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OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

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Pediatrics published online May 10, 2010;

DOI: 10.1542/peds.2009-2335

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American Academy of Pediatrics

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Water-Pipe Smoking Among North American Youths



WHAT'S KNOWN ON THIS SUBJECT: Water-pipe smoking has increased recently in North America and Europe. Because of its potential impact on life-threatening conditions and nicotine dependence and because of the lack of knowledge about its health effects, water-pipe smoking may represent a public health threat.



WHAT THIS STUDY ADDS: This study describes the sociodemographic characteristics of water-pipe users and compares the use of other psychoactive substances between users and nonusers. Evidence-based public health policies may be required to equip the public to make informed decisions about water-pipe use.

abstract

FREE

OBJECTIVES: The objectives of this analysis were to identify the sociodemographic characteristics of water-pipe users in a North American context and to describe concurrent psychoactive substance use.

METHODS: Data on sociodemographic characteristics, water-pipe smoking, and use of other psychoactive substances were collected in 2007 through mailed self-report questionnaires completed by 871 young adults, 18 to 24 years of age, who were participating in the Nicotine Dependence in Teens Study, a longitudinal investigation of the natural history of nicotine dependence among adolescents in Montreal, Canada. Independent sociodemographic correlates of water-pipe use were identified in multivariate logistic regression analyses.

RESULTS: Previous-year water-pipe use was reported by 23% of participants. Younger age, male gender, speaking English, not living with parents, and higher household income independently increased the odds of water-pipe use. Water-pipe use was markedly higher among participants who had smoked cigarettes, had used other tobacco products, had drunk alcohol, had engaged in binge drinking, had smoked marijuana, or had used other illicit drugs in the previous year.

CONCLUSIONS: Water-pipe users may represent an advantaged group of young people with the leisure time, resources, and opportunity to use water-pipes. Evidence-based public health and policy interventions are required to equip the public to make informed decisions about water-pipe use. *Pediatrics* 2010;125:1184–1189

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KEY WORDS

water-pipe, tobacco, smoking, youth, correlates, substance use

ABBREVIATION

NDIT—Nicotine Dependence in Teens

www.pediatrics.org/cgi/doi/10.1542/peds.2009-2335

doi:10.1542/peds.2009-2335

Accepted for publication Feb 5, 2010

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

As the prevalence of cigarette smoking decreases in North America, water-pipe smoking is becoming increasingly popular, especially among youths.^{1–5} Also known as hookah, shisha, goza, narghile, and hubble bubble,⁶ water-pipe smoking is a centuries-old tradition in Arabic societies^{6,7} that involves smoking tobacco by using an upright device with a small platform where tobacco is burned, a metal body, a base half-filled with water, and a hose with a mouthpiece for inhaling.^{3,6,8} The content and packaging of water-pipe tobacco sold on the market are not currently regulated by the Canadian Food Inspection Agency or the US Food and Drug Administration.^{8–10}

Little is known about the addictive nature or health risks of water-pipe smoking, but it may be at least as harmful as cigarette smoking. Similar to cigarette smoke, water-pipe smoke contains harmful constituents, including nicotine,¹¹ carbon monoxide,^{12,13} and carcinogens.¹⁴ In fact, water-pipe smoke may contain greater amounts of tar and heavy metals, including cobalt, chromium, and lead, than cigarette smoke.¹⁵ Water-pipe use has been linked to lung cancer, heart disease, infectious diseases, and pregnancy-related complications,^{6,8} although the health risks are likely influenced by the quantity and type of tobacco used, the duration and frequency of water-pipe use by the smoker, the volume of smoke inhaled, and the burn temperature.¹⁶ Estimates of the equivalence between cigarette and water-pipe smoking are highly variable and depend on how equivalence is measured. Neergaard et al¹⁷ reported that a single water-pipe session might be equivalent to smoking 2 cigarettes for a nondaily water-pipe user or 10 cigarettes for a daily water-pipe user. A World Health Organization report suggested that water-pipe use

is equivalent to smoking 100 cigarettes in a 200-puff session.¹⁸

There are few studies on the frequency and determinants of water-pipe use outside the Middle East.¹ In the United States, previous-month use proportions ranged between 9% and 20% among college students.^{2,3,19} In the 2006 Canadian Youth Smoking Survey,²⁰ 7% of adolescents in grades 7 to 12 reported ever use and 3% reported use in the previous 30 days. In the 2006 Canadian Tobacco Use Monitoring Survey,²¹ 5% of male participants and 2% of female participants ≥ 15 years of age, and 8% of participants 15 to 24 years of age had ever used a water-pipe. Several US studies report that rates of concurrent psychoactive substance use are high among water-pipe users.^{1,22} The aims of the current analysis were to identify the sociodemographic characteristics of water-pipe users in a North American context and to describe concurrent psychoactive substance use.

