



# The Predictors of Health Literacy Based on the Constructs of Health Belief Model for Smoking Prevention Among University Students

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## Abstract

**Background:** The rate of cigarette smoking has increased among students. Smoking prevention behavior has significant relationship with health literacy. Moreover, health literacy has potential effects on the constructs of the Health Belief Model (HBM).

**Objectives:** This study aimed to determine the predictors of health literacy based on HBM constructs for smoking prevention among university students.

**Methods:** This descriptive-analytical study was conducted in 2016 on 337 dormitory students recruited through one-stage cluster sampling from Shahid Beheshti University of Medical Sciences, Tehran, Iran. Data were collected using the Health Literacy for Iranian Adults scale as well as a researcher-made questionnaire on students' perceptions about smoking prevention developed based on HBM constructs. Chi-square test, Pearson correlation test, and multiple linear regression analysis were used. SPSS software (v. 16.0) was used to analyze the data.

**Results:** Health literacy had significant relationships with cigarette smoking and all HBM constructs ( $P < 0.05$ ). Multiple linear regression analysis revealed that the perceived susceptibility, perceived benefits, and self-efficacy constructs of HBM significantly predicted 32.9% of the total variance of health literacy ( $P < 0.05$ ).

**Conclusions:** Health literacy is significantly related with cigarette smoking. Moreover, the significant predictors of health literacy based on HBM constructs for smoking prevention are perceived susceptibility, perceived benefits, and self-efficacy. Therefore, educational programs based on these HBM constructs can be used as an appropriate framework for developing strategies to promote health literacy and prevent cigarette smoking.

**Keywords:** Health Literacy, Health Belief Model, Cigarette Smoking, Smoking Prevention, Students

## 1. Background

According to the World Health Organization estimates in 2030, the number of deaths from smoking will exceed more than 10 million (1). The prevalence of smoking has increased among university students. In the study of Jafari and Aminzadeh, this rate was reported as 30.3% (2). Also, one study indicated that in terms of the type of substance used by university students, the most frequently used was 47.4% for smoking and 42.9% for hookah (3).

There was an association between smoking status and health literacy (HL) (4). The latest research in this field showed that low HL can be an independent risk factor for

smoking (5), smoking relapse (6), and weaker results of smoking cessation (7). Furthermore, Fernandez et al. reported that there was a significant relationship between adequate HL and less tendency to use tobacco (8). Health literacy is affiliated with literacy and includes awareness, motivation, and the capacity of persons to gain access, understand, apprise, and use health information in order to judge and make routine decisions about health care, disease prevention and health promotion to maintain or enhance the quality of life in their lifetime (9). Regarding the level of HL, the study of Ramezankhani et al. showed that HL was inadequate for more than two-thirds of the univer-

sity students (10). Studies showed that the Health Belief Model (HBM) is a good model for predicting behaviors related to smoking. It has been reported that existence of a high level of perceived susceptibility and in parallel, high self-efficacy can reduce smoking in individuals. Also, perceived barriers as well as self-efficacy can play an important role in anticipating health behaviors, including smoking prevention in university students (11). Several researchers have proposed the use of HBM in educational programs for prevention of smoking (12-14). Health literacy has different roles among the constructs of HBM (15). Glashen et al. believe that HL has a potential impact on constructs of HBM and can strengthen this model (16). Also, HL is associated with the adoption of preventive behaviors (17, 18).

## 2. Objectives

So far, there has been no study in the world on the relationship between HL and constructs of HBM about smoking prevention. Regarding the increasing smoking prevalence amongst university students (2, 19), this study aimed at investigating the effect of factors related to HL, based on the constructs of HBM about smoking prevention among university students.

## 3. Methods

### 3.1. Design and Participants

This study was a descriptive and analytical study. The study population consisted of all students living in dormitories of Shahid Beheshti University of Medical Sciences, Tehran, Iran, 2016. In this study, participants were selected using the Single-Stage Random Cluster Sampling method. At first, a list of all dormitories that hosted students of different medical sciences was prepared. Then, two dormitories for females and two dormitories for males were selected randomly and the students residing in them were enrolled on the condition that they had the inclusion criteria.

