

Determinants of Tobacco and Hookah Smoking in a Nationally Representative Sample of Iranian Children and Adolescents: The CASPIAN-IV Study

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Received 2015 June 28; Revised 2015 October 31; Accepted 2015 December 19.

Abstract

Background: The consumption of tobacco through a hookah is growing in popularity, especially among children and adolescents, but little is known about the determinants of hookah smoking.

Objectives: The current study aimed to assess the determinants of tobacco smoking and hookah smoking in a nationally representative sample of Iranian children and adolescents.

Patients and Methods: This study was conducted as part of the fourth cross-sectional survey of a national school-based program. Using a cluster random sampling method, a validated questionnaire was completed anonymously by 14,880 students who were aged 6 - 18 years and living in urban and rural areas of 30 provinces in Iran.

Results: The final study group consisted of 13,486 children and adolescents (participation rate of 90.6%), of whom 49.2% were girls and 75.6% were urban residents. The mean age was 12.47 ± 3.36 years. According to the self-reports of the students, 2.6% (3.5% of boys and 1.7% of girls) were current tobacco smokers, 5.9% (7.5% of boys and 4.2% of girls) were ever tobacco smokers, and 1.8% (2.49% of boys and 1.14% of girls) were current hookah smokers. Based on a multiple logistic regression (MLR) model, the following factors increased the risk of current smoking: age, number of days spent with friends per week, hookah smoking or cigarette smoking by the father, hookah smoking by siblings, hookah smoking by other members of the family, and screen time. The age, number of days spent with friends, hookah or cigarette smoking by the father, hookah smoking by siblings, and screen time increased the risk of hookah smoking. Female gender and living in rural areas decreased the risk of current tobacco and hookah smoking.

Conclusions: Preventive measures against tobacco use should be underscored for Iranian families. The preparation of strategies on the promotion of a healthy lifestyle should be considered a health priority.

Keywords: Smoking, Hookah, Children, Adolescents, Iran

1. Background

Tobacco use in adolescence is a worldwide problem. In recent years, many countries have made efforts to prevent and reduce tobacco use in this vulnerable age group (1). To achieve this goal, factors that influence smoking in adolescents in different communities need to be understood.

Various studies have reported the determinants of smoking in different countries. A study in Turkey showed that household size, higher birth rank, school type, low academic performance, exposure to second-hand smoke,

and stress were important factors influencing tobacco use in high-school students (2). In a Brazilian study, the period of late adolescence, attending a private school, and work activities were associated with the initiation of hookah use (3). Parental tobacco use was also reported to increase the risk of smoking initiation in adolescents (4). A study of Canadian students showed that younger age, single-parent family status, stress, impulsivity, low self-esteem, experimentation with smoking, poor school performance, susceptibility to tobacco advertisements, alco-

hol use, consumption of other tobacco products, and attending a smoking-tolerant school, as well as smoking by parents, siblings, friends, and school staff, were the main determinants of smoking initiation (5). A community-based study in Iran showed that older age, poor parental control of children, insufficient parental supervision of adolescents in friend selection, and having a smoker friend or family member were associated with lifetime cigarette use among male adolescents (6). A study in Nepal demonstrated that late adolescence, male gender, attending a public school, and a substantial amount of pocket money were associated with tobacco use in secondary-school students (7). Another study in Nepal showed that substance use and parental smoking were associated with smoking among medical and dental students (8). A study of middle-school students in the U.S. underscored the independent role of seeing tobacco use in films in the initiation of smoking by adolescents (9). In a study in Iran, age, grade, the mother's job, and education had statistically significant differences between tobacco smokers and nonsmokers (10).

Although many common factors seem to influence tobacco use at a young age in different countries, understanding the determinants of using different kinds of tobacco in various populations is necessary to plan international and national preventive programs.

2. Objectives

The current study aimed to assess the determinants of smoking tobacco and hookah use in a nationally representative sample of Iranian students.

3. Patients and Methods

The data of this study were collected as a part of a national survey of school student high-risk behaviors (2011-2012), as part of the fourth survey of a school-based surveillance system entitled childhood and adolescence surveillance and prevention of adult non-communicable disease (CASPIAN-IV) study. The study protocol has been described previously (11). We describe them herein in brief.

