

# The Effect of a Web-based Educational Program on Prevention of Hookah Smoking among Adolescent Girls: Application of Theory of Planned Behavior

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## Original Article

### Abstract

**Background:** The prevalence of hookah is increasing worldwide and in all age groups, especially among women. Therefore, this study was conducted to determine the effect of web-based educational program in the prevention of hookah smoking among girls in Kermanshah, Iran, using theory of planned behavior (TPB).

**Methods:** This study was a randomized controlled trial performed on 110 adolescent girls in Kermanshah City in 2020. Multistage random sampling was used in this study. The data collection tool included a researcher-made questionnaire. Designed intervention was implemented for the intervention group in 5 educational sessions according to analysis of pre-test results. Data were collected 3 months after the end of the training intervention. Data analysis was carried out using SPSS software.

**Findings:** The presented interventions significantly improved the structures of attitude ( $P < 0.001$ ), subjective norms ( $P < 0.001$ ), and intention ( $P < 0.001$ ) in the intervention group compared with the control group. However, the difference between perceived behavioral control score in the two groups was not significant ( $P = 0.131$ ). There was also a significant difference in reducing the behavior of hookah smoking between the intervention and control groups after the educational intervention.

**Conclusion:** Using web-based interventions is a good educational strategy for prevention of hookah smoking in adolescent girls.

**Keywords:** Adolescent; Female; Education; Smoking

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## Introduction

The tobacco epidemic is one of the biggest public health warnings in the world. According to the World Health Organization (WHO) in 2019, 8 million people die each year from tobacco use, of which 7 million die from direct tobacco use.<sup>1</sup> One way to use tobacco that has been heavily promoted in recent years is to use hookah, known as Narghile, Hookah, Arghil, Waterpipe, or Hubble-Bubble.<sup>2</sup> Hookah smoking increases problems such as menstrual function changes, decreased bone density, estrogen deficiency disorders and pregnancy problems in women. Besides, hookah smoking is correlated with respiratory and cardiovascular diseases (CVDs). Smoke from hookah contains large amounts of carbon monoxide (CO) and carcinogenic substances such as arsenic and lead.<sup>2,3</sup> It is widely used in the Eastern Mediterranean and suggested as a way of smoking in Europe. In one study, the highest prevalence of hookah smoking among young people was reported in Lebanon with 36.9%, the West Bank with 32.7%, and Eastern Europe (Latvia with 22.7%, the Czech Republic with 22.1%, and Estonia with 21.9%).<sup>3</sup> It is also estimated that more than 100 million people in the world, especially adolescents, use hookah as a smoking substance.<sup>4</sup> In Iran, hookah smoking was common among men in the past and was considered a fun and enjoyable tool, but today it has become popular among teenagers and young people, and even its prevalence has increased significantly among women.<sup>5</sup> According to a 2014 global study, the highest prevalence of hookah use was among girls aged 13-15 in Lebanon, the United Arab Emirates (UAE), and Iran.<sup>6</sup>

Akl et al. found that hookah was more acceptable for women than smoking. The majority believed that hookah was less addictive than cigarettes.<sup>7</sup> Abdurashid et al. found that women considered hookah use as a sign of puberty, being up-to-date, and having a better mood.<sup>8</sup>

In a comprehensive review of studies, factors such as positive attitudes and behavioral beliefs towards hookah,<sup>9,10</sup> subjective norms,<sup>9,11</sup> and behavioral intention<sup>12,13</sup> are effective in the tendency of women to hookah smoking. Besides, perceived behavioral control can also be an important factor in adopting or not adopting high-risk behaviors in young people.<sup>14</sup> When a person has a high level of perceived behavioral

control, he/she is more likely to refrain from engaging in high-risk behaviors such as alcohol or hookah smoking.<sup>15</sup>