According to the results of the study by Jafari and Aminzadeh (2), considering  $P = 0.3$  for the prevalence of smoking, as well as using Cochran formula, 95% confidence and accuracy of  $d = 0.05$ , the sample size was calculated as 322 people, and for greater precision and also considering the possibility of a 15% attrition of subjects, the maximum sample size was calculated as 370 subjects.

The criteria for entering the current study included the willingness to enter the study, being an undergraduate student, being in the second or third year of college, Iranian ethnicity, and living in dorms covered by Shahid Beheshti

University of Medical Sciences, Tehran, Iran. Also, incomplete questionnaires were considered as the exclusion criteria.

### 3.2. Measures

The tools used in this study were as follows:

(1) Background and demographic variables, including gender, age, marital status, academic year, and determining the status of people in terms of smoking (non-smoker and smoker).

(2) To measure HL, the HL for Iranian Adults (HELIA) questionnaire was used. This questionnaire consists of 33 items measuring five major skills, including reading skills (four questions with score ranging from 4 to 20), gain access (six questions with score ranging from 6 to 30), understanding (7 questions with scores ranging from 7 to 35), assessment (four questions with scores ranging from 4 to 20), and decision making and application of health information (12 questions with scores ranging from 12 to 60). All skills were rated on a five-point Likert scale (from always = 5 to never = 1). Four questions related to reading skills were rated on a five-point Likert scale (from very easy = 5 to very hard = 1). Scoring was done by calculating raw scores related to HL dimensions and then converting raw scores to standard scores from 0 to 100. Scores ranged between 0 to 50, 50.1 to 66, 66.1 to 84, and 84.1 to 100 as inadequate HL, problematic HL, adequate HL, and excellent HL. Montazeri et al. psychometrically measured the capacity of this tool and concluded that the questionnaire had satisfactory reliability and validity (20). In the present study for HELIA questionnaire, the alpha coefficient was calculated for the dimension of reading skill as 0.84, gain access 0.85, understanding 0.90, appraisal 0.77, decision making and application of health information 0.86, and for the entire questionnaire of HELIA as 0.94.

(3) A researcher-made questionnaire that evaluates university students' perceptions about smoking prevention based on the constructs of HBM was also employed. This questionnaire consists of 31 questions to measure constructs of perceived severity (six questions), perceived susceptibility (four questions), perceived benefits (seven questions), perceived barriers (six questions), cues to action (two questions), and perceived self-efficacy (six questions). All questions related to constructs (except cues to action) were ranked on a five-point Likert scale (from strongly agree = 5 to totally disagree = 1). However, in the last three questions about the construct of perceived susceptibility, this criterion was the opposite. Two questions related to the construct of cues to action checked the source of information on smoking-related health advices that were calculated in a form of frequency measurement.

To determine Content Validity Ratio [CVR] and Content Validity Index [CVI], the HBM questionnaire was provided to a handful of professors and experts and their ideas were considered to modify or delete questions. Accordingly, in the pilot study (which was conducted on 30 students), reliability was calculated and finally these results were obtained as follows: perceived susceptibility (CVR = 0.88, CVI = 0.90, Cronbach's alpha = 0.85), perceived severity (CVR = 0.97, CVI = 0.99, Cronbach's alpha = 0.70), perceived barriers (CVR = 0.84, CVI = 0.93, Cronbach's alpha = 0.81), perceived benefits (CVR = 0.79, CVI = 0.91, Cronbach's alpha = 0.90), and perceived self-efficacy (CVR = 0.89, CVI = 0.96, Cronbach's alpha = 0.83). For questions related to cues to action because they were in objective form and did not measure the ability of students to comprehend, validity and reliability were not calculated (12). Finally, the validity and reliability of all constructions were confirmed.

### 3.3. Data collection

Questionnaires were self-reported in terms of completion and all students were asked to answer honest questions and ensure that all required information in this questionnaire were confidential. Completion of questionnaires was conducted at student dormitories. After completing the questionnaires, 33 cases were excluded due to incomplete questionnaires and the final analysis was performed on 337 cases.

