Women & Health

ISSN: 0363-0242 (Print) 1541-0331 (Online) Journal homepage: www.tandfonline.com/journals/wwah20

Factors associated with waterpipe tobacco smoking among Lebanese women

Karim N. Daou ,, Ibrahim R. Bou-Orm , & Salim M. Adib ,

To cite this article: Karim N. Daou ,, Ibrahim R. Bou-Orm , & Salim M. Adib , (2018) Factors associated with waterpipe tobacco smoking among Lebanese women, Women & Health, 58:10, 1124-1134, DOI: 10.1080/03630242.2017.1414102

To link to this article: https://doi.org/10.1080/03630242.2017.1414102

Published online: 19 Jan 2018.

WOMEN & HEALTH
2018, VOL. 58, NO. 10, 1124–1134
https://doi.org/10.1080/03630242.2017.1414102

Factors associated with waterpipe tobacco smoking among Lebanese women

Karim N. Daou, MD, MPH[a], Ibrahim R. Bou-Orm, MD, MPH[b], and Salim M. Adib, MD, DrPH[a]

[a]Department of Epidemiology and Population Health, Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon; [b]Non-Communicable Diseases (NCD) Unit, Ministry of Public Health, Beirut, Lebanon

ABSTRACT
Waterpipe tobacco smoking (WTS) has become a serious public health threat in the Middle East and beyond. To estimate the prevalence rates of cigarette and WTS among Lebanese women and describe characteristics associated with each behavior. Secondary analysis of women's health data obtained in a national survey in 2010. Of 2,255 selected women, 78 percent reported no or past long-term WTS. Among the 12 percent of regular waterpipe smokers, 40 percent were light users (mean three waterpipe heads weekly), while 60 percent were heavy users (mean of 11 heads per week). About 70 percent were never or past long-term cigarette smokers. Younger age, location within Greater Beirut (GB) and having professional employment were significantly associated with use of WTS. Older age, GB location, lower education, and ever-married were significantly associated with cigarette smoking. WTS is becoming a socially normative behavior among empowered professional women, who can spare the time and expense to engage in this behavior in easily accessible cafés, which prohibit cigarette smoking. Government, media, and NGO campaigns against smoking should target waterpipe use, not only in Lebanon but also across the Arab world and among Arab communities in the Diaspora with messages different from anti-cigarette campaigns.

ARTICLE HISTORY
Received 24 February 2017
Revised 13 October 2017
Accepted 18 October 2017

KEYWORDS
Arab; hookah; Middle East; narghile or narghileh or narguileh; shisha or shishah; Water pipe

Introduction

Waterpipe tobacco smoking (WTS) has become a serious public health threat in the Middle East and beyond, with alarmingly high prevalence among school youth and university students (Kim, Kabir, and Jahan 2016; Maziak et al. 2016). The average initiation age could be as low as 13–14 years, according to a study conducted in Beirut's southern suburbs in 2001 (Zoughaib, Adib, and Jabbour 2004), later confirmed in a national survey in 2012 (Bejjani et al., 2012). In the United States, the overall prevalence of ever smoking waterpipes among adult women was 6.3 percent (Salloum et al. 2015). A systematic literature review of WTS estimated the current prevalence among adults at 6 percent in Pakistan, 15 percent in Lebanon, 9–12 percent in Syria, and 4–12 percent in the Arab Gulf region (Akl et al. 2011).

This method of tobacco use, historically traditional in Southeast Asia and the Middle East (Akl et al. 2011), has been going through a revival in recent decades. Evidence is

CONTACT Karim N. Daou karim.n.daou@gmail.com P.O. Box 11-0236/Department of Epidemiology and Population Health, Riad El-Solh/Beirut 1107 2020, Lebanon.

accumulating on adverse health effects associated with use of WTS, after decades of misconceptions about its alleged safety, associated with "water filtration of smoke" (Maziak et al. 2015). WTS is associated with short- and long-term adverse health effects related to nicotine, heavy metals, particulate matters, various carcinogens, and the burning charcoal used to heat the tobacco mixture (Kim, Kabir, and Jahan 2016). WTS has been reported to increase heart rate and blood pressure, and has been associated with impaired pulmonary function and carbon monoxide intoxication, leading to major health complications, such as chronic bronchitis, emphysema, and coronary artery disease. Lung, gastric, and esophageal cancer have a direct relation with WTS, as well as periodontal disease, obstetrical complications for pregnant waterpipe smokers, osteoporosis, and mental health problems (El-Zaatari, Chami, and Zaatari 2015).

