

Determinants of oral health behaviors among high school students in Shahrekord, Iran based on Health Promotion Model

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Introduction

Oral health is fundamental to overall health, well-being and quality of life. A healthy mouth enables people to eat, speak and socialize without pain, discomfort or embarrassment.¹ Oral health means more than healthy teeth – it includes health of the gums, oral soft tissues, chewing muscles, the palate, tongue, lips and salivary glands.² Good oral health has always been the cornerstone of public and private dental health promotion.³

At the global level, the prevalence, incidence and pattern of oral diseases have changed considerably over the past 3 decades. Dental caries and periodontal diseases in children have been declining in most industrialized countries.^{4,5} Such changes are often attributed to changing living conditions and lifestyles, effective use of oral health services, implementation of school-based oral health care programs and adoption of regular self-care practices.⁶⁻⁸ However, this positive trend has not been seen in developing countries. Increasing levels of dental caries among children are observed, especially for those countries where community-based preventive oral care programs are not established.⁴

Poor oral health can have a harmful effect on children's performance in school and their success throughout life. Children with poor oral health are 12 times more likely to have more restricted-activity days, including missing school, than those with good oral

health.⁹ More than 50 million hours annually are lost from school because of oral diseases.¹⁰ Worldwide, the occurrence of gum disease is high among

Abstract

Purpose: This paper reports on predictors of students' oral health behaviors, using variables based on the Health Promotion Model in an attempt to identify influential variables that may be addressed through intervention efforts.

Methods: A non-probability sample of 300 high school students was recruited from 4 high schools in Shahrekord City, Iran. The study took place between January and March of 2008. Appropriate instruments were used to measure the variables of interest. The statistical analysis of the data included bivariate correlations, t-test, one-way ANOVA and linear regression.

Results: The cognition variables – perceived self-efficacy, perceived benefits, perceived barriers and activity-related affects, and commitment to a plan of Oral health behaviors, were significantly related to oral health behaviors among the respondents. A negative association was found between oral health behaviors and perceived barriers. Interpersonal influences, such as modeling and norms, and situational influences were found to be significantly related to increased oral health behaviors. All of the Health Promotion Model variables were statistically significant predictors of oral health behaviors, and accounted for 65.1% of the variation.

Conclusion: Promotion of interpersonal modeling and the students' perceived self-efficacy should be priorities of any programs aimed at promoting oral health behaviors among students. It is also concluded that the Health Promotion Model may be used in developing countries, like Iran, as a framework for planning intervention programs in an attempt to improve the oral health behaviors of students.

Keywords: Oral Health behavior, Health Promotion Model, Students

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older children and adolescents, with 50 to 100% of 12 year old children having the signs of gum inflammation.¹¹ Gum disease is also more prevalent among adults.

The Islamic Republic of Iran has a population of more than 70 million people. Approximately 40% of the population is younger than 20 years, making Iran a country with one of the youngest populations in the world.¹² There are approximately 13,000 dentists in Iran (1 dentist per 5,500 people), and nearly 1,200 specialists in universities and private practices.¹³ Data from surveys in the past 2 decades show a marked decline of 4 to 1.5 in dental caries using the DMFT index (D=decayed teeth or untreated caries, M=missing teeth, F=filled teeth and T=permanent teeth) in 12 year old children. However, the general level of oral health is still not satisfactory, particularly among children. The percentage of 6 and 9 year old children caries-free with deciduous and permanent teeth is 13.8 and 11.5, respectively, and more than 50% of 12 year old children have caries experience. Therefore, an important aim of the national oral health plan should be developing oral hygiene skills and health practices that improve oral self-care and promote dental and oral health throughout the community.¹⁴

Oral health as an essential part of overall health is the outcome of a complex interaction of many different influences. These health determinants include biological, social, economic, cultural and environmental factors, knowledge and attitudes to health and learned behaviors, as well as access to and availability of health services and interventions.¹ Within these determinants, oral health behaviors are an important factor which need to be addressed through a variety of research methods. Oral self-care behaviors are based on personal choices. The guiding principles found in health behavior models provide useful methods to the oral health care providers in promoting effective individual client behaviors. Theories provide explanations about observable facts in a systematic manner.¹⁵ Therefore, utilizing these health behavior models as a framework for understanding the determinant factors of oral health behaviors is critical for planners and oral health care providers to achieve a comprehensive set of those factors as the goals of intervention programs in the community.

