Brief report

Water Pipe Steam Stones: Familiarity and Use Among US Young Adults

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Abstract

Introduction: Water pipe tobacco smoking (WTS) is associated with substantial toxicant exposure. Water pipe steam stones (WSS) are marketed as a healthier alternative. The purpose of this study was to determine, in a nationally representative sample, young adults' familiarity with, perceptions regarding, and use of WSS.

Methods: A survey about WTS was completed by 3,253 members of an online nonvolunteer access panel. Four items specifically addressed WSS.

Results: Of the 228 individuals who had heard of WSS, 17% ($n = 41$) reported using them. Use was associated with ever (adjusted odds ratio [AOR] = 7.7, 95% confidence interval [CI] = 2.7–21.8) and current (AOR = 16.1, 95% CI = 5.1–51.5) WTS. Compared with those who thought that WSS had about the same harm as WTS, those who thought that WSS was “a lot less harmful” to a person's health had substantially higher odds of having tried WSS (AOR = 6.8, 95% CI = 2.0–23.1).

Conclusions: Approximately 1 in 6 young adults who have heard of WSS used them. WSS use is associated with the perception of reduced harm.

Introduction

Water pipe tobacco smoking (WTS, also referred to as a hookah) is increasing in popularity in the United States.^{1–3} Some of the appeal of WTS is due to the misperception that water pipe tobacco is less harmful than traditional cigarettes.^{4,5} However, WTS is now known to be associated with substantial toxicant load and potential adverse health effects.^{6–9} Similar to the cigarette industry's development of potentially reduced exposure products,¹⁰ the water pipe tobacco industry has introduced a new product known as water pipe steam stones (WSS).¹¹ WSS are porous stones soaked in a liquid solution of glycerin and flavoring, containing no nicotine, and are used in place of tobacco in a water pipe. Manufacturers of WSS

advertise them as free from health risks and policy limitations of smoking tobacco.^{12,13}

To date, there has been little research on the safety of WSS. However, similar to e-cigarettes, which also use glycerin and produce vapor instead of smoke, there will likely be questions regarding the safety of this process.^{14–16} For example, because WSS are activated with heated charcoal in the water pipe, users may be exposed to harmful components of charcoal smoke, such as carbon monoxide and polyaromatic hydrocarbons (PAH).^{17,18} One WSS manufacturer suggests using “electric coal” to mitigate this risk.¹³ Additionally, some members of an online WTS discussion board have discussed adding liquid nicotine, used in e-cigarette cartridges, to the WSS.¹⁹

Considering liquid nicotine can be toxic if not properly diluted, this could have harmful health effects when conducted by uninformed individuals.^{20,21}

Because of the likely emergence of WSS as an alternative to WTS, it would be valuable to assess familiarity with and engagement in it. The purpose of this study was to assess, in a nationally representative random sample of young adults, familiarity with WSS, perceptions of their harm, and prevalence of and factors associated with their use. Because of the newness of this behavior and the lack of prior published research, we had no specific *a priori* hypotheses.

Methods

Participants and Procedures

Participants were members of a nationally representative probability-based online nonvolunteer access panel recruited and maintained by a company called GfK (previously known as Knowledge Networks). GfK created the panel with a combination of random digit dialing and address-based sampling, with a sampling frame encompassing an estimated 97% of the U.S. households.²² At the time of this study, the panel contained approximately 50,000 members aged 18 and older from across the United States.²² Panel members without personal computers or Internet to complete the online surveys are provided laptop computers and Internet access, as well as telephone support for technical issues.²³

We commissioned GfK to survey approximately 3,000 adults aged 18–30 years about health behaviors related to WTS. The survey was sent to a randomly selected sample of panel members in March 2013 and was active for 1 month. This study was approved by the University of Pittsburgh Institutional Review Board.

Measures

Sociodemographic Characteristics

GfK maintains a database of sociodemographic information about panel members, from which we assessed for this study age, gender, race/ethnicity, and household income as a measure of socioeconomic status (SES). We added items to determine current living situation and current relationship status.

Water Pipe Steam Stones

All respondents to the WTS survey were asked whether or not they had ever heard of using WSS as an alternative to tobacco in a water pipe. Respondents who indicated they had heard of WSS were asked whether or not they had ever used WSS as an alternative to tobacco in their water pipe. Respondents who answered “yes” to that item were asked if they had ever added liquid nicotine to WSS. Additionally, those who responded that they had ever heard of WSS were presented with the following item: “Compared to hookah tobacco, do you think that steam stones are:” with responses of a lot less harmful; a little less harmful; about the same harm; a little more harmful; or a lot more harmful to a person’s health. Based on the distribution of the data and because WSS are marketed as a “healthier” alternative to WTS, we collapsed the five response categories into three, with “a lot more harmful,” “a little more harmful,” and “about the same harm” as one category.

