Oral Health-Related Factors based on Health Belief Model in 10th to 12th-Grade Students in Kashan

ARTICLE INFO

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ABSTRACT

Aims Oral problems, particularly dental caries, are among prevalent health problems across the world that normally initiate in adolescence. This study aimed to determine oral health-related factors based on the health belief model among 10th to 12th-grade students in Kashan.
Instrument & Methods This cross-sectional study was conducted on 180 10th to 12th-grade students living in Kashan City, Iran, in 2017-18. Using multistage sampling, students were randomly selected from schools. Then, students completed a valid and reliable researcher-made questionnaire. Utilizing independent t-test, logistic regression, ANOVA, and Pearson's correlation coefficient, the collected data were analyzed by SPSS 20.
Findings 50.6% of the participants brushed teeth at least once a day, 20% used dental floss once a day, and 8.3% referred to the dentist once every six months. There was a significant positive correlation between perceived self-efficacy and oral health behaviors (r=0.35; p<0.001). In addition, perceived barriers had a significant negative relationship with oral health behaviors (r=-0.30; p<0.001). However, perceived susceptibility, perceived severity, and perceived benefits had no significant correlation with oral health behaviors (p>0.05).
Conclusions The health belief model has the necessary effectiveness in promoting oral health behaviors. It is suggested to utilize appropriate plans and educational interventions based on behavioral models and theories to increase self-efficacy and remove barriers to toothbrushing behavior, utilization of dental floss, and improvement of oral health in students.

Keywords Oral Health; Students; Health Belief Model

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CITATION LINKS

[1] The effectiveness of oral health education by peers ... [2] Is peer education more effective than classical ... [3] Mortality trends and signs of health progress ... [4] survey of DMFT and DMFT indices in Urmia ... [5] Association of caries experience and dental ... [6] Textbook of public ... [7] Investigation of microbial contamination ... [8] DMFT index and bilateral dental caries occurance ... [9] Determining Liverpool adolescents' beliefs ... [10] Socio-demographic determinants ... [11] The effect of education based on health ... [12] Health behavior and health education ... [13] Oral health knowledge, attitude and practice ... [14] Factors influencing tooth brushing behaviour ... [15] The application of the health belief model in ... [16] Assessment of oral–dental health status: Using ... [17] Predictors of oral health care in pregnant ... [18] Survey of some related factors to oral ... [19] The effect of health beliefs on the compliance of ... [20] The Survey of oral-dental health of elementary ... [21] Effect of a training intervention program ... [22] Utilizing the health promotion model to predict oral ... [23] The effect of oral health education based on health ... [24] The effect of education based on health belief model ... [25] Oral health care based on educational health ... [26] Prediction of dental caries preventive behaviors ... [27] Prediction of oral health in children 3-6 ... [28] Predictors of oral health promotion behaviors ... [29] The Role of Self-Efficacy and Factors Related ... [30] Planning and evaluation of an educational intervention program ... [31] Determinants of oral health behavior among high school students ...

