

# Prevalence and Determinants of Waterpipe Tobacco Use among Adolescents in Oman

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## انتشار تدخين الشيشة بين المراهقين في عُمان ومحدداتها الوبائية

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**المخلص: الهدف:** تقييم مدى انتشار ومحددات استعمال الشيشة أو النرجيلة بين الطلاب المراهقين في سلطنة عُمان . **الطريقة:** أجريت هذه الدراسة المقطعية في المدارس سنة 2003 في تسع مناطق من عمان كجزء من المسح الشامل لاستخدام التبغ عند الشباب . طلبنا من المشاركين ملء استبيان يحوي صفات ديمغرافية واستعمال الشيشة في الماضي والحاضر . والمواقف تجاه تدخين السجائر وعادات الأبوبين والأصدقاء في التدخين . استخدمت النسب لحساب معدلات الانتشار . كما استخدم تحليل التَّحَوُّف اللوجستي (الامدادى) للحصول على نسبة الأرجحية وفترة الثقة 95% . **النتائج:** شارك في الدراسة 1962 طالبا وطالبة . منهم 1005 طالبا (51.2%) . 88% بين سن 13 - 16 سنة . خمسمائة واثان وعشرون (26%) قالوا انهم دخنوا الشيشة في حياتهم . بينما أفاد 189 (9.6%) بأنهم يدخنون حاليا الشيشة . 155 طالبا (15.5%) و 24 طالبة (2.6%) يدخنون الشيشة حاليا . تبين أن الطلاب يكونون أكثر عرضة لاستعمال الشيشة إذا كان أحد الوالدين أو الأصدقاء يدخن السجائر . يكون المراهقون أقل عرضة لتدخين الشيشة إذا ما اعتقدوا أن الدخان ضار للصحة . الطلاب الذين يأخذون 500 بيزة أو أكثر باليوم يكونون أكثر احتمالا لتدخين الشيشة مقارنة بالذين يأخذون أقل من ذلك المبلغ (نسبة الأرجحية 3.3 . فترة الثقة 95% بين 2.3 - 4.6) . وجدنا في التحليل متعدد الاختلافات أن نسبة الأرجحية للذكور ليكون مدخنا للشيشة مقارنة بالإناث هو 4.46 (فترة الثقة 95% هو بين 2.38 - 8.35) . بينما نسبة الأرجحية عندما يكون معظم أو كل الأصدقاء من المدخنين للسجائر مقارنة بالذين لا يدخنون 5.65 (فترة الثقة 95% هو بين 2.87 - 11.13) . الطلاب الذين يعتقدون أن التدخين ضار للصحة هم أقل احتمالا لاستعمال الشيشة من الذين لا يتصورون أن التدخين ضار للصحة (نسبة الأرجحية 0.31 وفترة الثقة 95% بين 0.29 - 0.92) والذين يأخذون 500 بيزة أو أكثر (نسبة الأرجحية 2.2 وفترة الثقة 95% بين 1.5 - 3.2) . **الخلاصة:** يعتبر تدخين الشيشة بين المراهقين العمانيين مشكلة صحية صاعدة . ولهذا ينبغي أن توجه الجهود اللازمة لمنع المراهقين نحو العوامل المرافقة لهذا السلوك . وكذلك يجب أن تشمل كل أنواع التبغ .

**مفتاح الكلمات:** التبغ . الشيشة . مراهقون . عمان.

**ABSTRACT: Objective:** To assess the prevalence and determinants of waterpipe use among school-going adolescents in Oman. **Methods:** A cross-sectional, school-based study was conducted in 2003 involving 9 regions of Oman, as part of the Global Youth Tobacco Survey. Participants were requested to complete an anonymous questionnaire containing demographic characteristics, current and previous use of waterpipe tobacco, attitudes towards cigarette smoking, parents' and friends' cigarette smoking habits. Proportions were used to calculate prevalence rates and logistic regression analysis to obtain odds ratio (OR) and 95% confidence interval (CI). **Results:** 1,962 students participated of whom 1,005 (51.2%) were males. Eighty-eight percent were between 13 and 16 years of age. Five hundred and twenty-two (26.6%) reported ever smoking waterpipe tobacco while 189 (9.6%) were current users. Among males, 155 (15.5%) were current users while among females only 24 (2.6%) smoked currently. Study participants were more likely to use waterpipe if they had a parent or friend who smoked cigarettes. Adolescents were, however, less likely to use waterpipe tobacco if they believed that cigarette smoking was harmful to health. Students who were receiving 500 Baisas (US\$ 1.3) or more per day pocket money were more likely to use waterpipe tobacco compared to those receiving less (OR 3.3, 95% CI 2.3 to 4.6). In multivariate analysis, the OR for males being a smoker of waterpipe tobacco compared to females was 4.46 (95% CI, 2.38 to 8.35); while the OR for most or all friends smoking cigarettes compared to non-smoking was OR 5.65 (95% CI 2.87 to 11.13). Study participants who perceived smoking as harmful to health were less likely to use waterpipe tobacco compared to those who did not believe smoking was harmful (OR 0.31, 95% CI 0.29 to 0.92) and those receiving 500 Baisas or more (OR 2.2, 95% CI 1.5 to 3.2). **Conclusion:** Waterpipe smoking among Omani adolescents is an emerging public health concern. Efforts to prevent adolescent smoking should be designed with knowledge of associated factors of such behaviour and should include all forms of tobacco.

