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Determinants of waterpipe smoking among high school students in Jakarta, Indonesia

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Abstract

Objectives: The study aimed to examine factors associated with past 30 days waterpipe use among high school students in Jakarta, Indonesia.

Methods: We surveyed a multistage cluster random sample of 1,318 students of grade 10th and 11th from 14 schools in Jakarta. Multiple logistic regressions were employed to examine the association between past 30 days waterpipe use with sociodemographic characteristics, cigarettes smoking status, parental and peer use, availability and affordability.

Results: Of 1,318 participants, 3.3% of female and 8.4% of male currently smoked waterpipe. Multivariate analysis revealed that current waterpipe use was significantly associated with family use (AOR: 4.844, 95% CI: 1.225–19.151), friend use (AOR: 2.554, 95% CI: 1.424–4.582), and availability (AOR: 2.143, 95% CI: 1.127–4.076). Being current smokers were six times more likely (AOR: 6.055, 95% CI: 3.123–11.739) to use waterpipe in the past 30 days.

Conclusions: The finding suggests that smoking by a family member, friends, use of conventional cigarettes, and availability are significantly associated with increased probability of current waterpipe used among adolescents.

Keywords: high school students; Indonesia; smoking; tobacco; waterpipe.

Introduction

Waterpipe smoking has been practiced in the Middle East since the Ottoman Empire in the fifteenth century [1]. Afterward, it rapidly spread to other parts of the world and

becoming one of major public health issue [2]. A recent systematic review of epidemiological data from 68 countries reported that the prevalence of waterpipe use steadily rose in all regions over the years [3]. Waterpipe has even replaced combustible cigarettes as the most popular method of tobacco used in some countries [2]. High school-age adolescents have the highest prevalence of shisha smoking among all age groups in Indonesia [4]. A total of 5.1% (95% CI: 4.6–5.7%) of the youth age of 15–19 were reported smoking waterpipe based on Basic Health Research 2018 [4].

Waterpipe use was traditionally known as a cultural phenomenon [5]. The practice has turned out to be a social phenomenon, particularly among adolescents today [6]. Waterpipe offers a unique sensation when young smokers and their friends have a social gathering [7]. Sharing the same mouthpiece of waterpipe in the restaurant, café or bar is a common practice for this group [2]. Moreover, the waterpipe smoking venues may get benefit from the lack or absent of regulation [8]. Weak regulation and growing café culture make waterpipe commercial venue viewed as a good prospect business [9]. Therefore, the waterpipe retail venues are flourishing in popular hangout spots and even nearby schools/universities [2].

Waterpipe tobacco and smokes contain 300 chemicals, including tar, nicotine, carbon monoxide, nitric oxide, carbonylic compounds, polycyclic aromatic hydrocarbon, tobacco-specific nitrosamines, heavy metals, primary aromatic amines, furanic compounds, volatile organic compounds, phenolic compounds, and other organic constituents, metals, and humectants [10]. These toxicants thought to be linked with adverse health effects on both short- and long-term basis [11]. A meta-analysis involving 50 studies reported that waterpipe smoking is significantly associated with respiratory diseases, oral cancer, lung cancer, metabolic syndrome, and cardiovascular diseases [12]. Besides, sharing waterpipe practices may increase the risk of infected communicable diseases, particularly tuberculosis, hepatitis, or meningitis [11].

People generally believe that waterpipe has lower health hazard and less addictive compared to combustible cigarettes [13, 14]. Accordingly, waterpipe receives the highest normative acceptability in society than any form of tobacco products [2]. The family tended to approve

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waterpipe use behavior even in the community where smoking is considering taboo for female [13]. In some cases, Waterpipe smoking initiation and regular use are facilitated by parents [13]. Besides, peer encouragement is an influential factor of waterpipe use among adolescent [15]. Having close friends who regularly smoke waterpipe increase the probability of waterpipe use among adolescents [16]. Conversely, having peers who disagree with waterpipe use is associated with lower odds of smoking [13].

