Smoking Behavior Among Students: Using Health Belief Model and Zero-Inflated Ordered Probit Model

Amin Ghanbarnejad1*, Atefeh Homayuni2, Zahra Hosseini3*, Abdolhossain Madani4

1Department of Public Health, School of Health, Tobacco and Health Research Center. Hormozgan University of Medical Sciences, Bandar Abbas, Iran
2Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
3Tobacco and Health Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
4Department of Public Health, School of Health, Social Determinants in Health Promotion Research Center, Research Institute for Health, Hormozgan University of Medical Sciences. Bandar Abbas. Iran

Abstract

Background: Smoking is increasing among adolescents and young adults. Adolescents’ smoking can predict frequent smoking in early adulthood. This study aimed to explore the predictors of smoking among high school students using health belief model (HBM).

Materials and Methods: In this cross-sectional study conducted in 2019 in Bandar-Abbas city, South of Iran, 444 male high-school students aged 15-19 years (mean age: 16.7 ± 0.85) were explored. Data were collected using a researcher-made questionnaire consisted of two main sections: socio-demographic characteristics and HBM constructs. The zero-inflated ordered probit (ZIOP) model was adopted for investigating the association between HBM constructs and smoking behavior.

Results: Results indicated that 82% of the participants never smoked cigarette. The results of ZIOP model showed that the knowledge (P = 0.026), susceptibility (P < 0.001), severity (P = 0.035), benefits (P = 0.004), and cues to action (P = 0.019) had significant effects on smoking cigarette after being adjusted for other covariates (i.e., age, parents’ education, losing one of the parents). Moreover, having a smoker friend was found to be an inflation factor (P < 0.001). Adolescents with smoking friends were 44% less likely to avoid smoking.

Conclusion: It was concluded that having a smoker friend, knowledge, susceptibility, severity, benefits, and cues to action had considerable predictive capacity for predicting smoking attitude. Therefore, it was recommended that these factors should be seriously considered when designing educational programs with the aim of reducing adolescent smoking.

Keywords: Adolescents, Health belief model, Smoking, Students, ZIOP model

Introduction

Smoking is a public health challenge worldwide due to its public accessibility (1). It is a leading cause of morbidity and mortality worldwide (2). Six million people die due to tobacco smoking every year. Over 600 thousand of this six million people are passive smokers who do not smoke cigarettes regularly, and over five out of six million are those who smoke tobacco (3). Many studies have already documented the negative role of cigarette smoking in producing adverse health-related outcomes (e.g., several types of cancer and chronic diseases) as well as in placing great economic burden on families and healthcare system (4).

It has been estimated that one billion young adults start smoking by 2030. The prevalence of daily cigarette smoking in Iran is roughly 12.5% (23.4% for men and 1.4% for women) and the average rate is 13.7 cigarettes per day (5).

In the last two decades, the adolescents have been exposed to more tobacco advertisement and marketing, and most smokers have been reported to start smoking before the age of 18 (6).

The prevalence of smoking among adolescent and young adult varies in different regions of the world. In Iran, the prevalence of monthly smoking among high school students varies from 2.7% to 20% (7). Studies have shown that those who initiate smoking at a young age have more nicotine dependency and more difficulty quitting it in adulthood (8).

Initiation of smoking in adolescents cannot be attributed to a single reason. Cigarette smoking is a complex behavior associated with psychosocial, economic, and cultural factors. Different risk factors have been identified in various scientific sources useful for predicting smoking

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attitude among adolescents, such as lack of awareness about addictiveness of cigarette smoking and its impact on health, perceived social acceptance due to smoking, life problems, peer pressure, socioeconomic conditions, family history of tobacco use, tobacco advertisement, smoking friends, stressful life events, dysfunctional family and weak parent-child relationship, low self-esteem, high level of negative emotion, weak problem-solving skill, low self-efficacy, depression, anxiety, weak self-control, low psychological well-being, and risk-taking tendency (6, 9-11).

