



Research Article

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# Impact of Waterpipe Educational Program on University Students' Who are Active Waterpipe Smokers

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## Abstract

**Background:** Water-Pipe Smoking (WPS) is considered as one of the most dangerous patterns of tobacco smoking. It is expected by the end of this century to kill a billion people or more unless urgent action is taken. Jordan is ranked as the fourth highest Arab country in regards to smoking rates. It aims to investigate Jordanian university students' knowledge and beliefs towards WPS; explore factors that are associated with being a WPS smoker; and evaluate the effectiveness of a WPS cessation program.

**Method:** A randomized clinical trial design was used to evaluate the effectiveness of a WPS cessation educational program. The sample included 400 students. Ethical approval was obtained from the target universities before data collection, and each participant was asked to sign a written consent form. Invitations was posted through internet websites and announcement boards in the universities.

**Results:** The difference in the educational program posttest total score (dependent variables) were statistically significant: motivation ( $F\{1, 257\}=1365, p=0.000$ ), attitudes ( $F\{1,257\}=276, p=0.000$ ), knowledge of health effects ( $F\{1, 257\}=307, p=0.000$ ), health risks ( $F\{1,257\}=329, p=0.000$ ), and intention to quit smoking shisha ( $F\{1,257\}=318, p=0.000$ ).

**Conclusion:** It was found to be effective in promoting students' knowledge and attitudes towards WPS and intention to quit WPS. Therefore, health faculties have the obligation to conduct frequent educational sessions using various teaching approaches as part of the campaigns to fight against the epidemic of the WPS within this age group.

**Keywords:** Educational program, Impact, University students, Waterpipe smoking

## Introduction

Tobacco-use is a major public health-related issue that is considered to be the second major cause of death worldwide [1]. The World Health Organization (WHO) warns that if the current smoking patterns continue, smoking will cause 10 million deaths yearly by 2020 [2]. Also, if the current trends persist, tobacco will kill more than 8 million people worldwide each year by 2030, with 80% of these premature deaths in low- and middle-income countries. By the end of this century, tobacco may kill a billion people or more

unless urgent action is taken [1]. Moreover, most tobacco-related deaths are in the developed countries, but this trend is expected to switch by 2030 when 80% of the tobacco-related deaths will be in the developing countries [2]. A study by Brikmanis and Doranb that examine the link between stress and hookah tobacco use among young adult found that there is a positive relationship between stressful situations and increase hookah use [3]. This indicated that more stress situations increase risk of unhealthy behaviors. Jordan,



as a developing country, is ranked as the fourth highest Arab country in regards to smoking rates and patterns [2].

Young adults are being encouraged to use WPS under the misconception of its safety, compared with smoking cigarettes, as less dangerous [4,5]. Further, *Smith-Simone, et al.*, [6] explored the knowledge, attitudes, beliefs and smoking patterns of WPS in USA, and found that smokers perceived WPS less harmful and addictive than cigarettes. This is supported by *Berg, et al.*, [7] who found that young adult perceived hookah as less harmful, less addictive, and most socially acceptable. The majority of WPS users (41%) use it weekly. Finally, most of the participants (80%) reported their confidence in their ability to quit WPS but had no intention to do so. Similarly, *Azab, et al.*, [8] assessed the prevalence of WPS and explored association between sociodemographic variables and WPS among university students in Jordan. The study found that most of the participants (62.2%) believed that WPS is more harmful than cigarette smoking. Conversely, 54.6% of the participants felt that cigarette smoking was more addictive than WPS.

Nowadays, WPS is becoming a favorable form of tobacco use by young adults globally. Jordan has higher rates of smoking compared to developed countries, such as the United States, where the rate of young adult females WPS was 20% [9]. Moreover, it is growing among the Jordanian young adults, and became common to see a group of young females in the public cafe smoking WP, which is contradictory to the cultural norms in the last decades. In fact, the WPS prevalence rate has increased recently, where it was found to be 27% among Jordanian young adults [10]. Hence, this study aims to

- a) Investigate Jordanian university students' knowledge of WPS hazards.
- b) Assess their beliefs towards WPS.
- c) Explore factors that are associated with being a WPS smoker.
- d) Evaluate the effectiveness of a WPS cessation program.