Introduction

Oral health is a major field of public health. According to the World Health Organization (WHO), oral health is a lifetime prerequisite for maintaining public health. In a similar vein, it is stated that oral health has a substantial impact on all aspects of health, especially gum and teeth health and functioning [1, 2]. In addition, the overall goals of oral health by 2020 are to enhance the quality of oral health systems [3]. In the United States, tooth decay is reported as the most common childhood disease, and it is five times more prevalent than asthma [4]. In 2004 and 2005, every Iranian child aged 5-6 years had 4.3 decayed teeth; furthermore, in 2011 and 2012, every schoolchild at the age of 12 had 1.62 decayed teeth, which had increased to 4.5 and 1.71, respectively, indicating a rise in tooth decay in about a decade [5]. The factors that cause tooth decay are divided into three categories: host factors (saliva, tooth structure, and composition), environmental factors (fluoride, nutrition, etc.), and microorganisms [6]. Among the suggested methods, mechanical techniques including toothbrushing and dental flossing are major techniques to decrease the incidence of dental plaque, which count as major factors in maintaining oral health [7]. An objective of the World Health Organization for maintaining oral health is to reduce the tooth decay index to reach a value less than one [2, 8]. A study of dental caries index in students in Kashan has shown that this rate has reached 2.6, which is a lower value and far from the goals of the World Health Organization until 2015 [9, 10]. Considering the large rate of tooth decay, its costly process of treatment, and the role of people in preventing tooth decay, it is essential to arrange for sufficient knowledge and information for maintaining oral health and changing behaviors [11]. Understanding the beliefs and attitudes of adolescents and young adults requires the use of models and theories of behavior change. The health belief model is one of the most practical models utilized for education and health promotion, especially for preventive behaviors [12]. Based on the mentioned model, people implement a preventive health behavior only when they accept that: a disease is threatening them (perceived susceptibility), the disease leads to serious outcomes for them (perceived severity), some behaviors can prevent the diseases or can reduce complications and problems associated with the disease (perceived benefits), several psychological, physical, or financial barriers can hinder the utilization of such behaviors (perceived barriers), one has to believe its abilities to perform preventive behaviors (perceived self-efficacy) [13]. Several studies have examined the role of the health belief model to make interventions for managing problems related to oral health. In addition, the findings of conducted studies have shown inconsistencies in the factors affecting oral health. Zare *et al.* investigated the items affecting toothbrushing in fifth and sixth-grade elementary school students based on the health model in Bushehr. Their research findings showed that the constructs of self-efficacy and perceived barriers were significantly associated with the brushing behavior [14]. Solhi *et al.* carried out a study on female students in Tehran, entitled "the use of health belief model in promoting oral health". Their research findings indicated a significant association between oral health index and perceived benefits [15].

The stimuli for this study came from consideration of several issues. To begin with, oral diseases usually start from adolescence, during which period observing oral hygiene has a great impact on reducing this disease in students. In addition, the pattern of health beliefs-which has been created exclusively for health-related behaviors-can play a practical role in oral diseases which have a dormant nature. Accordingly, the present study aimed at investigating oral health-related factors based on the health belief model among 10th to 12th-grade students.

Instrument and Methods

This cross-sectional study was performed on 10th to 12th-grade students living in Kashan in 2017-18. Of all 10th to 12th-grade students, 180 individuals were randomly selected. The samples were selected via a two-stage cluster sampling method. First, some high schools were selected from all high schools in Kashan County using the random sampling method. In order to ensure that high schools outside Kashan would be included in the sampling, the high schools in the county were first divided into two categories, inside and outside Kashan city. Considering the proportion of each group to the total number of schools, a specific share was determined for each group. Then, a class was randomly chosen from every high school, and all class members were enrolled in data collection (Figure 1).
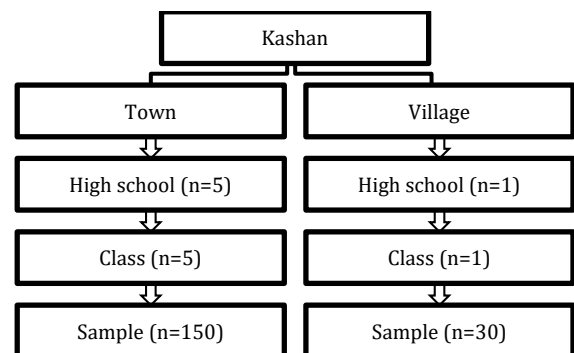

Figure 1) Flow diagram of the process of sampling and choosing the subjects of the study

The required sample size was obtained using the m=number of clusters, σ^2_{1x}=Variance between cluster (s=2.35), $\bar{X}$=Intra-cluster average (8), M=Total number of community clusters (74), $\bar{n}$= number of

people sampled within each cluster (30), σ^2_{2x}=Intra-cluster variance (s=2), $\bar{\bar{X}}$=Total Average (10.01), ε=Acceptable error (0.235) ,and 180 people were included in the study. Students who did not have oral problems and diseases were included. The exclusion criteria were individuals who submitted an incomplete questionnaire or who quitted the study for any reason.

