

Summaries of Waterpipe Research and Evidence that Support Policy Development

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Introduction

The recent popularity of waterpipe smoking is truly a global phenomenon. Current peer-reviewed research (mostly reviews) on its epidemiology, health effects, waterpipe second-hand smoke (SHS) composition and risks of exposure, along with prevalence of use are summarized below. Data from various Canadian surveys are also included, providing evidence that Canadian youth and young adults are not immune. Recognition of this pandemic is somewhat new, and research specific to waterpipe smoking has only started to emerge within the past 2 decades. As such, the body of waterpipe knowledge is modest but growing. However, given the vast body of knowledge on cigarette tobacco smoking and its SHS, and recognizing that waterpipe and cigarette smoke contain many of the same toxins, policy makers should not wait for knowledge gaps to be filled before acting. Bylaws and legislation that explicitly address waterpipe in smoking bans along with legislation and regulation regarding the taxation, packaging and labeling of shisha (tobacco or “herbal”) are all needed to ensure public health protection.

Air Quality: Waterpipe Second-Hand Smoke

1. Shihadeh A et al. Toxicant content, physical properties and biological activity of waterpipe tobacco smoke and its tobacco-free alternatives. *Tobacco Control* 2015;**24**:i1-i9. doi:10.1136/tobaccocontrol-2014-051907. http://tobaccocontrol.bmj.com/content/24/Suppl_1/i22.full.pdf+html?sid=e1c63edb-c7aa-46d1-8ee8-61c9483ebd65

Waterpipe use has become extremely popular in the past two decades, partly because there is a widely-held perception that this form of smoking is less harmful than cigarettes. This misperception has been compounded by manufacturers’ false or misleading claims regarding “herbal” shisha. Key findings from this recent review of the literature on the toxicity, physical properties and disease risks of waterpipe smoke, both tobacco and “herbal” include:

- All waterpipe smoke, tobacco as well as “herbal,” contains toxicants including carbon monoxide, ‘tar’, polycyclic aromatic hydrocarbons and volatile aldehydes;
- With the exception of nicotine, all toxicants measured in “herbal” smoke equal or exceed those found in tobacco waterpipe smoke;
- Smoking “herbal” shisha likely presents the same disease risks as tobacco shisha; and
- Waterpipe smokers inhale and absorb the same toxicants that are known to cause cancer, heart and lung disease and dependence in cigarette smokers.

This review confirms the toxicity of waterpipe smoke, tobacco and “herbal,” emphasizing the need for inclusion of all waterpipe smoking in smoke-free bylaws.

2. Kumar SR et al. A review of air quality, biological indicators and health effects of second-hand waterpipe smoke exposure. *Tobacco Control* 2015;**24**:i54-i59. doi:10.1136/tobaccocontrol-2014-052038. <http://tobaccocontrol.bmj.com/content/early/2014/12/05/tobaccocontrol-2014-052038.full.pdf+html>

Recognition of the waterpipe epidemic is relatively recent, and although the number of studies focused on waterpipe continues to increase, there currently remains knowledge gaps. However, the comprehensive body of knowledge on cigarette second-hand smoke (SHS) and its adverse health effects enables researchers to infer waterpipe health effects. To date, health effects studies have been limited to acute effects; more research is needed to confirm chronic exposure outcomes.

- Studies looking at indoor air quality have found increased pollutant levels where waterpipes are smoked, including carbon monoxide (CO), particulate matter (PM2.5) and polycyclic aromatic hydrocarbons (PAHs);
- Some of those studies have determined that waterpipe SHS contains hazardous levels of pollutants as per the Environmental Protection Agency’s air quality index.

3. Zhang B et al. ‘Enter at your own risk’: a multimethod study of air quality and biological measures in Canadian waterpipe cafes. *Tobacco Control* 2015;**24**:175-181. doi:10.1136/tobaccocontrol-2013-051180. <http://tobaccocontrol.bmj.com/content/early/2013/10/25/tobaccocontrol-2013-051180.abstract>

This study sought to measure the air quality in 12 waterpipe cafés in Toronto, as well as the air quality outside on 5 patios that permitted waterpipe smoking. Given that the *Smoke-Free Ontario Act* does not permit tobacco smoking in enclosed workplaces or public places, all of the venues tested ostensibly served non-tobacco shisha. Researchers visited waterpipe cafés for at least 2 hours each, during which time air particles (PM2.5), air nicotine and ambient carbon monoxide (CO) were measured. In addition, the non-smoking researchers measured their own breath levels of CO before and after each venue.