Although the waterpipe smoking behavior research has been growing worldwide, there is little known about this problem in Indonesia. On the other side, the majority of the current tobacco users initiate at the age of below 19 years old [4]. Previous studies on the waterpipe use in Indonesia are limited to the medical school students and older age group [17, 18]. Those population may not represent the critical determinants of waterpipe use in adolescents such as peer & family influence and accessibility to waterpipe venue. The study aimed to analyze factors associated with current waterpipe use among high school students in Jakarta, Indonesia.

Methods

The study is a part of a larger project that investigates electronic cigarettes and shisha use among high school students in Jakarta [19]. The survey was conducted among high school students grade 10th–11th in Jakarta between April and May 2015. This study required at least 786 students as participants. These numbers were based on sample size calculation to estimate proportion with 95% α and 0.05 acceptable errors. The sampling method was multistage cluster random sampling. First, we prepare a list of all high schools in Jakarta. Vocational, religious, and private high schools were excluded. Second, we randomly selected 14 schools from a total of 139 eligible schools. Subsequently, about three classes were randomly chosen from each school. Finally, all students from selected classes were recruited. The study was reviewed and approved by institutional review board Atma Jaya Catholic University of Indonesia (No: 404/III/LPPM-PM. 10. 05/04/2015). The questionnaire was adopted from the Global Youth Tobacco Survey (GYTS) and other previous studies related to tobacco use [20–22]. Three experts from Thailand reviewed the content validity of the questionnaire. Afterward, we tested the questionnaire to 36 high students in Tangerang City (neighboring city of Jakarta), and the Cronbach alpha score was 0.828.

Data were collected through self-administered anonymous questionnaires. Waterpipe user was classified into three categories, such as current, experimental, and non-users. Current users referred to having used waterpipe during the past 30 days. Experimental users were defined as having smoke waterpipe but never used it anymore in the past 30 days. This classification was also applied to conventional cigarettes smoking status.

Sociodemographic variables included age, sex, living arrangement, and parent highest education level. Living arrangement was

where participants stayed during school days either with family or alone. For the parent's education level, respondents were asked information about father or mother highest educational attainment and classified into completed primary school or less, completed secondary school, and having higher education (some college, bachelor's degree, or postgraduate degree). Family use referred to current waterpipe smoking behavior of participant's family member, including parents or siblings. Participants were also asked whether they had close friends who currently used waterpipe.

Availability was explored with questions, "Do you think you can get electronic cigarette easily anywhere you are and whenever you want them?" (Yes or No). Affordability was assessed by two following questions: (1) "Do you think the price of electronic cigarette smoking is affordable?" (2) "Do you think you always have enough money to buy electronic cigarette smoking?" The responses were in dichotomous (Yes or No). The waterpipe was considered affordable if the participants answered "yes" in both questions.

All data were managed and analyzed by SPSS Statistics Version 22. We described waterpipe and conventional cigarettes smoking status stratified by sex. Using the chi-square test, we examined the association of between sociodemographic characteristics, cigarettes smoking, waterpipe use among family members and friends, availability, and affordability with current waterpipe use. Fisher exact test was performed in the variables with more than 25% of less expected value (<5 cases in each cell). The variables significant at $p < 0.25$ in the bivariate test included in multivariate analysis. Multiple logistic regression was performed to find the predictors of current waterpipe use. The results were presented in adjusted odds ratio (AOR) and 95% of confidence interval (CI). We also performed the interaction test between independent variables (cigarettes use and sex) because those variables were strongly associated according to the previous study [23]. Ultimately, we conducted Hosmer–Lemeshow Test to determine the model fits.

Results

The total participants were 1,318 public high school students consist of 62.8% ($n=828$) female and 37.2% ($n=490$) male. Figure 1 shows the prevalence of cigarettes and waterpipe smoking stratified by sex. About 8.4% of male and 3.3% of female were currently smoking waterpipe. The proportion of current conventional cigarettes smoking difference was triple between male and female (29.2 vs. 8.5%).