Pender's comprehensive model of health promotion is one of the explanatory nursing models which predicts the health behavior.¹⁶ The revised Health Promotion Model,¹⁷ derived from social cognitive theory,¹⁸ includes 3 groups of factors which are proposed to influence health-promoting be-

haviors: individual characteristics and experiences, behavior-specific cognitions and affect and behavioral outcomes. Health promoting behavior is the desired behavioral outcome and is the end point in the Health Promotion Model.¹⁹

In this study, behavior-specific cognitions included the following:

- Perceived benefits (anticipated positive outcomes that will occur from oral health behaviors)
- Perceived barriers (anticipated, imagined or real blocks and personal costs of understanding oral health behaviors)
- Perceived self-efficacy (judgment of personal capability to organize and execute the health-promoting behavior)
- Oral health behaviors' related effects (subjective positive or negative feeling that occur before, during and following oral health behavior based on the stimulus properties of the behavior itself)
- Interpersonal (cognition concerning behaviors, beliefs or attitudes of the others like norms and modeling) and situational (personal perceptions and cognitions of any given situation or context that can facilitate or impede the health-promoting behavior) influences on oral health behaviors
- Commitment to a plan of oral health behavior (the concept of intention and identification of a planned strategy leads to implementation of the health-promoting behavior)
- Oral health behaviors (endpoint or action outcome directed toward attaining positive oral health outcome) taken¹⁹

These are variables from Pender's revised Health Promotion Model, which provides the theoretical basis for this study. In this model, the likelihood of performing oral health behaviors is related to these behavior-specific cognitions.

The strength of Pender's Health Promotion Model is that it is based on established theoretical perspectives (expectancy value theory and social-cognitive theory) and is grounded in research.²⁰ The model has been used in studies predicting exercise behaviors in American and Iranian adolescents, use of hearing protection in American workers, physical activity in Taiwanese adolescents and

explaining quality of life in chronic disabling conditions.²¹⁻²⁹ As far as our knowledge, the only study performed to investigate the determinants of oral health behaviors applying the Health Promotion Model in developing countries was the study done by Morowatisharifabad and Shirazi in Yazd, Iran.²⁰ Although this model has been applied to a range of health-promoting behaviors, its application on predicting oral health behaviors among students, especially in developing countries, has not been well examined.

Research questions

This paper reports on predictors of oral health behaviors, using variables based on the Health Promotion Model in an attempt to identify influential variables that may be addressed through intervention efforts. The following questions guided the study:

1. What is the pattern of performing oral health behaviors in the students in a developing country, like Iran?
2. In what aspects of oral health behaviors do students report having difficulties?
3. To what extent do the variables of the Health Promotion Model predict performing oral health behavior of the students?
4. May the Health Promotion Model be used in a developing country, like Iran, as a framework for planning intervention programs to improve the oral health behaviors of students?

Methods and Materials

The original survey protocol was reviewed and approved by the Human Subjects Committee at School of Public Health, Shahid Sadooghi University of Medical sciences. Ethical approval for the study was also given by the Medical Research Council's Ethics Committee in Yazd Shahid Sadooghi University of Medical Sciences.

Sample

In 2008, a non-probability sample of 320 high school students was recruited from 4 high schools in Shahrekord City, Iran. At the first days of autumn semester, the questionnaires were administered to the selected students prior to the beginning of formal classes, and they were told that the results would be confidential. The purpose of the study, which included their rights as human subjects for a research study, was explained to participants, and

all signed consent forms. Twenty students did not participate in the study or did not answer questions completely. Therefore, they were excluded from the study. Three hundred students (140 male, 160 female) completed the questionnaires.