Moreover, in designing educational interventions, considering the numerous and effective factors in the tendency to hookah smoking, using patterns and theories of behavior change, helps to identify the features that somehow affect high-risk behaviors and increases the probability of the effect of interventions.<sup>16</sup> In this regard, based on the identified determinants, theory of planned behavior (TPB) was selected as the theoretical framework of the study. Besides, the results of similar studies related to tobacco use also indicate the effectiveness of TPB in the prevention of smoking behavior among adolescents.<sup>17,18</sup>

According to this theory, the intention to perform a behavior is predicted by three factors: (A) attitude, which is the positive or negative evaluation of a behavior, (B) subjective norm, which refers to the social pressure perceived by the individual to perform or not to perform the target behavior. People often act on what others (friends, family) think they should do based on their perceptions, and their intention to accept potential behavior is influenced by people with whom they have a close relationship. And (C) perceived behavioral control, which is the degree of a person's sense of control over performing or not performing a behavior.<sup>19</sup> In Iran, limited studies have been conducted on hookah use, especially by adolescents.<sup>20</sup> However, intervention programs to prevent hookah smoking by adolescents is essential. Besides, it should be noted that in the behaviors and views of today's adolescents, fundamental changes are taking place, most of which are affected by the emergence and spread of new communication technologies such as the Internet.

It seems that the Internet and other new communication and information technologies have not only increased the level of information of the young generation but also affected their willingness and tendencies.<sup>21</sup> Therefore, the present study was designed and conducted to determine the effect of a web-based educational program on prevention of hookah smoking among adolescent girls in western Iran using the TPB.

## Methods

**Study design:** The study was a randomized controlled trial, which was conducted to

determine the effect of a web-based educational program on the prevention of hookah smoking among adolescent girls

**Setting and samples:** This study was conducted among 110 high school female students during 2020 in Kermanshah City, Iran.

First, a cross-sectional study was conducted in Kermanshah City to determine the schools with a high prevalence of hookah smoking. According to the results, among schools with a high prevalence of hookah smoking, two schools were randomly selected.<sup>2</sup> Then, these two schools were randomly selected as the intervention and control groups. Considering the power of 90%, type I error of 0.05, and also the fact that mean ± standard deviation (SD) of the behavior of reducing the hookah smoking was  $3.26 \pm 3.20$  and  $1.60 \pm 2.46$ ,<sup>17</sup> 54 students were calculated. With regard to 10% attrition rate, the sample size was calculated 60 students for each group. Ten students were lost in follow-up period; finally data collection was carried out from 110 students (54 students in intervention group and 56 students in the control group) (Figure 1).

Inclusion criteria for schools were as follows: public female high schools with a high prevalence of hookah smoking located in Kermanshah City. Eligible schools to participate in the study were selected by considering the average number of students in each class in high schools located in the study area and according to executive studies.

**Data collection:** The first part of the questionnaire included demographic variables: age, education, parental education, parental job, and questions related to hookah smoking including experience of hookah smoking during

life (Yes or No), history of hookah smoking, age of the first experience of hookah, and history of hookah smoking in family and among friends. The second part included TPB model structures. The content validity of the questionnaire was evaluated by an expert panel which consisted of 15 specialists in health education and promotion. The content validity ratio (CVR) and content validity index (CVI) were extracted. The internal consistency reliability was measured using Cronbach’s alpha. CVR, CVI, and Cronbach’s alpha coefficient of constructs obtained acceptable values (attitude:  $\alpha = 0.76$ , CVR = 0.81, CVI = 0.93; subjective norms:  $\alpha = 0.86$ , CVR = 0.83, CVI = 0.96; behavioral control:  $\alpha = 0.81$ , CVR = 0.90, CVI = 0.98; intention:  $\alpha = 0.86$ , CVR = 0.86, CVI = 0.96).

**Attitude:** 11 items were included in the questionnaire to ask the attitude of each individual toward hookah (for instance, the term “I feel like smoking if I smoke hookah”). A 5-point Likert scale was used to score each item with a score between 11 and 55 for a range of answers from “strongly disagree” to “strongly agree”. Internal reliability of the structure was assumed 0.76.

