Original Report:
Public Health

Waterpipe Tobacco Smoking among Arab Youth; a Cross-Country Study

Khalid A. Kheirallah, PhD[1]; Jomana W. Alsulaiman, MD[2]; Mohammad H. Al-Sakran, MSc[4]; Sukaina Alzyoud, PhD[3]; Sreenivas P Veeranki, DrPH[5]; Kenneth D. Ward, PhD[6]

Objective: Waterpipe tobacco smoking (WTS) is considered a global epidemic that is spreading among youth. Our analysis was conducted to compare the national baseline prevalence rate estimates of WTS among Arab boys and girls.

Design, Setting and Participants: The Global Youth Tobacco Survey (GYTS) is a school-based survey using standardized self-administered questionnaires; it employs a two-stage cluster sampling technique to obtain a representative sample of youth (13-15 years of age). We conducted a secondary data analysis of nationally representative GYTSs available from 16 Arab countries.

Main Measures: Youth who self-reported smoking waterpipe at least once in the past 30 days were considered to be current waterpipe tobacco smokers. National weighted WTS prevalence rate estimates along with respective 95% confidence intervals were reported for boys and girls.

Results: Pooled GYTS data from 16 Arab countries yielded a total of 31,359 youth. Overall, 10.6% of the respondents were current waterpipe tobacco smokers, with boys (13.7%) having significantly higher estimates than girls (7.2%). Overall, current WTS prevalence rate estimates ranged from .9% in Oman to 34.2%, in Lebanon. The WTS epidemic was more predominant among boys and girls, respectively, in the West Bank (42.8% and 24.2%), Lebanon (38.6% and 30.5%) and Jordan (25.7% and 14.5%).

Conclusion: Among Arab boys and girls, WTS represents a growing strain of the tobacco epidemic that requires immediate attention. *Ethn Dis.* 2016;26(1):107-112; doi:10.18865/ed.26.1.107

Introduction

The spread of waterpipe tobacco smoking (WTS) introduces a potentially new strain to the global tobacco epidemic[1] due to a misperception that is it less harmful than cigarettes. Still, WTS delivers large boluses of nicotine,[2] causes symptoms of nicotine addiction,[3,4] is being initiated earlier than cigarettes,[5-7] acts as a gateway for cigarettes smoking,[8] and contributes significantly to increasing morbidity.[9,10]

In the Arab countries, where the growing WTS epidemic is particularly apparent, especially among youth,[6,11-13] the spread of WTS was initiated in the early 1990s with the introduction of Ramadan tents (special form of cafés), where the waterpipe was the focus of social gatherings.[12] Today, WTS among youth is a socially acceptable habit that is built within the Arabic culture.[14-16] Such culture unifies a total of 23 Arab countries into a distinct territory with a dominant "panethnic" identity. Arabs constitute a heterogeneous population with different ancestral origins, identities, religions, local cultures, and socio-economic statuses. Yet, they share a heritage of common linguistic, cultural, and political traditions.

While 19 out of the 23 Arab countries ratified the Framework Convention on Tobacco Control (FCTC), only a few have implemented it and fewer have consistently enforced FCTC-mandated policies. For example, only seven countries have implemented complete smoking bans in public places and the rest have partial or no bans, and actual enforcement

Keywords: Tobacco, Waterpipe, Youth, Smoking

[1]Department of Public Health, Faculty of Medicine, Jordan University of Science and Technology
[2]Department of Pediatrics, Yarmouk Hospital, Jordan Ministry of Health
[3]Department of Community and Mental Health Nursing, Hashemite University
[4]Faculty of Science, University of Jordan/ Aqaba Branch
[5]Division of Epidemiology, Department of Preventive Medicine and Community Health, University of Texas Medical Branch, Galveston, TX
[6]Division of Social and Behavioral Sciences, School of Public Health, University of Memphis

Address correspondence to Khalid A. Kheirallah, PhD; Department of Public Health, Faculty of Medicine, Jordan University of Science and Technology; P.O.Box 3030, Irbid 22110, Jordan. +962.2.7201000. kkheiral@gmail.com

remains low. Even when properly enforced, FCTC-policies' significance in combating WTS is questionable as they were developed for cigarette smoking and do not address the uniqueness of waterpipe as a tobacco smoking method. For instance, indoor smoking bans are not often enforced when it comes to waterpipe due to the high net profit margin associated with its sales in restaurants and cafes.[13,17] Overall, paralysis in public health policies in combating WTS [13] poses a particularly high risk to youth, and calls for studies addressing the spread of WTS among this age group.