Measures

Most of the measures used within the study were developed in a previous study published by Morowatisharifabad and Shirazi.²⁰ The only measure developed by the researchers was commitment to a plan of oral health behavior, which was a 2 item scale. In the first item, the respondents were asked to report if they have a regular plan to brush their teeth. The respondents selected "Yes" or "No" and were scored 0 or 1. If yes, then the second item asked them to report how often they are committed to implement their plan of action. A 3-point Likert-type scaling was used (0=not at all, 1=somewhat, 2=completely) for the second item. Total possible scores ranged from 0 to 3, with higher scores suggesting greater commitment to a plan of oral health behavior.

While developing commitment to a plan of action scale, various ways of wording questions were considered to avoid the possibility that certain responses may be consistently chosen in error. This was important, as a particular phrasing of a question may ultimately be misleading to the respondent.

A panel of experts, consisting of 5 scholars in the areas of health behavior and education, a dentist and an oral health care provider with field experience in dentistry, reviewed and assessed the questions of commitment to a plan of action scale, orally, by evaluating the appropriateness and relevance of the items and response format. They confirmed them to be representative of the construct in order to confirm content validity of the instrument. The feedback from the panel of experts, which was mostly regarding the wording and phrasing of questions, was used to revise and modify the instrument.

A pilot study was conducted to examine the utility of the instruments and to identify the problems and benefits associated with the design. The first draft was prepared following consultation with the multidisciplinary team. The questionnaire was pilot-tested with 30 students. The data were used to estimate the internal consistency of the scales, using Cronbach's coefficient alpha. The content validity of the scales was also established. This pilot sample was not included in the final sample. The scales, number of items, reliability coefficients and

Table I: Health promotion model concepts, scales, and reliabilities

HPM concepts	Scales	Number of items	Alpha	Range	Mean	SD
Oral health behaviors	Oral health behaviors	13	.65	0–26	12.93	4.69
Perceived self-efficacy	self-efficacy	10	.81	0–20	11.47	3.82
Activity-related affect	Positive affects	5	.82	5–25	18.31	4.37
	Negative affects	4	.80	4–20	6.17	3.22
Perceived benefits	Benefits	7	.80	7–35	29.97	4.44
Perceived barriers	Barriers	9	.73	9–27	14.93	3.60
Interpersonal influences	Interpersonal norms	5	.66	5–15	11.61	2.19
	Interpersonal modeling	3	.65	3–9	7.44	1.25
Situational influences	Situational influences	4	.65	0–4	1.93	1.02
Commitment to a plan of action	Commitment to a plan of oral health behavior	2	.65	0–3	1.17	.26

possible ranges of the constructs are listed in Table I.

Demographic data relating to students, including age, gender and parents' education level, was also collected with a form designed for this study. The data are presented in Table II.

Statistics

The statistical package for the social sciences was used for the purpose of data entry, manipulation and analysis. Summary statistics and frequency distributions were used to describe and interpret the meaning of data and the relationship between demographic variables. The Health Promotion Model variables were calculated with t-test and one-way ANOVA. A Pearson's correlation coefficient was used to demonstrate the nature of associations between oral health behavior and the Health Promotion Model variables. In order to explain the variation in oral health behavior scores on the basis of these Health Promotion Model variables, linear regression analysis was performed.

Results

Three hundred questionnaires were completed and returned, giving a response rate of 93.7%. The demographic characteristics of the 300 students are shown in Table II. The mean age of the sample was 16.24±0.84. The sample contained more girls (53.3%) than boys (46.7%).

The prevalence of performing oral health behaviors in high school students were as follows: tooth

Table II: Demographic characteristics of the students

Total students	300
Mean Age ± SD (range), (year)	16.24±0.8(15–18)
Gender (%)	
Male	140(46.7)
Female	160(53.3)
Year of education in high school (%)	
Second year	125(41.7)
Third year	175(58.3)
Father's education (%)	
Illiterate	45(15)
Primary (1–9 years)	140(46.7)
High school(10–11 years)	63(21)
Diploma(12 years)	33(11)
College/university education	12(4)
Mother's education (%)	
Illiterate	16(5.3)
Primary (1–9 years)	102(34)
High school(10–11 years)	82(27.3)
Diploma(12 years)	70(23.3)
College/university education	22(7.3)

brushing (49.3%), using dental floss (15.3%), visiting a dentist twice a year (7%) and using fluidized oral irrigator (5.3%).

