



## Prediction of Dental Caries Preventive Behaviors using Health Belief Model (HBM)

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#### Authors

Oveisi S.<sup>1</sup> PhD,  
Zahedifar F.\*<sup>1</sup> MSc,  
Atashgar E.<sup>2</sup> MD,  
Yadegary Z.<sup>2</sup> MD,  
Amole N.<sup>2</sup> MD,  
Taherkhaneh N.<sup>2</sup> MD

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### ABSTRACT

**Aims** One of the most important factors in public health is oral and dental health. Determining the level of knowledge and attitude and the applicable criteria are effective factors in reducing dental problems. This study was conducted to determine the effective factors on oral hygiene based on the Health Belief Model (HBM) in students of Paramedicine, Qazvin University of Medical Sciences.

**Materials and Methods** This is a descriptive-analytical. The present study was conducted on 300 students that were selected by using a multi-stage random sampling method. The data collection tool was based on a standard questionnaire of health belief model. The obtained data were analyzed by SPSS 20 software, descriptive statistics, and Pearson coefficient tests, variance analysis, Turkey test, and linear regression logistic regression was taken as a significant level of 0.05.

**Findings** The mean of health behaviors among students was moderate (52.38±5.95). The regression analysis showed that constructs perceived barriers, self-efficacy and perceived benefits predict tooth decay prevention behaviors ( $p \leq 0.05$ ). Pearson's test showed a positive and significant relationship between perceived barriers and behavior ( $r = -0.471$ ,  $p = 0.00$ ).

**Conclusion** In order to promote health behaviors among the student's perceived barrier self-efficacy and perceived benefits, as the most important predictors of student behavior for holding educational courses should be used.

**Keywords** Preventive Behaviors; Health Belief Model; Students; Dental Caries; Prediction

<sup>1</sup>Education & Training Development Department, Health Faculty, Qazvin University of Medical Sciences, Qazvin, Iran

<sup>2</sup>Student Research Committee, Qazvin University of Medical Sciences, Qazvin, Iran

#### \*Correspondence

Address: Education & Training Development Department, Health Faculty, Qazvin University of Medical Sciences, Qazvin, Iran.

Phone: -

Fax: +98 (28) 3333238  
zahedifar8285@gmail.com

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[1] Mothers' attitude towards orodental health of their 1-6 years old children referred to medical centers of Zahedan city, 2006 [2] HBM trail in controlling tooth plaque in Arak primary school students in 2003-2004 [3] Applicability of Rosenstock-Hochbaum health behavior model to prevention of periodontal disease in Enugu students [4] Tehran: Tabib Publication; 2001 [5] Modern concepts of caries measurement [6] The effect of an educational intervention based on health belief model on the standard precautions among medical students of Rafsanjan University of Medical Sciences [7] The effect of educational program walking based on Health Belief Model on control sugar in woman by type 2 diabetics [8] Oral health knowledge, attitudes and behaviour of children and adolescents in China [9] Utilizing the Health Promotion Model to predict oral health behaviors in the students of Islamic Azad University of Sabzevar (2008) [10] A new model for oral health education [11] Health Promotion: Foundations for Practice [12] The effect of oral health education based on Health Belief Model in Mothers who had 3-6 year old children on decreasing dental plaque index in Zanjan

## Introduction

One of the most common diseases that affects the world's societies is tooth decay. The general health of the body is dependent on the health of the mouth and its health affects the health of the whole body [1]. One of the main criteria for the health of the community is the examination of oral and dental health [2].

The disease since sucrose has entered a human diet strongly increased. In all countries, millions of dollars are spent annually to treat dental caries. The total cost of dental treatment is likely to be the most expensive treatment ever spent. Despite much progress, the field of fighting diseases, on a global scale and increasing communication and presence of community members in different social situations, the need to observe oral hygiene more than ever is felt [3]. The instability of everyday patterns and changes in the lifestyle of people have increased these diseases, and more than 99% of humans suffer from these diseases and because of the problems, more than 50 hours waste the time [4]. The health and behavior of people in every community about oral and dental health are influenced by the level of knowledge, knowledge, and attitudes towards oral health [5]. Preserving the teeth and supporting tissues up to the ages, on the one hand signifying high standards of health and, on the other hand, reflecting the health system's performance.