METHODS

Data Source

Data were drawn from the Nicotine Dependence in Teens (NDIT) Study, a prospective cohort investigation of 1293 students recruited in 1999–2000 from all grade 7 classes in a convenience sample of 10 secondary schools in Montreal, Canada.²³ The present analysis uses data collected through mailed, self-report questionnaires in 2007–2008, when participants were 18 to 24 years of age. Participants provided written informed consent in this most recent follow-up evaluation. The study was approved by the research ethics committee of the University of Montreal Hospital Research Center (GRCHUM).

Study Variables

Sociodemographic data included data on age, gender, language spoken at

home (French, English, or other), currently in school, living with parents, annual household income (below \$30 000, \$30 000–99 000, \$100 000 or above, or missing data), white race, and currently employed. Frequency of previous-year water-pipe use was measured with the following question: “In the past 12 months, how often did you use a water-pipe (hubble bubble, nargil , or shisha)?” Response choices included never, less than once per month, 1 to 3 times per month, 1 to 6 times per week, and every day. For multivariate analyses, participants were grouped according to whether or not they had used a water-pipe in the previous year.

Previous-year cigarette smoking was measured as follows: “Check the one box that describes you best . . . I have smoked cigarettes but not at all in the past 12 months; I smoked cigarettes once or a couple of times in the past 12 months; I smoke cigarettes once or a couple of times each month; I smoke cigarettes once or a couple of times each week; or I smoke cigarettes every day.”²⁴ Use of other psychoactive substances was measured with the following question: “In the past 12 months, how often did you . . . (1) smoke cigars, (2) smoke a pipe, (3) use bidis (a tobacco product from India), (4) use chewing tobacco, (5) use snuff, (6) drink alcoholic beverages (beer, wine, or liquor), (7) drink 5 or more alcoholic beverages on one occasion (ie, binge drinking), (8) use marijuana, cannabis, or hashish, (9) use cocaine, (10) use speed (amphetamines), (11) use ecstasy (3,4-methylenedioxymethamphetamine) or other similar drugs, (12) use hallucinogens (phencyclidine, lysergic acid diethylamide [acid], or mushrooms), (13) use inhalants (glue or gasoline), (14) use heroin (smack or junk), and (15) use another illicit drug (use of illicit drugs)?” Response choices in-

cluded never, less than once per month, 1 to 3 times per month, 1 to 6 times per week, and every day. Because of low frequency, we grouped cigars, pipe, bidis, chewing tobacco, and snuff into a single variable termed “other tobacco products.” Participants were categorized as answering either yes (ie, used ≥ 1 of these tobacco products in the previous year) or no (ie, did not use any of these tobacco products in the previous year). Similarly, cocaine, speed, ecstasy, hallucinogens, inhalants, heroin, and other illicit drugs were grouped into a single variable termed “other illicit drugs.”

We created the indicator of number of other substances as the arithmetic sum of positive responses for previous-year use of cigarettes, other tobacco products, marijuana, other illicit drugs, and binge drinking. Use of alcohol was excluded because of its high prevalence and overlap with binge drinking. Values for the number of other substances ranged between 0 and 5 (mean \pm SD: 2.2 ± 1.5 ; median: 2.0).

Data Analysis

Descriptive statistics were computed to describe water-pipe use according to sociodemographic characteristics and concurrent psychoactive substance use. Adjusted odds ratios and 95% confidence intervals for potential sociodemographic correlates of water-pipe use were obtained in multivariate logistic regression analyses. All analyses were conducted by using SAS/STAT 9.1 (SAS Institute, Cary, NC).

RESULTS

Eighty-five of the original 1293 NDIT Study participants were either lost to follow-up monitoring or refused to participate after secondary school. Among 1208 participants available for follow-up evaluation, 878 (73%) completed questionnaires. Data on water-

TABLE 1 Previous-Year Water-pipe Use According to Selected Sociodemographic Characteristics