## Methods

### Design

To evaluate the effectiveness of a WPS cessation educational program (independent variable) on students' decision-making (dependent variable), a Randomized Clinical Trial (RCT) design was used. This study involves a random assignment of subjects to Control and Experimental groups, and administration of a pre-test and a post-test to all subjects in both groups separately.

### The WPS Educational Program Cessation (Intervention)

The experimental group attended a 2-hour WPS educational program in lecture rooms. Each session contained 15 to 20 students. Numerous teaching approaches used during the WPS educational program including Power Point presentation, videos, group discussion, paper-based and live WPS scenarios, and printed materials. The concepts and propositions of interaction, communication,

perception, and mutual goal attainment were integrated in the WPS education sessions.

### Study Setting

The study took place in five Jordanian universities. The researchers first randomly select five universities, three public and two private universities, from the two sectors using a simple random sampling technique. Jordan divided into three regions; north, central, and south. One public school from each of the three regions were randomly selected. One private school was randomly selected from the north and the central regions. However, a private university from the south was not selected because none exist there. The name of each university written on a piece of paper, and then from a box the principal researcher randomly selects the universities.

### Sample

A total of 400 students from five universities were invited to participate. Jordanian universities students were the target population in this study. Participants were recruited from the population of students who meet the eligibility criteria. The eligible subjects in this study were all male and female students who are enrolled in Bachelor, Master, or PhD degree in either public or private universities, had been in school for at least one year, and currently a WP smoker.

The participating students were randomly assigned to either experimental or control group from a list of students who showed up to an office that assigned for this study. The researchers participated in the delivery of a consent letter describing the study and inviting students to participate. Students who agreed to participate in this study responded directly to the researchers by returning the letter of consent. These replies grouped according to the site, and used to populate a table of random numbers. Then, to eliminate the possibility of selection bias, the researchers assigned odd numbers for the control group and even numbers for the experimental group. All the experimental groups at the five sites pooled and treated as one experimental group for education and analysis purposes, and the same for the control group.

### Ethical Considerations

Approval from the Scientific and Ethical Research Committees at the targeted universities before data collection began. Each participant asked to sign a written consent form to participate in this study, which clarifies the purpose of the study, and the rights of participants. Confidentiality of the respondents ensured throughout the study. Data was secured correctly, saved in the researcher's password protected computer, with hard copies in a cabinet in a locked office. Moreover, the demographic data sheets coded by numbers with no names to maintain confidentiality, and no one except the researchers had access to that data. Respondents were advised that participation in the study is voluntary, and they could withdraw from the study without any consequences professionally or personally.

## Instrument

The instrument section of this study contains five sections, where section one asks participants to answer demographic questions including gender, age, marital status, housing status, family income, nationality, specialty, level (year), program (if governmental university), university GPA, and high school type. The second section contains 14 items asking about Arghila profile. This section was mostly based on the work of *Smith-Simone, Maziak, Ward, & Eissenberg* [11].

The third section assesses participants' knowledge regarding the hazards of Arghila [12]. To answer the questions, participant can choose from 5-point Likert scale including "Definitely cigarette, Probably cigarette, Don't know, Probably Arghila, and Definitely Arghila." However, correct answers include only Probably Arghila and Definitely Arghila. A total score out of 5 was used and entered into analysis.

To assess participants' beliefs about Arghila smoking, the questionnaire [13] contains 10 items that use 7-point semantic differential scale ranging from -3 to +3. However, this study modified the scaling system to have 7-point Likert scale ranging from 1 "Slightly" to 7 "Extremely" in order to obtain a mean score out of 7, to be compared between pre and posttest. Noonan [13] reported a Cronbach's alpha of 0.746 for this scale among American college students.

The fifth section contains the WPS cessation profile, which consists of three questions based on the work of *Smith-Simone, et al.*, [11]. The section of knowledge and beliefs (mean score) and cessation items were tested pre and post intervention to evaluate the effectiveness of the program.

