

## Waterpipe tobacco smoking

Using a waterpipe to smoke tobacco is not a safe alternative to cigarette smoking.<sup>1-3</sup> Studies suggest that smoking waterpipes may carry similar health risks to smoking cigarettes. Waterpipe smoking increases the risk for heart disease, lung disease, cancer, periodontal disease and problems in pregnancy.<sup>1-3</sup> Secondhand smoke from waterpipe tobacco use produces a similar or greater level of air pollutants than cigarette smoking.<sup>4,5</sup> It potentially poses a serious health risk to those exposed, including lung cancer, heart disease, stroke, and in children, ear and chest infections and Sudden Infant Death Syndrome.<sup>4-7</sup>

### The spread of waterpipe smoking

Waterpipe smoking is a traditional method of smoking tobacco in the Middle East, Africa, the Far East and the Indian subcontinent. Names for waterpipe vary and include “narjeela”, “narghile”, “arghile”, “shisha”, “goza”, “hubble bubble” and “hookah”.<sup>8</sup> Some people use waterpipes when alone, but they are more commonly used by social or family groups, at home or in restaurants, cafes and bars.<sup>8,9</sup>

Waterpipe smoking used to be uncommon, but since the 1990s it has become more popular and has spread into countries in Europe, North America and Australia, along with waterpipe cafes.<sup>1,8,9</sup> In English speaking countries, people in the Arabic community were more likely to use waterpipes, however it is increasingly being taken up by westerners, in particular high school and university students.<sup>9-12</sup> Young people are attracted to the social aspect of waterpipe smoking, as well as its appealing taste and smell.<sup>1,13,14</sup> The rise in popularity of waterpipe smoking has previously benefited from a lack of waterpipe specific policies and regulations (discussed further below).<sup>9</sup>

Part of the reason for the spread and acceptability of waterpipe smoking is that it is often perceived as being less addictive, less harmful and “cleaner” than cigarette smoking.<sup>8,13-15</sup> Although research on waterpipe smoking is limited, current evidence indicates that it is both addictive and harmful.<sup>1,2,16</sup>

## What are waterpipes and waterpipe smoking?

Traditional waterpipes used for tobacco smoking have a head, body, water bowl, and a hose with a mouthpiece. A tube extends down from the head, through the body and ends submerged in water that half-fills the water bowl. Tobacco is placed in the head. It is not directly lit, but is usually covered with perforated aluminium foil, and charcoal (the burning agent) is placed on top.<sup>1</sup> When the charcoal is lit, it heats the tobacco producing smoke at a lower temperature than cigarette smoke.<sup>17</sup> When the smoker inhales through the hose, the tobacco and charcoal smoke is pulled down the waterpipe body and bubbles through the water in the bowl. The cooled smoke surfaces and is drawn through the hose and inhaled.<sup>1, 18</sup>

The most common type of tobacco used in waterpipes is called “maassel”, which is a tobacco fermented in molasses and flavoured with fruit essences or other flavours such as mint.<sup>1, 9, 19</sup> The introduction of mass production of maassel in the 1990s is thought to have contributed to the growth in popularity of waterpipe smoking.<sup>9</sup> This sweetened and flavoured tobacco is preferred by the majority of waterpipe users, especially young people. Many young people are drawn to waterpipe smoking because of maassel’s aromatic and smooth smoke and variety of flavours.<sup>1, 9, 14, 19-21</sup>

Alternative smoking products such as ‘steam stones’<sup>22</sup> and flavoured herbal and sugar cane products are sometimes used in place of tobacco.<sup>23</sup> These products are heated by charcoal and pose a risk of carbon monoxide (CO) poisoning.<sup>2</sup> Smoking any substance that is heated by burning charcoal is a health issue.<sup>18</sup>