The results of the bivariate analysis are presented in Table 1. There were 2.2% of participants who had never smoked conventional cigarettes reported used waterpipe in the past 30 days. The proportion of waterpipe use among participants who have peer smoked waterpipe was higher (12.1%) than who did not (4%). Current waterpipe use was also significantly associated with sex ($p < 0.001$), cigarettes smoking status ($p < 0.001$), family use ($p < 0.01$), availability ($p < 0.001$), and affordability ($p < 0.001$).

Table 2 indicates the result of multiple logistic regressions. The Hosmer–Lemeshow Test revealed that the

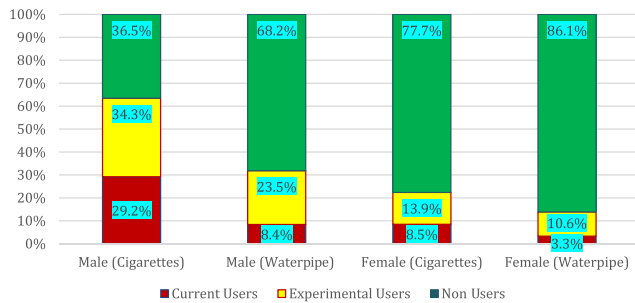


Figure 1: Conventional cigarettes and waterpipes use stratified by sex.

model was adequately fits the data (chi-square: 6.887, p : 0.442). We also found no significant interaction between sex and cigarettes use (p : 0.093). Sex (AOR: 1.620, 95% CI: 0.915–2.871) was marginally associated with current waterpipe use. Being current cigarette smokers were six times (AOR: 6.055, 95% CI: 3.123–11.739) more likely to used waterpipe in the past 30 days than nonsmokers. Moreover, family use (AOR: 4.844, 95% CI: 1.225–19.151), and close friends use (AOR: 2.554, 95% CI: 1.424–4.582) were the predictors of current waterpipe use. Ultimately, affordability was no longer associated with current waterpipe use after adjusted by sex, cigarette smoking status, family use, friend use, and availability.

Discussion

The study showed that about 8.4% of male and 3.3% female used waterpipe in the past 30 days. The result is nearly similar to previous studies on waterpipe use among high school students in the United States and Iran [24, 25]. However, the prevalence was considerably higher than the prior study among the older group in Indonesia [18]. This finding is unsurprising because the waterpipe is mainly marketed through the Internet [26]. In Indonesia, the majority (91%) of the youth aged between 15 and 19 actively use the Internet that is the highest proportion compare to other age groups [27]. Waterpipe lounges aggressively promote their product on Instagram to build a positive image and normalize its use [28]. They widely use themes that attract youth such as sociability, sexuality, relaxation, and nightlife activities [29]. A repeated cross-sectional survey in North Carolina revealed that current waterpipe use was significantly associated with the exposure to ads on the internet (AOR = 1.61, 95% CI: 1.13–2.28) [30]. Prior study in Canada also found the relationship between waterpipe smoking with the duration of social networking sites use per day [31].

Interesting results were found on the relation between sex and current waterpipe use. In multivariate analysis, sex was not a strong predictor of waterpipe use among youth. This result is not in the same pattern with the previous study on determinants of conventional cigarettes smoking among high school students in Depok City (neighboring city of Jakarta) [32]. The absolute and relative differences of cigarette smoking prevalence were vast between male and female [32]. Cigarettes smoking are considered a hostile behavior for the girls in Indonesian culture [33]. A qualitative study in Surabaya City reported that the girls frequently received negative reactions from the parents, peers, and teachers because of their smoking behavior [34]. However, tobacco use was no longer perceived as a taboo for female students in a big city and had become part of the urban lifestyle [34]. In addition, waterpipe use has more socially acceptable than conventional cigarette smoking [2]. These situations may create a friendly atmosphere for adolescents to engage in waterpipe smoking regardless of their gender.

