

# The Application of the Health Belief Model in Oral Health Education

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## Abstract

**Background:** The goal of this study was to determine the application of health belief model in oral health education for 12-year-old children and its effect on oral health behaviors and indexes.

**Methods:** A quasi-experimental study was carried out on twelve-year-old girl students (n=291) in the first grade of secondary school, in the central district of Tehran, Iran. Research sample was selected by a multistage cluster sampling. The data was obtained by using a valid reliable questionnaire for measuring the perceptions, a checklist for observing the quality of brushing and dental flossing and health files and clinical observation. First, a descriptive study was applied to individual perceptions, oral behaviors, Oral Hygiene Index (OHI) and Decayed, Missing and Filled Teeth Index (DMFTI). Then an educational planning based on the results and Health Belief Model (HBM) was applied. The procedure was repeated after six months.

**Results:** After education, based on HBM, all the oral health perceptions increased ( $P<.05$ ). Correct brushing and flossing are influenced by increased perceptions. A low correlation between the reduction of DMFTI and increased perceived severity and increased perceived barriers are found ( $r=-0.28$ ,  $r=0.43$  respectively). In addition, there was a limited correlation between OHI and increased perceived benefits ( $r=-0.26$ ).

**Conclusion:** Using health belief model in oral health education for increasing the likelihood of taking preventive oral health behaviors is applicable.

**Keywords:** Health belief model, Oral hygiene index, Decayed missing and filled teeth index (DMFTI), Brushing, Flossing

## Introduction

Decayed, Missing and Filling Teeth Index (DMFTI) is an Index for considering oral health and mean of the number of Decayed, Missing, and Filling Teeth. World Health Organization's categories for this index in 12 yr old children are very low (0-1.1), low (1.2-2.6), moderate (2.7-4.4), high (4.5-6.5), and very high (more than 6.5) (1, 2).

A study about American white children showed that DMFTI was 1.2 (3). This index was 6.12 in elementary student in Cape Town in South Africa (1986-200) and 4.4 in 12 yr old children in Madagascar (4, 5).

Prevalence of decayed teeth in 12 yr olds in secondary school in Tehran in 1995 indicated DMFTI in these children as 3.17. The mean of this index in girl and boy students were 3.26 and

3.09 respectively. DMFTI in 7.6% of these children was zero (6).

Based on the goal of "Health for all until the year 2010 Project" the DMFT index in 12 yr old children has to be three or less than three.

Achieving the goal is accessible by health education, florid therapy, nutrition recommendations, and primary health care. Health education is the important factor of all these factors (1, 2). Health education scientists have prepared models by using different psychological and social patterns, which are very effective. One of these models is Health Belief Model (HBM), which was planned in 1950 and developed during the years (7). It has these dimensions:

### *Perceived susceptibility*

That is the level, which a person knows his sensitiveness about a disease (8).

#### ***Perceived severity***

That is the perceptions of the person about severity of the disease (9).

#### ***Perceived benefits***

That is the person's understanding about the advantages of doing the preventive behavior (10).

#### ***Perceived barriers***

Each healthy behavior and practice may encounter some barriers and problems (11).

#### ***Cues to actions***

They are stimulations, which facilitate decision-making. They act in two ways: some of them are internal like headache, which make the person to show a behavior for solving it. Some of the cues to actions are from outside like mass media and communication between people, which helps the person to do an especial behavior (10, 12).

Hollister and Anema's study entitled "health behaviors models and oral health" suggest health belief model as an effective models on oral health (7). Other evidences showed that HBM model would increase likelihood of taking healthy behaviors. Results of research about oral healthy behaviors in American white children and their family showed that there was some relation between perceptions and the behaviors ( $r= 0.43$ ) and this finding support the application of HBM (3).

According to increasing DMF index in 12 yr old Iranian children (6) and because of importance of oral health education through proper model for studying the behaviors, in this study health belief model was used in oral health the first time.

In this investigation, dimensions of this model, DMFT index and the effects of education through H.B.M and the effects of increased perceptions on the behaviors and the Indexes were considered and finally the proper model for oral health education in these children prepared.