The researcher-made questionnaire was designed based on the studies by Hazavei *et al*. [16] and Shamsi *et al*. [17]. It included demographic questions about age, sex, mother's and father's level of education, mother's and father's job, family income level (7 questions), knowledge of oral health (12 questions), the construct of perceived susceptibility to the risk of oral diseases and problems (6 questions, e.g., "I may have dental plaque"), the construct of perceived severity of oral diseases and problems (9 questions, e.g., "decayed teeth may cause decay in the rest of my teeth"), the construct of perceived benefits of observing oral health (flossing and brushing) (6 questions, e.g., "brushing my teeth for a minimum of twice a day can prevent tooth decay"), the construct of perceived barriers to oral health (brushing and flossing) (10 questions, e.g., "severe gum pain when brushing prevents me from brushing"), the construct of perceived self-efficacy to observe and maintain oral health (brushing and flossing) (4 questions, e.g., "I can brush my teeth properly"). Each question was designed as 5-point Likert scale items, ranging from strongly agree and ending to disagree strongly. The options were given the scores a follows 5 points for "strongly agree", 4 points for "agree", 3 points for "no idea", 2 points for "disagree", and 1 point for "strongly disagree". To guarantee the correctness of the answers, some items were also repeated as reversed items. Oral health behavior (brushing and flossing) was assessed using five multiple-choice questions. To measure the instrument's reliability, a pilot study was performed on 30 people in the target population. Also, to assess the reliability of the data collection tool, Cronbach's alpha test was used. Cronbach's alpha of the construct of knowledge was 0.70; perceived sensitivity was 0.70, the perceived intensity was 0.76, perceived benefits was 0.67, barriers was 0.73, self-efficacy was 0.73, and behavior was 0.70. To investigate the validity of the instrument, face and content validity was performed qualitatively. A total of 30 people in the target group received the questionnaire. They were asked to examine inappropriate, incomprehensible and difficult words and sentences, the amount of appropriateness and good relationship of the questions with each other, and the possibility of ambiguity and misunderstandings of the question's phrases. Take action. At this stage, all questionnaire questions had a high and acceptable score. To confirm the content validity of the content, a group of experts- consisting of a group of specialists in health

education and health promotion, epidemiologists, biostatistics specialists, and dentists - was asked for comments and suggestions in the form of making corrections to the questionnaire questions in terms of Persian grammar, content and sentence structure, the number of words and sentence length, deletion or addition of new questions, order and sequence of questions and the general structure of the questionnaire, which would be included in all panel comments. In the end, all comments by the panel of experts were applied on the questionnaire draft in terms of simplification, aesthetics, integration or elimination of unnecessary questions, brevity, and logical sequence of review questionnaire questions. Based on the opinion of 8 experts, the value of the Content Validity Ratio (CVR) for the questionnaire questions was set between 0.78-1, and the value of the Content Validity Index (CVR) for the questionnaire questions was set between 0.83-1.

Ethical approval for the research was obtained from Kashan University of Medical Sciences. The study's objectives were explained to the patients to observe ethical considerations, and informed consent was obtained to enroll the subjects into the study voluntarily. Then, the oral health questionnaire was presented to the subjects, and students themselves completed the questionnaires. The desired data were gathered by referring to the schools.

The data were finally transferred into SPSS 20 statistical software. Independent t-test and analysis of variance were used to compare differences in the scores of health belief model constructs by demographic variables. Pearson correlation coefficient was used to compare the association between the mean scores of the health belief model constructs and oral health behaviors scores. Logistic regression was used to predict oral health behaviors by health belief model constructs. The level of significance was set at $p<0.05$ for all statistical analyses.

Findings

The mean age of the subjects was 16.65±0.66 years. 50% of all the 180 students were male, and 50% were female. In the level of education, 25.5% of the students' fathers had primary education, 64% had secondary and high school education, and 10.5% had a university education. Also, 38% of the students' mothers had primary education, 56.5% had secondary and high school education, and 5.5% had a university education. As well, most fathers job was freelance (49.8%), and mothers job was an unemployed (67.4%). in terms of family income level, 39% were medium.

Of all the studied subjects, 9.4% of them did not brush at all. Also, 15% of the students never used dental floss, and 41.1% of the students referred to the dentist at the time of pain (Table 1).

