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Original article

Factors Influencing Hookah Smoking in High School Students

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SUMMARY

In recent years, the prevalence of hookah smoking has increased worldwide, particularly in young people, which may have potentially serious consequences for their health.

The aim of this study was to examine the factors associated with the consumption of hookah by high school students.

The present study was conducted in the city of Novi Pazar, and students aged 17-19 years attending the following high schools were included: Medical School, Grammar School, Economic-Commerce School and Catering School. The study was designed as a case-control study. The cases were students who consumed nargile, while the control group consisted of students who had never smoked nargile. A special questionnaire was constructed for the purpose of this research, which was used to evaluate the opinions of adolescents on the consumption of nargile.

Our research included a total of 270 seniors in high schools in Novi Pazar. The average age of the students was 18 years. The most important factors that may contribute to start using nargile were: previous consumption of nargile by older family members, divorced parents, and active smoking of cigarettes by other family members. Most students emphasized that hookah smoking is socially unacceptable form of behavior. Also, hookah smoker were neither more attractive nor popular.

Nargile consumption is more common by adolescents whose parents are divorced, as well as by adolescents whose family members are smoking nargile or tobacco. The most common reason for nargile consumption among adolescents is a desire for relaxation.

Key words: **adolescents, risk factors, nargile, smoking**

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INTRODUCTION

"Waterpipe smoking" also known as nargile, shisha, hookah and hubble-bubble, became very popular during the last few centuries (1, 2). It is believed that the country of origin is India, where during the reign of Emperor Akbar, doctor Hakim Abdul Fatih invented smoking nargile as a less harmful way of using tobacco (2). There is also data that hookah originated in South Africa, Persia and Ethiopia (3), and that it is a common practice in Turkey, India, Pakistan and China (4). Nargile consumption is part of traditional heritage in most rural areas (5), gaining popularity among young people, especially in urban areas (6).

The attraction of this kind of tobacco consumption comes from an appealing smell of smoke. The size, shape and tobacco used in the nargile vary in different regions (7). The most commonly used form of nargile nowadays consists of the head, body, bowl (usually made out of glass), hose, and mouthpiece (7-9). This type of nargile and its use refer to the consumption of nargile containing flavored tobacco (apple, watermelon, strawberry, cappuccino, etc.)(10). Nargile consumption among young people around the world increased too much in the last decade (11). The prevalence of nargile smoking ranges from 6-34% in adolescents in the Middle East, and 5-17% among American adolescents (11). Also, the nargile smoking has increased globally and threatens to become the second biggest global epidemic after cigarettes (11-13).

Targets are adults, but, unfortunately, adolescents and children are also involved in nargile consumption (14). In a previous study that has been conducted, it has been shown that as much as 90% of non-adults have tried nargile already. However, the vast majority of these examiners did not know that tobacco was in the nargile (15). A study conducted in Egypt indicates that 26% of boys and 5% of girls consumed nargile, and as many as 22% of Israeli children used nargile once a week (16). Some studies have shown that passive smoking may be related to the level of parents' education and socioeconomic status (SES). The prevalence of nargile smoking was lower in children from families with higher SES, but higher in regions with high SES than in those with low SES (17). The level of higher education of fathers and mothers is significantly related to the lower frequency of smoking nargile by children (18-19).

A large number of studies conducted so far have provided information on the nature of nargile, the prevalence among young people and the effect on the health of users, but data on potentially contributing factors are scarce. Thus, the aim of this study was to examine the factors associated with the nargile consumptions among high school students.

METHOD

Study design

The study was designed as a case-control study. The cases were students who consume nargile, while the control group consisted of students who had never smoked nargile. The controls corresponded to cases by age and gender, and cases and controls were mutually compared in terms of exposure to risk factors for a few months, demographic characteristics and their life habits. While examining the prevalence of risk factors, neither cases nor controls were familiar with their case-control status.

Population

The data for this research were obtained via a questionnaire distributed to high school students of both sexes, 17 to 19 years old, living in Novi Pazar. All seniors were compatible as long as they met basal criteria listed in our research, whether they consumed nargile or not. It was planned that at least 200 seniors participate in the study.

Data collection

The research was conducted in Novi Pazar, in the following high schools: Medical School, Grammar School, Economic-Commerce School, and Catering School. Permissions to carry out the research in these schools were obtained by all school directors. Seniors filled out the questionnaire in their high school classrooms. Data collection was carried out from December 2016 to February 2017.