Statistically significant differences were found in oral health behaviors, perceived self-efficacy, activity-related affects and perceived benefits and barriers by gender using t-test (Table III). The difference favored female gender. Also, statistically significant differences were found in oral health behavior by father's education level ($p=0.007$) and mother's education level ($p=0.011$) using one-way ANOVA for independent samples. Both the father and mother's education level differences persisted after post hoc tests, with students having parents with high school, diploma and college/university education perform oral health behaviors significantly higher than those having parents with primary education and no literacy ($p<0.05$).

Regarding the commitment to a plan of oral health behavior, 50.7% of students reported that they did not have a regular plan to brush their teeth. Among those who reported having a regular plan, 43.7% were not committed to their plan of action at all, and only 36.6% were completely committed.

The respondents noted that the following individuals (as interpersonal influences) encourage them a lot to perform oral health behaviors: mothers ($n=255$, 85%), fathers ($n=195$, 65%), teachers ($n=126$, 42%), siblings ($n=133$, 44.3%) and peers ($n=46$, 15.3%). Moreover, from the students' point of view, 58% of their mothers, 39% of their fathers and 54.4% of their siblings perform oral health behaviors.

Applying Pearson's correlation analysis, it was found that oral health behaviors had statistically significant positive correlations with all Health Promotion Model variables (Table IV).

The cognition variables (perceived self-efficacy, perceived benefits, perceived barriers and activity-related effects) and commitment to a plan of oral health behavior were significantly related to oral health behaviors among the respondents, with a positive association found between oral health behaviors and perceived self-efficacy, perceived benefits, commitment to a plan of oral health behavior and activity-related effects. Negative associations were found between oral health behaviors and perceived barriers. Among the cognition variables, perceived self-efficacy had the highest correlation

Table III: Mean scores comparison of HPM variables and oral health behaviors by the students' gender

		Male n= 140 Mean(SD)	Female n=160 Mean(SD)	P
Oral health behaviors		12.03(5.1)	13.71(4.1)	0.002
Perceived self-efficacy		10.72(4.2)	12.13(3.2)	0.001
Activity-related affect	Positive affects	17.56(4.4)	18.97(4.1)	0.005
	Negative affects	6.83(3.7)	5.6(2.5)	0.001
Perceived benefits		29.3(5.2)	30.5(3.5)	0.013
Perceived barriers		15.38(3.8)	14.54(3.3)	0.043
Interpersonal influences	Interpersonal norms	11.5(2.2)	11.71(2.1)	>0.05
	Interpersonal modeling	7.39(1.2)	7.49(1.2)	>0.05
Situational influences		1.85(0.8)	1.97(0.7)	>0.05
Commitment to a plan of oral health behavior		1.15(0.4)	1.19(0.3)	>0.05

with oral health behaviors. Interpersonal influences, such as modeling and norms, and situational influences were found to be significantly related to the increased oral health behaviors.

Multiple regression analysis was performed to explain the variation in oral health behavior scores on the basis of Health Promotion Model variables. As shown in Table V, all norms (except for interpersonal norms and negative effects) were statistically significant predictors, and accounted for 65.1% of the variation.

Discussion

In this study, oral health related factors among Iranian high school students based on the Health Promotion Model were investigated. The results showed that the sample contained more girls than boys. This is similar with the findings of previous studies done in Yazd and Sanandaj, 2 Iranian cities, based on the Health Promotion Model.^{20,23} Moreover, the mean age of students and the level of parents' education in this study were very similar with those found in the study conducted in Yazd, considering the different grade of students in these 2 studies (high school (11th grade) vs. pre-university (12th grade)).²⁰ Therefore, we can presume that the students in the present study are representative of students in Iran.