3.1. Study Population and Sampling Framework

The sample size in this nationwide study was calculated based on the cluster sampling method. A total sample size of 480 subjects in each province was calculated as the maximum sample size needed to provide an optimal estimate of all the risk factors of interest. From the 30 provinces, 48 clusters of 10 subjects were selected in each province, in addition to 14,880 students and an equal

number of their parents. Using the multistage, cluster-sampling method, the students were selected from urban and rural areas of different cities in the 30 provinces of the country (48 clusters of 10 students in each province). Stratification was done in each province according to the area of residence (urban/rural) and school grade (elementary/intermediate/high school). The sampling was proportional to the size, with an equal sex ratio (i.e., equal numbers of boys and girls were selected from each province, and the ratios in urban and rural areas were balanced to the population of urban and rural students). In this way, the number of samples in the rural/urban areas and in each school grade was divided equally between the populations of students in each grade. Cluster sampling with equal clusters was used in each province to scope the required sample size. The clusters were concluded the level of schools, including 10 sample units (the students and their parents) in each cluster. The maximum sample size in each province required to provide a good estimate of all the risk factors of interest was calculated as 480 students. Finally, 48 clusters of 10 subjects in each of the provinces (N = 14,880 students) were selected.

3.2. Questionnaires

With the participation of trained teams of expert health care providers, all processes of examinations and inquiry follow under standard protocols of the world health organization-global school-based student health survey (10). The validity and reliability of the questionnaire were confirmed in a previous study (12). The Cronbach's alpha and Pearson's correlation coefficient for the reliability and stability of the questionnaire was 0.97 and 0.94, respectively. In the CVI assessment, all the questions had a score above 0.75 (12).

The questions were about demographic characteristics, parents' education levels and occupations, students' school grades, birth orders, family sizes, smoking habits, smoking habits of the families, school types (public/private), living with parents, and exposure to tobacco smoke, as well as the time spent with friends, physical activity level, sleep duration, and screen time.

Individuals who reported having tried smoking any tobacco product were considered ever smokers, and those who reported that they continued smoking at the study time were considered current smokers. A hookah smoker was based on self-reports of hookah use at the time of the study.

3.3. Ethical Concerns

Approval for the study was obtained from the ethical committees of Isfahan University of Medical Sciences,

Tehran University of Medical sciences (TUMS), and other relevant regulatory organizations at national and provincial levels. After explaining the study objectives and protocols, written consent and verbal assent were obtained from the parents and students, respectively. Participation was voluntary. The students were reassured about the confidentiality of their answers, and the questionnaires were completed anonymously.

3.4. Statistical Analysis

Continuous variables are reported as the mean and 95% confidence interval (CI), and categorical variables are presented as a percentage (95% CI). The association of age with smoking was assessed using an independent sample T-test. Chi-square tests were used to compare the prevalence rates in the study groups. Multiple logistic regression (MLR) models using the Enter method were fitted to assess the factors that increased or decreased the risk of smoking. All variables having a P value of < 0.2 in the univariate analysis were included in the MLR model. Statistical measures were assessed using survey data analysis methods in the STATA Corp. 2011, STATA statistical software (release 12. college station, TX: STATA Corp LP. Package). A P value of < 0.05 was considered statistically significant.

4. Results

The participants consisted of 13,486 children and adolescents (participation rate of 90.6%). They were 6640 (49.2%) girls and 6846 (50.8%) boys, of whom 75.6% were from urban areas, and 24.4% were from rural areas. The mean age of the participants was 12.47 ± 3.36 years, with no significant difference between boys (12.36 ± 3.40 years) and girls (12.58 ± 3.32 years) ($P > 0.05$).

According to the self-reports of the students, 2.6% (3.5% of boys and 1.7% of girls) were current tobacco smokers, 5.9% (7.5% of boys and 4.2% of girls) were ever tobacco smokers, and 1.8% (2.49% of boys and 1.14% of girls) were current hookah smokers. Table 1 shows the sociodemographic characteristic of the participants, according to their current or ever-smoking habits in the univariate analysis.

The mean (95% CI) age of the current smokers ($15.55 [15.28, 15.82]$ vs. $12.39 [12.33, 12.45]$) and ever smokers ($15.14 [14.94, 15.34]$ vs. $12.30 [12.25, 12.36]$) was significantly higher than that of the never smokers. The frequency of current tobacco use was significantly higher in boys than in girls (3.49% [95% CI: 2.91, 4.18] vs. 1.66% [95% CI: 1.32, 2.08]). Likewise, the frequency of ever tobacco use was significantly higher in boys (7.48% [95% CI: 6.54, 8.54] vs. 4.19% [95% CI: 3.6, 4.87]).

Overall, 3.01% of the urban students and 1.28% of the rural students were current tobacco smokers. The corresponding figures for ever tobacco use were 6.54% and 3.8%, respectively, with a significantly higher frequency in urban than rural residents ($P < 0.001$).

