Lifetime and current waterpipe use among adolescents in Tehran, Islamic Republic of Iran

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تدخين الشيشة في وقتٍ ما من العمر وفي الوقت الحاضر بين المراهقين في طهران، جمهورية إيران الإسلامية

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الخلاصة: أصبح تدخين المراهقين للشيشة في إيران مصدراً للقلق؛ وقد أجرى الباحثون مسحاً مستعرضاً توصيفياً مجتمعيّ المرتكَز في عام 2010 للتعرف على معدل انتشار تدخين الشيشة وعلى عوامل الاختطار التي يتعرض لها المراهقون في طهران، جمهورية إيران الإسلامية. وقد درس الباحثون عيِّنة تتألف من 1201 مراهقاً تتراوح أعمارهم بين 15 و18 عاماً، تلو اعتيان عشوائي متعدد المراحل، وقد استجاب أفراد العينة للاستبيان المستند على ترصُّد السلوك الخطر لدى الشباب. ووجد الباحثون أن المعدل الحالي لتدخين الشيشة (لمرة واحدة على الأقل خلال الأيام الثلاثين السابقة) كان 28٪، وهو معدل يزيد بقدر يعتد به إحصائياً بين الذكور (34.8٪) عمّا هو عليه لدى الإناث (21.4٪). وقد أبلغ 45.1٪ من مجمل البالغين عن تدخين الشيشة في وقتٍ ما من حياتهم، كما أبلغ 34.2٪ منهم أنهم تشاركوا تدخين الشيشة مع غيرهم. واستخدم الباحثون التحوف اللوجستي المتعدد المتغيرات ليتبين لهم أن الترابطات التي يعتد بها إحصائياً لعوامل اختطار تدخين الشيشة حالياً لدى كل من الذكور والإناث هي وجود مدخنين بين الأصدقاء وضمن أعضاء الأسرة، أضف إلى ذلك أن التقدم في العمر والفشل في التعليم كان له مفعوله أيضاً لدى الذكور.

ABSTRACT Waterpipe use among Iranian adolescents has become a matter for concern. A descriptive, cross-sectional community-based survey was performed in 2010 to determine the prevalence of waterpipe use and associated factors among Iranian adolescents in Tehran, Islamic Republic of Iran. After multi-stage, random cluster sampling 1201 adolescents aged 15–18 years old responded to a questionnaire based on the Youth Risk Behavior Surveillance. The prevalence of current waterpipe smoking (at least once in the previous 30 days) was 28.0%, significantly higher among males (34.8%) than females (21.4%). A total of 45.1% of adolescents reported lifetime use (ever use) of waterpipes and 34.2% had ever shared a waterpipe. In multivariate logistic regression analysis the significant correlates of current waterpipe use for both males and females were having smokers among friends and family members, while for males, older age and educational failure were also risk factors.

Usage de la pipe à eau, présente ou passée, chez des adolescents de Téhéran (République islamique d'Iran)

RÉSUMÉ L'usage de la pipe à eau chez les adolescents iraniens est devenu préoccupant. Une enquête transversale descriptive a été menée dans la communauté en 2010 afin de déterminer la prévalence de l'usage de la pipe à eau et les facteurs associés chez des adolescents iraniens à Téhéran (République Islamique d'Iran). Dans un échantillonnage aléatoire en grappes à plusieurs degrés, 1201 adolescents âgés de 15 à 18 ans ont répondu à un questionnaire inspiré du *Youth Risk Behavior Surveillance System* (Système de surveillance des facteurs de risque chez les jeunes). La prévalence de l'usage de la pipe à eau au moment de l'étude (au moins une fois au cours des 30 derniers jours) était de 28,0 %, mais la consommation des hommes était très supérieure à celle des femmes (34,8 % contre 21,4 %). Au total, 45,1 % des adolescents ont rapporté avoir déjà utilisé une pipe à eau dans leur vie et 34,2 % déclaraient l'avoir déjà partagée avec d'autres. À l'analyse de régression logistique multivariée, les corrélats significatifs d'une utilisation actuelle de la pipe à eau pour les hommes comme pour les femmes étaient d'avoir des fumeurs parmi leurs amis et les membres de leur famille, tandis que pour les hommes, un âge plus avancé et l'échec scolaire étaient également des facteurs de risque.

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Received: 13/09/12; accepted: 22/10/12

Introduction

In recent years, the use of waterpipes for smoking tobacco has increased in many parts of the world, especially in the Eastern Mediterranean Region [1]. Waterpipe use is related to social, cultural and traditional factors and is more socially acceptable than cigarette use [2,3]. Previous studies have shown an 11%–32% prevalence of waterpipe smoking among youth in Middle Eastern countries, and recent observations have suggested that this proportion is increasing [4–10]. The results of the Global Youth Tobacco Survey (GYTS) showed that current waterpipe use among people aged 13–15 years in the Middle East was 6%–34% [11]. Outside the Middle East, waterpipe use was reported to be 11% in Florida and 7% among 12th graders in Arizona in the United States of America (USA) [12,13].