**Subjective norms:** 6 items were included in questionnaire, ranging from the minimum score of 6 to the maximum score of 30. Among these six questions, three questions were designed to ask the attitudes of friends about hookah (“I should not use at all” to “I must consume”), while the rest of the questions were posed to know the attitudes of the friends about hookah and their effects were assessed based on the 5-point Likert scale ranging from “always” to “never”. In addition, for the subjective norms, the value of the internal reliability of the structure was assumed 0.86.

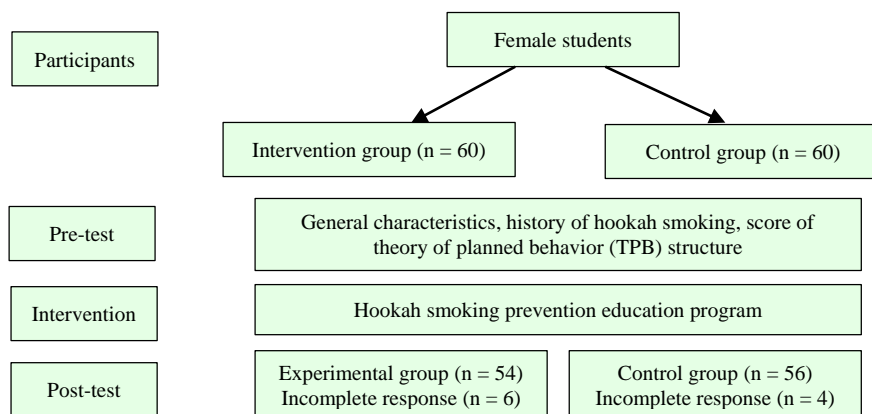


Figure 1. Study design

**Perceived behavioral control:** Perceived behavioral control was measured with 6 items, for example: "I resist temptation well", which was measured on a 5-item scale ["very high" (5) to "not at all" (1)]. All scores were ranged from 6 to 30, underlining the fact that a person with high attention to hookah received a higher score. Internal reliability was estimated to be 0.81.

**Intention:** The number of questions related to the intent of the behavior was 4, for example, "I may smoke a hookah". Scores should be between 4 to 20, which further indicates a high intention to use hookah. Internal reliability of the structure was assumed 0.76.

**Ethical considerations:** In addition to obtaining written consent, the name was not recorded in the questionnaire and also this study has approval of the Ethics Committee of Hamadan University of Medical Sciences, Hamadan, Iran (reference number: IR.UMSHA.REC.1397.696).

**Educational intervention:** Since the positive impact of the use of new educational methods on health promotion has been emphasized, in the present study, web-based educational program was used. For web-based education, the platform of the web-based management system of Hamadan University of Medical Sciences was used. A personal page was designed for each participant in the web-based management system. Then, for each person, the username and password were designed to enter their page. In the next step, the researcher taught the participants how to enter the system and personal page in person. He also reminded them how to log in to the system, use the photo, and send it through the social network. After designing the personal page for each participant, the prepared clips were uploaded to the system. Educational content was also used to modify TPB structures according to the set goals of effective approaches (Table 1).