This alternative smoking habit has been underestimated for a long time by public health professionals, who have traditionally focused on controlling cigarette smoking. However, a cross-sectional survey of Beirut's high schools in 2011 showed that 46 percent of students aged of 15–19 years old had already tried WTS at least once, as compared with only 25 percent for cigarettes (Zahlan et al. 2014). Another school survey in Lebanon in 2015 confirmed these figures, showing that the prevalence of waterpipe ever-use among sixth–seventh graders was 44.3 percent, and that current WTS prevalence was triple that of cigarettes (22.1 percent vs 7.4 percent). Among current waterpipe smokers, 40.0 percent were already at least weekly users (Jawad et al. 2015).

The rise in WTS popularity is related to several factors: delayed regulation policies compared to that for cigarette smoking, the depiction of WTS as "normative" of youth "café" culture through social/mass media, the introduction of manufactured sweet flavors to eliminate the bitterness of tobacco, and its relatively low cost (Nakkash, Khalil, and Afifi 2011; Maziak 2011). Despite good awareness of health risks of waterpipe use among Middle Eastern youth, some perception still persists that it is less addictive and less harmful than cigarettes. It is also seen as a gateway to leisure, entertainment and socializing (Maziak et al. 2004).

The prevalence of regular and public, long WTS sessions, while expectedly more prevalent among young Arab men, is gaining ground also among Arab women, unfettered by cultural taboos or social pressure encountered in public cigarette smoking (Asfar et al. 2005). A multinational qualitative study performed in 2013 among women smokers in Egypt, Palestine, Lebanon, and Syria found that WTS was perceived as giving a "sexy" allure and was considered as an act of emancipation (Khalil et al. 2013). The trend has been enhanced by the empowerment of women and their increased spending power. Younger, highly educated, and successful women are becoming the new customers of waterpipe cafés (Dar-Odeh and Abu-Hammad 2011).

The spread of WTS among women carries special health concerns. At least one study from Lebanon among residents aged 40 years and above has shown that, at equal levels of use, the degree of dependence and the health consequences were higher among adult women compared to men (Salameh, Khayat, and Waked 2012). Equal concern exists about WTS among pregnant women. In 2004, a survey of 864 Lebanese pregnant women recruited in 23 health-care centers revealed significant gaps in knowledge about the dangers of WTS, along with permissive attitudes toward this behavior. About 4 percent of women reported smoking only waterpipes, and 1.5 percent smoking both cigarette and waterpipes during their pregnancies (Chaaya et al. 2004).

Overall, knowledge remains scarce regarding the psychosocial and sociodemographic factors associated with WTS among adult women in the Middle East. This study assessed the prevalence of WTS and cigarette smoking among adult Lebanese women, rarely examined in previous studies. Additionally, this study examined the sociodemographic characteristics associated with waterpipe use and separately those associated with cigarette use.

Methods

Study design and target population

This was a secondary analysis of data from a national survey on Pap smear awareness and use, conducted in 2010, which targeted females aged 18–65 years, residing permanently in Lebanon. The study had been conducted under the auspices of the Ministry of Public Health (MOPH), after review from an ad-hoc institutional review board.