	<i>n</i> ^a	Previous-Year Water-pipe Use, %	Adjusted Odds Ratio (95% Confidence Interval) ^b
Age			0.8 (0.6–1.0) ^c
18–19 y	245	24.9	
20 y	483	24.0	
21–24 y	143	18.9	
Gender			
Female	471	21.2	Reference
Male	400	26.0	1.3 (1.0–1.9)
Language			
French	279	18.6	Reference
English	460	27.0	1.7 (1.1–2.4)
Other	129	20.9	1.2 (0.7–2.1)
Lives with parents			
Yes	667	22.5	Reference
No	200	27.0	1.8 (1.2–2.6)
White			
No	157	19.1	Reference
Yes	712	24.3	1.4 (0.9–2.2)
Annual household income, CAN\$			
<30 000	272	18.4	Reference
30 000–99 000	236	21.6	1.3 (0.8–2.0)
$\geq 100 000$	167	29.9	1.8 (1.1–2.9)
Missing data	196	27.0	1.7 (1.1–2.6)
Currently in school			
No	278	19.8	Reference
Yes	593	25.1	1.2 (0.8–1.8)
Employed			
No	191	27.2	Reference
Yes	680	22.4	0.8 (0.6–1.2)

^a Totals differ because of missing data.

^b Odds ratios were adjusted for all other variables in the table.

^c Age was used as a continuous variable in the multivariate regression analysis.

pipe use were missing for 7 participants; therefore, the analytic sample included 871 participants. Participants were 18 to 24 years of age (mean \pm SD: 20 ± 1 years), and 46% were male.

A total of 204 participants (23%) reported previous-year water-pipe use. Among water-pipe users, 78% smoked water-pipes less than once per month, 19% smoked 1 to 3 times per month, 3% smoked 1 to 6 times per week, and 0% smoked every day. Younger age, male gender, speaking English, not living with parents, and higher household income each independently increased the odds of water-pipe use (Table 1).

Use of other psychoactive substances investigated were relatively high in this sample (Table 2). The mean \pm SD number of other substances used in the previous year was 3.2 ± 1.3 among

water-pipe users, compared with 1.9 ± 1.4 among nonusers. Compared with nonusers, markedly higher proportions of water-pipe users reported using each of the psychoactive substances investigated (Table 2). Virtually all water-pipe users drank alcohol and 92% reported binge drinking. The largest difference between groups was in marijuana use; 74% of water-pipe users reported marijuana use, compared with 35% of nonusers. Table 3 shows that participants who had used other psychoactive substances in the previous year were markedly more likely to report previous-year water-pipe use.

DISCUSSION

In this study, 23% of young adults had used a water-pipe in the previous year, a prevalence estimate almost 3 times

TABLE 2 Use of Other Psychoactive Substances in Previous Year According to Previous-Year Water-pipe Use

Previous-Year Water-pipe Use	<i>n</i>	Use of Other Psychoactive Substances in Previous Year, %					
		Cigarettes	Other Tobacco Products ^a	Alcohol	Binge Drinking	Marijuana, Cannabis, or Hashish	Other Illicit Drugs ^b
Total	871	47	36	91	77	44	16
No	667	41	30	89	72	35	11
Yes	204	67	55	98	92	74	33
<i>P</i> for difference ^c		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

^a Includes cigars, pipe, bidis, chewing tobacco, and snuff.

^b Includes cocaine, speed, ecstasy, hallucinogens, inhalants, heroin, and other.

^c *P* values were obtained from Pearson χ^2 tests.

TABLE 3 Previous-Year Water-pipe Use According to Use of Other Psychoactive Substances in Previous Year

Use of Other Psychoactive Substances in Previous Year	<i>n</i> ^a	Previous-Year Water-pipe Use, %	<i>P</i> for Difference ^b
Cigarettes			
Yes	409	33.5	<.0001
No	461	14.5	
Other tobacco products ^c			
Yes	312	35.9	<.0001
No	559	16.5	
Alcohol			
Yes	790	25.3	<.0001
No	80	5.0	
Binge drinking			
Yes	668	28.1	<.0001
No	201	8.0	
Marijuana, cannabis, or hashish			
Yes	382	39.5	<.0001
No	488	10.9	
Other illicit drugs ^d			
Yes	141	47.5	<.0001
No	730	18.8	

^a Totals differ because of missing data.

^b *P* values were obtained from Pearson χ^2 tests.

^c Includes cigars, pipe, bidis, chewing tobacco, and snuff.