Many waterpipe users believe that waterpipe smoking is less harmful than cigarette smoking [14,15]. Previous studies, however, have shown that it is addictive and is associated with notable health risks [13,16–20]. A recent systematic review of the effects of waterpipe smoking showed that it increases the risk of lung cancer, respiratory diseases and low birth weight by more than 2-fold [17]. Another systematic review reported that waterpipe use, similar to smoking cigarettes, contributes to the development of chronic obstructive pulmonary disease [20].

Waterpipe use among Iranian adolescents has become a matter for concern. Previous studies among Iranian adolescents showed that the prevalence of current waterpipe smoking was 25.7%, with a higher prevalence among male than female respondents. Moreover, the prevalence of ever use and current use of waterpipes among adolescents had increased in 2005 compared with 2003 [10,21]. The present study was performed due to the lack of information available about the prevalence of waterpipe smoking and the associated factors among middle-age adolescents in developing countries, and the lack of population-based studies examining waterpipe use among adolescents in the Islamic Republic of Iran. For example, a study was conducted in intermediate and high schools in Tehran municipal district 13 [21]. Another study reported waterpipe tobacco use among Iranian university students in 2 major universities in the south of the country [22].

Tehran with a population of 8 million people is the capital of Islamic Republic of Iran. Most of the Tehran population lives in the city and more than 50% of the Tehran population are aged < 25 years. Since no previous studies have been based on adolescent populations in Tehran the trend of adolescent waterpipe use is unknown. Therefore, the current study was performed to determine the prevalence of waterpipe use and the associated factors in a study population representing 15–18-year-old adolescents in the metropolitan area of Tehran.

Methods

A population-based, cross-sectional survey was performed among 1201 adolescents in Tehran, Islamic Republic of Iran, in 2010.

Sample and procedures

The subjects were adolescents living in ordinary households in the 22 municipal districts of Tehran. The study population was derived through multistage cluster sampling. The blocks were considered as clusters and were randomly selected in proportion to the estimated population of each block; 10 households were selected from each cluster using systematic sampling. From each cluster, 10 households were selected in which 1 or more adolescent boys aged 15–18 years resided. A quota sampling method was used and for every female adolescent, a male adolescent was recruited. In addition, adolescents were assured that their information would remain confidential. The questionnaires were self-administered.

Measures

The research team developed a sociodemographic questionnaire and a waterpipe use questionnaire for use in this study. Waterpipe use was assessed with 3 items: "Have you ever smoked a waterpipe (even only 1 or 2 puffs)?", "During the past 30 days, how many times have you used a waterpipe?" and "Have you ever shared a waterpipe?" The sociodemographic and waterpipe-use questionnaires were administered to adolescents.

Data used in the analysis included sociodemographic variables [23]; lifetime waterpipe use; current waterpipe use; waterpipe smoking on 20 or more of the 30 days before the survey; and waterpipe sharing. The overall prevalence of lifetime waterpipe use was defined as the percentage of adolescents who had any experience of ever using a waterpipe. Current waterpipe use was defined as the percentage of adolescents who had smoked on at least 1 day in the 30 days prior to the survey.

The lifetime and current waterpipe use were defined based on the Youth Risk Behaviors System Surveillance System [24]. Using principle-factor analysis, 12 economic variables (having a vacuum cleaner, separate kitchen, computer, washing machine, bath, freezer, dishwasher, private car, mobile phone, colour television, any type of video equipment and home telephone) were considered. The resulting variable was defined as wealth index and was divided into quintiles according to the percentage of items owned: 0%–20% (poorest), 21%–40% (poor), 41%–60% (intermediate), 61%–80% (rich) and 81%–100% (richest).

Statistical analysis

The data gathered from the 1201 questionnaires were analysed using *SPSS*, version 16 for Windows and *Stata*, version 10. Descriptive indicators were determined. The prevalence rate was presented with 95% confidence intervals (CI). The chi-squared test was used for bivariate analysis. Univariate analysis was carried out, reporting crude odds ratios (OR) with 95% CI. Variables with *P*-values of < 0.2 were entered into a multivariate (backwards) logistic regression model to determine factors influencing waterpipe use. Lifetime and current waterpipe use were considered as dependent variables, and age, educational level, school type, social class, wealth index, parents' educational level, parental control on adolescent activity, use of punishment by parents, parents prefer sons to daughters, history of consulting about risk behaviours with experts, parental supervision on adolescent friend selection, family decision-making pattern, educational success, interest in education, adequacy of family income and having a waterpipe user among friends and family members were considered as independent variables. The results of the multivariate analysis were presented as adjusted OR with 95% CI and *P*-values. In all analyses, $P \leq 0.05$ was taken to indicate statistical significance.