### 3.4. Data Analysis

The data were analyzed using the SPSS software version 16 and chi-square test, descriptive statistics, Pearson correlation coefficient, and multiple regression analysis. In this study, HL was used as the dependent variable and the HBM perceptual constructs as independent variables. The significance level was considered in this study as 0.05.

## 4. Results

The average and standard deviation of age of participating students was  $22.93 \pm 4.05$  years. The current findings showed that 60% (n = 204) were female and 11.9% (n = 40) were married, 41% (n = 138) were second-year students, and 23.8% (n = 80) of subjects were current smokers. [Table 1](#) shows all the demographic characteristics and their relationship with the HL among students. The results of [Table 1](#) showed that HL had a significant relationship with the gender variable ( $P < 0.001$ ) and smoking ( $P < 0.05$ ) so that the levels of HL were higher among female and non-smoker students.

The results showed that the Internet (64.1%) and interaction with friends and acquaintances (38%) were the most

important sources for which participating students typically obtained information about the dangers of smoking, illness, and health.

[Table 2](#) showed the mean scores of HL and constructs of HBM. The findings showed that the participants obtained 70.52% of the score for HL. The results showed that 9.2% (n = 31) of the students had inadequate HL, 27.9% (n = 94) problematic HL, 43% (n = 145) adequate HL, and 19.9% (n = 67) excellent HL. Also, among the independent variables, perceived benefits and self-efficacy received the highest scores, while perceived susceptibility and perceived barriers constructs dedicated the lowest scores.

The results showed that there was a significant and direct correlation between HL and all constructs of HBM and perceived susceptibility and self-efficacy constructs had the highest correlation with HL ([Table 3](#)).

[Table 4](#) shows the results of multiple regression analysis for the constructs of HBM as the predictors of HL. The results of this multiple regression reflected that these variables could predict 32.9% of HL changes ( $R^2 = 0.329$ ). Among the other variables, perceived susceptibility, perceived benefits, and self-efficacy were predictors of HL, while perceived severity and perceived barriers did not predict significant HL.

## 5. Discussion

This study aimed at investigating the effect of factors related to HL based on the constructs of HBM about smoking prevention among students. The results of this study indicated that the three constructs of HBM had significant effects on HL. The study findings were consistent with the hypotheses of the researchers, which included the potential effects of HL on constructs of HBM (16), as well as the various roles of HL among the constructs of HBM, such as creating perfect knowledge and enough perceived susceptibility; the relationship between education and perceived severity, perceived benefits, and perceived barriers; the relationship between self-efficacy and behavior change; the role of media as a cue to action; and the role patient education can play in building HL (15).

The results showed that perceived susceptibility was the strongest predictor of HL. Regarding the possible causes of this effect, it can be said that perceived susceptibility has a strong cognitive component and is somewhat dependent on individual knowledge (21), and the same type with HL. On the other hand, one of the important roles of HL in the HBM is to create enough perceived susceptibility (15). Therefore, it can be concluded that perceived susceptibility can influence the variables of the type itself, such as HL.

**Table 1.** The Level of HL Based on Demographic and Background Characteristics of Students Participating in the Study<sup>a</sup>

Variables	Inadequate HL	Problematic HL	Adequate HL	Excellent HL	P Value <sup>b</sup>
<b>Age</b>					0.611
19 - 23	23 (9.6)	71 (29.7)	101 (42.3)	44 (18.4)	
24 - 28	7 (9.6)	18 (24.6)	34 (46.6)	14 (19.2)	
29 and older	1 (4.3)	5 (21.7)	9 (39.1)	8 (34.9)	
<b>Sex</b>					< 0.001
Female	12 (5.9)	42 (20.4)	102 (49.8)	49 (23.9)	
Male	19 (14.4)	52 (39.4)	43 (32.6)	18 (13.6)	
<b>Marital status</b>					0.114
Single	27 (9.2)	87 (29.7)	124 (42.3)	55 (18.8)	
Married/divorced/ death of spouse	4 (9.1)	7 (15.9)	21 (47.7)	12 (27.3)	
<b>Academic year</b>					0.113
Sophomore	14 (10.1)	44 (31.9)	61 (44.2)	19 (13.8)	
Third year student	17 (8.6)	50 (25.1)	84 (42.2)	48 (24.1)	
<b>Smoking</b>					0.003
Yes	17 (21.2)	48 (60)	11 (13.8)	4 (5)	
No	14 (5.5)	46 (17.9)	134 (52.1)	63 (24.5)	

Abbreviation: HL, health literacy.