## **Materials and Methods**

The population studied was 12 yr old girl students studying in the first grade of secondary

school six<sup>th</sup> district in Tehran. Number of samples was calculated 103 for each group by using volume of sample formula based on the percent and mean of the variables. Thirty percent was increased to this number for probably missing the cases after education and 20% was increased for Pilot Study. Totally, in the first stage, 291 students took part in two groups of 147 and 144 students (case and control). In the second phase, 235 students took part in two groups of 118 and 117 students. Missing cases were changed their school. Multistage cluster sampling method was applied. The data were obtained by using a questionnaire, a checklist for observing the quality of brushing and dental flossing, the health files of students in school and oral examination of the samples by a dentist. The questionnaire included some demographic question and 54 questions about HBM elements based on Lickert scale (five emotional detection spectrums). Score of variables (perceptions, DMFI and OHI) categorized based on (Mean±SD) into weak, moderate and good level. In addition based on the proportion of correct answers, perceptions were categorized into three levels i.e. weak (less than 50%), moderate (50-90%) and good (>90%). OHI was calculated by dentist based on sum of debris and plaque indexes on related surface of teeth. In order to assess the construct validity of the questionnaire, the factor analysis was performed by using the principal component method with Varimax Rotation. A factor loading of .40 was used as a cut-off point for the inclusion of items. Finally, some items were excluded from the instrument, because they did not sufficiently load on the intended subscales. To assess the internal consistency of the instrument items and following the factor analysis approach, a Chronbach's Alpha formula using Kuder Richardson (KR20) was applied to measure the reliability of the questionnaire. The results reveal the reliability rates, which are in an acceptable level. In addition, the Test-Retest survey was done. The comparison of the results has shown the reliability coefficient as 0.95. Test- retest method used for determining the reliability of checklist, the Oral Hygiene

Index and DMFTI results, and correlation coefficient of 0.95 has been achieved.

This research was performed during two academic years in 1995-6. First, primary data was collected by the instruments and a dentist did exams the students. Data was analyzed then an educational program planned based on the results and Health Belief Model elements. The duration of education session was for students 1-2 h, parents 1 h and teachers 1 h. The education methods were lecture, demonstration, and colloquy. Educational materials such as full mouth model with large toothbrush, dental floss, and picture collection were used. Six months after educational program administration, data gathered and analyzed again. This interval time was based on the dentist examination interval, which is six months.

Student's oral examination, estimation of OHI and DMFT Index based on related criterion did by a dentist and analysis of brushing behaviors and using dental floss performed based on usual standard by the researcher. Chi-squared test, Fisher test, Z test and paired t- tests and correlation coefficient test had been used for data analysis via SPSS 13. Students under study and their parents complete an informed consent. Control students received oral health education, dentist's recommendations and refer to a dental clinic at the end of research.

## **Results**

The situation of case and control groups had been equal in their priority of the children in the family and their total number, the job and education of mother and father, and economical situation of the family.

In the first phase, there was no significant difference between two groups regarding: individual perceptions about sensitivity, severity, benefits and barriers of oral health; cues to action; the most important kind of cues to action; daily brushing; time and occasion of brushing and daily usage of dental floss, the last visit to the dentist, occasions of visit to the dentist; OH I and DMFTI, quality of brushing, quality of using dental floss, total number of decayed, filled and missing teeth,

the therapeutic and recognizable needs, and kind of therapeutic and diagnostic needs. The mean of perceptions about sensitivity, severity, barriers and benefits of oral health behaviors were weak range in two groups. There had been cues to action in 84.4% of cases and 83.3% of controls and the most cues to action in two groups were: parents (70.7 & 71.5%) dentist (34 & 29.9%) and health school worker and other authorities of school (18.4 & 29.9%). 83.7% of case students and 86.1% of control students were brushing daily and each two groups were brushing once a day and in case of time of brushing, they were brushing after breakfast, lunch and dinner. Only 10.9% of cases and 11.7% of controls were using dental floss daily. In case of last visit to the dentist, each two groups have visited dentist over a year ago. 26.5% of case group and 26.4% of control group have declared that they have not visited dentist up to this time.

Mean of OHI in two groups was in good situation (96%). 71.4% of case group and 71.5% of control group had good OHI. DMFTI in two groups was moderate. The mean of this index in case group was 3.10 and in control group was 3.06. Both group brushed incorrectly. Only one student in case group (8%) brushed correctly and in control group none of them brushed their teeth correctly. In two groups, a few students were using dental floss and mode of quality of flossing was incorrectly. In the case group, only one student flossed correctly (6.25%) and in the control group the related percentage was zero. 78.9% of case group and 75.7% of control group needed diagnostic and therapeutic actions. In the case of remedy and needed diagnostic procedure, the remedy in two groups was "fill the teeth".