Studies in our country show that health behaviors are moderate [3]. Therefore, in order to enable people to work in the right ways to maintain their health and avoid diseases, they need to shape health behaviors and make appropriate training programs for these behaviors [6].

When need to transform human behavior in health and wellness health education comes up. Effective health education depends on mastering use of the best theories and appropriate strategies and behavior. Patterns are the basis for the development of theories. One of the most important models in preventing the disease is a health belief model that explains the relationship between health beliefs and behavior. It is also designing health messages and suggesting interventions to engage people in health-promoting behaviors [7].

Health belief model is one of the oldest patterns of behavioral health. This model is a comprehensive model that plays an important role in preventing the disease. It is an important indicator that shows the relationship between health beliefs and behavior and based on the hypothesis that preventive behavior based on the person's beliefs.

This model focuses on the motivation, past experiences of the person and, in general, on the change in beliefs and can describe long-term and short-term health behaviors.

Contains structures, perceived sensitivity (Perception of a person's susceptibility to disease),

perceived severity (Perceived person's seriousness of the disease), Perceived benefits (Individual perception of the benefits of behavior), perceived barriers (Individual perception of problems in the way of doing behavior), action guides (Speeds of behavior), and self-efficacy (Belief in ability to do behavior) [8].

According to important oral hygiene for a healthy lifestyle and increasing number of oral and dental diseases and a large number of students at the Paramedical School determine the current status of students' belief in oral hygiene and selecting a pattern for health education, the first step in the process of educational planning for students.

The purpose of this study was to predict the preventive behaviors of dental caries with the health belief model constructs in students of Paramedical School of Qazvin University of Medical Sciences.

## Materials and Methods

This study is a cross-sectional study. The population under study in this cross-sectional study was the students of the Faculty of Paramedicine of Qazvin University of Medical Sciences. A multi-stage random sampling was used to conduct the study. At first, the students of the Faculty of Paramedicine were divided into 5 clusters, divided into the fields of study, including fields (Surgery room, Anesthetics, Medical Emergency, Nursing and Laboratory science).

The total number of students was 640. The sample size was calculated by using the Cochran formula. In order to calculate the sample size, the following formula was used:

$$n = \frac{\left(z - 1 \frac{\alpha}{2}\right)^2 \times p \times (1 - p)}{d^2} = \frac{(1.96)^2 \times 0.15 \times 0.85}{0.01^2} = 61$$

A random sampling method was used to collect the samples from each cluster.

In each group, 61 people should be collected. Considering the possibility of loss in each group, 65 people were considered. The data collection tool was a questionnaire based on the health belief model [9]. The questionnaire consisted of three parts: the first part included demographic information, including the individual information of the field of study, and the second part related to the assessment of preventive behaviors of dental caries (7 questions). The third section included a series of poll questions based on the health belief model was in accordance with Likers criteria. The importance of using this model has been proven in numerous studies and its validity has been confirmed previously [8, 10, 11]. This model has the following constructs:

- 1) Perceived sensitivity: The person's opinion is about the chance of being in a particular position, which consists of 5 questions.
- 2) Severity: The person's belief in how serious this

condition is, which included 9 questions.  
 3) Benefits: The opinion of the person has an effect on the effectiveness of the recommended activities in reducing risk or severity, which includes 9 questions.  
 4) Objectives: The opinion of the person is that of the objective and the costs of the recommended activities, which consists of 18 questions.  
 5) Self-efficacy: Belief in the ability to conduct behavior that included 12 questions.

The validity of this questionnaire was measured by content validity method. The questionnaire was prepared on the basis of the Health Belief Model and according to reliable sources and books.

The validity of this questionnaire was assessed by content validity method so that the questionnaire was prepared based on the health belief model and according to reliable sources and books. The minimum acceptable ratio for content validity (CVR) based on the Lavelle's table and the number of specialists who evaluated the questions was 0.70.

In this study, 14 people included 7 dental specialists and 7 health education specialist participated for evaluated of content validity.