<sup>a</sup> Values are expressed as No. (%).<sup>b</sup> Chi-square test.**Table 2.** Mean and Standard Deviation of the Constructs of HBM and HL

Variables	N = 337 <sup>a</sup>	Score Range	The Percentage of the Score Obtained
Perceived susceptibility	16.55 ± 3.70	4 - 20	68.95
Perceived severity	25.41 ± 9.32	6 - 30	79.33
Perceived barriers	28.76 ± 4.87	7 - 35	88.85
Perceived benefits	23.79 ± 4.16	6 - 30	74.12
Perceived self-efficacy	25.76 ± 4.001	6 - 30	82.32
HL	70.52 ± 14.12	0 - 100	70.52

Abbreviation: HBM, health belief model; HL, health literacy.

<sup>a</sup> Values are expressed as mean ± SD.

The results showed that perceived benefits had a significant effect on HL. Regarding this effect, it can be said that due to the role of HL in helping the HBM to design training programs tailored for perceived benefits of the audience (15), this effect is justifiable.

In this study, self-efficacy had a significant effect on HL. Regarding the possible causes of this effect, it can be said that self-efficacy is one of the main dimensions of HL

**Table 3.** The Relationship Between HL and All the Constructs of HBM About Smoking Prevention

HL	r <sup>a</sup>	P Value
Perceived susceptibility	0.433	< 0.001
Perceived severity	0.357	< 0.001
Perceived barriers	0.158	0.004
Perceived benefits	0.411	< 0.001
Perceived self-efficacy	0.419	< 0.001

Abbreviation: HBM, health belief model; HL, health literacy.

<sup>a</sup> Pearson correlation coefficient.

(22), and HL also plays a role in the relationship between self-efficacy and adoption of behavior (15). Furthermore, there is a relationship between HL and self-efficacy (23, 24). Therefore, self-efficacy can influence HL.

The results showed that there was a significant and direct correlation between HL and all the constructs of HBM. Considering the various roles of HL among the constructs of the HBM (15), this findings imply that the sum of these constructs can help create the skills and abilities necessary for a desirable level of HL.

The results showed that perceived susceptibility and self-efficacy constructs had the highest correlation with HL. Given the important role of HL in creating enough per-

**Table 4.** Results of Multiple Regression for the Constructs of HBM as the Predictors of HL<sup>a</sup>

Constructs	$\beta$	S.E	95% CI	P Value
Perceived susceptibility	0.342	0.068	(0.208 - 0.475)	0.001
Perceived severity	0.129	0.086	(-0.039 - 0.297)	0.313
Perceived barriers	0.113	0.078	(-0.039 - 0.265)	0.251
Perceived benefits	0.157	0.073	(0.013 - 0.300)	0.012
Perceived self-efficacy	0.264	0.058	(0.150 - 0.377)	0.001

Abbreviation: HBM, health belief model; HL, health literacy.

<sup>a</sup> Method: Enter.

ceived susceptibility (15) and the relationship between HL and self-efficacy (23, 24), these results are justifiable.

The results of the present study indicated that the HL in the students was moderate, and the level of HL in more than one-third of the participating students was inadequate and problematic. The results of this study were in contrast with the results of the study by Ramezankhani et al. (10), in which the HL of more than two-thirds of the students was marginal and inadequate. Among the possible reasons for this discrepancy are the higher number of women than men, the education of different medical sciences and the easier questions of the HELIA questionnaire compared to the Newest Vital Sign (NVS), in this study compared to the study by Ramezankhani et al. The results of the present study were not consistent with the results of the study done by Zhang and Cui (25), which reported low levels of HL among students. These conflicting results are due the sample of this study, which comprised of students from different disciplines of non-medical sciences, whereas the samples of the present study were from various medical sciences students. Also, the results of the study by Vozikis et al. (9), in which the level of HL was moderate to high, seems to be consistent with the results of this study; despite the difference between the above study and the present study, in terms of topics, such as the presence of students studied at higher educational levels and also the HL tool (Bostock Query Questionnaire), they had similar results with the present study.

