

Original Paper

Predicting Tobacco Use Based on the Theory of Planned Behavior in Adolescent Girls



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ABSTRACT

Introduction: Tobacco use poses a serious threat to global health. The tobacco epidemic is spreading in low- and middle-income countries, where the tobacco industries mainly target young people and women.

Objective: This study aims to determine the predictors of tobacco use based on the Theory of Planned Behavior (TPB) in female high school students.

Materials and Methods: This cross-sectional study was conducted on 340 female high school students aged 14-18 in Rasht City, Iran, who were selected using a multi-stage sampling method. The data collection tool was the TPB questionnaire for tobacco use in Persian. The obtained data were analyzed using the Mann-Whitney U test, Kolmogorov-Smirnov test, Spearman correlation test and logistic regression analysis.

Results: The TPB constructs of attitude (OR=0.91, 95%CI: 0.85-0.97, P=0.007) and behavioral intention (OR=0.75, 95%CI: 0.64-0.88, P=0.001) could predict cigarette smoking. Also, constructs of perceived behavioral control (OR=0.92, 95%CI: 0.87-0.97, P=0.007), subjective norms (OR=0.83, 95%CI: 0.70-0.97, P=0.02), and behavioral intention (OR=0.88, 95%CI: 0.78-0.99, P=0.03) could predict hookah smoking in girls students.

Conclusion: Considering the predictive power of the TPB constructs in tobacco use by adolescent girls, it is possible to plan to reduce its rate in this group by a focus on the TPB constructs.

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Highlights

- Tobacco use is increasing in low- and middle-income countries.
- Theory of planned behavior can predict tobacco use in female high school students.
- The behavioral intention construct of the theory of planned behavior was the strongest predictor of tobacco use in female high school students.

Plain Language Summary

Tobacco use is a serious threat to global health, killing many people around the world every year. Unfortunately, we are witnessing an increase in tobacco use for various reasons among young people and women. Since tobacco use is a behavior, recognizing the predictive factors of this behavior can significantly help in future planning to reduce it. In this regard, health education models such as the theory of planned behavior can be used to study the predictors of tobacco use. The present descriptive-analytical study was conducted to determine the predictors of tobacco use based on this theory in female high school students in Rasht City, Iran. According to the study findings, the constructs of this theory can predict tobacco use. The constructs of attitude and behavioral intention were the predictors of cigarette smoking, while the constructs of perceived behavioral control, subjective norms, and behavioral intention were the predictors of hookah smoking. Further analytical research is recommended to knowing more precisely the causes of tobacco use, and then proper planning can be developed to reduce its rate.

Introduction

Smoking tobacco poses a serious threat to global health. According to the World Health Organization, about 8 million people worldwide die each year from smoking. In 2012, 3.1 billion people over the age of 15 in the world had smoked tobacco, and if the prevalence of tobacco smoking remains stable, this figure will almost double by 2025 [1]. Over the past three decades, the rate of tobacco smoking has decreased significantly in industrialized countries due to increasing awareness of its side effects and effective control policies, while there has been an increase in its prevalence in developing countries [2]. More than 80% of smokers live in low- and middle-income countries. The tobacco industry in these countries mainly targets young people and women. Although in many countries, women do not traditionally smoke, the target of current tobacco ads is mainly women. From 2005 to 2025, the number of women smokers is expected to double, especially in low- and middle-income countries. In 2018, 3.5% of women and 24.5% of men aged >15 years smoked tobacco in Iran [1].

Tobacco smoking has various types in Iran, including cigarette smoking and hookah smoking. Adolescents are more likely to smoke and are less aware of the consequences of their behavior, and less likely to quit smok-

ing [3]. The results of a study on high school students in Tabriz City, Iran, showed that 5.9% of students smoke cigarettes, and 5% hookah regularly [4]. In another study on medical students in southern Iran, most students reported their first experience of smoking tobacco at the age of 15-20 years, and the majority had hookah smoking with their friends [5]. The main reasons for smoking hookah and cigarettes were entertainment and fun. The results of a study on students of Tehran University of Medical Sciences, Tehran City, Iran, showed that 29% smoked hookah. Also, the most important factors in the tendency to smoke hookah were filling leisure time, being affordable, reducing anxiety, relieving fatigue, being accessible, and having hookah user friends [6].

In identifying the predictors of smoking behavior, factors such as attitudes, subjective norms, intentions, and perceived behavioral control can be influential [7]. To investigate these factors, health education and behavior change models are very helpful [8, 9]. These factors are constructs of the theory of planned behavior (TPB), which seems to be a suitable model for a better understanding the predictors of smoking behavior [10]. This theory is one of the theories of behavior change. It states that intention is the main determinant of human behavior. It is a mental and social situation and creates a link between the individual and her/his action, which is under the influence of three independent constructs of attitude, subjective norms, and perceived behavioral control.