Therefore, the questions with a content ratio of less than 0.70 were set aside in this study. The value of the validity or CVI validity index in the designed questionnaire was also checked as follows: If the number of items from each item exceeded 0.79, appropriate, between 0.70 and 0.70, the questionnaire needed to be corrected and reviewed, and if the CVI index was less than 0.70, unacceptable, and the item was removed.

Eventually, validity has been quantitatively verified. Cronbach Alpha in perceived susceptibility (0.70), perceived barriers (0.80), perceived benefits (0.78), self-efficacy (0.85) and attitude (0.73) were obtained. SPSS 20 software was used to analyze the data. Regarding the data normalization, based on Kolmogorov test, data analysis was performed by using descriptive tests (Frequency, percentage, mean, and standard deviation), and analytical tests (Correlation coefficient, logistic regression, and linear regression).

**Findings**

The mean age of the studied population was (23.18±3.51). 61.6% of fathers and 62.5% of mothers had post-secondary education. The prevalence of caries among students was 56.5% and 44.5% without caries. The mean DMFT (Rotten teeth, fallen teeth, and filled teeth) students was 3.15±2.05. The results of one-way ANOVA analysis showed a significant relationship between DMFT index and parenting education at the birth of the students (p=0.01).

In this survey, the average perceived severity score was 18.6 (Out of 45), the perceived susceptibility was 15.07 (Out of 25), perceived benefits 19.97 (Out

of 45), and perceived risk 65.02 (Out of 90), the average score of behavior was 15.16 (Out of 35 scores).

The highest score was perceived susceptibility (77.24). The lowest scores were perceived severity and perceived benefits, which obtained 33.48 and 37.71% of the acquired score, respectively (Table 1). Considering that the average total score of students' health beliefs is 144.06±11.41, students' health behaviors are moderately evaluated (p=0.03).

Pearson statistical test showed a significant correlation between the mean score of efficacy and the mean score of behavior (r=0.0937, p=0.00). Also, this test showed a significant relationship between the mean scores of perceived barriers (p=0.000, r=0.471). Pearson statistical test showed a significant correlation between the mean perceived benefit score and the mean score of the behavioral score (r=0.191, p=0.00). Other variables did not have a significant correlation with behavior (Table 2).

According to the results of Table 3, the sub-scales of the health belief model, predict 45% of the variance of health behavior. Also, according to Table 3 below, the perceived benefits, perceived barriers, and self-efficacy are significantly predicted by health behavior. Increasing the standard deviation in the perceived benefit score, the health behavior score will increase by 0.24 standard deviations. Also, by increasing a standard deviation in the self-efficacy score, the health behavior score will increase by 0.25 standard deviations.

**Table 1)** Oral and oral health items according to health patterns

Construct	Average	Significant
Perceived sensitivity	15.07±2.36	0.00
Perceived severity	18.06±3.6	0.020
Perceived benefits	16.97±3.84	0.01
Perceived barriers	25.02±9.5	0.02
Efficacy	28.93±6.8	0.54
Behavior	16.15±4.32	
Total score	144.06±11.41	0.02

**Table 2)** Correlation between health belief model variables and behaviors

Independent variables	Level Correlation	Squared	Significant	Direction Correlation
Perceived benefits	0.191	0.036481	p=0.000	Positive
Perceived barriers	0.471	0.221841	p=0.000	Negative
Efficacy	0.937	0.543169	p=0.000	Positive

Dependent variable (Showing behavior)

**Table 3)** Multiple regression analysis to predict health belief model structures with oral and dental health behaviors

Independent variables	B	SE	Beta	p-value	t
Perceived sensitivity	0.206	0.725	-	0.776	0.285
Perceived severity	0.210	0.919	0.127	0.264	123.1
Perceived benefits	0.071	0.040	0.245	0.012	156.3
Perceived barriers	0.051	0.022	0.354	0.024	229.2
Efficacy	0.041	0.020	0.254	0.034	129.2
Behavior	0.206	0.725	-	0.776	0.285

Adjusted R<sup>2</sup>=0.458; P=0.00

## Discussion

The average of health behaviors in students was 52.38%, which means that students' health behaviors are moderately evaluated. These findings are consistent with the results of Mehri, Mohseni *et al.* [6, 9].