It is important … to compare prevalence across countries to establish national baseline estimates of WTS in each of the Arab countries to better understand its burden and impact.

Studies of the prevalence of WTS by Arab youth have provided mainly restricted analyses from specific regions or sub-populations[7,18] with little attention to potential differences across the region in its spread. It is important, therefore, to compare prevalence across countries to establish national baseline estimates of WTS in each of the Arab countries to better understand its burden and impact.

Methods

Study Population

The most recent Global Youth Tobacco Survey (GYTS) datasets administered in the Arab countries were used to estimate the prevalence of WTS among youth (aged 13 to 15 years). The dataset from Palestine was collected separately in the West Bank and the Gaza Strip; therefore, Palestine was included using two separate datasets. Datasets from Arab countries where national samples were not used (Algeria, Iraq and Somalia), and where information on waterpipe use was not collected (Bahrain, Comoros, Mauritania and Gaza Strip) were excluded from the analysis (map available from lead author).

The standardized sampling and methods of the GYTS have been described elsewhere.[19] In brief, it is a school-based survey employing a two-stage cluster sampling technique to obtain a representative sample of youth that is proportionate to the size and distribution of youth in the respective countries. Data were collected using standardized self-administered questionnaires developed by the Global Tobacco Surveillance System collaborative group comprising the Center for Disease Control and Prevention, the World Health Organization, the Canadian Public Health Association, and other tobacco-specific organizations. Countries participating in the GYTS follow standardized local procedures for obtaining parental permission for ethical consideration and reassuring them that the information obtained are strictly anonymous and confidential.[19]

Measures

Current WTS was measured using the following question: "During the past 30 days (one month), on how many days did you smoke waterpipe (Shisha, Argila, Nargila, Hubble-Bubble)?" Youth who reported smoking waterpipe for a day or more in the last month were considered current waterpipe tobacco smokers.[19,20] We also included demographic information of youth including age, sex and the country where the GYTS was conducted.

Ethical Considerations

This study was approved by the institutional review board (IRB) of Jordan University of Science and Technology and King Abdulla University Hospital.

Statistical Analysis

Datasets were pooled and managed using SAS v.9.2 (SAS Institute Inc. Cary, NC) and analyzed using IBM SPSS Statistics v.20. Complex sample modules were utilized in SPSS to accommodate for final adjusted weights of the sample representing youth in each country. Frequencies (unweighted and weighted) along with weighted percentages were used to report estimates of youths' current WTS. Prevalence estimates and their respective 95% CI were reported for each country. In addition, prevalence estimates were reported by country and sex, and chi-square contingency tests were used to determine differences in WTS between boys and girls. ArcGIS for Desktop, version 10.3, software application was used for spatial data visualization.

Results

A total of 31,359 youth, representing 6,109,572 youth from 16 Arab countries were included in the study. (map available from lead author) More than half of participants were girls (51%); 35.0%, 36.9% and 28.1% were aged 13, 14, and 15 years, respectively (Table 1). The majority of youth were from Egypt (18.1%), Syria (15.6%), Morocco (14.8%), or Saudi Arabia (13.4%). Approximately 10.6% [95% CI =9.3% - 11.7%] of youth were current waterpipe tobacco smokers, with boys (13.7% [95% CI=11.6%-16.0%]) having significantly higher prevalence rate estimates than girls (7.2% [95% CI= 6.3%-8.2%]) *(P*<.001).