Selection of study participants

The sample was selected using a "multi-stage random cluster" sampling procedure. In each one of the five administrative districts ("mohafazat") in Lebanon, two subdistricts ("cazas") were first selected, in addition to the Greater Beirut (GB) area, which includes the capital city of Beirut and its north and south suburbs. In each caza, communities were selected randomly from complete listings and blocks from numbered detailed maps. Buildings were subsequently randomly selected in these blocks. If a building housed multiple apartments, one apartment was randomly selected. When more than one adult woman was available in a household at the time of selection, one woman was randomly selected to be interviewed per household. The surveyor explained the aim of the survey, and the woman was queried for her verbal consent to participate. If she refused to participate, she was automatically excluded. When no women were available in that household or they all refused to participate, the surveyors immediately went up one floor above. When no woman in a building agreed to participate, and no other floors were available, a new additional building was randomly selected until the desired sample size in each district was obtained. The number of women in each selected district was 450; corresponding to the number of households included, a total of 2,255 women were selected. Because of automatic replacement, participation rates and bias could not be evaluated.

The questionnaire was developed for this study and included questions on sociodemographic characteristics, gynecologic history, and awareness on the use of Pap smear examination and of cervical cancer.

The questions related to the smoking behavior were as follows:

1. Cigarette smoking:
   Do you currently smoke? (No; Yes but ≤1 cigarette per day; Yes but >1 cigarette per day)
   If smoker, what is the average number of cigarettes smoked per day?

If >1 cigarette per day, how long have you been smoking regularly (per month or day)?

- If non-smoker, did you use to smoke regularly and quit for at least 6 months ago? did you use to smoke regularly and quit for less than 6 months ago? Or you were never a smoker?

2. WTS:

Do you currently smoke? (No; Yes but ≤1 head per week; Yes but >1 head per week)
If smoker, what is the average number of heads smoked per week?
If >1 head per week, how long have you been smoking regularly (per month or day)?

- If non-smoker, did you use to smoke regularly and quit for at least 6 months ago? Did you use to smoke regularly and quit for less than 6 months ago? Or you were never a waterpipe smoker?

Data collection

Of all the collected data, two outcome variables of interest were calculated for the purposes of this analysis: the prevalence rate of WTS and that of cigarette use:

- WTS prevalence: measured in number of "heads" smoked per week. WTS was eventually divided into four levels: non-smokers, i.e., never-users or past-users who ceased more than 6 months preceding the survey; occasional users, i.e., those who smoked less than once weekly or had recently ceased; regular light users, i.e., less than daily use; regular heavy users: at least one head daily. Regular users were asked to specify the weekly number of waterpipe "heads" usually smoked.
- Cigarette smoking: measured in number of cigarettes smoked per day. Cigarette smoking was eventually divided into four levels: nonsmokers, i.e., never-users or past-users who ceased more than 6 months preceding the survey; occasional users, i.e., those who smoked less than daily or had recently ceased; regular light smokers, i.e., smoked ≤10 cigarettes/day; regular heavy smokers: smoked >10 cigarettes/day.

Independent variables included: socioeconomic status (SES); age (in years, divided into four categories), location (GB or elsewhere), marital status (ever or never married), educational level (elementary or less, complementary (equivalent to middle school in the USA), secondary, and university), and professional activity (working outside home or not working). SES was derived from the distribution of the household crowding index (measured in persons/room in the residence). Increasing crowding levels were categorized into upper, middle, or lower SES (crowding index of <1, 1–2, and >3 persons per room, respectively) (Melki et al. 2004). The use of the crowding index had previously been validated as an SES indicator essentially in the urban/suburban GB area (Melki et al. 2004). However, the rest of the country is urbanizing at an extremely fast rate, which seemed to justify using the index nationwide. According to the International Fund for Agricultural Development (IFAD) in 2007, only 13 percent of the population was still considered as "rural" (Poverty, Growth & Inequality in Lebanon, 2007). Consequently, the probability of error in using the crowding index as a nationwide SES indicator is relatively limited, although this use of this indicator needs to be validated.

Data analysis

All data were described and tabulated as frequency and percentages for categorical variables and means with standard deviations (SD) for continuous ones. Prevalence rates were calculated with their respective 95 percent confidence intervals (CIs). A bivariate analysis involving the association between each independent variable and each of the two outcomes of interest was conducted and assessed with the Chi-square test. An association was deemed "statistically significant" if the test yielded a $p \leq .05$. Independent variables with significant associations were entered into a multivariable ordinal logistic regression to assess their joint effects. In that model, significance was based on the 95 percent CI of the adjusted odds ratio (OR_{adj}). When the 95 percent CI of the estimated OR_{adj} included the value 1, the association was considered "not significant". At the end of this procedure, two "risk profiles" finally emerged for each of the two outcomes.