Table IV: HPM Variables with Oral Health Behavior Correlation Matrix

Variables	1	2	3	4	5	6	7	8
1=Perceived self-efficacy	1							
2=Activity-related affect	0.471**	1						
3=Perceived benefits	0.354**	0.511**	1					
4=Perceived barriers	-0.259**	-0.276**	-0.250**	1				
5=Interpersonal influences	0.310**	0.326**	0.264**	-0.157*	1			
6=Situational influences	0.125*	0.089	0.167*	-0.005	0.190*	1		
7=Commitment to a plan of oral health behaviors	0.179*	0.189*	0.223**	-0.129*	0.144*	0.085	1	
8=Oral health behaviors	0.529**	0.406**	0.374**	-0.293**	0.386**	0.228**	0.323**	1

* P < .05

**p < .01

Table V: Regression Analysis of HPM Variables as Predictors of Oral Health Behaviors

Predictors	Un-standardized B	t	p	F	R2
Constant	3.8	1.22	.221	22.97	0.651
Perceived self-efficacy	0.41	6.27	.000		
Positive affects	0.12	2.26	.024		
Negative affects	0.02	0.77	.442		
Perceived benefits	0.14	2.5	.012		
Perceived barriers	-0.14	-2.3	.021		
Interpersonal norms	0.44	1.5	.111		
Interpersonal modeling	0.85	4.7	.000		
Situational influences	0.22	3.0	.003		
Commitment to a plan of oral health behaviors	0.20	2.7	.007		

The mean score of oral health behavior scale in the respondents was 12.93±4.69. In the study reported by Morowatisharifabad and Shirazi, the mean was 13.05±3.67.²⁰ Girls had a better performance in oral health behaviors in proportion to the boys, which is consistent with the findings of the present study. Several studies have shown that, in the area of oral health care, girls perform better than boys.^{20,30,31} Therefore, in order to enhance performance among boys, we can propose that oral health educators consider the successful girls in performing oral health behaviors as role models in oral health-promoting programs.

In the oral health behavior domain, "tooth brushing regularly" and "using toothpaste while tooth brushing" were rated as the most frequent behaviors among study subjects. The lowest scores in oral health behaviors were for "referring to dentist regularly," "tooth brushing after eating food" and "using a fluidized oral irrigator." Oral health care profession-

als should provide information about the best way of performing oral health behaviors for students, or refer them to dental specialists for further guidance or assistance, as well as considering these behaviors as priorities while designing educational programs for students.

Approximately 15% of the studied students in Shahrekord were using dental floss, but in a study of teenagers in Sweden, more than 50% of respondents performed this behavior.³² In another study conducted on Turkish dental students, the rate of regular dental floss usage was 32.3%.³³ Not using dental floss in Iranian students may be a result of their lack of knowledge and attitude regarding the importance of this behavior for oral health and not instructing them. It was reported that education about dental health care in the pre-university curriculum could be an important factor that can influence the oral health attitudes of students entering the dental field.³⁴ Based on what was stated, edu-

cating students about oral health care in high school and pre-university periods may promote not only their knowledge and attitude, but promote performing oral health behaviors through other periods of their life.

In the commitment to a plan of oral health behavior domain, more than 50% of the respondents had never been committed to a plan of oral health, and approximately one third were committed completely. These results may, again, be a sign of weak knowledge toward oral health behaviors in students. The results showed that the commitment to a plan of oral health correlated to perceived benefits and self-efficacy, significantly. The Health Promotion Model proposes that commitment to a plan of action is less likely to result in the desired behavior when other actions are more attractive and thus preferred over the target behavior.¹⁹ Therefore, in order to attract the students to a plan of oral health behavior, instructing a planned oral health strategy along with the benefits of oral health behaviors and increasing their perceived self-efficacy through educational programs may result in promoting their commitment to the action plan and, consequently, oral health behaviors.

