesson lasting 45 minutes. Besides students, only a research team member was in the classroom. All respondents were informed about the purpose of the study and agreed to participate. The survey instrument was a self-administered European School Project on Alcohol and other Drugs (ESPAD) questionnaire which was the sixth data-collection wave in 2015.

In order to provide comparison with the results of other studies that have used ESPAD methodology, questionnaires with more than 50% of missing answers and those with missing data about gender or year of birth were excluded from the database. The final analyzed sample included 1067 participants (587 girls and 480 boys) born in 2002.

The prevalence of tobacco as well as e-cigarette use was examined during lifetime, and in the last 30 days. Lifetime prevalence of smoking cigarettes was assessed through the question: "On how many occasions (if any) have you smoked cigarettes during your lifetime?" with answers being on a seven-point-scale ("0" to "40 or more times"). This variable was dichotomized to indicate any smoking in the lifetime (with those reporting 0 times classified as "No" (never tobacco smokers) and those report-

ing any occasion classified as "Yes". Respondents were asked how frequently they had smoked in the last 30 days, with answers on a seven-point-scale ranging from „not at all" to „more than 20 cigarettes per day". Analysis was done based on variables categorized as "not at all"; "less than 1 cigarette per day" and "1 or more cigarettes per day". Those reporting at least 1 cigarette smoked in the last 30 days were classified as current tobacco smokers. Ever tobacco smokers were respondents who smoked cigarettes during their lifetime, but not in the last month. Data about e-cigarette use were gathered by the question "Have you ever used e-cigarettes?" For our purposes, the obtained data were categorized into 3 categories: "Never";"Yes, but more than 30 days ago" (ever e-cigarette users) and " Yes, in the last 30 days" (current e-cigarette users). Early onset of tobacco and e-cigarette use was assessed by questions: "When (if ever) did you smoke your first cigarette/Use your first e-cigarette" and "When (if ever) did you start smoking cigarettes on a daily basis/Use e-cigarettes on a daily basis". Responses were grouped and analyzed as "Never"; "At the age of 13 or younger" and "At the age of 14 or older". In order to assess availability of tobacco the following question was put: "How difficult do you think it would be for you to get cigarettes if you wanted?" The possible answers were: impossible, very difficult and fairly difficult (coded as difficult); fairly easy and very easy (coded as easy); and I don't know.

A Chi-squared test was used to check whether differences between distribution of proportions of variables were statistically significant. The level of statistical significance was set at $p < 0.05$. All the statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), 21.0 software package.

Results

The obtained results showed that a total of 40.1% of first year high school students in Novi Sad have tried cigarettes during their lifetime, girls significantly more (45.0%) compared to boys (34.1%). Every fifth student (20.0%) had smoked at least one cigarette during the 30 days preceding the survey, 18.2% of boys and 21.4% girls. During this period, 13.4% of the total has smoked on a daily basis (at least one cigarette per day). A total of 13.9% of students had smoked cigarettes at the age of 13 years or younger, girls significantly more (16.0% of girls vs. 11.3 % of boys). The percentage of students who began smoking cigarettes on a daily basis at the age of 13 or

Table 1. Prevalence of lifetime cigarette smoking and in the last 30 days, the age at which the first cigarette was smoked, and the availability of cigarettes among the first grade secondary school students in Novi Sad
Tabela 1. *Prevalencija pušenja cigareta tokom života i u poslednjih 30 dana, uzrast kada je popušena prva cigareta i dostupnost cigareta među učenicima prvih razreda srednjih škola u Novom Sadu*

Variable/*Varijabla*	Gender/*Pol*				Total/*Ukupno*		p
	Males/*Muški*		Females/*Ženski*				
	n	%	n	%	n	%	
Total/*Ukupno*	480	45.0	587	55.0	1067	100.0	
Lifetime cigarette smoking/*Pušenje cigareta tokom života*							
No/*Ne*	315	65.9	322	55.0	637	59.9	<0.001
Yes/*Da*	163	34.1	263	45.0	426	40.1	
Cigarette smoking in the last 30 days/*Pušenje cigareta u poslednjih 30 dana*							
Not at all/*Ne*	390	81.8	459	78.6	849	80.0	0.429
Less than 1 cigarette per day *Manje od 1 cigarete na dan*	28	5.9	42	7.2	70	6.6	
1 or more cigarettes per day/*1 ili više cigareta na dan*	59	12.4	83	14.2	142	13.4	
Age of first cigarette smoking/*Uzrast kada je popušena prva cigareta*							
Never/*Nikad*	317	66.3	322	54.9	639	60.1	
Age of 13 or younger/*Sa 13 godina ili mlađi*	54	11.3	94	16.0	148	13.9	0.001
Age of 14 or older/*Sa 14 godina ili stariji*	107	22.4	170	29.0	277	26.0	
Age of cigarette smoking on a daily basis/*Uzrast kada puši cigarete svakodnevno*							
Never/*Nikad*	411	86.2	470	81.2	881	83.4	
Age of 13 or younger/*Sa 13 godina ili mlađi*	16	3.4	22	3.8	38	3.6	0.079
Age of 14 or older/*Sa 14 godina ili stariji*	50	10.5	87	15.0	137	13.0	
Availability of cigarettes/*Dostupnost cigareta*							
Difficult/*Teško*	81	17.1	66	11.4	147	14.0	
Easy/*Lako*	297	62.5	392	67.8	689	65.4	0.029
Don't know/*Ne zna*	97	20.4	120	20.8	217	20.6	