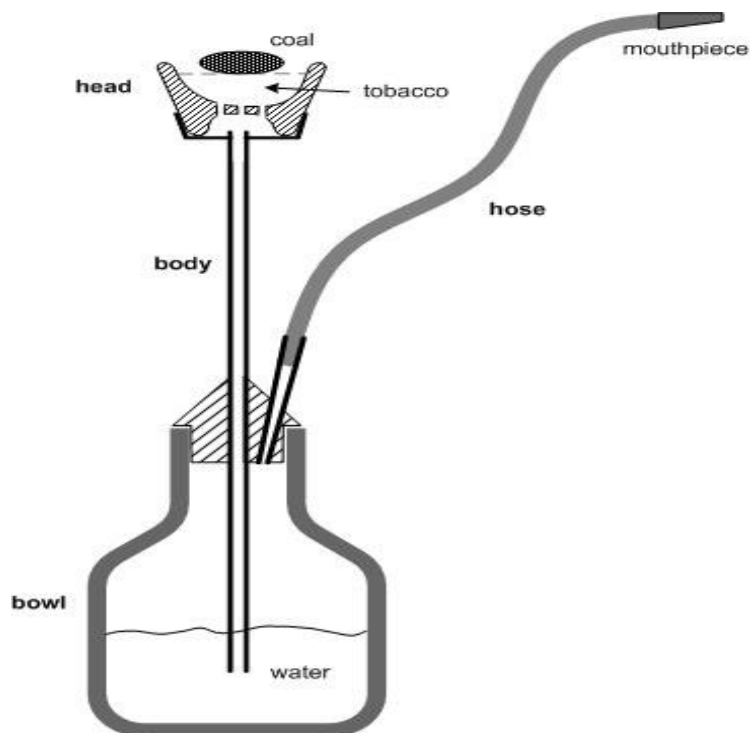


Diagram of a traditional waterpipe

## Waterpipe smoking sessions

Waterpipe smoking sessions may last from 15 minutes up to several hours, although 30 minutes to one hour is more typical.<sup>16, 18, 24-27</sup> Smokers breathe in deeply to generate the smoke from the waterpipe.<sup>28</sup> It is easy to take deep puffs as the smoke is cooled and less harsh.<sup>28, 29</sup> This means that each puff from a waterpipe can be about ten times the volume of a puff from a cigarette.<sup>13, 16</sup> A number of studies have demonstrated that a single session of waterpipe smoking exposes users to a much larger volume of smoke (and therefore higher levels of toxins) than a single cigarette. In an average session, waterpipe smokers inhale more than 100 times the volume of smoke compared to one cigarette (74 litres of smoke from a waterpipe versus 0.6 litres from a cigarette).<sup>26</sup>

## The harmful effects of waterpipe smoke

Common myths and misunderstandings about waterpipe smoking lead some people to believe it is less dangerous than cigarette smoking.<sup>8, 15</sup> Compared to cigarette smoking, waterpipe smokers are exposed to similar or even higher levels of dangerous substances in the waterpipe tobacco smoke.<sup>1, 18, 26</sup>

## Waterpipe myths and facts

Waterpipe users commonly believe that the toxins in the smoke are filtered out by the water in the pipe.<sup>1, 13-15, 28</sup> This is largely untrue. Much of the tar in the smoke, particularly fine particles, passes through the water in the bowl.<sup>17, 30</sup> The water absorbs some of the nicotine, but a waterpipe user can simply smoke more to get the amount of nicotine they want.<sup>17, 31</sup>

Some people find the moist, cooler smoke from waterpipes less irritating than cigarette smoke, and wrongly conclude that it therefore must be less toxic.<sup>21, 29</sup> The fruity or sweet smell and taste may also lead them to believe that it is healthier or safer than it is.<sup>14, 15</sup> However, less harsh smoke does not mean it is less dangerous.