Results

Prevalence of lifetime and current waterpipe use

Of the 1201 adolescents included in this study, 535 (45.1%) reported lifetime (ever use) of the waterpipe (Table 1). Prevalence of lifetime waterpipe use among male respondents was nearly double that of females (OR = 1.66; $P < 0.05$). Among the 45.1% of adolescents who had experienced waterpipe smoking, 64.2% were current waterpipe users. The prevalence of having ever shared a waterpipe among the current waterpipe users was 79.5%. Among these adolescents, sharing a waterpipe with friends was the most prevalent type of activity.

The prevalence of current waterpipe smoking among the total participants was 28.0% and was higher among male (34.8%) than female (21.4%) adolescents (OR = 1.74; $P < 0.001$). The prevalence of waterpipe smoking on 20 or more of the 30 days before the survey was 3.4% among all participants (5.4% among males and 1.5% among females) (OR = 2.96; $P < 0.01$). The prevalence of waterpipe sharing was 34.2% among all participants (39.7% among males and 28.9% among females) ($P = 0.65$).

Bivariate analysis

Tables 2 and 3 present the sociodemographic characteristics of the adolescents by sex and lifetime and current waterpipe use. The mean age of the adolescents was 16.7 (SD 1.1) years.

Lifetime waterpipe use

The results of the bivariate analysis in the female respondents indicated significant relationships between lifetime waterpipe use and educational failure ($P < 0.05$), being poor or poorest wealth index ($P < 0.01$), high levels of parental control ($P < 0.01$), very low or high levels of parental supervision ($P < 0.05$), the use of punishment by their parents ($P < 0.01$) and having smokers among family members ($P < 0.01$) and friends ($P < 0.01$) (Table 2). For the male adolescents there were significant relationships between lifetime waterpipe use and older age ($P < 0.01$), dropping out of school ($P < 0.01$), educational failure ($P < 0.01$), lack of interest in education ($P < 0.01$), adequacy of family income ($P < 0.05$), low or high levels of parental control ($P < 0.05$), decision-making in the family by people other than the parents and children ($P < 0.05$) and having smokers among family members ($P < 0.01$) and friends ($P < 0.01$) (Table 2).

Current waterpipe use

The results of the bivariate analysis in the female respondents showed significant relationships between current waterpipe

Table 1 Prevalence of waterpipe use among adolescents by sex (*n* = 1201)

Smoking pattern	Females (*n* = 609)			Males (*n* = 592)			Total (*n* = 1201)			
	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	OR (95% CI)
Lifetime waterpipe use	233	38.9	35.0–42.9	302	51.4	47.2–55.5	535	45.1	42.2–48.0	1.66 (1.32–20.1)*
Current waterpipe use	130	21.4	18.2–24.8	206	34.8	31.0–38.8	336	28.0	25.5–30.6	1.76 (1.22–2.50)*
Smoking on 20 or more of previous 30 days[b]	9	1.5	0.67–2.79	32	5.4	3.72–754	41	3.4	2.46–4.60	2.96 (1.38–6.34)*
Shared waterpipe use	176	28.9	25.3–32.7	235	39.7	35.7–43.8	411	34.2	31.5–37.0	1.21 (0.91–2.32)

**P ≤ 0.05.*
OR = odds ratio; CI = confidence intervals.
Missing data were excluded.

Table 2 Sociodemographic characteristics by sex and lifetime waterpipe use in the survey respondents