Based on the MLR model (Table 2), the following factors increased the risk of current tobacco smoking: age (OR = 1.37 [95% CI: 1.29, 1.44]), time spent with friends (1 - 3 days) (OR: 1.43 [95% CI: 1.07, 1.91]), and > 3 days (OR: 1.96 [95% CI: 1.38, 2.79]), hookah smoking by the father (OR: 3.02 [2.15, 4.25]), hookah smoking by sister(s) or brother(s) (OR: 4.01 [95% CI: 2.76, 5.8]), hookah smoking by other members of the family (OR: 4.00 [95% CI: 2.82, 5.67]), cigarette smoking by the father (OR: 1.63 [95% CI: 1.26, 2.1]), and more than 2 hours/day screen time compared to less than 2 hours/day screen time (OR: 1.64 [95% CI: 1.26, 2.14]). Female gender (OR: 0.51 [95% CI: 0.38, 0.70]) and living in a rural area (OR: 0.62 [95% CI: 0.40, 0.97]) decreased the risk of current smoking. The risks and protective factors of ever tobacco use are presented in Table 2.

The association between the independent variables in the univariate model and hookah use are presented in Table 3. As shown, the mean age of the participants who smoked a hookah was significantly higher than those who did not ($15.75 [95\% \text{ CI: } 15.47, 16.03]$ vs. $12.39 [95\% \text{ CI: } 12.33, 12.45]$).

The frequency of hookah use was significantly higher among boys than girls (2.49% [95% CI: 2.02, 3.08] vs. 1.14% [95% CI: 0.87, 1.50]) and among urban than rural students (2.14% [1.79, 2.56] vs. 0.85% [0.55, 1.32]). The association between all the factors, except the mother's educational level, living with parents, family size, and physical activity, with hookah use was statistically significant in the univariate model.

In the MLR model, age, the number of days spent with friends, hookah smoking or cigarette smoking by the father, hookah smoking by sister(s) or brother(s), and screen time increased the risk of hookah smoking, and female gender and living in a rural area decreased the risk of hookah smoking in students (Table 4).

5. Discussion

This nationwide survey, which to the best of our knowledge is the first of its kind in the Middle East and North Africa region, showed that tobacco use is a health concern in Iranian children and adolescents. Ever and current tobacco use were more frequent among older participants and boys. This finding is in line with previous studies in different countries (6, 13-17). Likewise, some previous studies in Iran reported a higher frequency of current and ever smoking among boys than girls (6, 15, 16, 18-20).

The current study suggested that the presence of a smoker in the family, especially hookah use by a sister or brother, increased the risk of smoking in adolescents. This finding is consistent with a previous nationwide Iranian study, which showed that tobacco use at home, especially by a sister or brother, increased the likelihood of smoking in adolescents (13). Another study in Iran found that smoking by friends and family members was associated with smoking among medical students (20). Many previous studies confirmed that tobacco use by parents and other relatives was a risk factor for intention to smoke in adolescents (21-25).

In the current study, spending more time with friends increased the risk of smoking in adolescents. Given the impact of friends on adolescent smoking, it seems that spending more time with friends increases the risk of smoking. Inadequate parental supervision of children may also explain the association between the time spent with friends and the increased risk of smoking. Some researchers documented that direct peer pressure was positively and independently associated with smoking and suggested that authoritative parents supervised and prevented their children associating with deviant peers, thereby preventing smoking in adolescence (21, 22).

Some studies also suggested that peer smoking was associated with positive attitudes toward cigarettes smoking (23) and might increase the friendship with deviant peers and the risk of smoking (24). Nonsmoker parents and strong family monitoring and bonding were reported to be associated with a lower risk of smoking initiation among children (25). Another study reported statistically significant differences between tobacco smokers and nonsmokers according to age, grade, the mother's occupation, and education (10).

A study of high-school boys documented a significant relationship between smoking behavior of best friends and the intention to smoke among peers (26). Attachment to friends and having friends who smoked were common factors related to the onset of smoking in both male and female adolescents (27).

In the present study, screen time of more than 2 h increased the risk of smoking 1.64 times in adolescents. A study conducted in six European countries suggested a causal relationship between exposure to smoking in movies and smoking initiation in adolescents (28). Other studies also reported that smoking in movies influenced adolescent smoking (29). In addition to this mechanism, we suggest that prolonged screen time and smoking can be considered two health risk behaviors as different aspects of an unhealthy lifestyle.

The present study showed that the prevalence of current hookah (or kalia in the Persian language) use among

adolescents was 2.49 (2.02, 3.08) in boys and 1.14% (0.87, 1.5) in girls. A report by IRAN GYTS in 2007 found that 16.5% of students aged 13 - 15 years were current hookah users (30). A study of Tunisians aged 13 - 17 years reported that 5.2% were current hookah users (31). Other studies conducted in New Jersey in the U.S. and Beirut reported that 9.7% of high-school students (32) and 29.6% of secondary-school students were current hookah users (33).