Questionnaire

Studies (9, 10, 20-21) that investigated nargile consumption represent the basis for this study and they were found searching for the key words such as: hookah, water pipe, smoking, high school, risk factors at

PubMed MEDLINE. On the basis of the above mentioned studies, a questionnaire was prepared for this research. Factors affecting nargile smoking were explored throughout the survey. All investigators participated in the selection of questions and final construction of the questionnaire. Using the questionnaire, the data on sociodemographic characteristics of the students such as age, sex, school success, cigarette and alcohol consumption, data of their parents, place of residence, and life habits were also gathered.

The questionnaire consisted of 30 questions, whereby some of them were from "Global Research on Student Health" questionnaire by World Health Organization, while other questions were found in studies, as mentioned earlier. The questionnaire included two separate sections: the first part of the questions was related to demographic characteristics of the students (sex, age, parents, brothers, sisters) as well as school success and parents' education, while the second part of the questionnaire was supposed to examine student awareness of the effects of nargile smoking on health, the consumption of cigarettes and alcohol, data on how often they smoke nargile, on what occasions, relationship with friends and so on. Questions were closed-type, with offered answers where participants could only choose one answer. Students were asked to be honest when giving answers to the questions asked, since the interview was anonymous. At the beginning of the research, students were provided with an explanation of how to participate in the survey and what the goal of our research was.

Variables measured in the study

Dependent variable was nargile smoking by seniors in high schools. Independent variables were factors assumed to influence high school students to consume nargile, such as: sex, age, place of residence, school, emotional partner, success at school, marital status of parents, whether the student is the only child in the family, the education of parents, the opinion of family members on the use of nargile (whether someone in the family consumes nargile), whether the student consumes alcohol and cigarettes.

Data analysis

The data were processed using IBM SPSS Statistics 18 program (23). To summarize the demographic data of the students, descriptive statistics were used. Continuous variables are presented by medians, maximum and minimum values, and categorical variables by number (percentage). Normality check was carried out using the Kolmogorov-Smirnov test. The differences between continuous variables in compared groups were assessed using a Student's t- test or Man Whitney U test depending on normality of data.

Chi-square test was used to explore the significance of the difference in the frequency between categorical variables. Binary logistic regression analysis was used to examine the impact of independent and confounding variables on a dichotomous outcome where the strength of association was presented by Odds Ratio (OR), with 95 % confidence interval.

The results were considered statistically significant if the probability value was < 0.05.

RESULTS

Our examination included a total of 270 high school seniors in Novi Pazar. The average age of the students was 18 years. The youngest of respondents were 17 and the oldest were 19 years old. There was no statistically significant difference in age between cases and controls (p = 0,913, Man-Whitney U test).

The socio-demographic characteristics of the students are shown in Table 1.

As smoking nargile is dependent and dichotomous variable, binary logistic regression analysis was carried out as well in order to determine what factors were associated with smoking nargile by high school seniors. In the regression model were included the variables that proved to be statistically significant using the Chi-square test and the Man-Whitney U test. Crude and adjusted Odds ratios are shown in Table 2.

The significance (P value) of the Hosmer and Lemeshow test was 0.679 (> 0.05), and Cox and Shell was 0.253 (Nagelkerke 0.348), indicating that the model was well performed. Significant interactions between parameters which were likely to have synergistic effect are shown in Table 3.

Significance (P value) of Hosmer and Lemeshow test for model with interactions was 0.568 (> 0,05) and Cox and Snell was 0.101 (Nagelkerke 0.138) indicating that the model with the interactions of the tested parameters was stable as well.

Student opinion on nargile smoking

The relaxation was identified as the main reason for smoking nargile by students. Students thought that people who smoked nargile were not more attractive or more socially acceptable, so nargile smoking was not

part of our culture and behavior. Student opinion on nargile smoking is shown in Table 4.

Table 1: Socio-demographic characteristics of the respondents

Variable	Cases (96)		Controls (174)		p value
	n	%	n	%	
Sex					
Male	42	43,8	58	33,3	
Female	54	56,2	116	66,7	0,091
Place of residence					
Village	12	12,5	31	17,8	
Town	84	87,5	143	82,2	0,255
School					
Medical school	57	59,4	73	42	
Technical school/ Grammar School	39	40,6	101	58	0,006*
Emotional partner					
No	65	67,7	119	68,4	
Yes	31	32,3	55	31,6	0,908
School success					
Excellent	41	42,7	96	55,2	
Very good/good	55	57,3	78	44,8	0,051
Parents' marital status					
Married	86	89,6	168	96,61	
Divorced	10	10,4	6	3,4	0,027*
The only child					
No	91	94,8	166	95,4	
Yes	5	5,2	8	4,6	0,832
Father's education level					
Higher	34	35,5	60	34,5	
Secondary/primary	61	64,2	114	65,5	0,830
Mother's education level					
Higher	15	15,6	33	19	
Secondary/primary	81	84,4	141	81	0,493
Cigarette consumption					
No	68	70,8	156	89,7	
Yes	28	29,2	18	10,3	0,000*
Alcohol consumption					
No	70	72,9	142	81,6	
Yes	26	27,1	32	18,4	0,098
Nargile consumption in family					
No	63	65,6	167	97,7	
Yes	33	34,4	4	2,3	0,000*