The identification of contextual factors resulting in tendency to cigarette smoking has been recognized as an important step toward designing interventional programs in order to prevent smoking. Researchers in developed countries have constantly emphasized the significance of preventing cigarette smoking among adolescents. Furthermore, several programs have been developed and implemented to prevent cigarette smoking among adolescents. These programs have largely aimed at increasing awareness, changing attitude, and affecting students’ behavior; however, only some of them have produced desired effect (12). Literature review shows that the health belief model (HBM) has been effective in improving the adoption of behaviors appropriate for preventing cigarette smoking. According to this model and in order for adopting smoking prevention behaviors, the individuals go through couple of stages. They need to: firstly, feel threatened against the problem (infected with cigarette smoking or exposure to its smoke) (perceived susceptibility); secondly, perceive the depth of this danger and the seriousness of its various physical, social, mental, and economic side effects (perceived severity); thirdly, believe that the smoking prevention program is beneficial and executable (perceived benefits) by receiving positive signs from the surrounding environment or their internal environment (cues to action); then, find out that the factors preventing this action are less expensive than its benefits (perceived barriers); and finally, feel capable and strong enough to remove the barriers of the behavior (self-efficacy). After passing through the given stages, then they can finally succeed in following the preventive behaviors toward smoking (13). The results have shown that a high level of perceived susceptibility and high self-efficacy can reduce smoking among individuals. Moreover, perceived barriers and self-efficacy can play important roles in predicting health behaviors including the prevention of smoking among university students (14). Given the harmful consequences of smoking for adolescents, recognizing its predictors and preventing it from happening prove useful in promoting adolescents’ physical, mental, and social health. This study, therefore, aimed to explore the predictors of smoking among students by using the HBM as well as the zero-inflated ordered probit (ZIOP) model.

Objectives
This study aimed to investigate the predictors of smoking among high school students in Bandar Abbas, Iran, by using HBM.

Materials and Methods
Participants
In this cross-sectional study, 444 male high-school students were selected using the stratified sampling design. The formula \( n = \frac{2z_{\alpha/2}^2 \cdot \sigma^2}{d^2} \) was used and the following were assumed: the first type of error = 0.05; test power = 0.8; standard deviation = 3 and \( d = 0.8 \); and \( n = 222 \) individuals. Since this study mainly aimed to compare the predictors of smoking in two groups of smokers and non-smokers based on HBM, the total sample size was determined to be 444 individuals.

The study was carried out in Bandar-Abbas city, the provincial capital of Hormozgan province located in south of Iran. This city is divided by two educational wards by administrative division. Four boy’s schools were random selected from each ward. Finally, the students were selected according to the number of them in the schools. Inclusion criteria were: male high-school students in the sixth to twelfth grades and willingness to participate in the study. The only exclusion criterion was a failure to complete the questionnaire. Prior to study initiation, the procedures and purpose of the study were explained to the participants and they were assured about the confidentiality of their information; then they were asked to enter the study only if they wished to.

Questionnaires
A researcher-made questionnaire was used to assess smoking behavior and HBM constructs. The questionnaire consisted of two main sections: Socio-demographic characteristics and HBM constructs. The HBM constructs included questions about the following information: knowledge about consequences of smoking (10 questions), perceived susceptibility (7 questions), perceived severity (9 questions), perceived barriers (5 questions), perceived benefits (5 questions), cues to action (4 questions), and self-efficacy in combating the temptation of smoking (6 questions).

The knowledge questions were scored on a binary scale: 1 for correct answer and 0 for wrong answer. Other constructs’ questions were scored on a five-point Likert scale from 1 as “strongly disagree” to 5 as “strongly agree.” Therefore, the scoring range of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy were 7-35, 9-45, 5-25, 1-15, 4-20, and 6-30, respectively.