**Key words:** Tobacco; Waterpipe; Adolescents; Oman.

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### Advances in Knowledge

- Illustrates the emergence of a new tobacco related epidemic in youth of an Arabian Gulf developing country.
- Shows the determinants of waterpipe tobacco use among youth in Oman
- Determines a baseline for waterpipe use among youth in Oman for monitoring future tobacco use among same groups.

### Applications to Patient Care

- Data could be used to educate adolescents, youth, patients and parents

**G**LOBALLY, TOBACCO USE IS A MAJOR CAUSE of preventable morbidity and mortality.<sup>1</sup> In developing countries and emerging economies, adolescents are particularly likely to initiate and maintain cigarette smoking as the public health and legal infrastructure may not be effective in preventing its use. Cigarette manufacturing firms have specifically targeted adolescents and young adults.<sup>2,3</sup>

While there has been a longstanding recognition in health literature of adolescent cigarette smoking, public health concerns about the prevalence and determinants of other forms of smoked tobacco use, such as the use of waterpipe, (also known as *shishah*, *narghile*, *hookah* or *hubble-bubble*), is a relatively recent phenomenon.<sup>4-6</sup> This interest has been galvanized by the World Health Organization's Study Group on Tobacco Product Regulation (TobReg) 2005 Advisory Note, *Waterpipe Tobacco Smoking: Health Effects, Research Needs and Recommended Actions by Regulators*.<sup>7</sup> Daily waterpipe use can produce nicotine absorption of a magnitude similar to that produced by daily cigarette use thus resulting in adverse effects to health similar to those resulting from nicotine obtain from cigarette smoking;<sup>8</sup> however, many people perceive waterpipe smoking as less harmful than cigarette smoking.<sup>4,9</sup> Nonetheless, waterpipe use may result in similar pulmonary disease, coronary heart disease, and pregnancy related complications to those associated with cigarette smoking.<sup>6</sup>

Earlier studies have reported the prevalence of tobacco use among Omani adults and noted that the majority of current smokers smoked manufactured cigarettes (82.9%), while 6.4% smoked *shisha* (contemporary type of waterpipe), 7.9% smoked *gadou* (old fashioned waterpipes), 7.7% smoked a pipe, and 4.5% used other tobacco products such as chewing tobacco.<sup>10</sup> There is, however, a paucity of data on the use of waterpipes among adolescents in Oman. We therefore set out to assess the prevalence of waterpipe tobacco use among school-going adolescents and the factors asso-

ciated with its use.

### METHODS

We conducted a secondary analysis of the Omani Global Youth Tobacco Survey (GYTS). This cross-sectional study was conducted in 2003 among school-going adolescents in 9 out of the 11 administrative regions of Oman. The regions surveyed were Muscat, Dakhliyah, North Batinah, South Batinah, North Sharqiyah, South Sharqiyah, North Dhahirah, South Dhahirah and Dhofar. The survey targeted students in classes 8-10 (usually aged 13-15 years) and was part of the GYTS. A comprehensive description of an equivalent study methodology has been reported elsewhere.<sup>11</sup> In brief, a multistage sample design was used in which schools were selected proportional to their enrollment sizes. In any selected school, classrooms were chosen randomly and all students within the selected classes were eligible for participation regardless of their actual ages, i.e. even though the study aimed to recruit students 13 to 15 years, younger or older students were still allowed to participate as long as they belonged to the selected classes (8 -10). At the initial stage of sampling, a list of governmental schools eligible to participate in the survey was collected in coordination with the Ministry of Education (MoE). Private schools were excluded mainly because of the smaller number of students in these schools and various logistical arrangements. The student enrolment numbers were obtained for each of the schools.