Our findings suggested that the use of a hookah or cigarettes by family members was associated with hookah use in students. This finding is in line with that of Amok and colleagues who reported that the presence of a hookah user at home increased current hookah use by students (34) and the study by Jamil et al. who reported that having a father, mother, or sibling who smoked a hookah at home was a significant risk factor for current hookah smoking (35). A study in Iran demonstrated that having a hookah smoker in the family was associated with hookah use (36). Rice and colleagues reported that having friends and family members who smoked were predictors of cigarette smoking and hookah use (37).

In the current study, increased spent time with friends was associated with hookah use in adolescents. A study of high-school student in San Diego county showed that half of students first understand about hookah from friends (38). Another study reported that 90.7% of students preferred to use a hookah with friends (3).

In the current study, hookah use was more common among older students and male students. Many studies have demonstrated that hookah use increased with age (3, 34, 39, 40) and that it was more common among males than females (41). However, in studies conducted by Jamil et al., male gender and younger age were associated with current hookah smoking (35, 42).

One of the main strengths of the present study is that it was based on a large national representative sample of Iranian children and adolescents. Moreover, it adhered to the protocol of the world health organization's global school-based student health survey. The main limitation of this study was its cross-sectional design and some limitation of recall bias of participants in some information.

Considering the harmful effects of smoking, public health practitioners and health care providers should identify high-risk individuals and design educational programs to prevent the use of all kinds of tobacco products. The preparation of strategies on the promotion of a healthy lifestyle through vast advocacy on the health impacts of tobacco smoking and access to appropriate health services as needed should be considered as the most priorities of youth health.

Acknowledgments

We also sincerely thank all the organizations and the large team who collaborated in this project.

Footnotes

Authors' Contribution: Study concept and design, drafting of the manuscript, and critical revision of the manuscript, Roya Kelishadi, Shirin Djalalinia, Gelayol Ardalan, and Ramin Heshmat; study concept and design and critical revision of the manuscript, Mohammad Esmaeil Motlagh, Armindokht Shahsanai, and Mojtaba Keikha; study concept and design, drafting of the manuscript, statistical analysis, analysis and interpretation of the data, Mostfa Qorbani; analysis and interpretation of the data, Maliheh Khoramdad; data acquisition and drafting of the manuscript, Fereshteh Najafi and Hamid Asayesh.

Competing Interests: The authors declare that they have no competing interests.

Financial Disclosure: The authors declare that they have no financial interests related to the material in the manuscript.

Funding/Support: This study was performed by contribution of the ministry of health and medical education, ministry of education and training, Universities of Medical Sciences nationwide, students and their parents, and school staff.

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Table 1. Association Between Independent Variables and Current and Ever Tobacco Smoking Habits in the Univariate Model: The CASPIAN-IV Study