The questionnaire was designed using the sources and articles. Then the validity of the questions was assessed using expert panel, and the reliability was examined adopting Cronbach’s alpha and test-retest method.
Cronbach’s alpha was 0.83 and intraclass correlation coefficient (ICC) for test-retest was 0.78.

**Statistical Analysis**

Demographic characteristic of participants such as age, parents’ education, parents’ job, and death of parents were examined in the study. The response variable is smoking behavior categorized in five ordered groups as follows: 0: Non-smoker, 1: once in lifetime, 2: ex-smoker, 3: once per month, 4: once per week.

Variables considered in the modeling as covariates were knowledge, susceptibility, severity, barriers, self-efficacy and cues to action, the constructs of the HBM.

Descriptive statistics were reported as mean ± SD for quantitative variables, as well as count and percent for categorical variables. The one-way ANOVA was used to compare the mean of each construct among response variable categories for univariate analysis. The approach to modeling the data was ZIOP model. The ZIOP model is a two-component mixture model consisting of a binary probit regression at zero mixed with an ordered probit regression. The binary probit regression part is used to identify the smokers from non-smokers, and the ordered probit regression is used to model the level of smoking count among the smokers. Let $c_i=1$ if the i-th adolescent belongs to the smoker group or let $c_i=0$ otherwise. $c_i$ is related to a latent variable $c_i^*$ if the following conditions exist: $c_i=0$ for $c_i^*<0$ and $c_i=1$ for $c_i^*>0$. The latent variable $c^*$ characterizes the propensity of adolescent’s smoking and is determined by:

$$c_i^* = x_i^T \beta + \epsilon_i, \quad i = 1, 2, ..., n$$

where $x_i^T = (x_{i1}, x_{i2}, ..., x_{ik})^T$ represents the vector of k covariates affecting the propensity of adolescent’s smoking and the coefficients vector is represented by $\beta = (\beta_1, ..., \beta_k)^T$. The error term $\epsilon_i$ is independent and is identically distributed as standard normal distribution. The probability of an adolescent smoking cigarette is determined by:

$$\Pr(c_i = 1 | x_i) = \Pr(c_i^* > 0 | x_i) = \Phi(x_i^T \beta)$$

where $\Phi(\cdot)$ represents the standard normal distribution function. Providing that $c_i=1$, the observed smoking levels $y_i^*$ are modeled using an ordered probit model; these levels may also include 0. $y_i^*$ is linked to a latent variable $y_i^*$ through a function $f(y_i^*)$. $y_i^*$ is given by:

$$y_i^* = z_i^T \theta + u_i, \quad i = 1, 2, ..., n$$

where $z_i^T = (z_{i1}, z_{i2}, ..., z_{ik})^T$ represents covariates in ordered probit regression part of the model along with the associated coefficients of $\theta = (\theta_1, ..., \theta_k)^T$; $x$ and $z$ could differ. The random error term $u_i$ is distributed as standard normal. The connection between $y_i^*$ and $y_i^*$ is obtained by:

$$y_i' = f(y_i^*') = \begin{cases} 0, & \text{if } y_i^* \leq 0 \\ 1, & \text{if } \mu_{i0} < y_i^* \leq \mu_i \\ 2, & \text{if } \mu_{i0} < y_i^* \leq \mu_i \\ 3, & \text{if } \mu_{i0} < y_i^* \leq \mu_i \\ 4, & \text{if } y_i^* > \mu_i \end{cases}$$

where $\mu$s are boundary parameters that must be estimated together with the parameters vector $\theta$. In this model, the probability of five smoking levels is written as follows:

$$\Pr(y_i' = s | z) = \Phi(\mu_{i0} - z_i^T \theta) - \Phi(\mu_{i1} - z_i^T \theta).$$

The observed response variable is $y_i = y_i' \times c_i$. Thus, the zero observation occurs when $c_i=0, y_i' > 0$ (the adolescent having a strong sense to never smoker in the life, belongs to always-zero group) or occurs when $c_i=1, y_i' > 0$ and $y_i' = 0$ (the adolescent is non-smoker only during research period).