From the list of schools, a sample was drawn with a probability proportional to enrolment size (i.e. large schools with more students were more likely to be selected than smaller ones). A total of 50 schools were selected with no replacement for schools that did not agree to participate. As there were low student numbers in some regions (Al-Wusta and Musandam), only nine out of eleven educational regions were included in the sample.

## STUDY QUESTIONNAIRE

The Omani version of the GYTS questionnaire had 72 questions. The questionnaire consisted of core components (similar to other GYTS questionnaires) and an optional component. The core component allowed for comparison with other countries which conducted the GYTS. The optional component included issues specific to the situation in Oman and the research needs of the Omani Ministry of Education. The questionnaire was translated into Arabic and reviewed by the Technical Office at the Ministry of Education. Subsequently, it was piloted tested in two schools which did not participate in the survey. The self-administered questionnaire was completed anonymously by the students and took between 30 and 40 minutes to complete. For the purposes of this paper, the following information was obtained: demographic characteristics, current and previous use of waterpipe tobacco, attitudes towards cigarette smoking; whether the study participant had a parent or friend who was a cigarette smoker. Current waterpipe use was defined as having ever used waterpipe in the preceding 30 days including the questionnaire completion date. Having ever used water was defined as having ever actively inhaled smoke from water-pipes even once.

We also aimed to determine whether the amount of pocket money the study participant received on a daily basis was associated with waterpipe use. For this variable, the amount of money was categorized as a binary variable (0, 1), the cut-off being pocket money  $\geq$  500 Baisa (US \$1.3) versus  $<$ 500 Baisa daily. There are 1,000 Baisa in one Omani Riyal which is equivalent to US \$2.6.

Permission to conduct the study was obtained from the relevant authorities within the Ministries of Health and Education. Participation by eligible students was voluntary. Data collection was supervised in schools by trained assistants, who in turn were supervised by school-health doctors without the presence of teachers. However, the research assistants' role was only limited to ensuring that questionnaires were distributed and then collected and to answering related questions. Parents of the students provided written permission while the study participants themselves assented to participate in the study.

The SUDAAN 9.0 software package (Research Triangle Institute, Research Triangle Park, USA) was used for data analysis. Proportions and 95% confidence intervals (CI) were obtained to estimate prevalence

rates. Bivariate logistic regression analysis was used to determine odds ratios (OR) between current waterpipe use and other relevant variables selected according to the literature.<sup>12-16</sup> A weighting structure to account for the study design and non-response was employed using the following formula:  $W = W1 * W2 * f1 * f2 * f3 * f4$  where  $W1$  = the inverse of the probability of selecting the school;  $W2$  = the inverse of the probability of selecting the classroom within the school;  $f1$  = a school-level non-response adjustment factor calculated by school size category (small, medium, large);  $f2$  = a class-level non-response adjustment factor calculated for each school;  $f3$  = a student-level non-response adjustment factor calculated by class;  $f4$  = a post stratification adjustment factor calculated by grade.

## RESULTS

A total of 2,024 students were eligible to participate; however, only 1,962 (96.9%) students participated in the study, of whom 1,005 (51.2%) were males, and 44 (2.2%) had missing data. The overall response rate was 96.6%. The mean age of participants was 15 years (SD  $\pm$ 1.50). Of the 1,614 study participants who reported their ages, 15.8% were 13 years old or younger, 25.2% were 14 years, 26.6% were 15 years, 20.1% were 16 years, and 12.3% were 17 years or older.

Over a quarter (522) of students (26.6%; 95% CI 24.6% to 28.6%) reported to have ever used waterpipe tobacco while 1 in 10 (9.6%; 95% CI 8.3% to 11.0%) were current users. There were 155 (15.4%; 95% CI 13.8% to 17.0%) male users of waterpipe tobacco and 24 (2.6%; 95% CI 1.8% to 3.4%) female users,  $p < 0.001$ . Ten smokers of waterpipe did not report their gender. Over half of current waterpipe users (50.3%; 95% CI 42.4% to 58.2%) were also current cigarette smokers. Of the current waterpipe users, 11.6% reported using it on 20 or more days in a month, 5.8% used it on 10 to 19 days and 82.6% had used a waterpipe on less than 10 days in the previous month.