The results of the present study reflected that among independent variables, perceived benefits and self-efficacy received the highest scores, while perceived susceptibility and perceived barriers had the lowest scores. These results were consistent with the results of the study by Li and Kay (11) and Reisi et al. (13). In justifying the results of this section, the following points can be made: The high score obtained from the perceived benefits variable may be related to the study of students in medical sciences and their adequate knowledge of the benefits of adoption of smoking preventive behaviors. Regarding the perceived barriers variable, it is possible to say that some of the items used

to measure perceived barriers in this study, were probably not considered to be barriers to adoption of smoking preventive behaviors. For this reason, students have scored lower grades. Moreover, a higher score in perceived benefits is associated with reduction in perceived barriers score (21). On the other hand, perceived barriers and self-efficacy are related, so that if perceived barriers are low, self-efficacy increases regarding preventive behaviors (21). Therefore, due to the low score of perceived barriers in this study, self-efficacy score was high. Regarding the low level of perceived susceptibility, it can be inferred that given the participants in this study were a group of young people, they did not know the likely risk of illnesses caused by smoking or exposure to smoke.

The results showed that there was a significant relationship between HL and smoking status so that the prevalence of inadequate and problematic HL in smokers was higher in comparison with non-smokers. These findings were consistent with the findings of the study by Hoover et al. (5), Stewart et al. (6), Stewart et al. (7), and Fernandez et al. (8). According to the findings, it can be said that low HL is a specific conceptual interpretation of inadequate Awareness regarding the harmful impacts of smoking on health. Furthermore, it is related to an inappropriate attitude towards smoking. Thus, low HL can lead to smoking.

In the present study, there was a significant relationship between gender and HL, so that the prevalence of inadequate and problematic HL in males was higher in comparison with females and the prevalence of adequate and excellent HL was higher in females than males. These results were not consistent with the results of most studies (26, 27). Possible reasons for the higher level of HL of female students include greater respect for health standards, more medical recommendations, such as periodic examinations, and greater female's interest in learning and obtaining health information. In this case, the results of the present study were consistent with the results of Zhang and Cui (25) and Shah et al. (28), and there was a significant difference between the HL level of females and males.

### 5.1. Limitations of the Study

The limitations of this study include the lack of specific questionnaire for measuring HL regarding smoking. One of most important limitations of this study was the failure of path analysis to predict HL by the constructs of HBM, such as the coexistence between some of the constructs of HBM and HL dimensions and the uniformity of the two questionnaires. The other limitation of the study was that the target group that included undergraduate dormitory students. Thus, the results of current study cannot be generalized to other students and other age groups. Therefore, the study is recommended to be conducted on different groups and populations. Furthermore, participants in the current study were undergraduates of different medical sciences, which are a group with higher HL than common people and this item may have an effect on the results of the study. Another limitation of this study was that the data collection, which was self-reported.

### 5.2. Conclusions

In conclusion, regarding the relationship between HL and smoking, and considering that perceived susceptibility, perceived benefits and self-efficacy variables were predictors of HL and had a high correlation with HL, it could be suggested that educational programs are based on the HBM with emphasis on the above three constructs, and can be used as a suitable framework for designing and implementing interventions to improve HL and smoking prevention. Eventually, it should be noted that despite the relationship between HL and some constructs of HBM, more studies are still required to determine, which construct is more related to HL.

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### Footnotes

**Authors' Contribution:** Rahman Panahi, Ali Ramezankhani and Shamsaddin Niknami participated in all parts of the study. Mehdi Sahraei and Mehdi Rezaei participated in designing the study. Nahid Aghaeian and Malihe Pishvaei participated in manuscript write-up and collecting the data. Fereshteh Osmani and Erfan Javanmardi participated in data analysis. All authors read and approved the final manuscript.

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