WTS prevalence rate estimates are presented in Table 2. Overall, current WTS prevalence rate estimates ranged between .9% in Oman to 34.2% in Lebanon. A substantial proportion of youth from Lebanon (34.2%), the West Bank (32.9%), Jordan (19.1%), and Syria (18.4%) were current waterpipe tobacco smokers. Among boys from the West Bank, Lebanon, Jordan, and Syria, respectively, 42.8%, 38.6%, 25.7%, and 23.7% were current WTS compared with 30.5%, 24.2%, 14.5%, and 13.4% among their female counterparts.

Table 1. Characteristics of Arab youth, Global Youth Tobacco Surveys, 2005-2011

Variable	Frequency		Percentage
	Unweighted, n=31,359	Weighted, N=6,109,572	Weighted %
Age, in years			
13	11,193	2,138,300	35.0
14	11,364	2,252,168	36.9
15	8,802	1,719,104	28.1
Sex			
Boys	16,147	2,978,322	49.9
Girls	14,668	2,984,842	50.1
Country, data collection year			
Djibouti, 2009	1,096	12,002	.2
Egypt, 2009	3,472	1,105,843	18.1
Jordan, 2009	1,523	255,249	4.2
Kuwait, 2009	2,213	52,736	.9
Lebanon, 2011	1,651	141,645	2.3
Libya, 2010	1,361	234,029	3.8
Morocco, 2010	2,106	906,673	14.8
Oman, 2010	905	80,168	1.3
Qatar, 2007	943	8,111	.1
Saudi Arabia, 2010	1,797	816,926	13.4
Sudan, 2009	950	505,265	8.3
Syria, 2010	1,210	953,223	15.6
Tunisia, 2010	1,294	356,822	5.8
United Arab Emirates, 2005	8,787	98,171	1.6
West Bank, 2009	1,401	149,739	2.5
Yemen, 2008	650	432,970	7.1

Our results point to the colossal public health work needed to curb the WTS epidemic among Arab youth and call for the development of culturally specific prevention as well as cessation strategies.

Discussion

The re-emergence of waterpipe as a "safe" and socially acceptable tobacco use method[16] exposed several youth to tobacco dependence and harm.[9] The increasing prevalence rates of cigarette smoking among Arab youth,[13,21,22] combined with the evident WTS's early initiation and prolonged maintenance,[5,6,11] centers WTS as a potential contributor to increasing the prevalence of cigarette smoking and makes it an important public health issue. Still, cross-country comparisons of WTS prevalence rates are rare. This study is the first cross-country investigation to report such estimates among Arab youth. Our results point to the colossal public health work needed to curb the WTS epidemic among Arab youth and call for the development of culturally specific prevention as well as cessation strategies.

Overall, one in every 10 Arab youth currently smokes waterpipe, with higher estimates among boys compared with girls. Reported estimates are consistent with the findings from local samples. In Jordan, for example, approximately 33% of youth living in Zarqa/Jordan *(N*=993) were

Table 2. Waterpipe tobacco smoking (WTS) prevalence rates among youth in the Arab world by country and sex