In other words, observing a positive, $y_i' > 0$, $y_i$ requires that $c_i=1$ and $y_i' > 0$ jointly. This can be illustrated in the model below:

$$\begin{align*}
y_i = y_i' \times c_i = & \begin{cases} 0, & \text{if } c_i = 0 \text{ or } y_i' = 0 \\ 1, & \text{if } c_i = 1 \text{ and } y_i' = 1 \\ 2, & \text{if } c_i = 1 \text{ and } y_i' = 2 \\ 3, & \text{if } c_i = 1 \text{ and } y_i' = 3 \\ 4, & \text{if } c_i = 1 \text{ and } y_i' = 4 \end{cases}
\end{align*}$$

Therefore, the probabilities in the ZIOP model can be expressed as:

$$\begin{align*}
\Pr(y_i = 0 | x_i, z_i) = & \Phi(x_i^T \beta) \\
\Pr(y_i = s | x_i, z_i) = & \Phi(x_i^T \beta) \Phi(z_i^T \theta) - \Phi(\mu_{i1} - z_i^T \theta)
\end{align*}$$

Because zero outcomes are the summation of zero from the ordered probit model and zero from the probit model, the ZIOP model can constitute the large proportion of zeros. In this study, the ZIOP model was used for investigating the association between HBM constructs and smoking behavior.

Analysis was performed using STATA 15 software. The normality of the HBM constructs was evaluated conducting Shapiro-wilk test, and all variables were detected to be normal at level of 0.05.

**Results**

In this study, 425 male adolescents were investigated. Demographic characteristics of participants are shown in Table 1. Mean age was 16.7 ± 0.85, and the participants were in the 15-19 age range. The smoking behavior categories are presented in Figure 1. Approximately, 82% of the participants had never smoked cigarettes. Therefore, zero-inflated ordinal model was adopted to analyze the data and explain the reason behind excess zeros in outcome variable.
Due to the marginal effect in the inflation part of the model, it was detected that those adolescents with smoking friends were 44% less likely to be never-smokers than those with non-smoker friends. We obtained the 44% by using margins effect.

### Discussion

The present study aimed to predict cigarette smoking among high school students in Bandar Abbas city using the constructs of the HBM. According to our results, nearly 81.8 percent of the participants were non-smokers. Despite the high percentage of non-smokers, using common models like logistic regression or the ordinal regression model failed to produce accurate results. Therefore, the ZIOP model was used in this study.

Our study results revealed that 18.2% of students had prior experience of smoking, which was higher than that found by other studies. According to the results from a study by Al-Zalabani and Kasim (6) exploring the students of Medina in Saudi Arabia, the prevalence of cigarette smoking among adolescents was 15.17%, which was significantly higher among male students (21.3%) and high school students (16.3%). A study by Ghaderi et al also found that the percentage of tobacco use was 4.7% (15). Panahi et al (16) examined the university students and discovered that 23.8% of them had smoked during the research period. Moreover, the results of the study by Mohammadi et al (17) demonstrated that 4.7% of the participants smoked cigarettes on a daily basis, nearly 6.4% of them had smoked in last 30 days, and 34.7% of them had previous experience of smoking at least once in their lifetime. There are several underlying reasons why adolescents like students explored in our study start smoking, the most important of which are ostentation and enjoyment. Curiosity about testing cigarettes, which is often encouraged by friends and peers, can also be a cause for smoking. Furthermore, some adolescents smoke in order to indicate disagreement with their family and eliminate humiliation; they want to boost their self-confidence in this way.