Table 1) Frequency of brushing behavior, flossing, and dental visits in 10th to 12th-grade students

Variable		N	%
Number of brushing	Not at all	17	9.4
	Once a day	91	50.6
	Twice a day	38	21.1
	Three times or more a day	34	18.9
Brushing time	Not at all	16	8.9
	In the morning or noon or at night before sleeping	154	85.5
	After consuming sweets and every meal	10	5.6
Frequency of using dental floss	Not at all	27	15
	Sometimes	94	52.3
	Once a day	36	20
	Twice a day	15	8.3
	Three times or more a day	8	4.4
Time to using dental floss	Before brushing	29	16.1
	After brushing	68	37.8
	At the time of food stuck between teeth	54	30
	Not at all	29	16.1
Frequency of visiting a dentist	Not at all	52	28.9
	At the time of toothache	74	41.1
	Every six months	39	21.7
	Once a year	15	8.3

According to the independent t-test, self-efficacy (p=0.012) and perceived severity (p=0.014) had a significant relationship with gender, and the average behavior of self-efficacy and perceived severity was higher in women than men.

Based on the findings obtained from the ANOVA test, no significant relationship was observed between oral health behaviors and demographic variables, including job and level of education of parents, income level, and gender (p>0.05).

Based on the findings obtained from Pearson's correlation coefficient, there was a significant and positive relationship between oral health behaviors and knowledge and self-efficacy (p<0.001). In addition, perceived barriers were significantly and negatively associated with oral health behaviors (p<0.001), indicating that with increasing barriers, there was a reduction in oral health-promoting behaviors (Table 2)

Table 2) Association between the constructs of health belief model and oral and health behaviors

Constructs	7	6	5	4	3	2	1
1- Knowledge	0.178**	0.097	-0.68	0.13	-0.10	0.05	1
2- Perceived Susceptibility	-0.03	0.04	-0.11	0.18**	0.40*	1	
3- Perceived severity	-0.09	0.01	-0.65	0.39*	1		
4- Perceived benefits	-0.12	-0.10	-0.13	1			
5- Perceived barriers	-0.30*	-0.49*	1				
6- Perceived self-efficacy	0.35*	1					
7- Behavior	1						

*p=0.01; **p=0.05

The regression model showed an association between the increase in self-efficacy score and knowledge and an increase in the oral health behavior of the subjects (p<0.05; Table 3).

Table 3) Results of the linear regression of items related to students' oral health behavior

Constructs	B	SD	β	p	Confidence interval	
					Lower limit	Upper limit
Constant	9.697	1.826	-	<0.001	6.093	13.300
Perceived barriers	-0.081	0.039	-0.168	0.037	-0.158	0.005
Knowledge	0.154	0.076	0.141	0.043	0.005	0.303
Self-efficacy	0.242	0.76	0.255	0.002	0.093	0.391

Discussion

This study showed that 50/6% of students brushed at least once a day, indicating a somewhat favorable status of brushing behavior in students. This rate was 59.2% in Zare et al.'s study [14] and 94.8% in Mazloomi et al.'s study [18]. The inconsistencies between the results may be due to differences in the methods of evaluation of behavior. In the present study, 20% of students utilized dental floss once a day, whereas, in the Hazavei et al.'s study [16], 18.35% of students take advantage of dental floss. Dental floss removes the plaque from the interdental areas, while people who do not use dental floss are at an increased risk of gum diseases. The low rate of using dental floss among students can be attributed to the absence of knowledge and attitude and lack of necessary and adequate training on the importance of the mentioned behavior in maintaining oral health. In the present research, oral health behaviors were not significantly associated with demographic variables, including parents' jobs and education levels, income status, and gender. In the study by Kuhner & Raetzke [19], the behavior was not significantly different between groups with different household statuses. However, in the research by Goodarzi et al.[20], the performance had a significant correlation with parents' level of education and family income.