Because we were not trying to build a predictive model, fit of the multivariable ordinal logistic model was not assessed, and we confined ourselves to finding those variables with the highest adjusted odds ratios for the outcomes of interest.

Results

The average age of the sample was about 38 years. As per design, 80 percent of selected women lived in areas outside the GB. Almost half of participants had obtained a secondary or higher education. Two-thirds of participants had ever been married at the time of the survey, and two-thirds were not performing any professional activity outside their homes, including being students or retired women. Based on the household crowding index, 59 percent of the sample belonged to the middle class (Table 1).

Globally, cigarette use was more prevalent than waterpipe use. Almost 78 percent of participants were never or past waterpipe smokers, while 70 percent were never or past cigarette smokers. Among the 12 percent reporting regular WTS, 40 percent were light users, smoking a mean of 3 waterpipe heads weekly, while 60 percent were heavy users, smoking a weekly mean of 11 heads. Very few (n = 71) were occasional waterpipe smokers. They were included in the "never-smokers" in subsequent analyses. Among regular cigarette smokers, 30 percent were light smokers with a weekly mean use of 7 cigarettes, and 70 percent were heavy smokers with a weekly mean of 21 cigarettes. More than half the sample (54 percent) did not engage in either of the two behaviors, while 19 percent reported WTS only (Table 2).

In bivariate analyses, younger age was associated with heavier WTS, as were location within GB, higher education, outside professional activity, never-married status and middle-to-high SES. As a summary of the multivariable ordinal logistic model, that included age, location, education, marital status, professional activity and the SES, only younger age, GB location and professional activity remained significantly associated with WTS (Table 3).

In bivariate analyses, older age, ever-married status and location within GB were associated with heavier cigarette use. However, higher education and middle-to-low SES were protective factors against cigarette smoking. As a summary of the multivariable ordinal logistic model, including age, location, education, marital status, and the SES, only older age, GB location, lower education, and married status remained significantly associated with cigarette smoking (Table 4).

Table 1. Sociodemographic characteristics of the sample (N = 2255).

Variables	*n* (%)
Age group (years)	
Younger (<25)	462 (20.5)
Middle (25–40)	853 (37.8)
Older (41–55)	687 (30.5)
Oldest (>55)	253 (11.2)
Mean age (SD)	38.0 (13.1)
Location	
Greater Beirut (GB)	455 (20.2)
Outside GB	1800 (79.8)
Educational level	
Elementary	429 (19.0)
Complementary (middle school)	644 (28.6)
Secondary	646 (28.6)
University	536 (23.8)
Marital status	
Never married	702 (31.1)
Ever married	1553 (68.9)
Professional activity	
Working outside home	754 (33.4)
Not working	1501 (66.6)
Socioeconomic status*	
Upper (<1 person/room)	344 (15.3)
Middle (1–2 persons/room)	1335 (59.2)
Lower (>2 persons/room)	576 (25.5)

* Based on the household crowding index in persons/room.

Table 2. Prevalence of tobacco use among Lebanese women (N = 2255).

Variables	*n* (%)	95% CI
Waterpipe tobacco smoking (WTS)		
Never or past use	1756 (77.9)	(76.1–79.6)
Occasional (less than weekly)	232 (10.3)	(9.0–11.6)
Regular*	267 (11.8)	(10.6–13.2)
Light (less than daily)	106 (40.0)	
Heavy (daily or more)	161 (60.0)	
Cigarette smoking		
Never or past use	1574 (69.8)	(67.8–71.8)
Occasional (less than daily)	71 (3.1)	(2.5–3.9)
Regular**	610 (27.1)	(25.2–29.0)
Light (≤10 daily)	186 (30.5)	
Heavy (>10 daily)**	424 (69.5)	
Combined risk (*n*, %)		
1. No WTS or cigarette smoking	1224 (54.3)	
2. WTS use but no cigarette smoking	421 (18.7)	
3. WTS use with cigarette smoking	78 (3.4)	
4. Cigarette use only	532 (23.6)	

* Mean weekly use of waterpipe heads: light: 3 (SD = 1); heavy: 11 (SD = 8).
** Mean daily use of cigarettes: light 7 (SD = 3); heavy: 21 (SD = 13).