The present study found that adolescents whose family member smoked waterpipe were more likely to used waterpipe in the past 30 days. A national survey in Lebanon found that those whose parents smoked waterpipe were having higher odds (AOR: 2.45, 95% CI: 1.26–4.75) of currently used waterpipe [35]. We also observed that peer use was associated with current waterpipe smoked, which consistent with a study in Sudan and Australia [36, 37]. Based on Bandura's Social Learning Theory, people may model, encode and later imitate the behavior of surrounded people [38]. Thus, the waterpipe use among children may be partly influenced by observing the behavior of parents, siblings, and close friends.

Consistent with existing studies [39–41], our result found actively smoking cigarettes was associated with past 30 days waterpipe use. Poly tobacco/nicotine product use is common among current cigarettes smokers [42]. Waterpipe is one of the most popular non-cigarettes tobacco products among poly tobacco users [36]. Concurrent waterpipe and cigarettes used may relate to novelty-seeking (or sensation-seeking) behavior [40]. Moreover, current cigarettes smokers presume that waterpipe has a lower health risk compare to combustible cigarettes and have a wide variety of flavors [43, 44]. A study in Texas found that dual/poly tobacco users thought waterpipe was less harmful to health and less addictive [43]. Therefore, health education on waterpipe use prevention should be integrated with the existing tobacco control program.

We too found that availability was strongly associated with current waterpipe use (AOR: 2.143, 95% CI: 1.127–4.076). The result is following the previous study

Table 1: Bivariate analysis of factor associated with waterpipe use.

| Independent variables | Current waterpipe users | | p-Value | OR (95% CI) |
|-----------------------|-------------------------|--------------|--------------------|-----------------------|
| | Yes, n (%) | No, n (%) | | |
| Sex | | | | |
| Male | 41 (8.4) | 449 (91.6) | <0.001 | 2.709 (1.644–4.463) |
| Female | 27 (3.3) | 801 (96.7) | | 1 |
| Age, (years) | | | | |
| 15–16 | 48 (5.2) | 871 (94.8) | 0.874 | 1.044 (0.661–1.784) |
| 17–19 | 20 (5) | 379 (95) | | 1 |
| Living arrangement | | | | |
| No | 5 (7.8) | 59 (92.2) | 0.375 ^a | 1.602 (0.621–4.132) |
| Yes | 63 (5) | 1,191 (95) | | 1 |
| Parent education | | | | |
| ≤Primary | 2 (4.4) | 43 (95.6) | 0.975 | 1 |
| Secondary | 35 (5.2) | 638 (94.8) | | 1.183 (0.275–5.085) |
| Higher | 31 (5.1) | 571 (94.8) | | 1.167 (0.27–5.042) |
| Cigarettes use | | | | |
| No | 18 (2.2) | 804 (97.8) | <0.001 | 1 |
| Experimental | 15 (5.3) | 268 (94.7) | | 7.25 (4.093–12.85) |
| Current | 35 (16.4) | 178 (83.6) | | 18.879 (9.179–38.833) |
| Family use | | | | |
| Yes | 64 (4.9) | 1,240 (95.1) | 0.004 ^a | 7.75 (2.366–25.384) |
| No | 2 (28.6) | 10 (71.4) | | 1 |
| Friend use | | | | |
| Yes | 22 (12.1) | 160 (87.9) | <0.001 | 3.258 (1.909–5.56) |
| No | 46 (4) | 1,090 (96) | | 1 |
| Availability | | | | |
| Easy | 54 (7.4) | 677 (92.6) | <0.001 | 3.265 (1.796–5.938) |
| Difficult | 14 (2.4) | 573 (97.6) | | 1 |
| Affordability | | | | |
| Yes | 31 (8.9) | 316 (91.1) | <0.001 | 2.476 (1.511–4.058) |
| No | 37 (3.8) | 934 (96.2) | | |

^a Fisher-Exact test.

conducted in North Carolina that found a strong relationship between the presence of commercial venue with current waterpipe use (AOR: 1.6, 95% CI: 1.1–2.33) [45]. People

commonly smoked waterpipe with their colleagues in the restaurant, bar, or café setting [2]. The venues attract the smokers by providing innovative devices, clean look and modern facilities, organizing special entertainment activities, serving good food, alcoholic beverages and a wide variety of waterpipe flavors [26]. Moreover, the presence of attractive women and other students create positive attribute toward waterpipe commercial venues [26].