Country	Weighted % 95% Confidence Interval					
	Boys		Girls		Total	
	Current WTS	Never WTS	Current WTS	Never WTS	Current WTS	Never WTS
Djibouti	7.7	92.3	5.2	94.8	6.6	93.4
	4.4 - 13.10	86.9 - 95.6	2.7 - 9.9	90.1 - 97.3	4.1 - 10.3	89.7 - 95.9
Egypt	10.4	89.6	3.2	96.8	6.7	93.3
	5.0 - 20.8	79.2 - 95.0	1.3 - 7.9	92.1 - 98.7	3.7 - 11.9	88.1 - 96.3
Jordan	25.7	74.3	14.5	85.5	19.1	80.9
	19.5 - 33.6	66.4 - 80.5	10.3 - 20.3	79.7 - 89.7	14.8 - 24.4	75.6 - 85.2
Kuwait	14.7	85.3	8.5	91.5	11.1	88.9
	11.8 - 18.2	81.8 - 88.2	6.3 - 11.3	88.7 - 93.7	9 - 13.7	86.3 - 91
Lebanon	38.6	61.4	30.5	69.5	34.2	65.8
	31.3 - 47.4	52.6 - 68.7	23.1 - 39.5	60.5 - 76.9	28.0 - 41.5	58.5 - 72.0
Libya	5.3	94.7	2.4	97.6	3.8	96.2
	2.9 - 9.2	90.8 - 97.1	1.1 - 5.3	94.7 - 98.9	2.4 - 6.0	94 - 97.6
Morocco	5.1	94.9	2.8	97.2	4.0	96.0
	3.1 - 8.8	91.2 - 96.9	0.9 - 9.1	90.9 - 99.1	2.2 - 8.1	91.9 - 97.8
Oman	1.6	98.4	0.4	99.6	.9	99.1
	0.5 - 5.3	94.7 - 99.5	0.0 - 2.5	97.5 - 100	.3 - 2.4	97.6 - 99.7
Qatar	13.0	87.0	6.1	93.9	8.4	91.6
	8.4 - 19.8	80.2 - 91.6	3.5 - 10.5	89.5 - 96.5	5.6 - 12.4	87.6 - 94.4
Saudi Arabia	13.0	87.0	5.7	94.3	9.3	90.7
	7.4 - 22.6	77.4 - 92.6	3.0 - 11.1	88.9 - 97.0	5.9 - 14.5	85.5 - 94.1
Sudan	6.7	93.3	3.2	96.8	4.8	95.2
	4.2 - 11.1	88.9 - 95.8	2.1 - 5.6	94.4 - 97.9	3.2 - 7.3	92.7 - 96.8
Syria	23.7	76.3	13.4	86.6	18.4	81.6
	17.0 - 32.4	67.6 - 83.0	8.2 - 21.4	78.6 - 91.8	14 - 24.1	75.9 - 86.0
Tunisia	9.5	90.5	1.6	98.4	5.3	94.7
	5.9 -15.4	84.6 - 94.1	0.8 - 3.9	96.1 - 99.2	3.5 - 8.0	92 - 96.5
United Arab Emirates	15.6	84.4	7.1	92.9	11.4	88.6
	12.9 - 18.7	81.3 - 87.1	5.5 - 9.1	90.9 - 94.5	9.5 - 13.8	86.2 - 90.5
West Bank	42.8	57.2	24.2	75.8	32.9	67.1
	35.4 - 51.0	49.0 - 64.6	16.7 - 34.0	66.0 - 83.3	24.8 - 42.9	57.1 - 75.2
Yemen	4.1	95.9	1.0	99.0	2.9	97.1
	1.7 - 9.9	90.1 - 98.3	0.2 - 5.3	94.7 - 99.8	1.3 - 7.0	93 - 98.7

current waterpipe smokers.[18] In a school-based longitudinal cohort of youth from Irbid/Jordan *(N*=1,781), current WTS prevalence estimates increased among boys and girls, respectively, from 20.3% and 7.7%, in 2008, to 35.3% and 18.2%, in 2011.[7] Interventions to curb WTS among youth should focus on its harmful effects and addictive properties, and should enhance the knowledge and shift the attitudes about such harm and dependence. Utilization of parents, schools and local communities for health promotion is also deemed necessary. Extra-curricular school interventions should be utilized to develop the skills necessary to refute the allure of WTS, especially among girls. Further, public health policies should consider the changes in tobacco use patterns and not rely on the old perceptions that tobacco use is still not prevalent among girls.

Diverse socioeconomic environments within the Arab countries may have contributed to the reported geographic differences in WTS estimates. These differences call for country-specific tobacco control policies to curb the spread of WTS among youth. Such policies should specifically address youth's WTS, as cigarette-smoking policies may not effectively address it. Today, the "one-size fits all" classical anti-tobacco use models, which rely on the perceptions that tobacco use is still not prevalent among youth, will not suffice. Given that Arab youth are

starting to smoke waterpipes at young ages, and that waterpipe smokers are at higher risk of becoming cigarette smokers,[11,13] it is imperative that prevention efforts, such as media campaigns and school-based efforts, specifically target youth and counteract pervasive "pro WTS" perceptions that it is relatively harmless and not addictive.