## What's in waterpipe smoke?

Approximately 300 chemicals have been identified in waterpipe tobacco and waterpipe tobacco smoke to date, many of which are toxic.<sup>18</sup> They include carbon monoxide, nicotine, tar, cancer causing chemicals and heavy metals including lead, arsenic, and chromium.<sup>1, 18</sup>

The smoke from a waterpipe is not exactly the same as the smoke from a cigarette. They have different levels and ratios of nicotine, carbon monoxide and other toxic chemicals. This is partly due to burning charcoal to heat the waterpipe tobacco.<sup>1, 18</sup> For example, compared to smoking a single cigarette, a waterpipe user will inhale during an average waterpipe session:<sup>18, 26</sup>

- two to three times the amount of nicotine,
- about 11 times the amount of carbon monoxide,
- about 25 times the amount of tar, and
- tens of times more lead.

Waterpipe smokers inhale much more of some types of cancer-causing chemicals than from a cigarette in a session but also less than one cigarette's worth of other carcinogens.<sup>1, 18</sup> This different pattern of carcinogens may result in different risks for specific cancers. For example, waterpipe smokers are exposed to high levels of benzene, which increases the risk for leukaemia.<sup>32, 33</sup>

Tobacco-free waterpipe products are often marketed with claims that it's healthier or that it has no tar or harmful effects. However, tests show that smoking these products generates the same or even greater amounts of toxins as from tobacco waterpipe products (except for nicotine).<sup>18, 23</sup>

### **Burning charcoal smoke**

The burning charcoal in waterpipe smoking is a major source of high levels of carbon monoxide, ultrafine particles and cancer-causing chemicals in the smoke.<sup>30, 33-35</sup> The smoke from any waterpipe product smoked by using charcoal will contain these toxic chemicals, whether the smoke comes from tobacco or not.<sup>23</sup> The amount of carbon monoxide inhaled during a waterpipe session can vary greatly and depends mainly on the amount of charcoal used.<sup>18</sup>

### **Waterpipe Accessories**

Some accessories for sale are claimed to reduce the harmfulness of the smoke, such as mouthpieces containing activated charcoal or cotton, chemical additives for the water bowl, and plastic mesh fittings to create smaller bubbles. None of these devices has been demonstrated to reduce smokers' exposure to toxins or risk of tobacco-related disease and death.<sup>1</sup>

## Addiction to waterpipe smoking

Waterpipe tobacco smoking can be addictive, at least in some users.<sup>16</sup> The smoke contains the addictive drug nicotine. Several studies have shown that after a waterpipe session, the concentration of nicotine in the blood of waterpipe smokers can go as high or even higher than that of a smoker having a cigarette.<sup>16</sup>

Smoking habits vary enormously among waterpipe users; many smoke only occasionally while others may have more than one waterpipe session per day.<sup>16</sup> People who smoke waterpipes more frequently are more likely to report that they are addicted.<sup>16, 24, 36</sup> While occasional smoking is common among water pipe users, the longer they have been smoking, the more likely they are to smoke daily or regularly.<sup>36</sup>

On average, daily waterpipe users take in enough nicotine to maintain nicotine addiction; equivalent to the nicotine from 10 cigarettes per day.<sup>31</sup> Often, daily waterpipe users feel that they are addicted in much the same way as cigarette smokers.<sup>24</sup> They have reported having urges to smoke, withdrawal symptoms, difficulty quitting and increasing use of the waterpipe over time.<sup>16</sup> Urges to smoke may be linked to triggers such as time of day or the sight and smell of a waterpipe.<sup>24</sup> Daily and weekly waterpipe smokers are more likely to carry a waterpipe with them, or choose a restaurant or café based on the availability of a waterpipe.<sup>16</sup>

For occasional smokers, the nicotine inhaled from a single session of waterpipe use is equivalent to smoking two to three cigarettes in one day.<sup>26, 31</sup> Occasional use of the waterpipe can be enough to start to develop nicotine addiction.<sup>37</sup> A study of adolescent waterpipe smokers showed that tobacco cravings, withdrawal symptoms and failed attempts at quitting waterpipe smoking can occur while smoking waterpipes on non-daily basis. In half the waterpipe users who developed symptoms of nicotine dependence, their first symptom appeared by the time they were using waterpipes six days per month (or 7.5 smoking sessions per month). Even with low levels of use, seeing or smelling a waterpipe can trigger cravings to smoke in adolescents with symptoms of nicotine dependence.<sup>37</sup> These findings are consistent with research showing that adolescent cigarette smokers also develop symptoms of nicotine dependence before they start smoking daily.<sup>38</sup>