Variable	Lifetime waterpipe use in females					Lifetime waterpipe use in males				
	No		Yes		Crude OR (95% CI)	No		Yes		Crude OR (95% CI)
	No.	%	No.	%		No.	%	No.	%	
Age (years)										
15	68	18.6	39	16.7	1	101	35.3	35	11.6	1
16	84	23.0	44	18.9	0.91 (0.53–1.65)	75	26.2	54	17.9	2.08 (1.24–3.49)**
17	100	27.3	72	30.9	1.26 (0.76–2.06)	60	21.0	74	24.5	3.56 (2.13–5.95)**
18	114	31.1	78	33.5	1.19 (0.73–1.94)	50	17.5	139	46.0	8.02 (4.86–13.3)**
Educational status										
Student	331	91.9	214	94.7	1	267	94.3	263	88.0	1
Dropout	29	8.1	12	5.3	0.71 (0.35–1.45)	16	5.7	36	12.0	2.44 (1.30–4.56)**
School type										
Public	237	72.9	145	69.0	1	135	51.7	155	59.4	1
Private	88	27.1	65	31.0	1.08 (0.68–1.72)	126	48.3	106	40.6	0.71 (0.47–1.06)
Educational success										
Yes	253	75.3	184	82.9	1	244	84.2	188	67.4	1
No	83	24.7	38	17.1	0.63 (0.41–0.97)*	42	15.8	91	32.6	2.58 (1.71–3.91)**
Interest in education										
Yes	223	69.5	154	71.6	1	214	81.7	150	59.3	1
No	98	30.5	61	28.4	1.21 (0.98–2.45)	48	18.3	113	40.7	2.73 (1.80–4.14)**
Social class										
Upper	2	0.6	2	0.9	1	0	0.0	4	1.4	1
Middle	234	65.9	180	79.3	0.77 (0.11–5.51)	193	68.9	204	69.4	0.34 (0.06–1.93)
Working	94	26.5	37	16.3	0.39 (0.50–2.90)	74	26.4	63	21.4	0.21 (0.04–1.04)
Lower	25	7.0	8	3.5	0.27 (0.03–2.36)	13	4.6	23	7.8	0.26 (0.06–1.26)
Wealth index										
Richest	81	22.9	34	15.1	1	60	21.2	55	19.7	1
Rich	83	23.4	44	19.6	1.26 (1.83–2.17)	53	18.7	36	12.9	0.74 (0.42–1.30)
Intermediate	45	12.7	28	12.4	1.48 (0.80–2.75)	37	13.1	42	15.1	1.24 (0.70–2.20)
Poor	70	19.8	55	24.4	1.87 (1.10–3.19)*	56	19.8	66	23.7	1.29 (0.77–2.14)
Poorest	75	21.2	64	28.4	2.03 (1.21–3.42)**	77	27.2	80	28.7	1.13 (0.70–1.83)
Adequacy of family income										
Inadequate	40	11.9	20	9.0	1	24	9.4	47	16.8	1
Approximately adequate	211	62.8	142	64.0	0.95 (0.64–1.41)	156	60.9	151	54.8	0.91 (0.62–1.33)
Adequate	85	25.3	60	27.0	0.71 (0.38–1.33)	76	29.7	81	29.0	1.84 (1.03–3.29)*
Father's educational level										
High school	131	36.6	75	32.9	1	118	42.0	140	47.3	1
University	80	22.3	69	30.1	1.54 (0.99–2.36)	94	33.5	76	25.7	0.69 (0.47–1.02)
Secondary	74	20.7	45	19.7	1.08 (0.68–1.73)	44	15.7	39	13.2	0.76 (0.46–1.24)
Primary	57	15.9	35	15.3	1.09 (0.66–1.82)	17	6.0	27	9.1	1.35 (0.70–2.61)
Illiterate	16	4.5	5	2.2	0.56 (0.20–1.58)	8	2.8	14	4.7	1.49 (0.60–3.68)
Mother's educational level										
High school	132	37.0	90	39.3	1	111	39.8	132	44.1	1
University	65	18.2	53	23.1	1.20 (0.76–1.89)	68	24.4	63	21.1	0.62 (0.14–2.84)
Secondary	72	20.2	46	20.1	0.94 (0.60–1.49)	55	19.7	48	16.1	0.77 (0.50–1.18)
Primary	63	17.6	32	14.0	0.75 (0.45–1.24)	25	9.0	35	11.7	0.72 (0.46–1.15)
Illiterate	25	7.0	8	3.5	0.47 (0.20–1.09)	20	7.2	21	7.0	1.16 (0.65–2.06)

Table 2 Sociodemographic characteristics by sex and lifetime waterpipe use in the survey respondents (*concluded*)

Variable	Lifetime waterpipe use in females					Lifetime waterpipe use in males				
	No		Yes		Crude OR (95% CI)	No		Yes		Crude OR (95% CI)
	No.	%	No.	%		No.	%	No.	%	
Family decision-making pattern										
Father & mother	170	47.5	107	48.4	1	144	51.6	127	43.3	1
Entire family	72	20.1	45	20.4	0.70 (0.28–1.75)	50	17.9	55	18.8	2.41 (1.01–5.77)*
Other people	16	4.5	7	3.2	0.99 (0.64–1.55)	8	2.9	17	5.8	1.25 (0.79–1.96)
Mother	21	5.9	24	10.9	1.82 (0.96–3.42)	12	4.3	11	3.8	1.04 (0.44–2.44)
Father	79	22.1	38	17.2	0.76 (0.48–1.21)	65	23.3	83	28.3	1.45 (0.97–2.17)
Parental control										
Intermediate	107	29.9	108	47.8	1	151	53.4	106	35.9	1
High	230	64.2	101	44.7	0.64 (0.31–0.64)**	69	24.4	25	8.5	0.52 (0.31–0.87)*
Low	21	5.9	17	7.5	0.99 (0.34–2.92)	63	22.3	164	55.6	2.85 (1.79–4.54)**
Parental supervision										
Intermediate	162	45.1	99	44.0	1	122	43.4	99	33.1	1
Very high	37	10.3	11	4.9	0.49 (0.24–0.99)*	30	10.7	26	8.7	1.07 (0.59–1.92)
High	73	20.3	38	16.9	0.85 (0.54–1.36)	80	28.5	62	20.7	0.96 (0.63–1.46)
Low	59	16.4	43	19.1	1.19 (0.75–1.90)	32	11.4	71	23.7	2.73 (1.67–4.48)**
Very low	28	7.8	34	15.1	1.99 (1.14–3.48)*	17	6.0	41	13.7	2.97 (1.59–5.55)**
Parents' use of punishment[a]										
No	275	77.2	146	64.3	1	165	58.9	183	61.8	1
Yes	81	22.8	81	35.7	0.53 (0.37–0.77)**	115	41.1	113	38.2	1.13 (0.81–1.58)
Parents prefer sons to daughters										
No	28	80.1	174	77.3	1	181	66.1	176	62.4	1
Yes	70	19.9	51	22.7	1.18 (0.78–1.77)	93	33.9	106	37.6	1.17 (0.83–1.66)
History of consultation[b]										
No	246	71.9	145	65.9	1	166	59.7	192	67.4	1
Yes	96	28.1	75	34.1	0.75 (0.52–1.09)	112	40.3	93	32.6	1.39 (0.99–1.97)
Having waterpipe user (s) among family										
No	255	70.8	95	41.1	1	242	87.1	181	60.5	1
Yes	105	29.2	136	58.9	3.48 (2.46–4.92)**	36	12.9	118	39.5	4.38 (2.88–6.67)**
Having waterpipe user (s) among friends										
No	231	63.8	69	30.1	1	149	52.7	58	19.4	1
Yes	131	36.2	160	69.9	4.09 (2.87–5.38)**	134	47.3	241	80.6	4.62 (3.19–6.69)**