Table 2. The prevalence of e-cigarette use, age of first e-cigarette use and use of e-cigarettes on a daily basis among first year high school students in Novi Sad
Tabela 2. *Prevalencija upotrebe e-cigarete (elektronske cigarete), uzrast prilikom prve upotrebe i svakodnevne upotrebe e-cigarete među učenicima prvih razreda srednjih škola u Novom Sadu*

Variable/*Varijabla*	Gender/*Pol*				Total *Ukupno*		p
	Males/*Muški*		Females/*Ženski*				
	n	%	n	%	n	%	
E-cigarette use/*Upotreba e-cigareta*							
Never/*Nikad*	349	79.3	461	83.4	810	81.6	<0.001
More than 30 days ago/*Pre više od 30 dana*	39	8.9	64	11.6	103	10.4	
In the last 30 days/*U poslednjih 30 dana*	52	11.8	28	5.1	80	8.0	
Age of first e-cigarette use/*Uzrast kada je upotrebljena e-cigareta prvi put*							
Never/*Nikad*	352	80.9	456	82.6	808	81.9	
Age of 13 or younger/*Sa 13 godina ili mlađi*	26	6.0	24	4.3	50	5.0	0.051
Age of 14 or older/*Sa 14 godina ili stariji*	57	13.1	72	13.0	129	13.1	
Age of e-cigarette use on a daily basis/*Uzrast kada koristi e-cigaretu svakodnevno*							
Never/*Nikad*	397	91.5	528	95.5	925	93.7	
Age of 13 or younger/*Sa 13 godina ili mlađi*	11	2.5	4	0.7	15	1.5	0.017
Age of 14 or older/*Sa 14 godina ili stariji*	26	6.0	21	3.8	47	4.8	

younger was 3.6% (3.4% of boys and 3.8% of girls). Over 60% of students replied that they could easily get cigarettes if they wanted to, girls significantly more (67.8%) compared to boys (62.5%) **(Table 1).**

Frequency distribution of e-cigarette use is shown in **Table 2**. A total of 183 participants (18.4%) had used e-cigarettes at least once. Boys (11.8%) were significantly more likely to have used e-cigarettes in the last 30 days than girls (5.1%). When examining at what age the respondents tried e-cigarettes for the first time, 5.1% reported that it was at the age of 13 years or younger. A total of 1.5% of students reported using e-cigarette on a daily basis since the age of 13 years or younger and 4.8% since the age of 14 years or older.

Data on e-cigarette use in regard to tobacco use are shown in **Table 3**. Every fifth current cigarette smoker used e-cigarettes (21.7%), among ever tobacco smokers 9.1% were current e-cigarette users, while among students who have never smoked tobacco 3.8% were current e-cigarette users.

Discussion

This paper presents the findings of a survey which was conducted among the first year high school students in Novi Sad using ESPAD methodology. The results showed that a total of 40.1% of students have tried cigarettes during their lifetime, which is slightly more than in the previous survey conducted in 2013 in Novi Sad (37.7%) [13], but lower than the results from the survey performed at a national level in 2009 (46%) [14]. Data on lifetime prevalence of cigarette use from other countries in the region vary widely: Croatia (62%), Hungary (55%), Bulgaria (55%), Romania (52%), Slovenia (47%), Former Yugoslav Republic of Macedonia (38%) and Montenegro (34%) [15]. In the countries included in the ESPAD project the percentage of respondents who smoked at least once in their lifetime was reduced from 67% to 47% over the period 1995 - 2015 [16]. In our study, the prevalence was higher among girls (45.0% vs. 34.1%). However, across the