Discussion

While WTS is increasingly taking hold within the Middle East and beyond, little has been done in understanding the factors related to this behavior, compared to the literature concerning cigarette smoking. WTS is especially more popular among younger women than cigarette smoking, as its use in public is much more socially tolerated in the Middle East (Obeidat et al. 2014). The health effects may be more serious among women than

Table 3. Sociodemographic variables associated with waterpipe tobacco smoking (N = 2255).

		WTS levels n (%)					
		Never	Occasional	Light	Heavy	*p*-value	OR_{adj} (95% CI)
		1756 (77.9)	232 (10.3)	106 (4.7)	161 (7.1)		
Age (years)	<25	277 (60.0)	87 (18.8)	35 (7.6)	63 (13.6)	<.01	Ref
	25–40	629 (73.7)	99 (11.6)	53 (6.2)	72 (8.4)		0.57 (0.43–0.76)
	41–55	608 (88.5)	40 (5.8)	15 (2.2)	24 (3.5)		0.21 (0.14–0.29)
	>55	242 (95.7)	6 (2.4)	3 (1.2)	2 (0.8)		0.08 (0.04–0.16)
	Mean age (SD)	40.0 (13.1)	31.3 (10.9)	31.0 (10.2)	30.0 (10.4)		—
Residential area	GB area	320 (70.3)	58 (12.7)	26 (5.7)	51 (11.2)	<.01	Ref
	Outside GB	1436 (79.8)	174 (9.7)	80 (4.4)	110 (6.1)		0.54 (0.42–0.68)
Educational attainment	≤ Elementary	385 (89.7)	16 (3.7)	9 (2.1)	19 (4.4)	<.01	Ref
	Complementary (middle school)	505 (78.4)	70 (10.9)	28 (4.3)	41 (6.4)		1.30 (0.89–1.92)
	Secondary	473 (73.2)	78 (12.1)	31 (4.8)	64 (9.9)		1.44 (0.97–2.13)
	University	393 (73.3)	68 (12.7)	38 (7.1)	37 (6.9)		1.19 (0.79–1.80)
Marital status	Never married	480 (68.4)	94 (13.4)	48 (6.8)	80 (11.4)	<.01	Ref
	Ever married	1276 (82.2)	138 (8.9)	58 (3.7)	81 (5.2)		0.92 (0.71–1.20)
Professional activity	Outside home	538 (71.4)	95 (12.6)	52 (6.9)	69 (9.2)	<.01	Ref
	At home	1218 (81.1)	137 (9.1)	54 (3.6)	92 (6.1)		0.67 (0.54–0.84)
Socioeconomic status	Upper	256 (74.4)	47 (13.7)	22 (6.4)	19 (5.5)	.013	Ref
	Middle	1032 (77.3)	129 (9.7)	62 (4.6)	112 (8.4)		0.96 (0.72–1.29)
	Lower	468 (81.3)	56 (9.7)	22 (3.8)	30 (5.2)		0.86 (0.60–1.24)

Table 4. Sociodemographic variables associated with cigarette smoking (N = 2255).