Due to the marginal effect in the inflation part of the model, it was detected that those adolescents with smoking friends were 44% less likely to avoid smoking altogether. This finding was in line with the results from the studies by Mohammadi et al (17), Al-Zalabani and Kasim (6), Karimy et al (18), Ghaderi et al (15), and Kasim (6), Karimy et al (18), Ghaderi et al (15).
and Villanti et al (19). According to Al-Zalabani and Kasim (6), there was a 12.5-fold increase in the risk of cigarette smoking among adolescents whose friends were smokers; this risk increased by 5.7 times among those individuals who had some smoking friends. In this age, adolescents are willing to make friends and engage with peers to create social networks. Peer pressure is expected to encourage the adolescents to use tobacco, especially when it is accompanied by the lack of parental support and supervision, family problems, and presence of a smoker family member (10, 20). According to Bandura’s social learning theory, social and interpersonal factors play important roles in committing drug abuse. This theory suggests that adolescents’ beliefs about drug abuse are mostly shaped by role patterns, especially those exhibited by parents and close friends. In other words, communication with parents and friends who use drugs encourages the individual to adopt specific beliefs that, in turn, encourage drug abuse (21).

The results revealed that the mean of perceived severity and perceived benefits among non-smoking students was higher than the mean of these constructs among smokers because the non-smoking students had prior knowledge of the side effects and risks posed by tobacco use as well as the benefits of smoking less cigarettes (Figure 2). Studies have demonstrated that low self-efficacy is a decisive factor contributing to initiation of smoking, determination of the rate of tobacco use, creation of more problems in quitting smoking, and increasing the rates of relapse among adolescents (22). According to our study results, the highest mean of the scores of self-efficacy and cues to action was observed for non-smoking students while the lowest mean of the scores of these constructs was detected for students who smoked once a week, which were in line with the findings from other studies.

The students who were aware of the risks and diseases caused by tobacco use avoided using it. The mean of the perceived susceptibility among these students was higher than that of the perceived susceptibility among smoking students and ex-smokers. The lowest rate of the sense of danger was recorded for students who smoked once a month. Finally, the highest mean of the scores of perceived barriers was recorded for students who smoked once a month and the lowest mean in this regard was reported for non-smokers.

Several studies have found a significant negative relationship between awareness and smoking. In other words, students’ knowledge and awareness of the detrimental effects of smoking have been discovered to lower the smoking rate. This finding is in agreement

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Non-smoker (Mean ± SD)</th>
<th>Once in Lifetime (Mean ± SD)</th>
<th>Ex-smoker (Mean ± SD)</th>
<th>Once Per Month (Mean ± SD)</th>
<th>Once Per Week (Mean ± SD)</th>
<th>Total (Mean ± SD)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>8.79 ± 1.75</td>
<td>8.21 ± 1.74</td>
<td>8.89 ± 1.36</td>
<td>7.88 ± 2.10</td>
<td>5.38 ± 2.56</td>
<td>8.64 ± 1.83</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>29.11 ± 4.96</td>
<td>24.87 ± 5.49</td>
<td>23.11 ± 5.99</td>
<td>18.75 ± 5.47</td>
<td>19.13 ± 5.22</td>
<td>28.08 ± 5.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Severity</td>
<td>37.10 ± 6.52</td>
<td>34.37 ± 6.18</td>
<td>34.56 ± 4.45</td>
<td>30.88 ± 5.11</td>
<td>30.00 ± 6.45</td>
<td>36.46 ± 6.61</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Barriers</td>
<td>5.74 ± 3.53</td>
<td>8.90 ± 3.24</td>
<td>8.78 ± 3.99</td>
<td>10.00 ± 3.51</td>
<td>8.25 ± 3.20</td>
<td>7.79 ± 3.53</td>
<td>0.001</td>
</tr>
<tr>
<td>Benefits</td>
<td>20.66 ± 3.78</td>
<td>19.29 ± 4.96</td>
<td>18.56 ± 3.91</td>
<td>15.88 ± 5.3</td>
<td>13.50 ± 3.38</td>
<td>20.22 ± 4.14</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>25.28 ± 4.59</td>
<td>23.15 ± 4.37</td>
<td>25.00 ± 5.03</td>
<td>23.38 ± 6.19</td>
<td>19.88 ± 4.16</td>
<td>24.88 ± 4.69</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cues</td>
<td>15.16 ± 4.68</td>
<td>13.46 ± 3.04</td>
<td>13.44 ± 3.13</td>
<td>12.88 ± 3.31</td>
<td>11.63 ± 3.34</td>
<td>14.80 ± 4.49</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Figure 2. Mean Score of HBM Constructs in Different Smoking Behavior Categories.
with the results from the studies conducted by Karimy et al (18), Cheng et al (23), and Nasser and Zhang (24); however, they are inconsistent with the results of a study by Mohammadi et al (17). Awareness of the side effects of smoking is a decisive factor that heavily contributes to quitting and preventing smoking. According to the knowledge-attitude-behavior model, a change in behavior requires gaining relevant knowledge, changing relevant attitudes, and implementing correction practices (24). Various studies conducted in Western countries have proven that smoking adolescents generally have lower level of awareness of the consequences and effects of smoking (25). A study by Islam and Johnson (26) exploring the psychosocial correlates of smoking behavior among Egyptian adolescents indicated that knowledge of the short-term negative consequences of smoking protected the females from susceptibility to smoking in the following years.