Variables	Current Smoker			Ever Smoker		
	Yes, % (95% CI)	No, % (95% CI)	P Value	Yes, % (95% CI)	No, % (95% CI)	P Value
Age, y^a	15.55 (15.28, 15.82)	12.39 (12.33, 12.45)	< 0.001	15.14 (14.94, 15.34)	12.3 (12.25, 12.36)	< 0.001
Sex			< 0.001			< 0.001
Boys	3.49 (2.91, 4.18)	96.51 (95.82, 97.09)		7.48 (6.54, 8.54)	92.52 (91.46, 93.46)	
Girls	1.66 (1.32, 2.08)	98.34 (97.92, 98.68)		4.19 (3.6, 4.87)	95.81 (95.13, 96.4)	
Residence			< 0.001			< 0.001
Urban	3.01 (2.58, 3.52)	96.99 (96.48, 97.43)		6.54 (5.84, 7.31)	93.46 (92.69, 94.16)	
Rural	1.28 (0.9, 1.80)	98.73 (98.2, 99.1)		3.76 (2.94, 4.8)	96.24 (95.2, 97.06)	
Type of school			0.16			0.18
Governmental	2.5 (2.14, 2.92)	97.5 (97.08, 97.86)		5.75 (5.15, 6.4)	94.25 (93.6, 94.85)	
Nonprofit	3.37 (2.32, 4.87)	96.64 (95.13, 97.68)		7.16 (5.29, 9.62)	92.84 (90.38, 94.71)	
Mother's educational level			0.15			0.1
Illiterate	3.00 (2.28, 3.93)	97 (96.07, 97.72)		5.73 (4.70, 6.96)	94.27 (93.04, 95.3)	
High school	2.57 (2.18, 3.03)	97.43 (96.97, 97.82)		6.06 (5.41, 6.77)	93.94 (93.23, 94.59)	
Academic	1.8 (1.16, 2.78)	98.2 (97.22, 98.84)		4.37 (3.29, 5.78)	95.63 (94.22, 96.71)	
Father's educational level			0.004			0.004
Illiterate	2.52 (1.76, 3.6)	97.48 (96.41, 98.25)		6.53 (5.3, 8.02)	93.47 (91.98, 94.7)	
High school	2.8 (2.40, 3.26)	97.2 (96.74, 97.6)		6.07 (5.43, 6.78)	93.93 (93.23, 94.57)	
Academic	1.42 (0.98, 2.06)	98.58 (97.94, 99.02)		4.1 (3.21, 5.22)	95.9 (94.78, 96.79)	
Maternal occupational status			0.07			0.235
Housekeeper	2.6 (2.23, 3.03)	97.4 (96.98, 97.77)		5.92 (5.32, 6.58)	94.08 (93.42, 94.68)	
Worker	1.7 (1.08, 2.67)	98.3 (97.33, 98.92)		4.62 (3.47, 6.14)	95.38 (93.86, 96.53)	
Others	3.67 (2.24, 5.96)	96.33 (94.04, 97.76)		6.11 (4.13, 8.97)	93.89 (91.03, 95.88)	
Father's occupational status			0.02			0.067
Unemployed	2.28 (1.39, 3.74)	97.72 (96.26, 98.61)		5.48 (3.94, 7.57)	94.52 (92.43, 96.06)	
Worker	2.32 (1.93, 2.79)	97.68 (97.21, 98.07)		5.24 (4.61, 5.94)	94.76 (94.06, 95.39)	
Farmer	1.86 (1.25, 2.77)	98.14 (97.23, 98.75)		6.07 (4.71, 7.8)	93.93 (92.2, 95.29)	
Self-employed	3.06 (2.54, 3.69)	96.94 (96.31, 97.46)		6.46 (5.63, 7.40)	93.54 (92.6, 94.37)	
Living with parents			0.19			0.003
None	2.19 (0.826, 5.66)	97.81 (94.34, 99.17)		6.01 (3.36, 10.54)	93.99 (89.46, 96.64)	
One parent	3.61 (2.41, 5.38)	96.39 (94.62, 97.59)		9.03 (6.94, 11.67)	90.97 (88.33, 93.06)	
Both parents	2.54 (2.19, 2.94)	97.46 (97.06, 97.81)		5.7 (5.13, 6.33)	94.3 (93.67, 94.87)	
Family size			0.15			0.774
≤ 4	2.39 (1.99, 2.86)	97.61 (97.14, 98.01)		5.78 (5.10, 6.56)	94.22 (93.47, 94.9)	
> 4	2.79 (2.33, 3.33)	97.21 (96.67, 97.67)		5.9 (5.19, 6.71)	94.1 (93.29, 94.81)	
Days spent with friends per week			< 0.001			< 0.001
No days	1.66 (1.32, 2.08)	98.34 (97.92, 98.68)		4.27 (3.66, 4.97)	95.73 (95.03, 96.34)	
1 - 3 days	2.83 (2.33, 3.42)	97.17 (96.58, 97.67)		6.41 (5.64, 7.27)	93.59 (92.73, 94.36)	
>3 days	4.48 (3.58, 5.59)	95.52 (94.41, 96.42)		8.82 (7.47, 10.37)	91.18 (89.63, 92.53)	