## Data Collection

After obtaining the required ethical approvals, invitations posted for participants through internet websites (universities' websites, social media including Facebook and Twitter) and announcement boards in the universities. The announcements asked students who meet the eligibility criteria and willing to participate in this study to show up to the assigned office. A self-administered questionnaire was implemented directly by the researchers to the

participants in both the experimental and the control group at the beginning of the WP education program (pretest) and after the completion of the program (post-test). The pre and posttest took approximately 30 minutes in duration. In each identified location or cluster, a total of 60 students were seated for the program, thus the survey had 5 universities. Potential respondents provided with basic information about the study and asked if they are willing to participate; if they consent, the pretest will be conducted. No unique identifying information such as respondent names or address were collected to ensure confidentiality among the participants. Data collected at the five sites during a period of three months from February 2018 to May 2018.

## Data Analysis

Descriptive statistics were utilized to draw summary measures of central tendency and frequencies. Means and standard deviations of the dependent variables estimated and compared among different groups of the study population. Inferential statistical tests were used as the followings; ANCOVA for dependent independent groups to test the difference between two independent group means (the experimental group compared with the control group), gender, and between the one group (the experimental group compared with pre and posttest). Also, ANOVA utilized to test differences in decision making abilities regarding level of years in college.

## Results

The researchers distributed 400 pretest questionnaires for students who met the inclusion criteria; 200 in the private universities and 200 in the public universities. The pretest response rate was 75% (n=300). The researchers randomly assigned the participants into two groups; interventional group (n=150) and the control group (n=150) using simple random table. About 79% (n=140) of the interventional group participants attended the educational sessions and 90% (n=126) completed the posttest questionnaire. Around 87% (n=131) of the control group completed the posttest questionnaire. From the 300 participants who completed the pretest questionnaire, only 257 participants responded to the post test questionnaire, which revealed a dropout rate of 14.33% (n=43).

**Table 1:** Selected demographic characteristics of study participants (N=257).

Variable	Range	Mean (SD)	Median	% (n)
Age	18-35	21.30(2.98)		
GPA	60-94	73.91(7.91)		
Gender				
Male			X	57.6% (148)
Female				42.4% (109)
Marital Status				
Single			X	89.1% (229)
Married				10.9% (28)
Family Monthly Income				

≤ 500 JD				25.3% (65)
500-1000 JD			X	47.1% (121)
1000 JD				27.6% (71)
School Type				
Scientific			X	46.7% (120)
Hum.				35.8% (92)
Health				17.5% (45)
School Level				
First Year				17.9% (46)
Second Year				31.5% (81)
Third Year				21% (54)
Fourth Year				23.3% (60)
Fifth Year				6.2% (16)

The results of the demographic characteristics for the study participants (n=257) revealed that the mean age of the participants was 21.3±2.98 years and the great point average (GPA) of the participants was 73.91%±7.91. More than half of them were males 57.6% (n=148), 46.7% (n=120) in scientific schools, 35.8% (n=92) in humanitarians schools, while 17.5% (n=45) in health schools. The majority of the participants 60.3% (n=155) reported that they live with their families, 23.7% (n=61) lives with other students in private house, and 16% (n=41) lives in students dorm. 89.1% (n=229) were single, 8.9% (n=23) were married, and 1.9% (n=5) were divorced, 25.3% (n=65) of the participants making less than 500JD monthly family income, while the majority 47.1% (n=121) making between 500-100 JD, and only 27.6% (n=71) making more than one thousand JD per month. 17.9% (n=64) where first year, 31.5% (n=81) second year, 22% (n=54) third year, 23.3% (n=60) fourth year, while only 6.2% (n=16) fifth year. Table 1 presents the participants demographic characteristics (Table 1).

The results of using shisha among those who reported ever using Shisha, the average age of first tobacco use was 17.37 years±2.07 and the average spending 25.53±2,01 JD per month. The majority of the students (65%) reported only smoking with friends/others and 10% reported usually smoking alone while (51.18%) reported smoking in a restaurant/café; also, 22.17% reported smoking in a friend's home/apartment; 11.67% reported smoking in their own home/apartment or dormitory; and 15.56% reported smoking in their parents' home/apartment. 38.5% (n=99) of the participants reported that they did not complain after using the shisha, while 47.1% (n=121) reported that they suffer from nausea and vomiting, and the rest complaint from difficulty in breathing and chest pain. The majority of the participants smoked honey with flavor 80.5% (n=207) and the rest smoked agami without flavor. Also, when participants asked if they have a plan to quit smoking shisha 49.4% of them answered yes. Table 2 presents the participants shisha use (Table 2).