## Can waterpipe smoking lead to cigarette addiction?

Whether waterpipe smoking acts as a gateway to cigarette smoking is still being investigated.<sup>1, 13</sup> One three-year study of teenage waterpipe-only smokers found that they were almost twice as likely to start cigarette smoking as adolescents who had never smoked any form of tobacco. The more often they smoked a waterpipe, the more likely they were to start cigarette smoking. The authors suggest that young waterpipe users may be switching to cigarettes as a more convenient way to deal with symptoms of nicotine dependence.<sup>39</sup>

More research is needed regarding waterpipe smoking and the development of nicotine addiction.

## Health effects of waterpipe smoking

Although the research on the health effects of waterpipes is limited, it is clear that waterpipe smoke is harmful.<sup>1, 2, 18</sup>

### **Adverse health effects associated with waterpipe smoking<sup>2, 3</sup>**

#### **Short term effects**

**Increased heart rate**  
**Increased blood pressure**  
**Carbon monoxide poisoning**  
**Lower exercise capacity**

#### **Long term effects**

**Heart disease**  
**Lung cancer**  
**Oesophageal cancer**  
**Stomach Cancer**  
**Reduced lung function**  
**Chronic Obstructive Pulmonary Disease**  
**Emphysema**  
**Chronic Bronchitis**  
**Low birth weight in newborns**  
**Periodontal disease**  
**Decreased bone density and fractures**

## **Cancer**

Waterpipe tobacco smoking increases the risk for cancers of the lung, stomach and oesophagus (wind pipe).<sup>1,2</sup> It may also be associated with mouth cancer.<sup>1</sup> There are 27 known or suspected cancer causing chemicals in waterpipe tobacco smoke.<sup>18</sup> Compared to smoking one cigarette, waterpipe smokers may be exposed to far greater amounts of some types of carcinogens in a waterpipe session.<sup>1,18</sup> Several studies have shown an association between waterpipe tobacco smoking and damage to cells in the body that may lead to cancer.<sup>2,40</sup>

## **Health effects on the lungs**

Waterpipe tobacco smoking reduces lung function, which is a measure of how hard and how much air you can breathe out. Waterpipe smoking is associated with chronic obstructive pulmonary disease (COPD).<sup>2</sup> COPD is a serious long-term lung condition that limits airflow causing shortness of breath. It includes emphysema and obstruction of the small airways.<sup>41</sup> Waterpipe tobacco smoking is also associated with chronic bronchitis, which defined as coughing with phlegm (mucus) that occurs for three months in each of two successive years.<sup>2</sup> Outbreaks of tuberculosis in people sharing waterpipes have been reported, but more research is needed before confirming an increased risk for infection with the sharing of waterpipes.<sup>2,3</sup>

## **Health effects on the heart**

Initial studies suggest that waterpipe tobacco smoking is associated with heart disease.<sup>2</sup> As with cigarette smoking, the immediate effects of waterpipe tobacco smoking include increases in heart rate and blood pressure. It also affects the body's ability to regulate blood pressure and heart rate, and lowers exercise capacity.<sup>2</sup> Waterpipe tobacco smoke contains high levels of fine particles, which are known to increase the risk of cardiovascular disease.<sup>4,13,30</sup>

## **Health effects of carbon monoxide**

Carbon monoxide (CO) is toxic gas associated with diseases of the blood vessels, including heart disease and stroke and problems in pregnancy.<sup>41</sup> In the blood, CO reduces the amount of oxygen delivered to the brain, muscles, and other organs, and can cause dizziness, headache, nausea and fainting.<sup>2,42</sup>