In this research, perceived susceptibility had no significant relationship with behavior, which is in line with the results of Faghih Rahimzadeh et al.'s study [21]. However, this relationship was reported to be significant in studies by Solhi et al. [15]. According to these studies, perceived susceptibility is effective in practicing desirable behaviors. In addition, in this study, perceived severity had no significant relationship with oral health behaviors, which is in line with the results of a study by Mehri & Morowatisharifabad [22]. However, this relationship was significant in Shamsi et al.' study entitled "evaluation of oral health care behaviors in pregnant women in Arak based on the Health Belief Model" [17] and in Hajimiri et al.'s research [23]. The inconsistencies between the results of different studies may be due to differences between the studied samples in terms of physiological and age conditions, resulting in differences in perceived susceptibility and severity.

In our study, perceived benefits had no significant relationship with behavior, which is in line with the findings of similar research by Solhi *et al.* [15] and Zare *et al.* [14]; however, this relationship was significant in studies by Sohrabivafa [24] and Rahimi *et al.* [25]. The inconsistency between the results may be because, in the mentioned studies, students' perception has been affected by group training and supplementary reinforcements through paying special attention to individual and social dimensions.

In this study, perceived barriers were significantly associated with behavior. It is in line with the findings of studies by Mazloomi *et al.* [18] and Oveisi *et al.* [26]. When people have a poor understanding of the risk, the deterrent factors and barriers are reinforced. One deterrent to oral health care is the lack of time; however, this barrier can be removed via extensive training. Oral health behaviors are expected to improve via removing existing barriers.

In our research, self-efficacy had a significant relationship with behavior, which means that with increasing students' self-efficacy and ability, their oral health behaviors also improved. This result is in line with the findings of research by Esmaeili *et al.* [27] and Mehri & Morowatisharifabad [22], and Bashirian *et al.* [28], but this relationship was not observed in the studies by and Badri Gargari & Salek Hadadian [29]. The construct of self-efficacy should receive special attention because it can be significantly related to behavior and act as a facilitator to perform a behavior. Knowing what one should do and the consequences of behavior for him or her is not enough for a person to practice a behavior; rather, one must consider himself/herself capable of doing that particular behavior [30]. When students find themselves more capable and proficient in maintaining health in various areas, they are more prone to practice a relevant behavior. In other words, students are more prone to practice healthy behaviors and even confront probable challenges when they feel that they have control over their health behaviors [17]. Therefore, it can be concluded that to perform oral health behaviors during high school age, the perception of self-efficacy is more important than the perception of susceptibility and severity. Hence, it is necessary to enhance self-confidence in students to observe oral health behaviors. Role-modeling is a strategy to improve self-efficacy. Accordingly, students with good practice regarding oral health could be identified and introduced as role models for other students [31].

In this research, there was a significant association between students' knowledge and oral health behaviors. Nevertheless, students' oral health knowledge was not good, which could be due to the absence of theoretical and practical education about oral health. It can also be due to the lower effectiveness of non-systematic training than training designed based on models and theories in schools. Thus, students need training regarding oral health.

The absence of knowledge is also presented in Hazavei *et al.*'s study [16].

As one of the limitations of this study, the data was collected via self-reports. It highlights the need to use more objective indices and data, including the prevalence of decay, missing, and filled teeth (DMFT) in future studies. As another limitation of this study, it is impossible to generalize the results to other population groups, and there is the risk of error in completing the questionnaire. Hence, it is expected to design longitudinal research and training interventions for changing oral health behaviors for all population groups based on behavioral models. The health belief model has the necessary efficiency in promoting oral health behaviors, so it is suggested to use this model to educate students in schools. The more students see themselves as able and efficient to perform health behaviors in various fields, the more they engage in the relevant behaviors. Moreover, if students believe that problems, costs, and time constraints cannot be an obstacle to carrying out certain behaviors, they will take more care of their mouth and teeth. In general, to promote oral health behaviors in students, it is suggested to adopt measures such as teaching students and removing various obstacles such as unwillingness, laziness, and bad feeling to perform brushing and flossing. Therefore, to create appropriate training programs and planning at different levels and sectors, it is crucial to utilize effective models, theories, and experiences to ensure that students are capable of practicing positive behaviors. On the other hand, it is necessary to remove perceptual barriers, apply positive reinforcing factors, and change people's perception of barriers to converting a behavior into a habit.

Conclusion
Knowledge, self-efficacy, and perceived barriers are associated with students' oral health behavior.

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