**Table 2:** Shisha Smoking Practice.

Details	Range	Mean (SD)	% (N)
Age of Smoking	10-24 yrs	17.37(2.07)	
Average Spending on Shisha	5-120JD	25.53(22.37)	
<b>Place of Residency</b>			
With family			60.3(155)
Students' dorms			14.8% (38)
Lives with students in Private home			24.9% (64)
<b>Smoking Arrangements</b>			
With Friends			65% (167)
With family			25% ((65)
Alone			10% (25)
<b>Type of Flavor</b>			
Honey flavor			80.5% (207)
Agami without flavor			19.5% (50)
<b>Place of Smoking</b>			

Restaurant/café		52.18% (130)
Friend home/apartment		22.17% (57)
Own apartment or dormitory		11.67% (30)
Parents' home/apartment		15.56% (40)
<b>Shisha Average Smoking</b>		
One a month		29.2% (75)
Once a week		30.4% (78)
2-3 times a week		23.0% (59)
Daily		17.5% (45)
<b>Chief Complaints</b>		
No complaints		38.5% (99)
Nausea and vomiting		47.1(121)
Difficulty in breathing		11.67% (30)
Chest pain		0.27% (7)

Analysis of covariance (ANCOVA) was used to test research hypotheses. Participants who completed the pretest and the posttest, from both the intervention group and the control group were included in the analyses (n=257). The independent variable was the program with two categories; one represents the intervention group and the other represents the control group. The pretest of total scores of the motivation factors, attitudes, knowledge of health effects, health risks, and intention to quit smoking shisha were measured before conducting the shisha educational program used as covariate in the analyses table 3 represent the variables pretest means for the intervention and the control group. The dependent variable was the educational program posttest for the intervention and the control group. Preliminary data screening was conducted to ensure there were no violations of ANCOVA assumptions. Scores on covariate and dependent variable were reasonably normally distributed with no outliers; however, scatter plots and bivariate Pearson correlation between the covariate and the dependent variables show linear relation with bivariate outliers. The covariate, pretest total scores, is one of the participants' characteristics believed to have an effect on the dependent variables, post test scores. The relationship between the covariate and the dependent variables were continuous variables. The zero order of each variable was requested in addition to set of 0.05 P value (two tailed) as a default level of significance. The results of Pearson Correlation showed the education program pretest total scores had significant positive correlation with the program posttest scores. Thus, the covariate seemed to be sufficiently correlated to the dependent variable to justify its inclusion covariates; motivation variable ( $r=0.35$ ,  $p=0.02$ ), attitudes ( $r=0.43$ ,  $p=0.01$ ), knowledge of health effects

( $r=0.18$ ,  $p=0.004$ ), health risks ( $r=0.53$ ,  $p=0.003$ ), and intention to quit smoking shisha ( $r=0.63$ ,  $p=0.006$ ).

To assess whether there was interaction between treatment and covariate, a preliminary ANCOVA General Linear Model with a customized model that included an independent variable X covariate interaction term. The interaction were not statistically significant for the variables: motivation ( $F_{1,257}=0.919$ ,  $p=0.33$ ), attitudes ( $F_{1,257}=3.51$ ,  $p=0.06$ ), knowledge of health effects ( $F_{1,257}=0.17$ ,  $p=0.67$ ), health risks ( $F_{1,257}=0.49$ ,  $p=0.48$ ), and intention to quit smoking shisha ( $F_{1,257}=0.83$ ,  $p=0.36$ ), indicating there were no significant violation of the homogeneity of regression assumption.