Waterpipe tobacco smoking has been associated with carbon monoxide poisoning.<sup>2,43</sup> Compared to smoking a single cigarette, an average waterpipe session can expose the smokers to around 11 times more CO.<sup>26</sup> Users of tobacco-free waterpipes have been found to inhale at least as much CO as tobacco waterpipe smokers.<sup>44</sup> There are several international case reports of CO poisoning after waterpipe use.<sup>2</sup> There has been at least one documented case in Australia involving a 20 year old woman who was hospitalised after experiencing severe light-headedness and nausea following an hour long waterpipe session.<sup>45</sup> High levels of CO in the bloodstream can cause problems during surgery with a general anaesthetic.<sup>42</sup>

### **Health effects on pregnancy**

Babies born to pregnant women who use waterpipes have an increased risk of troubled breathing and of having a low birth weight, which makes them more vulnerable to illness and death.<sup>2, 46</sup> Many of the health effects known to be caused by cigarette smoking have not been studied in waterpipe users and more research is needed.

Of particular concern are the high levels of carbon monoxide (CO) that waterpipe users are exposed to. Average rises of CO measured in the blood of waterpipe users after a waterpipe smoking session can be at least three times as high as a cigarette smoker's after a cigarette.<sup>47, 48</sup> CO is believed to play a role in a number of serious health effects from cigarette smoking affecting unborn babies including miscarriage, low birthweight and Sudden Infant Death Syndrome (SIDS). Studies show a decrease in the baby's movement for at least an hour after smoking one cigarette, and this is also due to the lack of oxygen caused by CO.<sup>49</sup> Women who are pregnant should also avoid secondhand smoke from waterpipes as unborn babies are particularly vulnerable to CO.<sup>50</sup>

A waterpipe smoking session also exposes users to much higher levels of lead and other heavy metals compared to smoking a cigarette, however their effects on unborn babies are unstudied.<sup>18, 51</sup>

### **Diseases of the mouth and throat**

Tobacco smokers are much more likely to suffer from periodontal disease, which affects the gum and bone supporting the teeth.<sup>46, 52</sup> Similarly waterpipe smoking is also associated with problems such as loss of jawbone that holds teeth in place and deep spaces forming around the teeth.<sup>2, 3</sup> Waterpipe tobacco smoking may also harm the voice box.<sup>2</sup>

### **Bone health**

Waterpipe tobacco smoking increases the risk of lower bone density (osteoporosis) and for fractures.<sup>2</sup>

### **Secondhand smoke from waterpipes**

Secondhand smoke from waterpipes is a mixture of tobacco smoke and the smoke from the charcoal.<sup>1</sup> It contains, among other things, fine particles that can be inhaled deep into the lungs. These particles are made up of toxic and cancer-causing substances, and they increase the risk of heart disease.<sup>4, 5, 35</sup>



Research shows that a single person smoking a waterpipe for up to 30 minutes produces, on average, more fine particles than smoking a cigarette.<sup>4, 35</sup> When a waterpipe is shared among a group, it may produce even more pollution.<sup>4</sup> Levels of fine particles in the air build up gradually during a waterpipe session, reaching higher levels than that generated by smoking a cigarette within 30 minutes. As waterpipe sessions can last longer than an hour, high levels of fine particles can be produced.<sup>4</sup>

As with direct smoking, the secondhand smoke produced by waterpipe smoking has different levels and ratios of carbon monoxide and other toxic chemicals compared to secondhand smoke from cigarette smoking. For example, it is estimated that smoking a waterpipe for one hour can release as much carbon monoxide into the air as from 20 cigarettes. The same waterpipe session also emits certain toxic and cancer-causing chemicals in amounts found in the secondhand smoke from about four cigarettes.<sup>35</sup>