Studies have also determined a significant negative relationship between perceived susceptibility and smoking. This finding is in line with the results from the studies conducted by Mohammadi et al (17), Tseng et al (27), and Ghasemi and Sabzmakan (28); however, it is inconsistent with the results of a study by Ghaderi et al (15). Perceived susceptibility among adolescents is a significant predictor of starting smoking in the future, practicing it, and current or permanent smoking (29). Ghasemi and Sabzmakan (28) suggested that the perceived susceptibility and severity of the students who had not smoke any kind of tobacco was higher than those of cigarette smokers and hookah consumers. These students were reported to have perceived the risk of smoking-related illnesses and refused smoking. The most important perceptions related to perceived susceptibility among the smoking students in this study included non-addictive nature of smoking, occasional tobacco use, and low sense of danger associated with communication and companionship with consumers. One of the participants in Wolburg's study (30) who was not willing to quit smoking and was not worried about smoking risks stated, “nothing bad will happen to me, then why to bother myself?” Ghaderi et al (15) also found that most students, similarly, had a roughly low perceived susceptibility toward smoking behavior.

Table 3. Results of Parameter Estimates of ZIOP Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Coefficient</th>
<th>Standard Deviation</th>
<th>P Value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td></td>
<td>-0.153</td>
<td>0.184</td>
<td>0.401</td>
<td>-0.514, 0.206</td>
</tr>
<tr>
<td>Father alive</td>
<td>No a</td>
<td>1.106</td>
<td>0.984</td>
<td>0.261</td>
<td>-0.823, 3.034</td>
</tr>
<tr>
<td>Mother alive</td>
<td>No a</td>
<td>1.049</td>
<td>1.128</td>
<td>0.352</td>
<td>-1.162, 3.261</td>
</tr>
<tr>
<td>Father's education</td>
<td>Illiterate a</td>
<td>-0.747</td>
<td>0.732</td>
<td>0.308</td>
<td>-2.182, 0.689</td>
</tr>
<tr>
<td></td>
<td>School education</td>
<td>-1.072</td>
<td>0.732</td>
<td>0.143</td>
<td>-2.507, 0.362</td>
</tr>
<tr>
<td></td>
<td>Associate Degree</td>
<td>-1.005</td>
<td>0.797</td>
<td>0.207</td>
<td>-2.568, 0.557</td>
</tr>
<tr>
<td></td>
<td>BSc and higher</td>
<td>-1.901</td>
<td>0.842</td>
<td>0.024</td>
<td>-3.550, -0.251</td>
</tr>
<tr>
<td>Mother's education</td>
<td>Illiterate a</td>
<td>-0.525</td>
<td>0.490</td>
<td>0.284</td>
<td>-1.485, 0.435</td>
</tr>
<tr>
<td></td>
<td>School education</td>
<td>0.016</td>
<td>0.492</td>
<td>0.975</td>
<td>-0.948, 0.980</td>
</tr>
<tr>
<td></td>
<td>Associate Degree</td>
<td>-0.070</td>
<td>0.605</td>
<td>0.907</td>
<td>-1.257, 1.116</td>
</tr>
<tr>
<td></td>
<td>BSc and higher</td>
<td>-1.036</td>
<td>0.585</td>
<td>0.077</td>
<td>-2.183, 0.111</td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td>-0.171</td>
<td>0.077</td>
<td>0.026</td>
<td>-0.121, -0.021</td>
</tr>
<tr>
<td>Susceptibility</td>
<td></td>
<td>-0.164</td>
<td>0.030</td>
<td>&lt;0.001</td>
<td>-0.222, -0.105</td>
</tr>
<tr>
<td>Severity</td>
<td></td>