**Table 1.** Comparing the frequency of personal characteristics between intervention and control groups

Characteristics	Intervention group	Control group	P
Age (year) [n (%)]			0.452
14-15	16 (29.6)	10 (17.8)	
16-17	27 (49.9)	35 (62.4)	
18	11 (20.4)	11 (19.6)	
Father's education [n (%)]			0.031*
Illiteracy	3 (5.5)	2 (3.5)	
Under the diploma	15 (27.7)	4 (7.1)	
Diploma	26 (48.1)	30 (53.5)	
College	11 (20.4)	18 (32.1)	
Mother's education [n (%)]			0.512
Illiteracy	5 (9.2)	5 (8.9)	
Under the diploma	17 (31.4)	15 (26.7)	
Diploma	24 (44.4)	25 (44.6)	
College	8 (14.8)	11 (19.6)	
Father's job [n (%)]			0.542
Employee	19 (35.1)	14 (25.0)	
Self-employed	31 (57.4)	40 (71.4)	
Unemployed	3 (5.5)	2 (3.5)	
Mother's job [n (%)]			0.252
Housewife	49 (90.7)	51 (91.0)	
Employed	1 (1.8)	4 (7.1)	
Self-employed	4 (7.4)	1 (1.9)	
Friend use [n (%)]			0.960
Yes	21 (38.8)	25 (44.6)	
No	33 (61.2)	31 (53.4)	
Father use [n (%)]			0.829
Yes	24 (44.4)	24 (42.8)	
No	30 (55.5)	32 (57.1)	
Mother use [n (%)]			0.099
Yes	15 (27.7)	7 (12.5)	
No	39 (72.1)	49 (87.5)	
Hook smoking [n (%)]			0.357
Former	26 (48.1)	24 (42.8)	
Current	16 (29.6)	16 (28.5)	
Initiation age (mean ± SD)	12.86 ± 2.21	13.00 ± 1.58	0.535

SD: Standard deviation

At the end of each training session, 3 questions were designed, and these questions were uploaded to the system. The purpose of designing the questions was that after watching the educational video of each session and giving the correct answers to the questions, the participants were able to go to the next clips. If the answers to the questions were incorrect, they should watch the tutorial clip again to identify the correct answer.

After the completion of the educational intervention, memorable messages were sent to the students on the WhatsApp social network for a month. Three months after the completion of the educational intervention, the questionnaires were re-completed by the two groups of experimental and control.

Data were analyzed by SPSS software (version 22, IBM Corporation, Armonk, NY, USA), using Wilcoxon test (comparison of mean score of structures in each group), Mann-Whitney test (comparison of the mean score of structures between groups), chi-square test, and McNemar test.  $P < 0.05$  was considered significant.

### Results

Table 1 shows the demographic characteristics and history of hookah smoking in the two groups of experimental and control. The results of this study showed that the mean  $\pm$  SD of participants' age in the experimental and control groups was  $16.35 \pm 1.18$  and  $16.55 \pm 1.08$  years, respectively. The mean age of starting hookah smoking in the experimental and control groups was  $12.86 \pm 2.21$  and  $13.00 \pm 1.58$  years, respectively. 48.1% of the intervention group and 42.8% of the control group experienced hookah once in their lifetime. Other

details are shown in table 1.

The results of Mann-Whitney analysis in table 2 showed that before the intervention, both experimental and control groups were similar in subjective norm structures, attitudes, and behavioral intention. However, after the intervention, these structures in the experimental group had a significant difference with the control group ( $P < 0.05$ ). Regarding the perceived behavioral control structure, no significant relationship was observed between the two groups of experimental and control before and after the education ( $P = 0.131$ ).

The results of the Wilcoxon test showed the effectiveness of the web-based intervention in correcting the positive attitude towards hookah ( $P < 0.001$ ), reducing the subjective norm that encouraged hookah smoking ( $P < 0.001$ ), and reducing the behavioral intention to use hookah ( $P < 0.001$ ) in the experimental group after intervention.

Table 3 shows the findings related to the hookah smoking behavior before and after the intervention in the experimental and control groups. Using the chi-square test, there was no significant difference in the frequency of hookah use in the last month between the participants of the experimental and control groups before the intervention ( $P = 0.535$ ). The analysis of the McNemar test showed that there was a significant relationship between the frequency of hookah smoking in the last month in the experimental group before and after the educational intervention. In other words, in the experimental group, the hookah smoking decreased from 29.6% before the educational intervention to 14.8% after the intervention.