Cigarette smoking levels		Never	Light	Heavy		
n (%)		1645 (72.9)	186 (8.2)	424 (18.8)	*p*-value	OR_{adj} (95% CI)
Age (years)	Younger (<25)	418 (90.5)	25 (5.4)	19 (4.1)	<.01	Ref
	Middle (25–40)	673 (78.9)	65 (7.6)	115 (13.5)		2.10 (1.44–3.07)
	Older (41–55)	396 (57.6)	67 (9.8)	224 (32.6)		5.29 (3.53–7.64)
	Oldest (>55)	158 (62.5)	29 (11.5)	66 (26.1)		3.30 (2.10–5.18)
	Mean age (SD)	35.8 (0.3)	41.5 (0.9)	44.6 (0.5)		—
Residential area	GB area	302 (66.4)	51 (11.2)	102 (22.4)	<.01	Ref
	Outside GB	1343 (74.6)	135 (7.5)	322 (17.9)		0.68 (0.54–0.86)
Educational attainment	≤ Elementary	253 (59.0)	43 (10.0)	133 (31.0)	<.01	Ref
	Complementary (middle school)	453 (70.3)	61 (9.5)	130 (20.2)		0.72 (0.55–0.95)
	Secondary	494 (76.5)	49 (7.6)	103 (15.9)		0.61 (0.46–0.82)
	University	445 (83.0)	33 (6.2)	58 (10.8)		0.41 (0.29–0.58)
Marital status	Never married	594 (84.6)	40 (5.7)	68 (9.7)	<.01	Ref
	Ever married	1051 (67.7)	146 (9.4)	356 (22.9)		1.37 (1.04–1.81)
Professional activity	Outside home	567 (75.2)	59 (7.8)	128 (17.0)	.218	—
	At home	1078 (71.8)	127 (8.5)	296 (19.7)		
Socioeconomic status	Upper	264 (76.7)	30 (8.7)	50 (14.5)	.002	Ref
	Middle	984 (73.7)	116 (8.7)	235 (17.6)		1.04 (0.77–1.40)
	Lower	397 (68.9)	40 (6.9)	139 (24.1)		1.12 (0.79–1.58)

among men (Salameh, Khayat, and Waked 2012). This analysis considered Lebanese women aged 18–65 years of all socioeconomic classes across the country.

Most previous surveys in Lebanon had focused on adolescents and young adults in universities, and only one, the WHO-STEPS risk factors survey conducted in 2008–2009, had looked at all types of tobacco use in adult women aged 25–64 years. The present survey revealed a prevalence of occasional or regular WTS of 22 percent, which did not differ from the prevalence of 21.6 percent (19.1–24.0) reported by STEPS. The prevalence of occasional or regular cigarette use in this study was 30 percent, which compares well with the STEPS findings of 31.6 percent (28.8–34.4). STEPS found no significant differences in WTS between men and women, while cigarette smoking was significantly higher in men [46.8 percent (43.5–50.1)] (Rahim et al. 2014). Remarkably more than half of participants in this survey did not report any tobacco use, while 19 percent were exclusive waterpipe users.

Differences emerge in the risk profiles of the two tobacco behaviors considered separately. Higher prevalence rates of WTS were found in younger women living within GB and employed in a formal professional activity, suggesting the possibility that empowered professional women are finding this behavior "normative" in easily accessible cafés within the city and its suburbs and can spare the time and expense to engage in WTS. Cigarette smoking was also more prevalent among women in GB, reflecting the less traditional, more open social behaviors of urban women compared to those in less urbanized area. In contrast, cigarette smoking remained more popular in older, married and less-educated women. This difference in risk profiles highlights the importance of devising approaches to WTS prevention and control, which use different cognitive messages than those used for cigarettes. In particular, while greater education was negatively associated with cigarette smoking in women, the same was lacking with WTS. Thus, emphasizing the specific health dangers of WTS without mixing the information with more general "smoking" information seems to be urgently needed. Waterpipes should be featured prominently as dangerous devices in all educational programs, not just as a "side-show" to cigarette use, and misconceptions about their safety debunked. A longitudinal study in Jordan, conducted between 2008 and 2011, showed that awareness of the harms of WTS and the presence of warning labels on the waterpipe tobacco packs were protective from WTS progression among both male and female youth (Jaber et al. 2015).