A new General Linear Model analysis with full factorial model was run and that does not include the interaction term. When the educational program pretest total score (covariates) were not statistically controlled, the difference in the educational program posttest total score (dependent variables) were statistically significant: motivation ( $F_{1,257}=1365$ ,  $p=0.000$ ), attitudes ( $F_{1,257}=276$ ,  $p=0.000$ ), knowledge of health effects ( $F_{1,257}=307$ ,  $p=0.000$ ), health risks ( $F_{1,257}=329$ ,  $p=0.000$ ), and intention to quit smoking shisha ( $F_{1,257}=318$ ,  $p=0.000$ ) (Table 3). The main effect of intervention (educational program) in the final ANCOVA using the pretest total score as covariate were also statistically significant motivation ( $F_{1,257}=1328$ ,  $p=0.000$ ), attitudes ( $F_{1,257}=274$ ,  $p=0.000$ ), knowledge of health effects ( $F_{1,257}=274$ ,  $p=0.000$ ), health risks ( $F_{1,257}=314$ ,  $p=0.000$ ), and intention to quit smoking shisha ( $F_{1,257}=314$ ,  $p=0.000$ ) (Table 3,4).

**Table 3:** ANCOVA pretest posttest of WBS Variables without interaction.

Variable	Group	n	df	mean (SD)	F	P Value
Motivation	Treatment	126	1	24.92(1.58)	1365.93	0.000 **
	Control	131		14.64(2.70)		
Attitude	Treatment	126	1	61.26(7.67)	276.09	0.000 **
	Control	131		44.49(8.47)		
Knowledge of WPS	Treatment	126	1	21.56(3.56)	371.43	0.000 **
	Control	131		14.07(3.16)		
Health Risks	Treatment	126	1	61.26(7.67)	307.1	0.000 **
	Control	131		44.49(8.47)		
Intention to quit shisha smoking	Treatment	126	1	24.26(4.04)	318.26	0.000 **
	Control	131		17.29(1.87)		

Note\*: P value  $\leq$  0.01.

**Table 4:** ANCOVA pretest posttest of WBS Variables with interaction.

Variable	Group	n	df	mean (SD)	F	P Value
Motivation	Treatment	126	1	24.92(1.58)	1328.22	0.000 **
	Control	131		14.64(2.70)		
Attitude	Treatment	126	1	61.26(7.67)	274.46	0.000 **
	Control	131		44.49(8.47)		
Knowledge of WPS	Treatment	126	1	21.56(3.56)	317.16	0.000 **
	Control	131		14.07(3.16)		
Health Risks	Treatment	126	1	61.26(7.67)	294.83	0.000 **
	Control	131		44.49(8.47)		
Intention to quit shisha smoking	Treatment	126	1	24.26(4.04)	317.16	0.000 **
	Control	131		17.29(1.87)		

Note\*: P value  $\leq$  0.01.

## Discussion

It was noteworthy that participants in both groups had relatively poor knowledge, negative attitudes and low intention to quit WPS before attending the intervention, which comes in line with many national local and international literatures [14,15]. Further, literature suggested that inadequate knowledge and the negative attitude about WP to be significant predictors of continuing WPS and decreased intention to quit [16].

Indeed, it is imperative to teach university students to be aware concerning WPS since it can positively affect their WPS behaviors, which indicates the importance of this study that comes within the local and international efforts fighting against this alarmingly dangerous epidemic, [17,18] especially in the developing countries [2]. It is anticipated that the results of the current study would provide additional evidence and perhaps practical intervention for health-care providers in challenging against the increasing WPS prevalence. Also, this study comes as a response to the recent call to action for actual interventions against the massive increase in WPS rates [19]. Further, Lopez, Eissenburg, Jaafar, and Afifi [20] pointed

out to the lack of evidence concerning effective interventions for WPS prevention and control and described it as "at ground zero". Correcting the misconception of WPS as being less harmful and less addictive [21] than other tobacco products is another importance for this study.

The findings of the current study revealed that the program was effective in improving participants' WPS knowledge in the intervention group in the follow up measurement. Meanwhile, participants in the intervention group had significantly higher scores than those in the control group. The differences in knowledge scores (both within and between groups) support the effectiveness of our interventional program. Similar findings were reported by Escoffery, McCormick and Bateman [22] among college students indicating the effectiveness of such programs being conducted among such group at earlier age and among other groups [23,24] Therefore, such a strategy should be generalized among colleges and universities to adopt topics regarding WPS within university curricula to benefit from the curiosity and enthusiasm of this age group. Smoking awareness campaigns should also target universities for the same purpose.