**P ≤ 0.05; **P ≤ 0.01; ***P ≤ 0.001.*
[a]The most common type of punishment used by the parents was verbal punishment; [b]Having consultation with a teacher or another adult about risk behaviours.
Missing data were excluded.
OR = odds ratio; CI = confidence interval.

use and older age ($P < 0.05$), going to private schools ($P < 0.05$) and having smokers among friends ($P < 0.01$) and family members ($P < 0.01$) (Table 3). Among the males bivariate analysis showed significant relationships between current waterpipe use and older age ($P < 0.01$), dropping out of school ($P < 0.01$), low levels of parental supervision ($P < 0.05$), educational failure ($P < 0.01$) and having smokers among family members ($P < 0.01$) and friends ($P < 0.001$) (Table 3).

Table 3 Sociodemographic characteristics by sex and current waterpipe use in the survey respondents

Variable	Current waterpipe use in females					Current waterpipe use in males				
	No		Yes		Crude OR (95% CI)	No		Yes		Crude OR (95% CI)
	No.	%	No.	%		No.	%	No.	%	
Age (years)										
15	20	20.4	19	14.6	1 (ref.)	20	22.5	13	6.3	1 (ref.)
16	21	21.4	21	16.2	2.28 (1.03–5.04)*	15	16.9	39	18.9	4.00 (1.60–10.0)**
17	33	33.7	38	29.2	1.21 (0.55–2.65)	20	22.5	52	25.2	4.00 (1.68–9.53)**
18	24	24.5	52	40.0	1.05 (0.44–2.52)	34	38.2	102	49.5	4.62 (2.08–10.3)**
Educational status										
Student	96	99.0	116	92.8	1 (ref.)	85	96.2	171	83.7	1 (ref.)
Dropout	1	1.0	9	7.2	7.45 (0.93–9.84)	3	3.4	33	16.2	5.47 (1.63–8.37)**
School type										
Public	72	75.0	72	64.9	1 (ref.)	49	58.3	103	60.2	1 (ref.)
Private	24	25.0	39	35.1	2.50 (1.12–5.58)*	35	41.7	68	39.8	1.08 (0.57–2.04)
Educational success										
Yes	84	88.4	99	79.8	1 (ref.)	69	82.1	115	60.2	1 (ref.)
No	11	11.6	25	20.2	1.93 (0.90–4.15)	15	17.9	76	39.8	3.04 (1.62–5.70)**
Interest in education										
Yes	67	69.8	85	72.6	1 (ref.)	56	68.3	91	54.8	1 (ref.)
No	29	30.2	32	27.4	1.93 (0.90–4.15)	26	31.8	75	45.1	1.73 (0.96–3.13)
Social class										
Upper	0	0.0	2	1.6	1 (ref.)	1	1.1	3	1.5	1 (ref.)
Middle	79	81.4	97	77.6	0 (0)	59	67.8	140	69.7	0.79 (0.08–7.60)
Working	16	16.5	20	16.0	0 (0)	21	24.1	41	20.4	0.65 (0.06–6.65)
Lower	2	2.1	6	4.8	0 (0)	6	6.8	17	8.5	0.67 (0.05–8.16)
Wealth index										
Richest	16	16.7	17	13.6	1 (ref.)	19	22.9	34	17.8	1 (ref.)
Rich	21	21.9	23	18.4	1.45 (0.62–3.41)	10	12.0	25	13.1	1.40 (0.56–3.52)
Intermediate	15	15.6	13	10.4	1.65 (0.69–3.96)	9	10.8	33	17.3	2.05 (0.81–5.18)
Poor	20	20.8	35	28.0	0.82 (0.30–2.24)	22	26.5	44	23.0	1.12 (0.52–2.39)
Poorest	24	25.0	37	29.6	1.03 (0.42–2.54)	23	27.7	55	28.8	1.34 (0.64–2.81)
Adequacy of family income										
Inadequate	9	9.5	12	9.8	1 (ref.)	15	17.6	32	17.1	1 (ref.)
Approximately adequate	64	67.4	73	59.3	0.86 (0.34–2.16)	43	50.6	101	54.0	1.10 (0.54–2.24)
Adequate	22	23.2	38	30.9	1.29 (0.47–3.56)	27	31.8	54	28.9	0.94 (0.44–2.02)
Father's educational level										
High school	39	39.8	36	28.6	1 (ref.)	38	44.8	99	48.5	1 (ref.)
University	29	29.6	37	29.4	1.75 (0.00–2.02)	24	28.2	50	24.5	0.77 (0.42–1.42)
Secondary	16	16.3	28	22.2	1.55 (0.68–3.53)	10	11.8	28	13.7	1.04 (0.46–2.35)
Primary	14	14.3	20	15.9	1.90 (0.88–4.09)	10	11.8	16	7.8	0.59 (0.25–1.43)
Illiterate	0	0.0	5	4.0	1.38 (0.71–2.70)	3	3.5	11	5.4	1.36 (0.36–5.16)