**Table 2.** Comparison of mean scores of theory of planned behavior (TPB) constructs before and 3 months after intervention in the control and intervention groups

Constructs	Groups	After intervention (mean $\pm$ SD)	Before intervention (mean $\pm$ SD)	P*
Attitude	Experimental	11.13 $\pm$ 24.72	8.84 $\pm$ 19.81	< 0.001
	Control	12.16 $\pm$ 27.61	11.96 $\pm$ 26.65	0.528
	P**	0.236	0.002	
Subjective norms	Experimental	3.44 $\pm$ 15.66	1.96 $\pm$ 13.18	< 0.001
	Control	3.28 $\pm$ 16.35	2.96 $\pm$ 16.28	0.904
	P	0.938	0.002	
Perceived behavioral control	Experimental	4.80 $\pm$ 14.94	5.59 $\pm$ 14.88	0.702
	Control	5.43 $\pm$ 16.41	5.68 $\pm$ 15.78	0.574
	P	0.131	0.382	
Intention	Experimental	4.82 $\pm$ 10.46	5.30 $\pm$ 8.70	< 0.001
	Control	4.81 $\pm$ 10.78	4.91 $\pm$ 11.01	0.233
	P	0.690	0.012	< 0.001

\*Wilcoxon test; \*\*Mann-Whitney test  
SD: Standard deviation



**Table 3.** Comparing hookah smoking behavior between intervention and control groups before and after the intervention

Groups	Before intervention [n (%)]	After intervention [n (%)]	P*
Intervention	8 (14.8)	16 (29.6)	0.039
Control	18 (32.1)	16 (28.5)	0.375
P**	0.535	0.027	

\*McNemar test; \*\*Chi-square test

## Discussion

The results of this study showed that a significant decrease in the mean score of positive attitude towards hookah smoking was observed after the intervention in the experimental group compared to the control group. This reduction in the mean score was achieved by loading the educational clips, weakening the positive beliefs about hookah, and strengthening the negative beliefs about the destructive physio-psycho-social effects of hookah smoking in people consuming it. These findings indicate the effect of web-based educational interventions on strengthening the negative attitude towards hookah use in the intervention group. Besides, the results of studies conducted by Heidarnia et al.<sup>21</sup> and Curtis<sup>22</sup> showed that e-learning led to a negative attitude towards smoking. Moreover, the results of this part of the study were consistent with the findings of Fathi et al.<sup>18</sup> on the effectiveness of TPB-based intervention in creating a negative attitude towards drugs. Since changing adolescents' attitudes toward smoking is the first step in the process of preventing addictive behaviors, researchers need to be aware of these factors when designing interventions. The findings of this study showed that there was a significant difference between the experimental and control groups in the score of subjective norms encouraging hookah smoking after the intervention. That is, after the intervention, the score of the subjective norms encouraging hookah use had a significant decrease in the intervention group compared to the control group, which was consistent with the results of other studies.<sup>12,23,24</sup> Since hookah is a collective phenomenon, one of the factors that have a significant impact on hookah smoking is the role of friends and family.<sup>25</sup>

In this study, 33.8% and 42.8% of students in the experimental and control groups, respectively, had a hookah-consuming friend. Khani Jaihooni et al. found that the probability of increasing hookah smoking among students who had a hookah-

smoking friend or classmate was 10 times higher. Lack of adequate skills, such as the ability to say no to the friend's offer, seems to be one of the main reasons for the willingness to smoke.<sup>26</sup>

Therefore, designing and implementing interventions is recommended to reduce the subjective norms that encourage smoking. Other findings of the present study showed that the score of intention of hookah smoking after the educational intervention had a significant statistical decrease in the intervention group compared to the control group, which was consistent with the other studies.<sup>27,28</sup> In a study by Lipkus et al., about 62% of people who were trained on the dangers of hookah intended to quit hookah consumption.<sup>29</sup> Thus, the intention seems to be a good predictor of behavior.