The association between selected variables and waterpipe use was assessed using bi-variate and multivariate logistic regression analysis. We present the results of both bivariate and multivariate analysis in Table 1. Male gender was positively associated with smoking waterpipes in the multivariate analysis (OR 4.46; 95% CI, 2.38-8.35). Smoking in some and most/all friends was also positively associated with waterpipe tobacco use OR 3.76 (95% CI 2.28 to 6.22) and 5.65 (95% CI 2.87 to 11.13) respectively. Study participants who believed

Characteristics	Waterpipe user (%)	Bivariate odds ratios (95% CI)	Multivariate odds ratios (95% CI)
<b>Gender</b>			
Female	2.6	1.00	1.00
Male	16.5	7.37 (4.65 to 11.67)	4.46 (2.38 to 8.35)
<b>Parental smoking status</b>			
None	8.2	1.00	1.00
One or both parents smokers	14.2	1.84 (1.30 to 2.62)	1.25 (0.75 to 2.09)
<b>Best friend smokers</b>			
None	4.4	1.00	1.00
Some	22.8	6.40 (4.42 to 9.27)	3.76 (2.28 to 6.22)
Most or all	30.3	9.40 (5.97 to 14.80)	5.65 (2.87 to 11.13)
<b>Perception that smoking is harmful</b>			
No	19.3	1.00	1.00
Yes	6.8	0.31 (0.19 to 0.48)	0.51 (0.29 to 0.92)
<b>Receiving pocket money</b>			
< US 1.3 per day	1410	1.00	1.00
> = US 1.3 per day	552	3.3 (95% CI 2.3 to 4.6).	2.2 (95% CI 1.5 to 3.2)

**Table 1: Factors associated with current smoking of waterpipe among adolescents in Oman**

that smoking was harmful were less likely to have been users of waterpipe OR 0.31 (95% CI, 0.29 to 0.92).

The amount of pocket money received by the adolescent each day was strongly associated with waterpipe tobacco use. In a bivariate logistic regression analysis, the OR for using waterpipe for adolescents receiving 500 Baisa or more (US \$1.3) per day compared to those receiving less than 500 Baisa was 3.3 (95% CI 2.3 to 4.6). In a multivariable logistic regression in which adjustment for sex, friends smoking status, fathers smoking and mothers smoking status were made, the OR was 2.2 (95% CI 1.5 to 3.2).

## DISCUSSION

This study presents the prevalence of waterpipe use among school-going adolescents in Oman. Our study is among just a few others from the Eastern Mediterranean Region which investigated the use of this emerging form of tobacco among adolescents in the region. It shows that at least 1 in 4 Omani students have ever tried this form of tobacco use while 1 in 10 is a regular user of this form of tobacco smoking.

Like cigarettes smoking, waterpipe use appears to be a gender-specific habit with males being 7 times more likely to be waterpipe users than girls. Zoughaib

et al, in a study of waterpipe use in Lebanon also reported a male predominance in its use.<sup>17</sup> Maziak et al, suggested that this gender-gap is declining with a ratio of 1.9:1.0 for male to female waterpipe use compared to the ratio of 4.3:1.0 for cigarettes smoking.<sup>6</sup> Pooled data from 76 countries involved in the GYTS showed no gender difference in the use of tobacco products other than cigarettes.<sup>11</sup> Other studies have reported male predominance and suggested that predominance of one gender over another in waterpipe use is location and context-specific and can not be generalized.<sup>4</sup>

We found 26.6% of adolescents in Oman were ever users of waterpipe. Rice et al<sup>18</sup>, reported a similar prevalence (27%) of waterpipe among Arab American adolescents. The high percentage of experimenters with waterpipe may be attributed to this form of smoking being viewed as a trendy part of youth lifestyle.<sup>19</sup> The prevalence of current waterpipe use in our study was much lower than that reported from neighbouring Gulf nations of Bahrain (18.2%) and Kuwait (24.1%) GYTS.<sup>20</sup> However, the latter figures were reported as “use of other forms of tobacco” than cigarettes and thus may have included oral or snuff tobacco use. Nonetheless, waterpipe was reported as the “predominant” form in this category. Lower prevalence of tobacco use has

been a consistent finding in Oman when compared with other Arabian Gulf states. This may be attributed to the fact that Oman's recent development started later (in 1970 following a régime change) than other Gulf states, and thus opened up to world markets, including tobacco trade, relatively later than other Gulf states such as Kuwait, Bahrain and Saudi Arabia. In addition, tobacco use has been traditionally viewed as a taboo in Oman's non-costal areas, together with the strict ruling by the religious authorities that have long declared tobacco as *haram* (religiously forbidden).