Hookah smoking by father				< 0.001			<0.001
Yes	8.12 (6.51, 10.1)	91.88 (89.9, 93.49)		12.74 (10.65, 15.17)	87.26 (84.83, 89.35)		
No	2.14 (1.81, 2.52)	97.86 (97.48, 98.19)		5.31 (4.75, 5.92)	94.69 (94.08, 95.25)		
Hookah smoking by mother				< 0.001			< 0.001
Yes	5.73 (4.01, 8.12)	94.27 (91.88, 95.99)		10.17 (7.812, 13.13)	89.83 (86.87, 92.19)		
No	2.45 (2.118, 2.86)	97.55 (97.14, 97.89)		5.68 (5.11, 6.32)	94.32 (93.68, 94.89)		
Hookah smoking by sister(s) or brother(s)				< 0.001			< 0.001
Yes	13.73 (11.09, 16.88)	86.27 (83.12, 88.91)		23.77 (20.11, 27.86)	76.23 (72.14, 79.89)		
No	2.11 (1.8, 2.47)	97.89 (97.53, 98.2)		5.1 (4.58, 5.67)	94.9 (94.33, 95.42)		
Cigarette smoking by father				< 0.001			< 0.001
Yes	4.24 (3.51, 5.11)	95.76 (94.89, 96.49)		8.2 (5.31, 6.51)	91.8 (90.56, 92.89)		
No	2.08 (1.76, 2.47)	97.92 (97.53, 98.24)		5.14 (4.59, 5.76)	94.86 (94.24, 95.41)		
Cigarette smoking by mother				0.10			0.003
Yes	5.71 (2.153, 14.3)	94.29 (85.7, 97.85)		14.29 (7.866, 24.55)	85.71 (75.45, 92.13)		
No	2.59 (2.24, 3.0)	97.41 (97, 97.76)		5.84 (5.27, 6.48)	94.16 (93.52, 94.73)		
Cigarette smoking by sister(s) or brother(s)				0.009			< 0.001
Yes	5.47 (3.07, 9.57)	94.53 (90.43, 96.93)		12.94 (9.06, 18.14)	87.06 (81.86, 90.94)		
No	2.56 (2.21, 2.96)	97.44 (97.04, 97.79)		5.78 (5.21, 6.41)	94.22 (93.59, 94.79)		
Passive cigarette smoke exposure				< 0.001			< 0.001
Yes	8.34 (7.36, 9.43)	91.66 (90.57, 92.64)		8.34 (7.36, 9.43)	91.66 (90.57, 92.64)		
No	4.58 (4.04, 5.18)	95.42 (94.82, 95.96)		4.58 (4.04, 5.18)	95.42 (94.82, 95.96)		
Physical activity				0.02			< 0.001
Mild	3.16 (2.59, 3.86)	96.84 (96.14, 97.41)		7.42 (6.44, 8.54)	92.58 (91.46, 93.56)		
Moderate	2.2 (1.76, 2.75)	97.8 (97.25, 98.24)		4.97 (4.23, 5.86)	95.03 (94.17, 95.77)		
Vigorous	2.47 (1.97, 3.09)	97.53 (96.91, 98.03)		5.3 (4.49, 6.26)	94.7 (93.74, 95.52)		
Screen time				< 0.001			< 0.001
> 2 hours/day	1.93 (1.64, 2.27)	98.07 (97.73, 98.37)		10.63 (9.209, 12.23)	89.37 (87.77, 90.79)		
< 2 hours/day	5.53 (4.553, 6.71)	94.47 (93.29, 95.45)		4.79 (4.29, 5.35)	95.21 (94.65, 95.71)		
Birth order^a	2.27 (2.15, 2.39)	2.07 (2.05, 2.09)	< 0.001	2.18 (2.10, 2.26)	2.07 (2.05, 2.09)		0.005
Sleeping hours/day^a	8.75 (8.56, 8.94)	9.02 (9.0, 9.05)	< 0.001	8.80 (8.68, 8.91)	9.03 (9.0, 9.06)		< 0.001

^aAre presented as the mean (95% CI).

Table 2. Association Between Independent Variables and Current and Ever Tobacco Smoking Habits in the Multivariate Logistic Regression Model: the CASPIAN-IV Study

Variables	Current Smoker		Ever Smoker	
	OR (95% CI)	P Value	OR (95% CI)	P Value
Age, y ^a	1.37 (1.29, 1.44)	< 0.001	1.31 (1.26, 1.36)	< 0.001
Sex (F/M)	0.51 (0.38, 0.70)	< 0.001	0.54 (0.43, 0.67)	< 0.001
Residence (rural/urban)	0.62 (0.40, 0.97)	0.037	0.74 (0.55, 0.99)	0.05
Type of school (nonprofit/governmental)	1.08 (0.7, 1.67)	0.73	1.04 (0.74, 1.45)	0.80
Mother's educational level				
Illiterate	1	-	1	-
High school	0.97 (0.65, 1.47)	0.9	1.42 (1.06, 1.91)	0.02
Academic	1.18 (0.59, 2.35)	0.64	1.58 (0.95, 2.61)	0.08
Father's educational level				
Illiterate	1	-	1	-
High school	1.24 (0.75, 2.06)	0.4	0.87 (0.64, 1.18)	0.38
Academic	0.82 (0.42, 1.58)	0.55	0.67 (0.43, 1.03)	0.07
Maternal occupational status				
Housekeeper status	1	-	1	-
Worker	0.69 (0.39, 1.22)	0.2	0.85 (0.58, 1.26)	0.42
Other	1.32 (0.72, 2.41)	0.37	0.82 (0.51, 1.31)	0.4
Father's occupational status				
Unemployed	1	-	1	-
Worker	1.23 (0.64, 2.38)	0.54	1.07 (0.69, 1.65)	0.76
Farmer	1.00 (0.46, 2.21)	0.99	1.41 (0.85, 2.34)	0.18
Self-employed	1.32 (0.69, 2.52)	0.39	1.26 (0.80, 1.98)	0.35
Living with parents				
None	1	-	1	-
One parent	2.02 (0.42, 9.63)	0.37	4.85 (1.41, 16.63)	0.01
Both parents	1.36 (0.34, 5.46)	0.66	2.49 (0.79, 7.86)	0.11
Family size (> 4 or ≤ 4)	0.82 (0.63, 1.08)	0.17	-	-
Days spent with friends per week				
No. of days	1	-	1	-
1-3	1.43 (1.07, 1.91)	0.02	1.37 (1.13, 1.67)	0.001
> 3	1.96 (1.38, 2.79)	< 0.001	1.68 (1.31, 2.16)	< 0.001
Physical activity				
Mild	1	-	1	-
Moderate	1.02 (0.74, 1.42)	0.87	0.89 (0.72, 1.11)	0.34
Vigorous	1.11 (0.80, 1.54)	0.50	0.93 (0.74, 1.17)	0.57
Sleep time, hour	1.06 (0.96, 1.16)	0.24	1.05 (0.99, 1.11)	0.1
Hookah smoking by father	3.02 (2.15, 4.25)	< 0.001	2.16 (1.65, 2.83)	< 0.001
Hookah smoking by mother	1.16 (0.68, 1.97)	0.59	1.13 (0.76, 1.68)	0.53
Hookah smoking by sister(s) or brother(s)	4.01 (2.76, 5.8)	< 0.001	3.91 (2.93, 5.23)	< 0.001