Attitude is a person's positive or negative evaluation of behavior. Subjective norms suggest that perceived social pressures may or may not cause a person to engage in certain behaviors. Finally, perceived behavioral control is the perceived ease/difficulty of successfully performing a particular behavior and is thought to, directly and indirectly, affect the behavior. Individuals evaluate a behavior positively and intend to do it when they believe that important, influential people in their life approve the behavior and that the behavior is under their control [9].

Regarding that the theories of behavior change are variables based on the cultural and social context of society, we found that few studies have been conducted to identify the factors affecting smoking behavior in adolescent girls living in Guilan Province of Iran. Thus, we aimed to determine the predictors of smoking based on the TPB in female high school students in Rasht City, Iran.

Materials and Methods

This cross-sectional study was performed on female high school students aged 14-18 years in Rasht, Iran. Based on the study by Najafi et al. [11], who reported the prevalence of smoking in students as 18%, considering a precision of 5% and a confidence level of 95%, the sample size was calculated 340. The research samples were selected with a multi-stage sampling technique. In the first stage, from each of the two education districts of Rasht city, 5 clusters were randomly selected. Then, proportional to the population of the two districts, 53% of the samples were selected from one district and 47% from the other one. In each of the schools, 20% of the sample size related to each district was selected by systematic sampling method using the list of students in the school management office. The inclusion criteria were being a female high school student in Rasht and having a willingness to participate in the study. Sampling was done from October to December 2016. By referring to the selected schools and coordinating with the school principal, one classroom was selected in each grade. From each classroom, 12 students were selected randomly. If a selected student wanted to leave the study, she would be replaced with another eligible one in the classroom.

The data collection tools were a demographic form and the TPB questionnaire for tobacco use developed by Karimy et al. [12] in Persian. In this questionnaire, 14 items are related to the construct of attitude toward the behavior scored on a 5-point Likert scale (from 1=strongly agree to 5=strongly disagree) except for items 7, 8, and 12, which have reverse scoring. Also, 7 items are

related to the construct of perceived behavioral control scored on a 5-point Likert scale (from 1=extremely likely to 5=extremely unlikely) except items 5, 6, and 7, which have reverse scoring. Another 5 items are related to the construct of subjective norm scored on a 5-point Likert scale (from 1=strongly agree to 5=strongly disagree) with a total score ranging from 5 to 25. Finally, 7 items are related to intention to perform the behavior scored on a 4-point Likert-type scale (from 1=I definitely will to 4=I definitely will not) with a total score ranging 7-28.

Each student should have completed the questionnaire individually in the absence of school staff. The collected data were analyzed in SPSS v. 21. Descriptive statistics (Mean±SD, percentage) were used for describing data. The normality of data distribution was assessed with the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare the construct scores of the TPB questionnaire for smoking. Logistic regression analysis was used to determine the matched odds ratio at a 95% confidence interval for each variable in predicting smoking behavior, and the Spearman correlation test was used to determine the correlation between the TPB constructs. The significance level was set at 0.05.

Results

About 12% of the students answered yes to the question of "Have you ever tried smoking cigarettes?". However, 1.5% answered yes to the question of "Are you currently smoking cigarettes?". About 41% answered yes to the question of "Have you ever tried smoking hookah?". But 5% answered yes to the question "Have you smoked cigarettes in the past three months?". The Mean±SD score of attitude construct was 57.2±8.1 out of 70. The Mean±SD score of the perceived behavioral control construct was 29.3±3.4 out of 35. The Mean±SD score of subjective norms was 23±2.3 out of 25, and the Mean±SD score of behavioral intention was 25.2±3.1 out of 28. In examining the difference in the mean scores of TPB constructs for smoking, those who answered "No" to the questions had a higher mean score than those who answered "Yes", and this difference was statistically significant ($P=0.01$) (Table 1).

The results of the Spearman correlation test showed a significant correlation between attitude and perceived behavioral control constructs of TPB ($r=0.47$, $P=0.01$). There was a significant negative relationship between the construct of behavioral intention and the four items related to smoking ($P=0.01$), including experience of cigarette smoking ($r=-0.348$), the experience of hookah smoking ($r=-$

Table 1. Comparison of the mean scores of Theory of Planned Behavior (TPB) constructs and four items related to smoking