It is vital to note that the exposure of secondhand smoking in the waterpipe commercial venues may have an adverse health effect in the long-term. Particulate Matter concentrations (PM 2.5 $\mu\text{g}/\text{m}^3$) were consistently found at unhealthy to hazardous level in waterpipe café [46]. A study in Virginia revealed that The PM 2.5 concentrations were even higher in the waterpipe café smoking room (374 $\mu\text{g}/\text{m}^3$) than restaurant room that allowed cigarettes smoking (119 $\mu\text{g}/\text{m}^3$) [47]. Besides, side-stream smoke in a single session of waterpipe had higher dangerous toxic exposures (polycyclic aromatic hydrocarbon [PAH], volatile aldehydes, and CO) than one cigarette [46]. Those chemical compounds potently lead to adverse health consequences such as cancer, impaired cardiovascular, adverse respiratory diseases [48].

The study found no significant relationship between affordability and current waterpipe smoking (AOR: 1.391, 95% CI: 0.804–2.407). The price of shisha use is surprisingly low in Jakarta. For instance, one session of single-flavored shisha in a luxury shisha café costs around 100,000–150,000 Rupiah [49]. The price is the same as four packs of the most popular cigarette brand (Sampoerna A Mild) [50]. In addition, adolescents usually come to the shisha lounge together with their peers [2]. The cost will be borne along, which makes the price much cheaper [51]. The join payment for tobacco use is a normal practice in Indonesian youth culture [51].

There are some limitations of this study. First, we only included students at 10th and 11th grade from general public schools. Hence, this may limit generalizability to all adolescents aged 15–19 in Jakarta. Second, the study is unable to investigate the causal relationship between independent and dependent variables due to the nature of the cross-sectional design. Lastly, we relied on self-report for data collection method which subjects to error reporting. However, the study adds valuable evidence to non-cigarettes epidemic literature in Indonesia that has been lacking.

This result means that cigarettes smokers had a high probability of using other types of tobacco products as well. Thus, tobacco control education program should comprehensively cover a wide array of tobacco products and not only cigarettes. The finding also suggests that cessation and prevention of tobacco use should involve

Table 2: Predictors of current waterpipe use.

| Independent variables | AOR | 95% CI | | p-Value |
|-----------------------|-------|--------|--------|---------|
| | | Lower | Upper | |
| Sex | | | | |
| Male | 1.620 | 0.915 | 2.871 | 0.098 |
| Female | 1 | | | |
| Cigarettes use | | | | |
| No | 1 | | | |
| Experimental | 1.737 | 0.830 | 3.633 | 0.142 |
| Current | 6.055 | 3.123 | 11.739 | <0.001 |
| Family use | | | | |
| Yes | 4.844 | 1.225 | 19.151 | 0.024 |
| No | 1 | | | |
| Friend use | | | | |
| Yes | 2.554 | 1.424 | 4.582 | 0.002 |
| No | 1 | | | |
| Availability | | | | |
| Easy | 2.143 | 1.127 | 4.076 | 0.02 |
| Difficult | 1 | | | |
| Affordability | | | | |
| Yes | 1.391 | 0.804 | 2.407 | 0.237 |
| No | 1 | | | |

family members, particularly parents. Evidence shows that family-based intervention is successfully to prevent and treat adolescents from tobacco addiction [52]. It also effective in lowering parental smoking rates and helps parents that already quit smoking to stay abstinent [52]. Finally, we recommend that the government imposed the supply side control policy such as increasing tax rate and prohibiting sales to minor in order to limit availability and affordability of waterpipe.

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Competing interests: Authors state no conflict of interest.

Ethical approval: The study was approved by the Institutional Review Board, Atma Jaya Catholic University of Indonesia with number 404/III/LPPM-PM.10.05/04/2015.

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