The WTS habit seems also to be well-established among youth from socially liberal states, such as Palestine, Lebanon, Jordan, and Syria, but not among youth from Tunisia, for example. Youth's WTS may depend on local perceptions and beliefs and may intersect with local cultures. The net effect of such intersection on youth's WTS needs to be further investigated using proper variables measured at individual level. Still, our findings indicate that the social pressure against tobacco use may be softening, allowing more youth to *free* themselves through WTS.

In that our results were gained from a secondary data analysis, our study has some limitations. Self-reported WTS was not validated using biomarkers. Additionally, national prevalence rate estimates are not for the same year. Therefore, comparing country-prevalence estimates across several years should be interpreted cautiously. Our findings, however, are constructed using standardized methodological approaches in term of sampling, questionnaire, and data collection procedures.

Conclusion

In conclusion, the roots of WTS seem to be expanding among Arab youth. Future research should continue to monitor this expansion and carefully evaluate the factors causing it. Interventions combating this epidemic should be adjusted by country, start from an early age, and include prevention as well as cessation arms.

Acknowledgments

The author would like to thank all stakeholders who made this data possible.

Conflict of interest

There are no conflicts of interest to report.

Author Contributions

Research concept and design: Kheirallah, Alsulaiman, Alzyoud, Veeranki. Acquisition of data: Kheirallah, Veeranki. Data analysis and interpretation: Kheirallah, Al-Sakran, Alzyoud, Ward. Manuscript draft: Kheirallah, Alsulaiman, Al-Sakran, Alzyoud, Veeranki, Ward. Statistical expertise: Kheirallah, Al-Sakran, Veeranki, Ward. Administrative: Kheirallah, Alsulaiman, Al-Sakran, Alzyoud. Supervision: Kheirallah, Alsulaiman, Alzyoud, Veeranki.

References

1. Maziak W. The global epidemic of waterpipe smoking. *Addict Behav*. 2011;36(1-2):1-5. http://dx.doi.org/10.1016/j.addbeh.2010.08.030. PMID:20888700.
2. Shihadeh A, Saleh R. Polycyclic aromatic hydrocarbons, carbon monoxide, "tar", and nicotine in the mainstream smoke aerosol of the narghile water pipe. *Food Chem Toxicol*. 2005;43(5):655-661. http://dx.doi.org/10.1016/j.fct.2004.12.013. PMID:15778004.
3. Maziak W, Eissenberg T, Ward KD. Patterns of waterpipe use and dependence: implications for intervention development. *Pharmacol Biochem Behav*. 2005;80(1):173-179. http://dx.doi.org/10.1016/j.pbb.2004.10.026. PMID:15652393.
4. Maziak W, Ward KD, Eissenberg T. Factors related to frequency of narghile (waterpipe) use: the first insights on tobacco dependence in narghile users. *Drug Alcohol Depend*. 2004;76(1):101-106. http://dx.doi.org/10.1016/j.drugalcdep.2004.04.007. PMID:15380294.
5. Mzayek F, Khader Y, Eissenberg T, Al Ali R, Ward KD, Maziak W. Patterns of waterpipe and cigarette smoking initiation in schoolchildren: irbid longitudinal smoking study. *Nicotine Tob Res*. 2012;14(4):448-454. http://dx.doi.org/10.1093/ntr/ntr234. PMID:22140149.
6. Dar-Odeh NS, Abu-Hammad OA. The changing trends in tobacco smoking for young Arab women; narghile, an old habit with a liberal attitude. *Harm Reduct J*. 2011;8(1):24. http://dx.doi.org/10.1186/1477-7517-8-24. PMID:21878112.
7. McKelvey KL, Wilcox ML, Madhivanan P, Mzayek F, Khader YS, Maziak W. Time trends of cigarette and waterpipe smoking among a cohort of school children in Irbid, Jordan, 2008-11. *Eur J Public Health*. 2013;23(5):862-867. http://dx.doi.org/10.1093/eurpub/ckt140. PMID:24078649.
8. Kheirallah KA, Alzyoud S, Ward KD. Waterpipe use and cognitive susceptibility to cigarette smoking among never-cigarette smoking Jordanian youth: analysis of the 2009 Global Youth Tobacco Survey. *Nicotine Tob Res*. 2015;17(3):280-284. http://dx.doi.org/10.1093/ntr/ntu140. PMID:25159679.
9. Akl EA, Gaddam S, Gunukula SK, Honeine R, Jaoude PA, Irani J. The effects of waterpipe tobacco smoking on health outcomes: a systematic review. *Int J Epidemiol*. 2010;39(3):834-857. http://dx.doi.org/10.1093/ije/dyq002. PMID:20207606.
10. Shah SB, Chestnutt IG, Lewis MA. 'Hubble-bubble leads to trouble'--waterpipe smoking and oral health. *Dent Update*. 2013;40(10):800-802, 804. PMID:24597023.
11. Maziak W. The waterpipe: a new way of hooking youth on tobacco. *Am J Addict*. 2014;23(2):103-107. http://dx.doi.org/10.1111/j.1521-0391.2013.12073.x. PMID:25187045.
12. Nakkash RT, Khalil J, Afifi RA. The rise in narghile (shisha, hookah) waterpipe tobacco smoking: a qualitative study of perceptions of smokers and non smokers. *BMC Public Health*. 2011;11(1):315. http://dx.doi.org/10.1186/1471-2458-11-315. PMID:21569577.
13. Maziak W, Nakkash R, Bahelah R, Husseini A, Fanous N, Eissenberg T. Tobacco in the Arab world: old and new epidemics amidst policy paralysis. *Health Policy Plan*. 2014;29(6):784-794. http://dx.doi.org/10.1093/heapol/czt055. PMID:23958628.
14. Maziak W, Eissenberg T, Rastam S, et al. Beliefs and attitudes related to narghile (waterpipe) smoking among university students in Syria. *Ann Epidemiol*. 2004;14(9):646-654. http://dx.doi.org/10.1016/j.annepidem.2003.11.003. PMID:15380795.
15. Roskin J, Aveyard P. Canadian and English students' beliefs about waterpipe smoking: a qualitative study. *BMC Public Health*.