Legend: Chi- square test; n - number of patients; * - statistically relevant (0 < 0,05))

Table 2: Raw and adjusted ratio of chances of regression model

Variable	P	Crude OR (95%CI)	P	Adjusted OR* (95%CI)
School	0,006	0,495 (0,298-0,821)	0, 000	0,308 (0,166-0,570)
Parents' marital status	0,027	21,869 (7,446-64,229)	0,544	1,522 (0,391-5,920()
Cigarette consumption	0,000	3,569 (1,850-6,884)	0,001	3,728 (1,728-8,040)
Nargile consumption in the family	0,000	21,869 (7,446-64,229)	0,000	23,111 (7,469-71,511)

Legend: OR – odds ratio; CI – confidence Interval; Adjusted to: school, parents' marital status, cigarette and nargile consumption in family

Table 3: Significant interactions between parameters with synergistic effect

Variable	P	OR(95%CI)
School* Cigarette consumption	0,286	1,642 (0,660-4,085)
Cigarette consumption* Nargile consumption in the family	0,175	4,969 (0,490-50,376)
School* Nargile consumption in the family	0,004	7,264 (1,892-27,889)

Legend: OR – odds ratio; CI - Confidence Interval

DISCUSSION

The results of our research indicate that the problem is of a complex nature and that there are several important factors for which we can say with certainty that they are the cause of increased nargile consumption. Firstly, we have a group of socio-demographic factors that are predominantly related to the family of adolescents and the circumstances they meet during their growing up. The most influential factors were: consumption of nargile by family members as well as a factor related to the marital status of their parents, since the children of divorced parents were almost 22 times more likely to decide to try nargile. In addition, a significant factor was a distinguished consumption of cigarettes in the family, since children who grow up in families with smokers have a 3.5 times higher chance of deciding to consume nargile. Also, in our research we have come up with interesting results concerning the impact that the type of school that adolescents attend has on nargile smoking. Therefore, our research has shown that Medical School students are more likely to consume nargile compared to students of the Grammar School and Technical School. Opinions that local adolescents participating in our research had on consuming nargile indicate that the consumption of nargile in Novi Pazar was not part of their tradition or culture, and that pupils most often consume nargile in order to relax in this way. Our results are consistent with the results of other authors, which is described in more detail in the text below.

The number of teenagers consuming nargile is rising worldwide (23). Such a trend can have major consequences for their health since there are data indicating that people who consume nargile quite often also con-

sume some other substances that have a harmful effect on their health, most often cigarettes and marijuana (24).

Table 4: Students' opinion on nargile smoking

Opinion	Strongly disagree (%)	Partly disagree (%)	I don't know (%)	Partly agree (%)	Strongly agree (%)
People consuming nargile are cool	61,2	10,4	17,3	4,6	6,5
People consuming have more friends	66,2	10,8	9,6	6,2	2,7
Nargile consumption is part of our culture	70,0	10,0	9,6	6,2	4,2
Nargile smoking is more socially acceptable than cigarette smoking	23,9	15,1	20,5	22,0	18,5
Girls feel more comfortable smoking nargile than cigarettes	28,3	9,7	21,7	18,6	21,7
Boys smoking nargile are more attractive	65,4	10,5	10,9	9,3	3,9
Girls smoking nargile are more attractive	69,3	8,9	8,2	6,2	7,4
Shisha bars are important for promoting nargile	13,3	6,7	14,9	21,2	43,9
I smoke nargile to be part of my friends crew	41,8	11,2	13,3	12,2	21,4
I smoke nargile to boost my self-confidence	66,2	10,8	14,2	6,2	2,7
I smoke nargile for personal satisfaction	80,6	5,1	8,2	5,1	1,0
I smoke nargile to relax	28,3	9,1	8,1	13,1	41,4