Multivariate logistic regression

The results of the multivariate logistic regression analysis are shown in Tables 4 and 5.

Lifetime waterpipe use

The results of the multivariate logistic regression analysis in the female respondents indicated significant relationships between lifetime waterpipe use and the use of punishment by the parents ($P < 0.01$), history of consultation with an expert ($P < 0.05$), very low or high levels

Table 3 Sociodemographic characteristics by sex and current waterpipe use in the survey respondents (*concluded*)

Variable	Current waterpipe use in females					Current waterpipe use in males				
	No		Yes		Crude OR (95% CI)	No		Yes		Crude OR (95% CI)
	No.	%	No.	%		No.	%	No.	%	
Mother's educational level										
High school	40	41.2	49	38.9	1 (ref.)	38	43.1	90	44.1	1 (ref.)
University	28	28.9	23	18.3	1.35 (0.00–1.91)	20	22.7	40	19.6	0.84 (0.44–1.63)
Secondary	20	20.6	25	19.8	1.94 (0.80–4.72)	10	11.4	38	18.6	1.60 (0.72–3.54)
Primary	9	9.3	21	16.7	1.04 (0.51–2.14)	15	17.0	20	9.8	0.56 (0.26–1.21)
Illiterate	0	0.0	8	6.3	0.69 (0.34–1.37)	5	5.7	16	7.8	1.34 (0.46–3.94)
Family decision-making pattern										
Father and mother	52	54.2	53	44.2	1 (ref.)	34	39.5	92	45.8	1 (ref.)
Entire family	23	24.0	23	19.2	2.45 (0.46–3.21)	17	19.8	36	17.9	0.68 (0.23–1.98)
Other people	2	2.1	5	4.2	0.98 (0.49–1.96)	6	7.0	11	5.5	0.78 (0.39–1.57)
Mother	7	7.3	14	11.7	1.96 (0.73–5.25)	4	4.7	7	3.5	0.65 (0.18–2.35)
Father	12	12.5	25	20.8	2.04 (0.93–4.49)	25	29.1	55	27.4	0.81 (0.44–1.50)
Parental control										
Intermediate	40	41.7	63	50.4	1 (ref.)	35	40.2	71	35.0	1 (ref.)
High	50	52.1	52	41.6	1.06 (0.36–3.14)	11	12.6	11	5.4	0.49 (0.20–1.25)
Low	6	6.2	10	8.0	0.66 (0.38–1.15)	41	47.1	120	59.4	1.28 (0.67–2.47)
Parental supervision										
Intermediate	45	46.4	51	41.5	1 (ref.)	32	36.4	65	31.9	1 (ref.)
Very high	3	3.1	7	5.7	1.12 (0.51–2.46)	11	12.5	13	6.4	0.58 (0.24–1.44)
High	18	18.6	20	16.3	1.43 (0.68–3.01)	22	25.0	39	19.1	0.87 (0.45–1.71)
Low	16	16.5	26	21.1	0.98 (0.46–2.08)	12	13.6	59	28.9	2.42 (1.14–5.13)*
Very low	15	15.5	19	15.4	2.06 (0.50–8.44)	11	12.5	28	13.7	1.25 (0.55–2.83)
Parents' use of punishment[a]										
No	65	66.3	80	64.0	1 (ref.)	54	62.1	124	61.4	1 (ref.)
Yes	33	33.7	45	36.0	0.90 (0.52–1.57)	33	37.9	78	38.6	0.97 (0.58–1.63)
Parents prefer sons to daughters										
No	76	78.4	93	76.2	1 (ref.)	54	65.9	118	60.8	1 (ref.)
Yes	21	21.6	29	23.8	1.13 (0.60–2.14)	28	34.1	76	39.2	1.24 (0.72–2.13)
History of consultation										
No	61	65.6	79	65.3	1 (ref.)	56	68.3	132	67.0	1 (ref.)
Yes	32	34.4	42	34.7	0.99 (0.56–1.74)	26	31.7	65	33.0	0.94 (0.54–1.64)
Having waterpipeuser(s) among family										
No	56	58.3	40	30.8	1 (ref.)	66	75.9	113	55.1	1 (ref.)
Yes	40	41.7	90	69.2	3.15 (1.82–5.46)**	21	24.1	92	44.9	2.56 (1.46–4.49)**
Having waterpipeuser (s) among friends										
No	37	38.5	32	25.0	1 (ref.)	29	33.3	26	12.7	1 (ref.)
Yes	59	61.5	96	75.0	1.88 (1.06–3.34)**	58	66.7	179	87.3	3.44 (1.88–6.31)***