Participants' attitudes toward WPS were also promoted two weeks after the educational intervention, indicating that students have benefited from our program. Such improvement represents another success for our intervention that could improve not only participants' knowledge, but also their attitudes. This finding is consistent with *Escoffer, et al.*, [22] who reported the effectiveness of such programs in improving the university students' attitudes towards WPS. Actually, improving WP smokers' attitudes towards WPS should be the core of any interventional programs to improve WPS cessation [25].

The ultimate success for our educational program is the effectiveness in promoting participants' intention to quit WPS after exposure to the program. Previous studies with educational programs support our finding [26,27] Such conclusion sends message to all efforts fighting against this new epidemic to invest in this age group that can gain valuable knowledge and behavioral changes, and can serve as a mean to convey messages to their communities. Therefore, university students can be a vital target of those efforts to guarantee their success.

Indeed, our educational program was provided through lecture model, distributing pamphlet and group discussion. *Leavens, et al.*, [28] used an individualized feedback approach in teaching participants WPS cessation and found it effective in increasing their knowledge of WP-related harm and promoting risk perception, motivating them to quit WPS, and in developing positive attitudes. Others have utilized a brief educational messages about WPS and discovered their effectiveness in promoting perception of WPS harm Therefore, future studies are invited to use various strategies of health education (e.g., online education, social media, individualized feedback) while making sure to use the advanced technology so that they are attractive enough to gain the attention of the students.

## Limitations

Using a convenience sample constitute is the major limitation of this study, which might have an effect on the generalizability of its results among all university students in Jordan. However, we tried to overcome this limitation through recruiting participants from various universities. Another limitation is the use of a self-reported scale to assess participants' quit intention, which may lead to biased responses. Using more objective methods for evaluating long term smoking cessation using diaries and biochemical tests is highly recommended. Finally, this study conducted the posttest two weeks after the education, which makes it difficult to evaluate the sustainability of changes acquired in participants' knowledge, attitudes and quit intention reported. However, *Leavens, et al.*, [27] evaluated the effectiveness of their program post intervention and three months later and found that the differences were maintained.

## Conclusion

This study examined the effectiveness of an educational pro-

gram regarding WPS among university students in Jordan, which was found to be effective in promoting their knowledge and attitudes towards WPS and intention to quit WPS. Therefore, health faculties have the obligation to conduct frequent educational sessions using various teaching approaches as part of the campaigns to fight against the epidemic of the WPS within this age group, which is considered to have an important role regarding within their communities through influencing their knowledge and attitudes towards better outcomes of smoking cessation campaigns.

## Funding

No funding was obtained for this study.

## Key points

- a) Health professors have the obligation to conduct frequent educational sessions using various teaching approaches to fight against the epidemic of the WPS.
- b) Policy makers in the area of public health need to update existing tobacco regulations to include waterpipe smoking, similarly, public health researchers should develop public health campaigns and interventions to address the increasing rates of waterpipe smoking.
- c) Policy makers in the area of public health need to require warning labels on tobacco packs-caution: waterpipe smoking may be hazardous to your health.
- d) Policy makers in the area of public health should establish and enforce restriction on tobacco advertising and promotion.

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Ethics approval and consent to participate: Approval from the Institutional Review Board at the University of Jordan was obtained. Moreover, approval from the targeted universities (i.e., the University of Jordan Institutional Review Board no. 2017-2016/152) before data collection began was gained. Each participant asked to sign a written consent form to participate in this study, which clarifies the purpose of the study, and the rights of participants. Confidentiality of the respondents ensured throughout the study. Data was secured correctly, saved in the researcher's password protected computer, with hard copies in a cabinet in a locked office. Moreover, the demographic data sheets coded by numbers with no names to maintain confidentiality, and no one except the researchers had access to that data. Respondents were advised that participation in the study is voluntary, and they could withdraw from the study without any consequences professionally or personally.

## Conflict of Interest

None.

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