The results demonstrate the need for the inclusion of waterpipe smoking in smoke-free bylaws and legislation. The air quality measured in all indoor venues was much poorer than outdoor background levels measured nearby. In fact, based on the U.S. Environmental Protection Agency’s air quality index, measurements of PM2.5 and ambient CO almost always exceeded what is considered hazardous. Although PM2.5 measurements taken on patios were better, air quality was still considered poor according to the Ontario Ministry of the Environment. Based on the researchers’ high CO breath measurements, it was calculated that non-smoker exposure to second-hand smoke in Toronto waterpipe cafés is equivalent to smoking 10 cigarettes per day, or a waterpipe for 15 minutes. Air nicotine was also detected at all venues, demonstrating that in order to truly protect public health, smoking bans must include non-tobacco products to reduce the incidence of

establishments deliberately skirting the law.

Prevalence

4. Minaker LM et al. Hookah use prevalence, predictors, and perceptions among Canadian youth: findings from the 2012/2013 Youth Smoking Survey. *Cancer Causes Control* 2015; doi:10.1007/s10552-015-0556-x. http://download-v2.springer.com/static/pdf/191/art%253A10.1007%252Fs10552-015-0556-x.pdf?token2=exp=1431104636~acl=%2Fstatic%2Fpdf%2F191%2Fart%25253A10.1007%25252Fs10552-015-0556-x.pdf*~hmac=6871dc7408c8e009ade361b87b0eee57e5ff9c68a747fd5a660fcb98bb12ffad

Drawing on data from the national, biennial Youth Smoking Survey (n=27,404), this paper examined the prevalence, socio-demographic factors and perceptions of hookah smoking among Canadian students in grades 9 – 12. Key findings include:

- 5.4% of all students reported current hookah use, which is a significant increase since 2010;
- 14.3% of all students reported ever trying a hookah, including 56% of current cigarette smokers;
- 48% of cigarette smokers believed hookah use is less harmful than cigarettes compared to 37% of never smokers;
- Students who believed that hookah smoking was less harmful than cigarettes had significantly higher odds of reported current hookah use;
- Over half (51%) of hookah users reported smoking flavoured tobacco; and
- Socio-economic factors associated with hookah ever use include being male, being in an older grade, identifying as being non-white and having more spending money.

The results of this latest wave of the Youth Smoking Survey confirm that the prevalence of hookah use among Canadian students in grades 9 – 12 is increasing, that misperceptions of harm persist, and that flavoured tobacco is a popular choice for youth. However, the study's design unfortunately does not provide information to help determine if hookah smoking serves as a gateway to cigarette smoking.

5. Canadian Tobacco Use Monitoring Survey (CTUMS): Summary of Annual Results for 2012. http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutc_2012/ann_summary-sommaire-eng.php

Canadian Tobacco, Alcohol & Drugs Survey (CTADS): Summary of results for 2013. http://healthycanadians.gc.ca/science-research-sciences-recherches/data-donnees/ctads-ectad/summary-sommaire-2013-eng.php?_ga=1.215627796.2053364095.1408501290

According to results from CTUMS and CTADS (Figure 1), the popularity of waterpipe has been growing since it was first included as a survey question in 2006. The data show that prevalence has been increasing for all Canadians aged 15+, but is most pronounced among young adults aged 20 – 24 years. The most recent data from CTADS confirm that misperceptions regarding health risk

persist among Canadians who reported waterpipe use within the past 30 days. Thirty-four percent perceived waterpipe smoking to be more harmful than cigarette smoking, 28% believed it to be neither more nor less harmful, and 38% believed it to be less harmful than cigarette smoking. Public health information to counter these misperceptions is needed, along with policy changes to include shisha under tobacco control packaging and labeling regulations as well as smoke-free bylaws.