Table 3. E-cigarette use among first year high school students in Novi Sad in regard to the tobacco smoking status
Tabela 3. *Upotreba e-cigarete (elektronske cigarete) među učenicima prvih razreda srednjih škola u Novom Sadu u odnosu na pušački status*

	Never tobacco smokers *Nikad nisu pušili cigarete*		Ever tobacco smokers *Nekad su pušili cigarete*		Current tobacco smokers *Trenutno puše cigarete*		p
	n	%	n	%	n	%	
Never e-cigarette users *Nikad nisu koristili e-cigarete*	569	93.6	145	73.6	90	50.0	
Ever e-cigarette users *Nekad koristili e-cigarete*	16	2.6	34	17.3	51	28.3	<0.001
Current e-cigarette users *Trenutno koriste e-cigarete*	23	3.8	18	9.1	39	21.7	

ESPAD countries, boys were generally more likely to have tried cigarettes than girls. Countries with the largest gender differences, where higher rates were found in girls, are Monaco, Bulgaria and Malta [15].

According to the results of our study, a total of 20% of respondents have smoked at least one cigarette in the last 30 days, which is the same result like in 2011 ESPAD Report in Serbia [17]. Similarly, according to the 2015 ESPAD Report, on average, 21% of students in the ESPAD countries had used cigarettes during the last 30 days, while based on the results of a National Survey on Drug Use and Health in United States the prevalence of current cigarette smoking among youth 16 – 17 years of age was 13.6% [3, 15].

Results showed that the age of smoking initiation was 13 years or less in 13.9% of students. According to the literature, the age of smoking initiation is a significant factor for continuation of smoking. Khuder et al. concluded that men who started smoking before 16 years of age are at two times higher risk for not quitting smoking compared to those who started at a later age [18]. Adolescents who begin smoking earlier are more likely to become regular smokers at the age of 15 and are more likely to report multiple risk behaviours [19, 20].

There are two ways to obtain cigarettes; the first is to buy them from a store (commercially) and the second is to borrow, buy or steal them from other young people or adults (socially) [3]. Although in Serbia the Law on Tobacco prohibits selling tobacco products to minors, the results of Global Youth Tobacco Survey conducted in Serbia in 2013 among students 13 – 15 years old, showed that almost two thirds of students who smoke usually buy cigarettes from a supermarket, while a quarter of them get them from someone else [9, 21]. Consistent with previous findings, the results of our study showed that 65.4% of students considered that it would be easy to obtain cigarettes. This result is slightly higher compared to the average value of ESPAD countries (61%) [15].

This study also investigated the e-cigarette use among the first year high school students in Novi Sad. As described in the Surgeon General's Report, the patterns of tobacco use are changing recently, with more intermittent use of cigarettes and an increase in use of other products [3]. National Youth Tobacco Survey in the United States reports an increase in current use of e-cigarettes among high school students from 1.5% in 2011 to 16.0% in 2015 [5]. In our sample, the prevalence of current e-cigarette users is lower (8.0%). However, 18.4% are those who had tried e-cigarettes. This figure is lower than reported in Ireland among young people 16 - 17 years old (23.8%) and in Poland among students aged 15 - 19 years (62.1%) [22, 23]. In Finland, 17.4% of adolescents had tried e-cigarettes in 2013, and 25.0% in 2015 [24]. The prevalence of e-cigarette use in the last 30 days was significantly higher among young males than females. This corresponds with findings of other studies, which found that adolescent boys were more likely to use e-cigarettes than girls [22, 25]. Among current tobacco smokers the number of current e-cigarette users was significantly higher than in non-smokers. Tobacco smokers used e-cigarettes more frequently than non-smokers. However, among ever and never smokers, 9.1% and 3.8% were current e-cigarette users, respectively. Some authors suggested that e-cigarettes could recruite young non smokers to shift from e-cigarette to tobacco smoking once they are addicted to nicotine, who would otherwise be less susceptible to tobacco product use [26, 27].

Conclusion

Two-fifths of the first grade high school students in Novi Sad had tried smoking at least once during their life, significantly more girls. Every fifth student had smoked at least one cigarette in the month preceding the survey, and a total of 13.4% of respondents had smoked every day during this period. Every seventh student tried smoking cigarettes at the age of 13 or less, significantly more girls. Two-thirds of students believe they can easily get cigarettes, significantly more girls. Slightly less than one-fifth of respondents have tried e-cigarettes. In the month preceding the study 8% of students used e-cigarettes. Findings of this study indicate that the prevalence of tobacco smoking among young people needs to be carefully followed, especially e-cigarettes use as a relatively new tobacco product. These results point out the need for continuous increase of activities in the field of health promotion as well as a consistent implementation of effective tobacco control measures.

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