Variables	Mean±SD		Sig.*	
	Yes	No		
Experience of hookah smoking	Attitude	7.2±59.5	7.2±59.5	0.001
	Perceived behavioral control	31.2±4.1	31.2±4.1	0.001
	Subjective norms	24.2±1.7	24.2±1.7	0.001
	Behavioral intention	26.6±1.9	26.6±1.9	0.001
Experience of cigarette smoking	Attitude	59.2±6.9	59.2±6.9	0.001
	Perceived behavioral control	30.6±4.6	30.6±4.6	0.001
	Subjective norms	24.1±1.7	24.1±1.7	0.001
	Behavioral intention	26.5±2.04	26.5±2.04	0.001
Current cigarette smoking	Attitude	57.9±8.4	57.9±8.4	0.004
	Perceived behavioral control	30.1±5.1	30.1±5.1	0.001
	Subjective norms	23.9±1.9	23.9±1.9	0.004
	Behavioral intention	26.07±2.8	26.07±2.8	0.001
Cigarette smoking in the past three months	Attitude	58.6±7.6	58.6±7.6	0.001
	Perceived behavioral control	30.4±4.8	30.4±4.8	0.001
	Subjective norms	24.1±1.8	24.1±1.8	0.001
	Behavioral intention	26.3±2.3	26.3±2.3	0.001

* Mann Whitney U Test.

0.271), current cigarette smoking ($r=-0.195$), and cigarette smoking in the past three months ($r=-0.361$) (Table 2).

The logistic regression model of the experience cigarette smoking showed that, if the effect of other TPB constructs remained constant, the increase in the attitude ($P=0.007$, 95%CI: 0.85-0.97, OR=0.91) and behavioral intention (OR=0.75, 95%CI: 0.64-0.88, $P=0.001$) could reduce the risk of smoking cigarette in the students. The other two constructs of perceived behavioral control and subjective norms could not predict smoking in them. Logistic regression model of the experience of hookah smoking showed that, if the effect of other TPB constructs remained constant, the increase in perceived behavioral control ($P=0.007$, 95%CI: 0.87-0.97, OR=0.92), subjective norms ($P=0.02$, 95%CI: 0.70-0.97, OR=0.83), and behavioral intention ($P=0.03$, 95% CI: 0.78 - 0.99, OR=0.88) could reduce the risk of smoking hookah in female students. The attitude construct could not predict hookah use (Table 3).

Discussion

This study aimed to determine the predictive factors of smoking based on the TPB in female high school students. Many students had previously tried cigarette smoking, had smoked cigarettes in the past three months, and were currently smoking cigarettes and hookah. Najafi et al., in a study in high schools in Rasht, reported the prevalence of cigarette smoking for the first time as 18.3% in boys and 12.3% in girls [11]. Haghdoost et al., in a meta-analysis of Iranian university students during 2001-2011, reported the prevalence of cigarette smoking in male and female students as 19.8% and 2.2%, respectively [13]. In the study by Atai Asl et al. on high school students in Tabriz City, it was also found that 5.9% of students smoked cigarettes regularly, 15.4% had the experience of cigarette smoking, 33.5% had the experience of hookah, and 5% smoked hookah regularly [4]. Zebhi's study on the students of Guilan University of Medical Sciences also showed that 4.9% smoked a cigarette and 30.22% smoked hookah [14].

Table 2. The correlation matrix between the Theory of Planned Behavior (TPB) constructs and four items related to smoking

Variables	Outcomes							
Attitude	1							
Perceived behavioral control	0.470*	1						
Subjective norms	0.396*	0.249*	1					
Behavioral intention	0.424*	0.441*	0.266*	1				
Experience of cigarette smoking	0.350*	0.309*	-0.342*	-0.348*	1			
Experience of hookah smoking	0.196*	0.285*	-0.267*	-0.271*	0.263*	1		
Current cigarette smoking	0.196*	0.200*	-0.176*	-0.195*	0.376*	0.157*	1	
Cigarette smoking in the past three months	0.340*	0.315*	-0.322*	-0.361*	0.615*	0.257*	0.483*	1

* Spearman correlation coefficient, $P < 0.01$.

The results of Miri Moghaddam's study also confirmed that hookah use was higher than cigarette smoking in medical students in southern Iran and the majority of students mentioned the first experience of tobacco use

around the age of 15-20 years [5]. According to these studies and the present study, tobacco use (especially hookah) is common in students in different parts of Iran (mostly start at school age). Meanwhile, in industrial-

Table 3. Adjusted Odds Ratio (OR) of tobacco smoking based on the Theory of Planned Behavior (TPB)