Main stream tobacco smoke from waterpipes contains large amounts of heavy metals such as arsenic, cobalt, chromium, and lead.<sup>22</sup> This form of tobacco use is also known to increase the risk of many chronic diseases including oral and lip cancer and obstructive lung disease.<sup>23</sup> Hadidi and Mohammed<sup>5</sup> have assessed the content of smoke from waterpipe tobacco and concluded that, in relation to nicotine exposure and dependence, smokers of them are not at a lesser health risks than cigarette smokers. Chaouachi, however, has argued that many factors, such as aspiration speed, pressure, water solubility of certain substances, volume of the bowl, the amount and temperature of the water, added substances and the length of the aspiration hose, need to be taken into consideration in comparing the harmful substances inhaled from waterpipe as compared to cigarettes.<sup>4</sup> As yet, global health institutions have failed properly to address the health risks associated with this form of tobacco use, and thus there is an urgent need to establish solid knowledge of the health risks associated with tobacco use in the form of waterpipes.<sup>6</sup>

We found that at least 50% of current waterpipe smokers were also current cigarette smokers. Arab American teenagers who smoked waterpipes were found to be twice as likely to have smoked cigarettes in the previous 30 days and 8 times more likely to be ever cigarette smokers compared to teenagers not smoking waterpipes.<sup>18</sup> Faeh et al, have reported on the clustering of unhealthy behaviours such as illicit drug use, cigarette smoking and alcohol use among young people.<sup>24</sup> Adolescents using waterpipes may also have other unhealthy habits, such as cigarette smoking, that compounds the deleterious health effect from a single substance. Further, the dual use of waterpipe and cigarettes illustrates the need to control for the confounding effect of cigarette smoking when attempting to study specific effects of waterpipe use.

We also found that having a parent who was a cigarette smoker was associated with being a waterpipe user. Kelishadi et al, have reported similar findings with current smoking being associated with having a closer relative who was also a smoker.<sup>25</sup> In our study, though, participants were not asked about waterpipe use among their relatives, but rather cigarette smoking, yet it is likely that having a relative who was a cigarette smoker may influence waterpipe use adolescents of the family.

Adolescents who received pocket money of more than 500 Baisa (US \$1.3) per day had higher odds of being current waterpipe users than if their pocket money was lower. This may suggest that having more money may have encouraged the adolescents to initiate and maintain their smoking habit. Studies have shown that price increase is a very effective measure to reduce tobacco consumption. A 10% increase in the real (inflation adjusted) price of cigarettes reduces their consumption by 4-8% in low and middle income countries.<sup>26, 27</sup> Currently, the price of one waterpipe is only one Omani Rial (US \$2.6) and taxes on tobacco have remained static since the year 2000 in Oman and other Gulf states. The same trend applies to local municipal taxes on cafes serving this product. Thus applying price measures such as tax increases, could significantly contribute to halting the waterpipe epidemic and its increasing trend in the Arab world in general.

#### LIMITATIONS

Our study has several limitations. First, data collected was based on self-administered questionnaires; this may have contributed to a reporting bias especially in terms of understanding specific questions. To minimize this bias, explanatory notes were given at the beginning of the questionnaires. They were also completed anonymously with reasonable confidentiality. Secondly, smoking history or lack of it, was not corroborated with biochemical markers such blood nicotine or cotinine levels or their metabolites.<sup>28, 29</sup>

Thirdly, the study involved only in-school adolescents in Oman thus the results can not be generalized to all adolescents in the entire country as adolescents out of school may differ from those still in school. However, we believe that out of school adolescents are more likely to be waterpipe users than those still in school. If that is the case, then our estimates are likely to be lower than the actual situation. Furthermore, the GYTS

only surveys students who are present in school on the day the questionnaire is administered. We did not follow-up students who may have not been in class on that day. In the Omani GYTS, 2,024 persons were eligible as in-school adolescents in the selected school with a high participation rate (96.6%).

Finally, despite the fact that the research assistants' responsibility was limited to supervising the students without influencing any responses, it is possible that some students may have completed the questionnaires in a different way given the presence of such a person. We however, believe this was unlikely to have influenced the findings to any appreciable degree.

### CONCLUSION

Waterpipe smoking among Omani adolescents is an emerging public health concern. Public health interventions against tobacco should be directed not only towards cigarette smoking, but also other forms of tobacco use including the use of waterpipes, especially in the light of Oman being party to the World Health Organization's Framework Convention on Tobacco Control. One of the effective instruments to curb smoking in general is the introduction of comprehensive tobacco control legislation, which Oman most urgently needs.

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