**P ≤ 0.05; **P ≤ 0.01; ***P ≤ 0.001.*
[a]The most common type of punishment used by the parents was verbal punishment.
Missing data were excluded.
OR = odds ratio; CI = confidence interval.

of parental supervision ($P < 0.05$) and having smokers among family members ($P < 0.01$) and friends ($P < 0.01$) (Table 4). Among the male respondents there were significant relationships between lifetime waterpipe use and older age ($P < 0.01$), low levels of parental control $P < 0.01$), history of consultation with an expert ($P < 0.05$), very low or high levels of parental supervision ($P < 0.05$) and having smokers among friends ($P < 0.01$) and family members ($P < 0.01$) (Table 4).

Current waterpipe use

The results of the multivariate logistic regression analysis in the female respondents indicated that having smokers among friends ($P < 0.05$) and family members ($P < 0.01$) was significantly related to current waterpipe use. In the male respondents, current waterpipe use was associated with older age ($P < 0.05$), educational failure ($P < 0.05$), and having smokers among friends ($P < 0.01$) and family members ($P < 0.01$) (Table 5).

Table 4 Results of the multivariate logistic regression analysis of lifetime waterpipe use in adolescents using the sociodemographic variables in a backward regression model

Variable	Adjusted OR (95% CI)	
	Females	Males
Age (years)		
15	n/s	1 (ref.)
16		1.34 (0.65–2.79)
17		1.58 (0.75–3.35)
18		5.12 (2.43–10.82)**
Parental control		
Intermediate	n/s	1 (ref.)
High		0.62 (0.30–1.90)
Low		2.32 (1.17–4.60)**
Parental supervision		
Intermediate	1 (ref.)	1 (ref.)
Very high	0.36 (0.15–0.92)*	2.51 (1.10–6.30)*
High	1.07 (0.61–1.89)	1.45 (0.77–2.72)
Low	1.21 (0.68–2.16)	3.47 (1.63–7.42)**
Very low	2.42 (1.21–4.43)*	1.05 (0.42–2.65)
Use of punishment		
No	1 (ref.)	n/s
Yes	0.51 (0.32–0.81)**	
History of consultation		
No	1 (ref.)	1 (ref.)
Yes	0.54 (0.32–0.93)*	1.81 (1.06–3.09)*
Having waterpipe user(s) among family		
No	1 (ref.)	1 (ref.)
Yes	3.43 (2.24–5.24)**	2.72 (1.57–4.70)**
Having waterpipe user(s) among friends		
No	1 (ref.)	1 (ref.)
Yes	2.82 (1.86–4.29)**	3.81 (2.07–7.03)**

**P ≤ 0.05; **P ≤ 0.01.*
n/s = not significant in model; OR = odds ratio; CI = confidence interval.

Discussion

In this study, almost half the adolescent respondents had ever used a waterpipe for smoking tobacco. The overall prevalence of current waterpipe use was 28.0%. Ever-use of waterpipes and current waterpipe smoking was significantly higher among male than female respondents.

In a previous study of Iranian adolescents, the prevalence of current waterpipe use was 25.7% [21]. The higher prevalence of waterpipe smoking in the present study may be a warning sign suggesting an increased use of tobacco products other than cigarettes, especially waterpipes, by adolescents. The results of the present study were compatible with those of the Global Youth Tobacco Survey (GYTS), which indicated an increasing prevalence of tobacco use in developing countries [25]. Our study also indicated that the prevalence of current waterpipe use among Iranian adolescents was higher than previously reported. Previous studies have shown an 11%–32% prevalence of waterpipe smoking among youth in Middle Eastern countries, and recent observations have suggested that this proportion is increasing [4,5,7–9,12,26–28]. In the present study, the male to female ratio of lifetime waterpipe use was approximately 1.7:1 (OR = 1.66). Consistent with other studies, male sex is a predictor of tobacco use [29]. The GYTS also showed a tendency towards females' increasing use of tobacco products other than cigarettes, such as waterpipes [11,30].