Cigarette smoking by father	1.63 (1.26, 2.1)	< 0.001	1.28 (1.07, 1.55)	0.008
Cigarette smoking by mother	0.5 (0.05, 4.5)	0.53	0.79 (0.24, 2.6)	0.7
Cigarette smoking by sister(s) or brother(s)	0.57 (0.23, 1.42)	0.23	0.78 (0.43, 1.42)	0.41
Screen time (> 2 or ≤ 2)	1.64 (1.26, 2.14)	< 0.001	1.49 (1.25, 1.78)	< 0.001
Birth order (number)	0.99 (0.88, 1.12)	0.91	0.92 (0.85, 1.00)	0.06

^a Are presented as the mean (95% CI).

Table 3. Association Between Independent Variables and Hookah Use Habits in the Univariate Model: The CASPIAN-IV Study

Variables	Current Hookah Use		P Value
	Yes, % (95% CI)	No, % (95% CI)	
Age, y ^a	15.75 (15.47, 16.03)	12.39 (12.33, 12.45)	< 0.001
Sex			< 0.001
Boys	2.49 (2.02, 3.08)	97.51 (96.92, 97.98)	
Girls	1.14 (0.87, 1.5)	98.86 (98.52, 99.13)	
Residence			< 0.001
Urban	2.14 (1.786, 2.562)	97.86 (97.44, 98.21)	
Rural	0.85 (0.55, 1.32)	99.15 (98.68, 99.45)	
Type of school			0.06
Governmental	1.74 (1.45, 2.08)	98.26 (97.92, 98.55)	
Nonprofit	2.69 (1.75, 4.14)	97.31 (95.87, 98.25)	
Mother's educational level			0.38
Illiterate	2.0 (1.43, 2.81)	98.0 (97.19, 98.57)	
High school	1.85 (1.53, 2.23)	98.15 (97.77, 98.47)	
Academic	1.29 (0.76, 2.2)	98.71 (97.8, 99.24)	
Father's educational level			0.02
Illiterate	1.99 (1.33, 2.96)	98.01 (97.04, 98.67)	
High school	1.96 (1.64, 2.34)	98.04 (97.66, 98.36)	
Academic	0.99 (0.63, 1.55)	99.01 (98.45, 99.37)	
Maternal occupational status			0.03
Housekeeper	1.82 (1.53, 2.17)	98.18 (97.82, 98.47)	
Worker	1.14 (0.65, 1.99)	98.86 (98.01, 99.35)	
Other	3.20 (1.87, 5.43)	96.8 (94.57, 98.13)	
Father's occupational status			0.01
Unemployed	1.84 (1.05, 3.19)	98.16 (96.81, 98.95)	
Worker	1.58 (1.26, 1.98)	98.42 (98.02, 98.75)	
Farmer	1.22 (0.74, 2.01)	98.78 (97.99, 99.26)	
Self-employed	2.27 (1.84, 2.8)	97.73 (97.2, 98.16)	
Living with parents			0.63
None	1.1 (0.28, 4.33)	98.9 (95.67, 99.73)	
One parent	2.17 (1.27, 3.68)	97.83 (96.33, 98.73)	
Both parents	1.83 (1.54, 2.18)	98.17 (97.82, 98.46)	
Family size			0.18
≤ 4	1.68 (1.36, 2.07)	98.32 (97.93, 98.64)	
> 4	1.98 (1.61, 2.43)	98.02 (97.57, 98.39)	
Days spent with friends per week			< 0.001
No. of days	1.06 (.805, 1.4)	98.94 (98.6, 99.2)	
1 - 3 days	2.12 (1.70, 2.63)	97.88 (97.37, 98.3)	
> 3 days	3.18 (2.46, 4.1)	96.82 (95.9, 97.54)	