The findings of the present study may have been affected by the inevitable limitations of cross-sectional surveys of lacking the temporal sequence. None of the associations found can be determined to be "causal", even though they definitely point to a correlation. Also, the composition of women who refused to participate was not available for analysis, and therefore potential participation bias could not be estimated but could have resulted in inaccurate and/or non-representative, non-generalizable results. As in all surveys tackling stigmatized topics, social desirability bias could have been present in this study, shifting the results toward an underestimation of the real prevalence of WTS. Recall bias is unlikely to have interfered with the quality of data as respondents had to report on the situation of smoking at the time of the survey or over the period of 6 months preceding it.

In addition to health information targeting more empowered young urban women, more research should be conducted to understand better the psychosocial and cognitive variables which may affect a person's "translation" of knowledge received into action contemplated or already initiated. Several psychological models can be used as a conceptual framework to investigate the perceptions of Lebanese women related to WTS. No such analyses could be found in the literature on WTS. This gap in our knowledge should be addressed in future research.

Declaration of interests

None of the coauthors declared any conflict of interest.

Acknowledgment

The authors acknowledge the contribution of Dr. Rana Sakr who collaborated with the senior coauthor (SA) in the process which led to the collection of data analyzed for this study.

References

Akl, E. A., S. K. Gunukula, S. Aleem, R. Obeid, P. A. Jaoude, R. Honeine, and J. Irani. 2011. The prevalence of waterpipe tobacco smoking among the general and specific populations: A systematic review. *BMC Public Health* 11 (1):244–55. doi:10.1186/1471-2458-11-244.

Asfar, T., K. D. Ward, T. Eissenberg, and W. Maziak. 2005. Comparison of patterns of use, beliefs, and attitudes related to waterpipe between beginning and established smokers. *BMC Public Health* 5:19. doi:10.1186/1471-2458-5-19.

Bejjani, N., C. El Bcheraoui, and S. M. Adib. 2012. The social context of tobacco products use among adolescents in Lebanon (MedSPAD-Lebanon). *Journal of Epidemiology and Global Health* 2 (1):15–22. doi:10.1016/j.jegh.2012.02.001.

Chaaya, M., S. Jabbour, Z. El-Roueiheb, and H. Chemaitelly. 2004. Knowledge, attitudes, and practices of argileh (water pipe or hubble-bubble) and cigarette smoking among pregnant women in Lebanon. *Addictive Behaviors* 29 (9):1821–31. doi:10.1016/j.addbeh.2004.04.008.

Dar-Odeh, N. S., and O. A. Abu-Hammad. 2011. The changing trends in tobacco smoking for young Arab women; narghile, an old habit with a liberal attitude. *Harm Reduction Journal* 8:24. doi:10.1186/1477-7517-8-24.

El-Zaatari, Z. M., H. A. Chami, and G. S. Zaatari. 2015. Health effects associated with waterpipe smoking. *Tobacco Control* 24 (Suppl 1):i31–i43. doi:10.1136/tobaccocontrol-2014-051908.

Jaber, R., P. Madhivanan, Y. Khader, F. Mzayek, K. D. Ward, and W. Maziak. 2015. Predictors of waterpipe smoking progression among youth in Irbid, Jordan: A longitudinal study (2008–2011). *Drug and Alcohol Dependence* 153:265–70. doi:10.1016/j.drugalcdep.2015.05.008.

Jawad, M., R. T. Nakkash, Z. Mahfoud, D. Bteddini, P. Haddad, and R. A. Afifi. 2015. Parental smoking and exposure to environmental tobacco smoke are associated with waterpipe smoking among youth: Results from a national survey in Lebanon. *Public Health* 129 (4):370–76. doi:10.1016/j.puhe.2015.01.011.

Khalil, J., R. Afifi, F. M. Fouad, F. Hammal, Y. Jarallah, M. Mohamed, and R. Nakkash. 2013. Women and waterpipe tobacco smoking in the eastern mediterranean region: allure or offensiveness. *Women & Health* 53 (1):100-116. doi:10.1080/03630242.2012.753978.

Kim, K.-H., E. Kabir, and S. A. Jahan. 2016. Waterpipe tobacco smoking and its human health impacts. *Journal of Hazardous Materials* 317:229–36. doi:10.1016/j.jhazmat.2016.05.075.