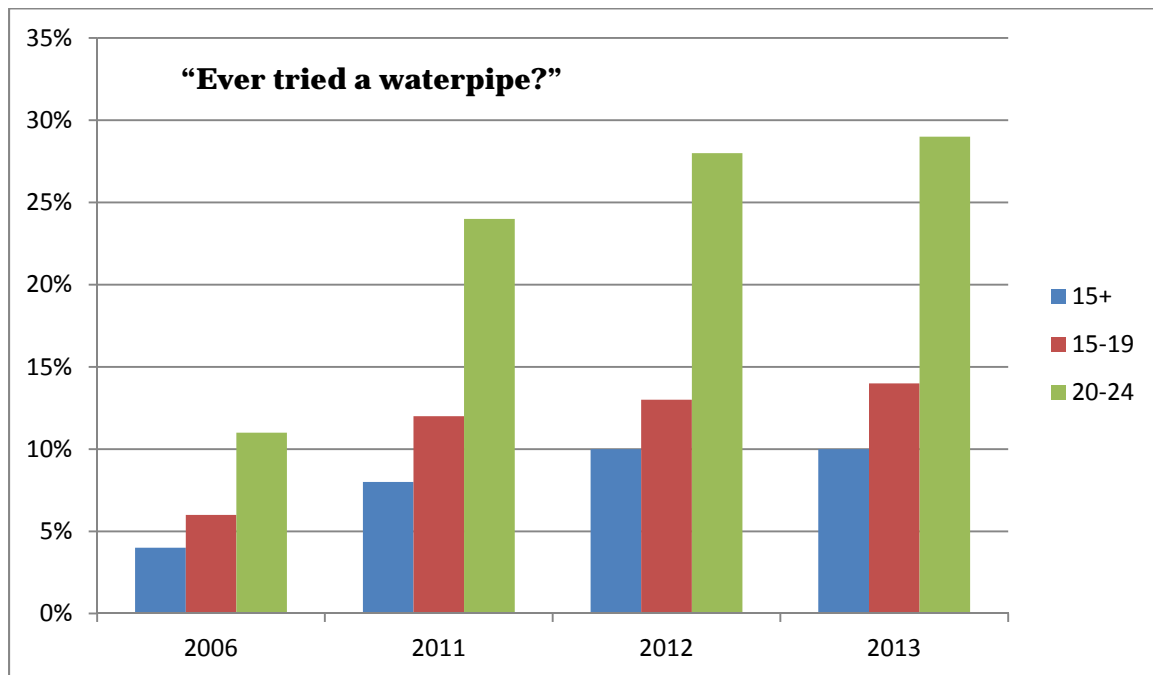


Figure 1: Positive response to the question “ever tried a waterpipe?” Data taken from the Canadian Tobacco Use Monitoring Survey (2006 – 2012) and the Canadian Tobacco, Alcohol & Drugs Survey (2013)

6. Ontario Student Drug Use & Health Survey (OSDUHS), 2013.

http://www.camh.ca/en/research/news_and_publications/ontario-student-drug-use-and-health-survey/Documents/2013%20OSDUHS%20Docs/2013OSDUHS_Detailed_DrugUseReport.pdf

The 2013 OSDUHS survey included over 10,000 Ontario students in grades 7 – 12, and for the first time students were asked about their past year use of a waterpipe.

- Approximately 10% of all students (88,400) reported trying a waterpipe;
- The likelihood of past year waterpipe use increases with age. Past year use among students in grades 7 & 8 was reported at 1.3%, an average of 12.5% of students in grades 9 – 12 reported past year use, and this climbed to 18.8% of grade 12 students;
- Male students are significantly more likely to try a waterpipe (11.5%) than females (7.9%); and
- Just 18.2% of all students in grades 7 -12 perceived a great risk of harm from regular waterpipe smoking.