Furthermore, the results of the current study were consistent with those of a study performed among high-school students in the USA, showing that waterpipe smoking was more common among older adolescents [12]. This finding reflects the social and environmental changes in adolescence [24]. Consistent with other studies, increasing age was a predictor of tobacco use [31]. In this study, older age was the

Table 5 Results of the multivariate logistic regression analysis of current waterpipe use in adolescents using the sociodemographic variables in a backward regression model

Variable	Adjusted OR (95% CI)	
	Females	Males
Age (years)		
15	n/s	1 (ref.)
16		4.04 (1.29–6.64)*
17		3.24 (1.14–9.22)*
18		3.74 (1.39–10.1)*
Educational success		
Yes	n/s	1 (ref.)
No		2.89 (1.21–6.92)*
Having waterpipe user(s) among family		
No	1 (ref.)	1 (ref.)
Yes	3.17 (1.70–5.96)**	3.29 (1.57–6.91)**
Having waterpipe user(s) among friends		
No	1 (ref.)	1 (ref.)
Yes	2.19 (1.08–4.41)*	4.17 (1.82–9.57)**

**P ≤ 0.05; **P ≤ 0.01.*
n/s = not significant in model; OR = odds ratio; CI = confidence interval.

strongest predictor of current waterpipe use by male adolescents. A study performed in universities and colleges in the USA showed higher rates of waterpipe smoking among younger students [27]. These observations may be related to social interactions with peers and the process of adolescent socialization. Adolescents are generally looking for opportunities to communicate with their peers, which may make waterpipe use for smoking tobacco attractive and acceptable in this age group.

In the present study, having a waterpipe smoker among family members almost tripled the prevalence of tobacco use in adolescents. This may reflect a lack of close monitoring and the social acceptance of behaviours related to tobacco use, especially the use of waterpipes [25,29]. Similar to previous studies, the results reported here confirmed the impact of tobacco use by a family member on tobacco use by adolescents [25,32,33]. A total of 39.7% of the adolescent respondents in this study reported that at least 1 person in the family used a waterpipe for smoking tobacco. Having waterpipe smokers among friends and among family members significantly increased the probability of waterpipe use by the adolescents. The highest probability was seen in adolescents who had waterpipe smokers among their friends.

Consistent with the literature, the present findings showed that a low level of parental behavioural control was a risk factor of lifetime and current waterpipe use in adolescents [34,35]. A recent study showed that parenting style was associated with waterpipe use. For example, parental punishment is a protective factor for lifetime waterpipe use in female adolescents. The review of the literature showed that adolescents with authoritative parents might be motivated to follow their parents' socialization rules [35–37].

The current study indicated that lack of academic success was a predictor of current waterpipe use in boys. Consistent with other studies, this finding shows the association of academic failure with adolescent tobacco use [38]. Although the rate of lifetime waterpipe use was lower (51.4% in boys and 38.9% in girls) compared with other studies conducted in the Islamic Republic of Iran (64.4% in boys and 51.3% in girls), current waterpipe use by adolescents in the country was higher [21,39]. Thus, many Iranian adolescents are engaged in waterpipe smoking and are therefore at elevated risk of serious health problems.

Due to several cultural barriers encountered in this study, self-administered questionnaires were used. However, to reduce the under-reporting associated with self-administration and to prevent systematic errors in the study, anonymous questionnaires were used. There were some difficulties in gaining access to the adolescents, especially female respondents, due to parental intervention; however, the parents gave their consent once they had been assured of the confidentiality of the information obtained in the survey. Moreover, this study concentrated only on 4 items related to the pattern of waterpipe use. Further consideration of additional items would yield a better understanding of the patterns of waterpipe use among adolescents. The present study represents the starting point for monitoring the patterns of waterpipe use among Iranian adolescents. Moreover, with regard to oral health, sharing waterpipe use was examined among adolescents and this has not previously been investigated. One of the strengths of this study was the use of demographic information, wealth index, educational status and family relations, all of which are important factors affecting smoking behaviours among adolescents.

In conclusion, the results of the present study performed among Iranian adolescents, which represents the

first such investigation using a random sample, showed that the experience of waterpipe smoking is common among Iranian adolescents. This study showed that adolescents have a high rate of use of waterpipes for smoking tobacco. Therefore, health promotion programmes should focus on waterpipe use and its social acceptance. Further studies regarding this public health problem are required. Based on these results, a qualitative study in this field is recommended to explore the views and experiences of adolescent waterpipe smokers. Finally, health promotion programmes focusing on waterpipe use should be developed. As waterpipe use is more socially acceptable than cigarette use in Islamic Republic of Iran [2,3], such prevention programmes must highlight its adverse health effects.

Acknowledgements

We would like to thank all the adolescents and their parents for their participation.

Funding: This project was funded and supported by Tehran University of Medical Sciences; grant no.89-01-28-10494.

Competing interests: None declared.

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