2009;9(1):10. http://dx.doi.org/10.1186/1471-2458-9-10. PMID:19134220.
16. Akl EA, Jawad M, Lam WY, Co CN, Obeid R, Irani J. Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. *Harm Reduct J*. 2013;10(1):12. http://dx.doi.org/10.1186/1477-7517-10-12. PMID:23816366.
17. Shafey O. Health issues in the Arab American community. Global epidemiology and health hazards of tobacco use: arab world patterns. *Ethn Dis*. 2007;17(2)(suppl 3):S3-S13, S3-S15. PMID:17985441.
18. Alzyoud S, Weglicki LS, Kheirallah KA, Haddad L, Alhawamdeh KA. Waterpipe smoking among middle and high school Jordanian students: patterns and predictors. *Int J Environ Res Public Health*. 2013;10(12):7068-7082. http://dx.doi.org/10.3390/ijerph10127068. PMID:24351734.
19. Warren CW, Lee J, Lea V, et al. Evolution of the Global Tobacco Surveillance System (GTSS) 1998-2008. *Glob Health Promot Educ*. 2009;16(2)(suppl):4-37. http://dx.doi.org/10.1177/1757975909342181. PMID:19770233.
20. Koh HK, Alpert HR, Judge CM, et al. Understanding worldwide youth attitudes towards smoke-free policies: an analysis of the Global Youth Tobacco Survey. *Tob Control*. 2011;20(3):219-225. http://dx.doi.org/10.1136/tc.2010.038885. PMID:21270072.
21. Akl EA, Gunukula SK, Aleem S, et al. The prevalence of waterpipe tobacco smoking among the general and specific populations: a systematic review. *BMC Public Health*. 2011;11(1):244. http://dx.doi.org/10.1186/1471-2458-11-244. PMID:21504559.
22. Maziak W, Ward KD, Afifi Soweid RA, Eissenberg T. Tobacco smoking using a waterpipe: a re-emerging strain in a global epidemic. *Tob Control*. 2004;13(4):327-333. http://dx.doi.org/10.1136/tc.2004.008169. PMID:15564614.