<td>-0.067</td>
<td>0.032</td>
<td>0.035</td>
<td>-0.129, -0.004</td>
</tr>
<tr>
<td>Barriers</td>
<td></td>
<td>0.001</td>
<td>0.047</td>
<td>0.978</td>
<td>-0.090, 0.093</td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td>-0.100</td>
<td>0.034</td>
<td>0.004</td>
<td>-0.167, -0.032</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td>-0.028</td>
<td>0.033</td>
<td>0.405</td>
<td>-0.037, 0.092</td>
</tr>
<tr>
<td>Cues to action</td>
<td></td>
<td>-0.124</td>
<td>0.053</td>
<td>0.019</td>
<td>-0.228, -0.020</td>
</tr>
</tbody>
</table>

Inflation Part of the Model

<table>
<thead>
<tr>
<th>Have a smoker friend</th>
<th>No a</th>
<th>Yes</th>
<th>Coefficient</th>
<th>Standard Deviation</th>
<th>P Value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.183</td>
<td>0.236</td>
<td>&lt;0.001</td>
<td>0.721</td>
<td>1.646</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.808</td>
<td>0.200</td>
<td>&lt;0.001</td>
<td>-1.200</td>
<td>-0.020</td>
<td></td>
</tr>
</tbody>
</table>

aReference category.
Other studies, moreover, have discovered a significant negative relationship between perceived severity and smoking. This finding is consistent with the result from a study by Yan et al (31) in which stronger desire for smoking has been observed to be closely associated with lower perceived severity. In the study by Ghasemi and Sabzaman (28), non-smoker students were found more afraid than smoking ones. The most important perceptions related to perceived severity of the smoking and non-smoking students included the lack of acceptance by others, increased likelihood of premature death due to smoking, addiction, high cost of treating diseases caused by tobacco use, inability to perform daily tasks, fear of parents, family and social problems, harming others, and family's pessimism and lack of trust in the individual. On the contrary, Wolburg (30) demonstrated that many smokers who were partially aware of smoking risks reduced the severity and significance of these risks and simply ignored the potential consequences of these risks. Underestimation of smoking risks has also been documented in the study by Romer and Jamieson (32). They found that 40% of the participants underestimated the average number of the years of life lost due to smoking.

The high perceived severity in the present study may have been attributed to the higher awareness of students toward smoking risks.

No significant relationship was observed between perceived barriers and smoking behavior in the present study. This finding was inconsistent with the results from the studies by Ghaderi et al (15) and Mohammadi et al (17). Mohammadi et al (17) investigating high school students reported a weak correlation between smoking and perceived barriers. According to Ghaderi et al (15), the most important barriers perceived for not smoking included having smoking friends, easy access to cigarettes, parents' blame and lack of attention, as well as low price of cigarettes. The most important barrier in their study was “inability to decline an offer” when the offer of smoking was made by friends and peers.