Other Related Substance Use

Respondents were asked about their current (past 30 days) cigarette and e-cigarette use.²⁴ Respondents were asked about both their current and ever WTS because WSS are used within a water pipe apparatus.

Data Analysis

Only individuals who answered “yes” to our WSS familiarity item were included in our final sample. Probability weights were used in all analyses to represent the U.S. population of 18–30 year olds. We calculated frequencies and percentages for WSS items. We described and compared sociodemographic characteristics between individuals who had used WSS and those who did not using chi-square tests. Unadjusted and adjusted logistic regression models were used to assess independent associations between perceived WSS harm, other substance use (water pipe, cigarette, and e-cigarette), and WSS use. We decided *a priori* to control for sociodemographic variables in our adjusted models (see Table 2). We defined statistical significance using a two-tailed alpha of 0.05 and conducted all analyses in Stata version 12.0.²⁵

Results

Of the 3,252 participants who returned questionnaires (response rate = 54%), 228 (6%) had ever heard of using WSS as an alternative to tobacco in a water pipe. Of those 228 individuals, 17% (41) reported using WSS, which is 1% of all responders. While 17% (38) believed WSS were a lot less harmful to a person’s health than WTS, 24% (56) believed they were a little less harmful, and 60% (131) believed WSS were equally or more harmful than WTS. Three participants refused to answer the item. Of the 17% who reported using WSS, 6% (6) reported adding liquid nicotine to the WSS.

Our final sample (228) was approximately evenly divided among the four age groups (Table 1). The sample was slightly more female (55%) than male (45%). About half of respondents self-identified as White (52%), single (47%), and living with a parent or guardian (43%). Our final sample had households with low (28%), medium (31%), and high (41%) incomes. Sociodemographic characteristics did not significantly differ between individuals who reported use of WSS (17%) and those who did not (83%) except for household income ($p < .001$), with the majority (63%) of WSS users having a low (under \$25,000) household income (Table 1).

In multivariable analyses, both ever and current water pipe tobacco use were associated with increased odds of WSS use (adjusted odds ratio [AOR] = 7.7, 95% confidence interval [CI] = 2.7–21.8; AOR = 16.1, 95% CI = 5.1–51.5, respectively). Additionally, odds of being a WSS user significantly increased in our adjusted model as perceptions of harmfulness decreased ($P_{\text{trend}} < .003$). For example, compared with those who thought that WSS had about the same harm as WTS, those who thought that WSS was “a lot less harmful” to a person’s health had substantially higher odds of having tried WSS (AOR = 6.8, 95% CI = 2.0–23.1). We did not find significant associations between current cigarette and e-cigarette use and WSS use. (Table 2).

Discussion

This study found that, in a nationally representative panel of 3,252 young adults, 228 (6%) had heard of WSS, and that of this group 41 (17%) had used them. Additionally, we found that WSS use was significantly associated with SES, ever and current WTS, and the belief that WSS was less harmful than WTS.

The fact that 17% of those who had heard of this relatively new product also used it is consistent with studies of other products, such as e-cigarettes.²⁶ Considering both awareness and use of e-cigarettes among U.S. adults is rising,²⁷ it is possible that the same trends could be seen with WSS.

Table 1. Comparison of Sociodemographic Characteristics Among WSS Users and Nonusers (*N* = 228)

Characteristic	Whole sample ^a <i>N</i> = 228	WSS use		<i>p</i> ^b
		Yes (<i>n</i> = 41)	No (<i>n</i> = 187)	
	Column %		Column %	
Age, years				
18–20	26	25	26	.67
21–23	23	24	23	
24–26	24	33	22	
27–30	27	18	29	
Sex				
Female	55	58	55	.85
Male	45	42	45	
Race/ethnicity				
White, non-Hispanic	52	42	54	.40
Black, non-Hispanic	10	4	11	
Hispanic	26	41	23	
Biracial/multiracial/other, non-Hispanic	13	13	13	
Relationship/marital status				
Single/separated/divorced/ widowed	47	55	46	.72
Engaged/committed relationship	33	27	35	
Married/domestic partnership	19	18	19	
Living situation				
Alone	14	18	13	.84
Parent/guardian	43	44	43	
Significant other	27	18	29	
Friends	13	15	12	
Other	4	5	3	
Household income ^c				
Low (under \$25,000)	28	63	21	<.001
Middle (\$25,000–\$59,999)	31	15	34	
High (\$60,000 and above)	41	22	45	

WSS = water pipe steam stones.

^aPercentages are based on the total for each category and may not total 100 due to rounding.^bSignificance value determined by chi-square test.^cThis variable was collapsed into tertiles based on its distribution.