In multiple regression analysis, we found that interpersonal modeling and perceived self-efficacy are the most powerful predictors of oral health behavior. The total variance explaining these behaviors was 65.1%. In the Morowatisharifabad and Shirazi study, perceived self-efficacy was the strongest predictor of oral health behaviors, and the total variance explaining oral health behaviors was 32%, considering the direct and indirect effects of the Health Promotion Model variables.²⁰ In the report which tested the Health Promotion Model for the use of hearing protection devices among farmers, interpersonal and situational influences and barriers were the most powerful predictors of the behavior.³⁵ But in the reports that tested the Health Promotion Model for physical activity and exercise, self-efficacy was the strongest predictor of the behavior among youth.^{27,28,36} Therefore, and on the basis of our findings, the practical implications of interpersonal modeling and perceived self-efficacy in promoting oral health behaviors of students are noteworthy.

The results of this study showed that parents are the most important influences on oral health behaviors of the students, and peers are the least important. Furthermore, regression analysis showed that interpersonal modeling is the strongest predictor of oral health behaviors. Oral health care providers should consider the student's parents as an important part of intervention while designing interven-

tion programs in order to promote the oral health behaviors of students.

About 45% of students in the present study stated that teachers are great incentives of performing oral health behaviors. Petersen et al noted that a successful school health program would depend on the responses by teachers.³⁷ Some previous programs were not reported successful since the teachers received limited instruction on dental health education or they lacked motivation.³⁷ Therefore, joining the teachers in school oral health programs may have a great influence on the successfulness of program.

The results of this study showed a statistically significant correlation between students' level of self-efficacy and all of the other variables of the Health Promotion Model, especially oral health behaviors. Our findings complement the conclusions of other studies which have shown that self-efficacy mediated the effect of other variables on health behaviors.^{20,27,29,38} As Brekke pointed out, self-efficacy is not a static trait and can be altered.³⁹ Additionally, we may find in clinical trials that self-efficacy programs have a beneficial effect.^{40,41} Therefore, we can propose self-help courses for students within which promoting self-efficacy is one of the most important priorities.

According to our data, there was a strong relationship between interpersonal influences and self-efficacy. Furthermore, mothers were the most important influences on the oral health behaviors of students. In other words, self-efficacy is probably related to the importance that mothers place on oral health. A strategy to enhance self-efficacy is modeling.¹⁸ Modeling means that patients who are successful in coping with certain problems act as models for other patients. Therefore, we can presume that if mothers act as models for their children in performing oral health behaviors, the children's self-efficacy, as well as their adherence with oral health behaviors, will be increased.

Moreover, similar to another researcher who has reported self-efficacy to be negatively correlated with perceived barriers,²⁰ our results also showed a significant negative relationship between self-efficacy and perceived barriers. As Morowatisharifabad and Shirazi noted before,²⁰ it means that when perceived barriers on practicing oral health behaviors are high, it may cause an increase on perceived self-efficacy for dealing with the problems, but any programs aimed at increasing perceived self-efficacy among students may induce a decrease on perceived barriers and a higher practice of oral health behaviors.

Conclusion

In multiple regression analysis, we found all of the variables, with the exception of interpersonal norms and negative effects, to be effective predictors of oral health behaviors, accounting for 65.1% of the total variance, within which interpersonal modeling and perceived self-efficacy were the most powerful predictors of oral health behavior. It was concluded that the Health Promotion Model may be used in developing countries, like Iran, as a framework for planning intervention programs in order to predict and improve the oral health behaviors of students.

Health care professionals should develop stage-specific intervention programs based on the Health Promotion Model, within which promoting interpersonal modeling and the student's perceived self-efficacy are priorities of the program, followed by providing individual instructing practices and information through self-help groups in an interactive environment to improve Oral health behaviors. To improve the oral health behaviors of the students, an aim of the educational program should be strengthening students' self-efficacy. Effective

methods to increase self-efficacy are guided exercise of new skills, setting short-term goals and combining feedback about accomplishments and modeling.¹⁸ Social support can be a motivating factor for the students to perform oral health behaviors. Therefore, it is important not only to educate the student, but to also educate the student's parents, teachers and other close relatives.

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