In the present study, there was no significant difference between the score of the perceived behavioral control structure among the participants in the two groups of intervention and control before the study, which was consistent with the findings of another study,<sup>18</sup> but contradicted the findings of the study by Gilchrist et al.<sup>30</sup> Perhaps the reason for the difference between the results of the present study and this study is the longer follow-up period of 15 months to examine the effects of educational intervention on the perceived behavioral control variables. The findings of the present study showed that the rate of intention to use hookah after educational intervention in the intervention group decreased compared to the control group, which was consistent with the other studies.<sup>31-34</sup>

## Conclusion

The results emphasize the need for web-based interventions because of the cost-effectiveness and feasibility of implementing interventions. Web-based education overcomes some of the barriers to face-to-face education and provides more flexibility for learning. Moreover, implementing the TPB-directed instructional sessions resulted in preventing tobacco smoking in the students.

**Limitations:** To the educational calendar as well as the educational level of the target group students, it was not possible to extend the follow-up period.

### Conflict of Interests

The Authors have no conflict of interest.

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### Authors' Contribution

Participated in the study designing: SB, MB, MK, BH and EE; participated in data collection: EE; participated in the data analysis: SB, MK and EE; wrote the manuscript: SB and EE.

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## بررسی اثربخشی مداخله آموزشی مبتنی بر وب در پیشگیری از مصرف قلیان در دختران نوجوان در غرب ایران: کاربرد الگوی تئوری رفتار برنامه‌ریزی

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### مقاله پژوهشی

### چکیده

**مقدمه:** شیوع قلیان در سراسر جهان و در همه گروه‌های سنی به ویژه در بین دختران رو به افزایش است. بنابراین، پژوهش حاضر با هدف تعیین تأثیر مداخله آموزشی مبتنی بر وب در پیشگیری از مصرف قلیان با استفاده از نظریه رفتار برنامه‌ریزی شده در بین دختران در کرمانشاه انجام شد.

**روش‌ها:** این مطالعه از نوع کارآزمایی تصادفی کنترل شده بود که بر روی ۱۱۰ دختر نوجوان در شهر کرمانشاه در سال ۱۳۹۹ انجام گردید. در تحقیق حاضر، از نمونه‌گیری تصادفی چند مرحله‌ای استفاده شد. ابزار جمع‌آوری اطلاعات شامل پرسش‌نامه محقق ساخته بود. مداخله طراحی شده برای گروه مداخله در ۵ جلسه آموزشی با توجه به تحلیل نتایج قبل از آزمون اجرا و داده‌ها سه ماه پس از پایان مداخله آموزشی جمع‌آوری گردید. در نهایت، داده‌ها در نرم‌افزار SPSS مورد تجزیه و تحلیل قرار گرفت.

**یافته‌ها:** مداخلات ارایه شده به طور قابل توجهی ساختار نگرش ( $P < 0/001$ )، هنجارهای ذهنی ( $P < 0/001$ ) و قصد ( $P < 0/001$ ) را در گروه مداخله در مقایسه با گروه شاهد بهبود بخشید. با این حال، تفاوت بین نمره کنترل رفتاری درک شده در دو گروه معنی‌دار نبود ( $P = 0/131$ ). همچنین، تفاوت معنی‌داری در کاهش رفتار مصرف قلیان بین گروه مداخله و شاهد پس از مداخله آموزشی وجود داشت.

**نتیجه‌گیری:** استفاده از مداخلات مبتنی بر وب، استراتژی آموزشی خوبی به منظور پیشگیری از مصرف قلیان در دختران نوجوان می‌باشد.

**واژگان کلیدی:** نوجوان؛ دختران؛ آموزش؛ مصرف دخانیات

**ارجاع:** بشیریان سعید، براتی مجید، کرمی منوچهر، حمزه بهروز، عزتی الهه. بررسی اثربخشی مداخله آموزشی مبتنی بر وب در پیشگیری از مصرف قلیان در دختران نوجوان در غرب ایران: کاربرد الگوی تئوری رفتار برنامه‌ریزی. مجله اعتیاد و سلامت ۱۴۰۰؛ ۱۳ (۴): ۲۶۷-۲۵۹.

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