7. Maziak W et al. The global epidemiology of waterpipe smoking. *Tobacco Control* 2014;**0**:1-10. doi:10.1136/tobaccocontrol-2014-051903.

http://tobaccocontrol.bmj.com/content/24/Suppl_1/i3.full.pdf+html?sid=abc3c442-278a-4c47-a94e-1a148f809d88

This global review, which focused on large studies, national data or high quality reports, provides an updated analysis from a similar review done by the same principal author a decade earlier. Citing four key epidemiological drivers, (1) the introduction of flavoured shisha (maassel), (2) the intersection between waterpipe’s social dimension and thriving café culture, (3) the evolution of the internet coupled with mass and social media, and (4) a lack of waterpipe-specific regulation and policy, the researchers state “...*the global evolution of this smoking habit has exceeded worst predictions.*”

In the Middle East, waterpipe smoking among youth has eclipsed cigarettes to become the most popular form of tobacco use. A 2013 study involving more than 100,000 students from 152 post-secondary schools in the United States found that 8.4% reported current waterpipe use, second only to cigarettes. Data from the 2010 Canadian Youth Smoking Survey (grades 9 – 12) also showed an upwards trend in reported waterpipe use. Factors associated with waterpipe use include age (youth and young adults), cigarette smoking, higher socioeconomic status and being male.

Policy makers will be wise to recognize levers of control for 2 of the 4 key drivers of this youth-focused epidemic, and to explicitly include waterpipe and flavoured tobacco in tobacco control laws and regulations.

Health Effects

8. El-Zaatari ZM, Chami HA & Zaatari GS. Health effects associated with waterpipe smoking. *Tobacco Control* 2015;**0**:1-13. doi: 10.1136/tobaccocontrol-2014-051908.

http://tobaccocontrol.bmj.com/content/24/Suppl_1/i31.full.pdf+html?sid=ce375cc0-7ae4-40b1-9cca-25399ced93d3

All literature focused on acute or chronic health effects associated with waterpipe tobacco smoking was included in this comprehensive narrative review (studies date back to 1995). Conclusions are as follows:

- Immediate observations linked with waterpipe smoking include increased heart rate, increased blood pressure, impaired lung function and carbon monoxide intoxication;
- Complications from long-term use include bronchitis, emphysema and coronary artery disease;
- Waterpipe tobacco smoking is associated with lung, stomach and oesophageal cancer;
- Other health effects associated with waterpipe smoking include periodontal disease, obstetrical complications, osteoporosis and mental health issues.

However, it should also be noted that because of methodological limitations in most studies, it is impossible to determine causality—only observed associations are possible. Some studies did not

control for concurrent cigarette smoking, making it difficult to isolate health effects from waterpipe smoking specifically. The authors state that large, well-designed, community-based longitudinal studies are needed to better assess the long-term health effects of waterpipe tobacco smoking. Nevertheless, this review concludes that there is enough evidence to support public health interventions to curb the growing waterpipe smoking epidemic.

9. Aboaziza E & Eissenberg T. Waterpipe tobacco smoking: what is the evidence that it supports nicotine/tobacco dependence? *Tobacco Control* 2015;**24**:i44-i53. doi: 10.1136/tobaccocontrol-2014-051910. http://tobaccocontrol.bmj.com/content/24/Suppl_1/i44.full.pdf+html?sid=b51f1d54-c862-4c91-9365-fd0c09c11745

Drawing on the evidence from 32 selected studies, this narrative review determined that waterpipe tobacco smoking is associated with nicotine delivery, withdrawal and dependence. Observations include:

- The nicotine content of tobacco shisha varies, with one study reporting an average of 3.4 mg/g. This is less than the average reported for 32 brands of tobacco cigarettes (13.8 mg/g); however, waterpipe smoking typically involves using 10-20 grams of shisha tobacco vs about 1 gram of tobacco in a typical cigarette;
- A single puff from a waterpipe is many times the volume of a cigarette puff, increasing nicotine delivery to waterpipe smokers;
- Objective smoke analysis has demonstrated that waterpipe tobacco smoke contains approximately 1 mg of nicotine vs 0.73 mg in a standard cigarette;
- Nicotine/tobacco dependence can be measured using various validated instruments;
- Inadequate or misleading labels (including nicotine content that does not reflect actual nicotine delivery) and poor or absent health warnings on tobacco shisha are contributing to widespread misperceptions about the risks and harms from waterpipe tobacco smoking; and
- There remains a paucity of effective cessation treatments for waterpipe smokers.

Given that it is associated with disability, disease and death, and that it supports dependence, more effort must be placed on tobacco shisha to ensure that it is not exempt from packaging and labeling laws, smoke-free laws, and that the general public is adequately educated regarding its significant health risks.