Several studies have measured levels of fine particles in hookah bars in the United States, Canada and Pakistan. On the scale used by the U.S. Environmental Protection Agency – the Air Quality Index (AQI) – the venues ranged from unhealthy levels of fine particles to hazardous levels (the highest category). Some studies found that the mean or average level of fine particles in the hookah bars were extremely high, i.e. far above the maximum value of the hazardous level. Levels of fine particle in waterpipe venues tended to be higher than in venues where only cigarettes were smoked.<sup>1, 5</sup>

Although the health effects of secondhand smoke from waterpipes have not yet been widely studied, they are likely to include many of those caused by secondhand smoke from cigarettes.<sup>5</sup>

**For children,** these include ear and chest infections, worsening of asthma, weaker lungs and sudden infant death syndrome (SIDS).<sup>5, 6</sup> Pregnant women exposed to secondhand smoke are more likely to have a baby with a low birthweight and have a preterm delivery (the baby is carried for less than 37 weeks).<sup>6</sup>

**For adults,** secondhand smoke from cigarettes is a cause of heart disease, stroke and lung cancer. It is also associated with other forms of cancer, lung disease, worsening of asthma, and respiratory symptoms such as cough, wheeze, and difficulty breathing.<sup>6, 7</sup>

It has been shown that waterpipe smoking can be responsible for the build-up of toxic levels of indoor secondhand smoke pollution similar to or greater than what occurs with cigarette smoking.<sup>4, 5</sup>

## Waterpipes and tobacco control laws in Victoria

Traditionally, waterpipes were not captured by Victoria's tobacco control laws. Prior to 1 August 2017, the *Tobacco Act 1987 (Vic)* ('the Tobacco Act') defined 'tobacco product' in the following terms:

*'Tobacco product means tobacco, cigarette or cigar or any other product the main ingredient of which is tobacco and which is designed for human consumption;'* [emphasis added]

Waterpipe tobacco generally consists of a mixture of tobacco, molasses and flavourings. Tobacco therefore may not be the 'main ingredient' in waterpipe tobacco, with molasses and fruit flavourings possibly accounting for up to 70 per cent of ingredients. This meant that prior to 1 August 2017, waterpipe tobacco was not captured by Victoria's smoke-free laws, and was therefore able to be smoked indoors at shisha cafes.

In view of the adverse health effects of waterpipe use, the Victorian Parliament has now amended the definition of 'tobacco product' so that waterpipe tobacco is captured by Victoria's tobacco control laws. From 1 August 2017, the Tobacco Act defines 'tobacco product' as follows:

*'Tobacco product means tobacco, cigarette or cigar or any other product containing tobacco and which is designed for human consumption;'*<sup>53</sup>

From 1 August 2017, Victoria's smoke-free laws therefore apply to waterpipe tobacco.<sup>54</sup> In addition, retailers and café operators are prohibited from selling waterpipe tobacco to persons under the age of 18.<sup>55</sup> Venues selling waterpipe tobacco are also required to comply with the various restrictions on point of sale advertising and displays contained in the Tobacco Act.<sup>56</sup>

## Conclusions

- Using a waterpipe to smoke tobacco is not a safe alternative to cigarette smoking.
- The water in the waterpipe does not filter out the harmful particles or carbon monoxide from the waterpipe smoke.
- Using a waterpipe to smoke tobacco has serious health effects for smokers and for others exposed to secondhand smoke.
- Waterpipe smokers may be exposed to similar or higher levels of dangerous substances compared with cigarette smokers.

- Daily waterpipe users feel that they are addicted in much the same way as cigarette smokers. Occasional waterpipe smokers are more likely to become daily or regular smokers, the longer they have been smoking.
- A one-hour waterpipe smoking session can produce secondhand smoke with as much carbon monoxide as that produced by 20 cigarettes.
- Venues that allow waterpipe smoking frequently have very high levels of indoor smoke pollution that can be worse than what occurs with cigarette smoking.
- From 1 August 2017, Victoria's tobacco control laws (including smoke-free laws) apply to waterpipe tobacco.

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