The results revealed a significantly negative relationship between perceived benefits and smoking. This finding was in line with the results from studies by Ghaderi et al (15), Song et al (33), and Aryal and Bhatta (34). According to Song et al (33), the adolescents with highest perceptions of the benefits related to smoking were 3.31 times more likely to start smoking. Aryal and Bhatta (34) examined university students and showed that the current smoking behavior risk was considerably increased among individuals arguing that smoking was enjoyable, helped them confront problems or stress, created a comfortable atmosphere with friends, gave them relief, and was a relaxing activity after being tired. Young adults who believed that smoking leaves yellowish stains on teeth and nails is harmful for their health were considerably at a lower risk of starting smoking. Wolburg (30) and Balch (35) identified several factors positively contributing to quitting smoking such as financial gain due to cutting the cost of cigarettes, improved athletic performance, better breathing, unstained fingers, and more pleasant smell of clothes. The students participating in the study of Ghasemi and Sabzaman (28) also believed that quitting tobacco use was effective in reducing the likelihood of being infected with lung cancer and cardiovascular diseases, breathing easier and more regular, saving money, achieving educational and occupational success, and presenting a desirable public image.

Studies have failed to identify a significant relationship between self-efficacy and smoking. This finding is in agreement with the findings of the studies conducted by Kazemi et al (36) and Kear (37). Kear (37) explored Chinese students to identify the contributory psychological factors to smoking and showed that factors such as male gender, low social and economic situation of the family, smoking peers, and low perception of consumption harms were closely associated with smoking. However, no statistically significant relationship was detected between individuals' self-efficacy and smoking behavior. The findings of the studies by Ghasemi and Sabzaman (28), Yan et al (31), Panahi et al (16), Shahnazi et al (38), Ghaderi et al (15), Karimy et al (18), Von Ah et al (39), and Chang et al (40) in this regard revealed that the more people trusted in their efficacy and ability for avoiding tobacco, the more they performed the intended behavior.

Finally, the results indicated that there was a significantly negative relationship between cues to action and smoking. In Mohammadi and colleagues' study (17), cues to action was an effective predictor of smoking behavior. In the study of Rudatsikira et al (41), anti-smoking advertisements such as health warning messages on cigarette packs was discovered to reduce the risk of smoking among adolescents. The education presented by teachers, broadcasted educational programs, and relevant useful contents in books were among the most important cues for avoiding smoking identified by Ghaderi et al (15).

Since the present study only investigated male high school students, its results may not have been generalizable to other age groups and students. Therefore, it was suggested that further studies should be conducted using this model to explore different populations and groups in terms of age and gender. Data collection in this study was performed by taking interviews, which was one of the advantages of this research. Finally, the authors were aware of the fact that factors other than those examined in this study were involved in smoking; therefore, it was also recommended that further studies should be carried out to investigate other factors using other models.

Conclusion

Taking into account our study findings as well as the effectiveness of the HBM constructs in predicting smoking, it was recommended that educational programs should be designed in order to increase students' awareness
of smoking losses and promote their self-efficacy; it was also suggested that educational workshops should be held in order to improve their social skills such as those required for “declining an offer”. Planning alternative activities to fill students' leisure time, developing sports and recreational centers, monitoring the production, purchase, and consumption of cigarettes, and developing counseling centers may have been effective in reducing smoking rate. Finally, since young adults model each other in this age, it was highly recommended that the parents should pay careful attention to their children as well as the healthy relationship of them with their friends.

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Authors’ contributions
ZH conceptualized and designed the project, AH collected the data AGH and AM analysed and interpreted the data, ZH, AGH and AH prepared the manuscript. All authors read and approved the final version of the manuscript.

Conflict of Interest Disclosures
The authors declare no competing interests.

Ethics Statement
Ethical approval of this study was granted by the Ethics Committee of the Hormozgan University of Medical Sciences (IR.HUMS.REC.1395.122). Written informed consent was obtained from the participants prior to enter the study.

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