WSS use was greater in individuals who were current water pipe users, who had 16 times greater odds, and ever water pipe users, who had almost 8 times greater odds, of using WSS than nonusers of water pipes. This is likely due to the fact that WSS are used within a water pipe apparatus, so individuals who use WSS may be familiar with WTS. Additionally, those who thought WSS to be a lot less harmful to one's health than WTS had almost 7 times greater odds of using WSS than those who thought it was the same or more harm. We do not know whether WSS is less harmful than WTS. Considering recent research on e-cigarettes that suggest that they may contain fewer toxins than cigarettes,^{15,28} and the fact that WSS do not contain nicotine, it is plausible that WSS are the same or less harmful as WTS. However, the use of charcoal to heat the steam stones will still expose users to carbon monoxide and PAH.^{17,18} Further research is needed to determine what WSS and their associated vapor are composed of, as well as potential health effects.

WSS users may also be swayed by manufacturers' claims that the product does not contain nicotine.¹³ Although most traditional WTS users do not believe it to be addictive, the fact that WTS exposes users to substantial amounts of nicotine,^{9,29} coupled with emerging research into risk for WTS dependence,^{30,31} may make a nicotine-free alternative appealing. One concerning fact, however, is that 6% of WSS users had added their own liquid nicotine to the

stones. Anecdotally, liquid nicotine kits, some needing to be diluted manually, can be purchased online through a simple Internet search. Considering pure liquid nicotine is toxic,³² use of it by inexperienced individuals can be problematic.

Our study found that individuals of lower SES had greater odds of being WSS users compared with those of higher SES. This result is not surprising, considering individuals of lower SES tend to have higher tobacco use and uptake rates.³³ Our study did not find any significant relationships between current e-cigarette and cigarette smoking and WSS use. This could be because the health effects of cigarettes is well-documented³⁴ and users of WSS may want a product with less harm. Although e-cigarettes are similar in design to WSS—containing glycerin, tobacco-free, and producing vapor instead of smoke—they are a product that delivers nicotine. Although this was not specifically assessed in this study, it may be possible that users of WSS prefer a product that does not contain nicotine. These questions should be addressed in further research, perhaps with qualitative studies or quantitative studies with a larger population of WSS users. Another potential avenue for water pipe researchers is alternative uses for the water pipe, such as for smoking marijuana, as well as alternative products, such as “electronic hookahs” and “hookah pens”, as well as policies related to these products.

Table 2. Bivariate and Multivariate Associations Between Independent Variables and WSS Use (N = 41)

Independent variable ^a	Whole sample	WSS use	
	Column % ^b	OR (95% CI) ^c	AOR (95% CI) ^c
Compared to WTS, do you think WSS are ^d			
About the same or more harmful to a person's health	60	Ref	Ref
A little less harmful to a person's health	24	2.3 (0.6–9.1)	2.2 (0.6–8.2)
A lot less harmful to a person's health	17	7.2 (2.0–25.6)	6.8 (2.0–23.1)
Ever WTS			
No	69	Ref	Ref
Yes	31	6.2 (1.9–19.8)	7.7 (2.7–21.8)
Current WTS			
No	95	Ref	Ref
Yes	5	9.2 (2.7–31.2)	16.1 (5.1–51.5)
Current cigarette			
No	77	Ref	Ref
Yes	23	1.1 (0.4–3.3)	1.1 (0.4–3.2)
Current e-cigarette			
No	92	Ref	Ref
Yes	8	2.6 (0.7–9.7)	2.1 (0.7–6.8)

WTS = water pipe tobacco smoking; WSS = water pipe steam stones.

^aA separate logistic regression model was run for each independent variable.

^bPercentages are based on the total for each category and may not total 100 due to rounding.

^cOR = odds ratio; CI = confidence interval; AOR = adjusted odds ratio; adjusted for age, sex, race/ethnicity, relationship/marital status, living situation, and household income.

^dPerception of WSS harm was significant in our unadjusted and adjusted models ($p_{\text{trend}} = .003$).

This study was limited in that it assessed a small sample for analysis. However, because this is a newer product, we expected the number of individuals familiar with WSS to be small. Another limitation is that participants were asked few questions about WSS. Given this pilot data, future researchers may assess in-depth factors to offer a more complete understanding of this product. Additionally, including a picture of WSS in the survey may have increased validity of the WSS items; this is recommended for future WSS research. Finally, because this study was limited to WSS only, no conclusions can be made about WTS in general.

In conclusion, we found that almost one in six young adults who had heard of WSS also used this newer product without knowing the health risks. Additionally, those who believed WSS to be less harmful than WTS were much more likely to use them. It may be valuable for researchers to investigate the composition of WSS and its associated vapor. Finally, educators should reinforce the messages that (1) the health effects of this product are unknown and (2) there is potential danger of experimenting with liquid nicotine.

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Declaration of Interests

None declared.

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