Notably, results of previous studies (25) indicate that consumers of nargile are generally aware of adverse consequences which can provoke this habit, but in spite of that they express doubt that these consequences could occur. When it comes to the factors that increase the chance that adolescents could consume nargile, the results of our research are in keeping with the results of other authors. One of the most decisive factors for adolescents to consume nargile is smoking nargile in the family by at least one family member. A large number of authors have shown these data in their studies (26-31). Similar to this factor, smoking cigarettes by family members is also a risk factor that could influence adolescents to start smoking nargile (32, 33). With respect to the influence of the marital status of parents, it is important to mention that the previous studies on the consumption of nargile by adolescents lack information about the causative effect of this factor. On the other hand, abuse of some other substances was well examined in these studies. It is well known that children of divorced parents more often decide to consume alcohol, cigarettes, marijuana and other addictive substances (34, 35), which is consistent with the results of our research. Also, in the studies of other authors, slightly different data can be

found, related to the influence of secondary school education on nargile consumption by adolescents, since schools in the publications of other authors are divided into state or private schools. Anyway, the results are controversial, since the study (25) shows that students in private schools more often decide to consume nargile, while the results of the other studies (36) are quite the opposite.

When it comes to the opinions that adolescents have about the consumption of nargile, the results of our research are significantly different from those of other researchers. Our results suggest that adolescents think that smoking nargile does not represent a form of behavior that is generally accepted in the society, and that people who consume nargile are not more popular in society than those who do not. Consuming nargile in the Republic of Serbia is definitely not part of the tradition, in contrast to the countries of the Far East and the Middle East, where the consumption of nargile is part of the cultural heritage (37). As the most important reason for nargile consumption, our adolescents indicate the desire for relaxation, and their opinions are completely divided on the idea that smoking nargile can be considered more socially acceptable than smoking cigarettes. On the other hand, in the study (38), the students clearly thought that smoking nargile is more acceptable than smoking cigarettes. There are also results (39) indicating that nargile users consider smoking nargile less harmful than smoking tobacco. Particularly interesting are the results of the study (40) indicating that users of nargile consider themselves to be smarter, more attractive and more popular than people who do not consume nargile, which is completely opposite to the results in our research.

Our study has certain limitations. The most important constraint refers to the place of conducting the research, since the research has been conducted only in one town on the territory of the Republic of Serbia, and to get a wider picture, similar researches are needed in other towns. Other restrictions can refer to the number of factors that could be associated with consuming nargile, which due to the design of the questionnaire, are not included in this research.

CONCLUSION

In conclusion, we could say that the consumption of nargile is often among adolescents in the City of Novi Pazar. The most important risk factors for the consumption of nargile among adolescents are related to the behavior of their family members - nargile consumption is more common in adolescents whose parents are divorced as well as in adolescents whose parents are using nargile or cigarettes. Unexpected, students believe that people who consume nargile are not more popular or more attractive in society, and as the main reason for consuming nargile they point out a desire for relaxation.

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Faktori koji utiču na pušenje nargile kod učenika srednjih škola

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SAŽETAK

Tokom poslednjih godina prevalencija pušenja nargile je u porastu u svetu, posebno kod mladih ljudi, što može da ima potencijalno opasne posledice po njihovo zdravlje.

Cilj studije bio je da se ispitaju faktori koji su povezani sa konzumiranjem nargile među učenicima srednjih škola.

U studiju koja je bila bila sprovedena u Novom Pazaru bili su uključeni učenici starosti od 17 do 19 godina koji su pohadjali sledeće škole: Medicinsku školu, Gimnaziju, Ekonomsko-trgovinsku školu i Ugostiteljsku školu. Studija je dizajnirana kao studija slučaj-kontrola. Učenici koji konzumiraju nargilu su predstavljali grupu slučajeva, dok je kontrolna grupa bila sačinjena od učenika koji nikad nisu pušili nargilu. Za potrebe istraživanja konstruisan je poseban upitnik, koji je služio za procenu mišljenja koje adolescenti imaju prema konzumiranju nargile.

Naše istraživanje je obuhvatilo ukupno 270 učenika četvrtog razreda srednjih škola u Novom Pazaru. Prosečna starost ispitanika bila je 18 godina. Najvažniji faktori koji mogu uticati na konzumiranje nargile su bili: konzumiranje nargile kod članova porodice, razvedeni roditelji i aktivno pušenje cigareta od strane članova porodice. Većina studenata je istakla da pušenje nargile predstavlja društveno neprihvaćenu formu ponašanja. Takođe, osobe koje konzumiraju nargile nisu ni atraktivnije ni popularnije.

Konzumiranje nargile je češće kod adolescenata čiji su roditelji razvedeni, kao i kod adolescenata čiji članovi porodice puše nargile ili cigarete. Najvažniji razlog za konzumiranje nargile kod adolescenata je želja za opuštanjem.

Ključne reči: **adolescenti, faktori rizika, nargile, pušenje**