Hookah smoking by father			< 0.001
Yes	6.24 (4.85, 8.01)	93.76 (91.99, 95.16)	
No	1.47 (1.21, 1.79)	98.53 (98.21, 98.79)	
Hookah smoking by mother			< 0.001
Yes	4.85 (3.32, 7.05)	95.15 (92.96, 96.68)	
No	1.69 (1.42, 2.03)	98.31 (97.97, 98.58)	
Hookah smoking by sister(s) or brother(s)			< 0.001
Yes	11.73 (9.29, 14.71)	88.27 (85.29, 90.71)	
No	1.4 (1.16, 1.69)	98.6 (98.31, 98.84)	
Cigarette smoking by father			< 0.001
Yes	3.01 (2.43, 3.73)	96.99 (96.27, 97.58)	
No	1.46 (1.19, 1.79)	98.54 (98.21, 98.81)	
Cigarette smoking by mother			0.02
Yes	5.71 (2.15, 14.3)	94.29 (85.7, 97.85)	
No	1.82 (1.53, 2.15)	98.18 (97.85, 98.47)	
Cigarette smoking by sister(s) or brother(s)			< 0.001
Yes	5.5 (3.086, 9.615)	94.5 (90.38, 96.91)	
No	1.77 (1.5, 2.1)	98.23 (97.9, 98.51)	
Physical activity			0.15
Mild	2.16 (1.72, 2.69)	97.85 (97.31, 98.28)	
Moderate	1.6 (1.23, 2.09)	98.4 (97.92, 98.77)	
Vigorous	1.79 (1.38, 2.31)	98.21 (97.69, 98.62)	
Watching TV			< 0.001
> 2 hours /day	1.27 (1.04, 1.54)	98.73 (98.46, 98.96)	
< 2 hours/day	4.31 (3.44, 5.37)	95.69 (94.63, 96.56)	
Birth order^a	2.25 (2.1, 2.39)	2.07 (2.05, 2.09)	0.01
Sleeping hours/day^a	9.02 (9.0, 9.05)	8.8 (8.6, 9.03)	0.02

^a Are presented as the mean (95%CI).

Table 4. Association Between Independent Variables With Hookah Use Habits in the Multivariate Logistic Regression Model: The CASPIAN-IV Study

Variables	Hookah Use	
	OR (CI)	P Value
Age, y ^a	1.43 (1.35, 1.52)	< 0.001
Sex (F/M)	0.5 (0.35, 0.72)	< 0.001
Residence (rural/urban)	0.57 (0.33, 0.98)	0.04
Type of school (nonprofit/governmental)	1.27 (0.77, 2.09)	0.35
Father's educational level		-
Illiterate	1	0.88
High school	1.04 (0.61, 1.76)	0.29
Academic	0.68 (0.34, 1.38)	
Maternal occupational status		
Housekeeper	1	-
Worker	0.63 (0.29, 1.33)	0.23
Others	1.61 (0.85, 3.02)	0.14
Father's occupational status		
Unemployed	1	-
Worker	1.00 (0.47, 2.14)	0.98
Farmer	0.91 (0.37, 2.27)	0.84
Self-Employment	1.18 (0.58, 2.41)	0.64
Physical activity		
Mild	1	-
Moderate	1.11 (0.76, 1.62)	0.57
Vigorous	1.21 (0.82, 1.77)	0.32
Family size (>4/≤4)	0.85 (0.61, 1.18)	0.33
Days spent with friends per week		
No. of days	1	-
1-3	1.67 (1.18, 2.36)	0.004
3	2.19 (1.41, 3.4)	0.001
Sleep time (hours)	1.1 (0.98, 1.22)	0.1
Hookah smoking by father	3.11 (2.11, 4.61)	< 0.001
Hookah smoking by mother	1.42 (0.81, 2.49)	0.22
Hookah smoking by sister(s) or brother(s)	4.96 (3.26, 7.5)	< 0.001
Cigarette smoking by father	1.52 (1.13, 2.04)	0.006
Cigarette smoking by mother	0.49 (0.04, 6.08)	0.58
Cigarette smoking by sister(s) or brother(s)	0.7 (0.26, 1.88)	0.48
Screen time (>2/≤2)	1.93 (1.42, 2.62)	< 0.001
Birth order(number)	0.93 (0.8, 1.06)	0.27

^aAre presented as the mean (95%CI).