Based on the results of multiple regression analysis of health belief model constructs about dental caries preventive health behaviors, perceived barrier structures significantly had the most predictive power and 35% of the calculated variance of health behaviors in the research sample described. Also, Pearson test showed a significant correlation between the mean perceived barriers score and behavior ( $r=-0.471$ ,  $p=0.00$ ).

These results are consistent with the study of Solhi and Zamani [2, 10]. When perceiving danger weakness, perceived barriers increase [11]. From the viewpoint of 43.2 of the students referring to the dentist and restoration of decayed teeth was an important barrier. Studies have shown that perceived barriers are the most potent dimension in expressing or predicting health protective behaviors [8]. Considering the results, it is necessary to consider measures to reduce the cost of teeth for students. Therefore, it is expected that by removing existing barriers, oral hygiene behaviors can be improved. Also, multiple regression tests showed that perceived and self-efficacy barriers were one of the important factors affecting the behavior of students. In another study on students of Yazd city self-efficacy and perceived barriers, predicted a total of 29% of behavior variance [9].

Pearson statistical test showed a significant correlation between the mean score of automatic achievement and the mean score of behavior ( $r=0.937$ ,  $p=0.00$ ). In other words, as students' self-efficacy and abilities increase, their oral and dental health behaviors Upgrades. This result is consistent with the findings of the Mehri [9]. Self-efficacy, as an important construct, of the health belief model is a strong predictor of oral health behaviors [9].

Considering the fact that the self-efficacy structure has a strong relationship with behavior, so it should be considered specially. According to Pearson test results, there was a significant correlation between mean perceived benefit score and mean score of behavioral scores ( $r=0.191$ ,  $p=0.00$ ). This results confirms the results of Mehri, Solhi, Zamani [2, 9, 10]. These results indicate that when students do more health behavior who have confidence in their ability to carry out health behaviors and have oral and dental care.

In this study, 49.4% of students brushed once a day, 36.1% brushed more than once, and 2.4% did not brush at all. 59.8% of students sometimes used dental floss and 24.4% of the students did not use dental floss. Because of good and bad health behaviors part of the community's culture, there is a

lack of respect for health behaviors in this community. Therefore, the implementation of appropriate training programs to prepare people and use the right methods of life in order to promote health and avoidance of diseases is recommended.

In other words, findings may suggest inadequate and inappropriate education in oral and dental care. The study of Ndiokwelu showed that although the students regularly brushed teeth and arranged meetings with the dentist, they had little knowledge about the causes of oral and dental illnesses.

From the perspective of students, the preferred sources of information were, in order of priority, educational films and parents. However, according to the study of Mazloomi and Solhi at earlier age health educators and parents, the most important source and performance guide

The results showed that with increasing age the information resources changed. Therefore, in planning for the promotion of oral hygiene in students the role of the educational film must be strengthened.

In this study, 41.7% of the students visited the dentist twice a year. This is consistent with the results of Silva's study.

Also, Pearson correlation test showed a significant correlation between the mean of indicators of this model (Perceived sensitivity, perceived severity, perceived benefits, perceived barriers, and self-efficacy) and behavior with parents' education. These results are consistent with the study of Mehri [12]. According to these results, it can be assumed that parental education is a means to raise the awareness of the children and lead to better performance.

## Conclusion

According to the results, structures, perceived barriers, self-efficacy, and perceived benefits are considered as the most important structures with predictive power in adopting tooth decay preventive behaviors and predict 45% of health care variance. The results of the study indicated that students' health behaviors were moderate. Educational interventions based on perceived barrier structures self-efficacy and perceived benefits can be effective in promoting preventive behaviors from dental caries. Students' self-efficacy is enhanced through education and leads to increased health. According to the findings, this study is recommended to use the model along with the following suggestions for oral health care:

- 1) Repeat the training with new content, with the interests and needs of the students and the use of new educational methods.
- 2) Revision of the content of continuing education courses and increasing the practical level of these courses and the ability to implement them.
- 3) Provide low-cost student dental services.

4) Implement oral and dental care programs twice a year, at universities for students.

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