Maziak, W. 2011. The global epidemic of waterpipe smoking. *Addictive Behaviors* 36 (1–2):1–5. doi:10.1016/j.addbeh.2010.08.030.

Maziak, W., T. Eissenberg, S. Rastam, F. Hammal, T. Asfar, M. E. Bachir, … K. D. Ward. 2004. Beliefs and attitudes related to narghile (waterpipe) smoking among university students in Syria. *Annals of Epidemiology* 14 (9):646–54. doi:10.1016/j.annepidem.2003.11.003.

Maziak, W., Z. B. Taleb, M. Jawad, R. Afifi, R. Nakkash, E. A. Akl, … T. Eissenberg. 2016. Consensus statement on assessment of waterpipe smoking in epidemiological studies. *Tobacco Control*. [tobaccocontrol-2016-052958] doi:10.1136/tobaccocontrol-2016-052958.

Maziak, W., Z. B. Taleb, R. Bahelah, F. Islam, R. Jaber, R. Auf, and R. G. Salloum. 2015. The global epidemiology of waterpipe smoking. *Tobacco Control* 24 (Suppl 1):i3–i12. doi:10.1136/tobacco-control-2014-051903.

Melki, I., H. Beydoun, M. Khogali, H. Tamim, and K. Yunis. 2004. Household crowding index: A correlate of socioeconomic status and inter-pregnancy spacing in an urban setting. *Journal of Epidemiology and Community Health* 58 (6):476–80. doi:10.1136/jech.2003.012690.

Nakkash, R. T., J. Khalil, and R. A. Afifi. 2011. The rise in narghile (shisha, hookah) waterpipe tobacco smoking: A qualitative study of perceptions of smokers and non smokers. *BMC Public Health* 11:315. doi:10.1186/1471-2458-11-315.

Obeidat, S. R., O. F. Khabour, K. H. Alzoubi, A. M. Mahasneh, A. M. Bibars, Y. S. Khader, and A. Alsa'di. 2014. Prevalence, social acceptance, and awareness of waterpipe smoking among dental university students: A cross sectional survey conducted in Jordan. *BMC Research Notes* 7:832. doi:10.1186/1756-0500-7-832.

Rahim, H. F. A., A. Sibai, Y. Khader, N. Hwalla, I. Fadhil, H. Alsiyabi, … A. Husseini. 2014. Non-communicable diseases in the Arab world. *The Lancet* 383 (9914):356–67. doi:10.1016/S0140-6736(13)62383-1.

Salameh, P., G. Khayat, and M. Waked. 2012. Lower prevalence of cigarette and waterpipe smoking, but a higher risk of waterpipe dependence in lebanese adult women than in men. *Women & Health* 52 (2):135–50. doi:10.1080/03630242.2012.656885.

Salloum, R. G., J. F. Thrasher, F. R. Kates, and W. Maziak. 2015. Water pipe tobacco smoking in the United States: Findings from the national adult tobacco survey. *Preventive Medicine* 71 (Supplement C):88–93. doi:10.1016/j.ypmed.2014.12.012.

United Nations Development Programme (UNDP) Lebanon (2007). *Poverty, growth & inequality in lebanon. Retrieved from http://www.undp.org/content/dam/lebanon/docs/poverty/publications/poverty,%20growth%20and%20inequality%20in%20lebanon.pdf*

Zahlan, L., L. Ghandour, N. Yassin, R. Afifi, and S. S. Martins. 2014. Double trouble: Exploring the association between waterpipe tobacco smoking and the nonmedical use of psychoactive prescription drugs among adolescents. *Drug and Alcohol Dependence* 145:217–23. doi:10.1016/j.drugalcdep.2014.10.020.

Zoughaib, S. S., S. M. Adib, and J. Jabbour. 2004. Prevalence and determinants of water pipe or narghile use among students in Beirut's southern suburbs. *Le Journal Médical Libanais. The Lebanese Medical Journal* 52 (3):142–48.