^d Includes cocaine, speed, ecstasy, hallucinogens, inhalants, heroin, and other.

higher than the 8% reported in the 2006 Canadian Tobacco Use Monitoring Survey for a similar age group.²¹ Numerous factors may underlie the growing popularity of water-pipes including low cost,^{8,25} easy access,⁸ appeal of the social interaction that accompanies use,^{9,17,26,27} commercialization by the media,^{16,18} availability of sweetened, flavored, and aromatic tobacco or maassel, which can mask the taste of tobacco,^{1,22,28} perceptions of low risk to health,^{1,2,22,26} linked to the belief that the water filters the toxins from the smoke,^{1,18} the lack of public health warnings about the dangers of water-pipe use,^{10,26} and the perception that water-pipe smoking is less addictive

than cigarette smoking.^{2,3,22} In fact, Knishkowsky and Amitai⁸ described 4 myths about water-pipe use that seem common across cultures, as follows. (1) Water-pipes are safer than cigarettes because of lower nicotine content. In reality, different water-pipe products and smoking patterns could result in higher nicotine intake. (2) Because the texture of water-pipe smoke is smoother, it is less toxic. In fact, the lack of irritation has been associated with the moisture in the pipe, which makes its use more palatable but not less toxic. (3) Toxins are filtered through water before the smoke is inhaled. Although it is plausible that some water-soluble toxins may be ab-

sorbed in the “filtration” process, the concentrations of toxic substances are not reduced sufficiently to reduce negative health effects.¹⁰ (4) Fruits added to flavored tobacco makes water-pipe tobacco smoking a healthy choice. In fact, fruit flavors mask the tobacco taste and cannot be viewed as a healthy food intake/choice.

Our results on the sociodemographic correlates of water-pipe use mirror findings in other Western countries^{5,21,29} indicating that water-pipes are used primarily by younger persons and by male individuals. Water-pipe users in the NDI Study were more likely to be male and, even with the restricted age range in the NDI Study, younger participants were more likely to use water-pipes. This may reflect the experimentation with new substances that typically occurs during later adolescence,^{30,31} although preferences for specific substances often do not solidify until the early 20s.³² Increased exposure to psychoactive substances may coincide with the end of secondary schooling and a shift to either working or further schooling in less-structured settings characterized by decreased parental control and increased socialization with new friends. Consistent with previous reports,²⁹ water-pipe use was not restricted to any single racial, ethnic, or cultural group, which supports the idea that water-pipe smoking has spread to many groups within Western cultures. Finally, not living with parents and

higher annual household income were associated with water-pipe use. This supports the previous finding that higher weekly disposable income was associated with water-pipe use.⁵ Water-pipe users may represent a more-privileged group of young people with the leisure time, resources, and opportunities to use water-pipes.

Although findings were similar to prevalences reported among young adults in Canada,³³ Europe,³⁰ Australia,³⁴ and the United States,^{35–38} there was a high level of psychoactive substance use among NDIT Study participants irrespective of water-pipe use. Relatively more users than nonusers of other psychoactive substances reported water-pipe use. Individuals who use multiple substances concurrently are potentially exposed to higher doses of noxious substances and elevated risks of dependence and disease,³ and water-pipe users may be among those at highest risk. Use of multiple substances concurrently in this young age group is also associated with increased likelihood of mental health problems,^{39–40} greater health

service utilization attributable to alcohol and illicit substance use problems,⁴¹ and decreased work productivity.⁴² Interestingly, one-third of water-pipe users did not smoke cigarettes. Although cigarette smokers may switch intermittently to water-pipes to reduce their cigarette-related risk, individuals who do not smoke cigarettes may try smoking tobacco with a water-pipe because of the perception that water-pipe smoking is less harmful than cigarette smoking.⁴³

Limitations of this analysis include the fact that self-report data may be subject to recall bias. Use of a convenience sample may limit generalizability of the findings. The NDIT Study sample had low power to study water-pipe use in ethnic groups other than the white group. Finally, use of cross-sectional data limits the causal inferences about the determinants of water-pipe use that can be made.

CONCLUSIONS

Although the public health burden of water-pipe smoking is not known, more in-depth surveillance of appar-

ently increasing use is required. Research is needed to increase understanding of the health effects, natural history, and determinants of water-pipe smoking, as well as the reasons for the high levels of concurrent psychoactive substance use. The constituents of water-pipe smoke should be better delineated and, if water-pipe use is associated with impairment or increased health service utilization, then research on treatment for misuse may be justified. Evidence-based public health interventions may be required to facilitate the public making informed decisions about water-pipe use.

ACKNOWLEDGMENTS

This work was supported by the Canadian Cancer Society (grants 010271 and 017435). Dr O'Loughlin holds a Canada Research Chair in the Early Determinants of Adult Chronic Disease. Dr Low holds a Clinical Research Scholar Career Award from the Health Research Foundation of Quebec.

We thank the NDIT Study participants and their parents.

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Pediatrics published online May 10, 2010;

DOI: 10.1542/peds.2009-2335

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