Dependent variable	Predictor	Wald	Sig.	SE	95%CI		OR
					Lower	Upper	
Experience of hookah smoking	Attitude	0.32	0.74	0.018	0.96	1.04	1.006
	Perceived behavioral control	-2.70	0.007	0.030	0.87	0.97	0.92
	Subjective norms	-2.23	0.02	0.002	0.70	0.97	0.83
	Behavioral intention	-2.13	0.03	0.060	0.78	0.99	0.88
Experience of cigarette smoking	Attitude	-2.71	0.007	0.034	0.85	0.97	0.91
	Perceived behavioral control	0.65	0.51	0.045	0.93	1.15	1.03
	Subjective norms	-0.61	0.54	0.118	0.74	1.16	0.93
	Behavioral intention	-3.41	0.001	0.084	0.64	0.88	0.75
Current cigarette smoking	Attitude	-0.47	0.64	0.086	0.80	1.14	0.96
	perceived behavioral control	-1.10	0.2	0.126	0.69	1.1	0.87
	subjective norms	-0.48	0.63	0.196	0.61	1.3	0.91
	behavioral intention	-0.48	0.39	0.338	0.58	1.2	0.85
Cigarette smoking in the past three months	Attitude	-2.17	0.03	0.085	0.69	0.98	0.83
	Perceived behavioral control	0.37	0.7	0.106	0.83	1.3	1.04
	Subjective norms	-0.07	0.9	1.664	0.65	1.4	0.89
	Behavioral intention	-2.25	0.02	0.177	0.46	0.94	0.67

ized countries, the prevalence of tobacco consumption is decreasing [1]. In these countries, the replacement of traditional tobacco (cigarettes and hookahs) with other forms of substances such as electronic cigarettes [15, 16] or marijuana [17] is common.

The present study results showed that the mean scores of TPB constructs in students who did not have a history of tobacco use were significantly higher than those with a history of tobacco use. There was also a significant positive relationship between the constructs of TPB in them. In cigarette smoking, attitude and behavioral intention constructs had higher predictive power than other constructs. In hookah use, the constructs of perceived behavioral control structures, subjective norms, and behavioral intention had a higher predictive power. In other words, the TPB can predict tobacco use. Karimy et al. also found that all constructs of the TPB help predict cigarette smoking behavior, especially perceived behavioral control and attitude [10]. Topa et al. also reported that the TPB is a good predictor of tobacco use. According to them, behavioral intention and perceived behavioral control could predict smoking behavior, and the behavioral intention was a stronger one. Attitude, subjective norms, and perceived behavioral control could predict behavioral intention, where attitude had a weaker effect [18]. Joveini et al. found a significant relationship between attitude and the intention to quit or continue hookah use in the future. It means that by increasing positive attitude towards hookah use, the intention to quit decreases [19]. Su et al. also found that all constructs of TPB were significantly related to cigarette smoking behavior and intention, and a positive psychological attitude towards cigarette smoking was significantly associated with cigarette smoking behavior and intention [20]. Tapera found that the construct of TPB predicted tobacco use, and students who had a positive attitude towards cigarette smoking were more likely to smoke [8].

In the present study, perceived behavioral control and subjective norms could not predict cigarette smoking compared to the studies mentioned above. This discrepancy may be related to the difference in the number of samples that smoke. Their number was lower compared to the number of samples in above mentioned studies. Moreover, it may be because only female students participated in our study. Culturally, tobacco use by girls is perceived as a more inappropriate behavior than by boys in Iran, and subjective norms are stricter for girls. Hence, cigarette smoking in girls is less than in boys, which may influence the outcome. The reason that attitude construct could not predict hookah smok-

ing in the present study is that the obscurity of hookah smoking in Iranian society is less than cigarette smoking, and the use of hookah as a recreational pastime is more common among adolescents and families.

Because of the increasing prevalence of tobacco use in adolescent students in Iran, and since adolescence is the age of psychological development and the beginning of many high-risk and substance-use behaviors, it is necessary to devise special programs and plans for this stage of life to investigate the factors that cause this behavior in adolescents. The TPB can be used to identify the predictors of tobacco use. For example, by adequately informing the mass media and social media about the complications of smoking, a negative attitude towards this issue can be created. Also, by teaching life skills (especially the skill of saying no) to adolescents, their perceived behavioral control can be strengthened. By creating healthy recreational environments within families and friends with easy access to leisure facilities (e.g., swimming pools, libraries, playgrounds), appropriate options for filling leisure time and discharging the energy of adolescents can be created.

As one of the limitations of the present study, it was conducted only in public schools in Rasht, which may not be generalizable to all female adolescents. Hence, further studies are recommended in other parts of the country. Since this study was cross-sectional, analytical and interventional studies are recommended to examine the predictors of tobacco use more closely.

Ethical Considerations

Compliance with ethical guidelines

This study obtained its ethical approval from the Research Ethics Committee of Guilan University of Medical Sciences (Code: IR.GUMS.REC.2016.126).

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Authors' contributions

Conceptualization, methodology, and writing – original draft: Maryam Ghasemipour, Rabiollah Farmanbar, Parisa Kasmaee, and Sima Nickandish; Resources: Maryam Ghasemipour; Editing, review, and data analysis:

Zahra Atrkar Roshan and Maryam Ghasemipour; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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