After educational program in case group and passing of six months, there was significant difference in the mean of perceptions, behaviors and oral indexes between before and after intervention in this group ( $P < 0.05$ ). However, no significant differences observed in the mean of these variables in control group between two stages ( $P > 0.05$ ). In first phase, the mean of perceptions in case group reached good level. After education in

most of case children, four desired perceptions were in good level and in the others were in moderate level. One hundred percent of cases brushed daily. The related percentage in control group was 82.2%. 26.5% of case students and 9.3% of control students brushed three times a day. 34.2% of case group students and 6.2% of control group students were brushing their teeth once every night before sleep. 87.2% of case students and 10.2% of control students were using dental floss daily. 65.81% of cases and 6.77% of controls use dental floss once a day inappropriate. 96.6% of case group and 5.9% of control group visited a dentist four to six month ago (Table 1).

95.7% of cases and 33.9% of controls had good OHI. The mean of this index was 0.72 in case group and 1.33 in control group.

Although DMFTI in two groups were moderate, but statistical tests showed the significant difference clarified in two groups, so that the mean of this index in case group was 3.07 and in control group was 3.86. Comparison of this mean in control group after and before education by the paired *t*-test, showed this index had become worse. 18.80% of cases and 11.10% of controls were cares free. In the second phase, there had been significant difference between two groups in quality of brushing (Table 2).

75.5% of case students use dental floss correctly and in 24.5% of them dental flossing was to some extent correct but in 16.66% and 83.33% of control group the quality of using dental floss was to some extent correct and incorrect respectively. Exact Fisher test showed a significant difference between two groups ( $P < 0.0001$ ). From 78.9%

of case students who needed the diagnostic and therapeutic procedure in first phase, the therapeutic and recognition procedure was done for 61.5% of them in the second phase. Nevertheless, in control group from 75.7% of them, who needed diagnostic and therapeutic procedure in the first phase, only 0.8% received total treatment and 72% and 2.5% of them did not or up to certain limit received diagnostic and therapeutic care. The important point was that 10.2% of control students who needed of therapeutic procedure in the first phase; they have become afflicted with decayed teeth and have not done anything for it. In the second phase, a correlation observed between the performance of brushing and sensitivity, severity, barriers and benefits perceptions in case group ( $P = 0.00$ ). In addition, there had been a correlation between brushing quality and the four desired perceptions. Four Spearman correlation coefficient achieved were respectively 0.38, 0.30, 0.33 and 0.35 ( $P = 0.001$ ). There had been a correlation between brushing correctly and four perceptions (about benefits perception  $p = 0.03$  and about three other perceptions  $P = 0.000$ ). In addition, there was a correlation between flossing correctly and these perceptions. The related correlation coefficients were respectively 0.29, 0.26, 0.25 & 0.24 (about the first perception  $P = 0.001$  and about three other perceptions  $P = 0.01$ ). There was a negative correlation in amount of -0.26 between OHI and perceived benefits. In addition, there were negative correlations in amount of -0.28 and -0.43 between DMFTI with perceived severity and perceived barriers.

**Table 1:** Frequency distribution of the last visit to dentist in groups under studying in second phase

Last visiting to dentist	Case		Control		Total	
	n	%	n	%	n	%
Have not visited dentist yet	0	0	20	16.9	20	8.5
Less than 3 months ago	0	0	7	5.9	7	3
4 to 6 months ago	113	96.6	7	5.9	120	51.1
7 to 12 months ago	4	3.4	29	24.6	33	14
Over 1 year ago	0	0	55	46.6	55	23.4
Total	117	100	118	100	235	100

$X^2$  test ( $P < 0/000$ )

**Table 2:** Frequency distribution of quality of brushing in study groups in second phase

Manner of using brush	Case		Control		Total	
	n	%	n	%	n	%
Correct	90	76.9	0	0	90	41.7
To some extent correct	27	23.1	31	31.95	58	27.8
Incorrect	0	0	66	68.04	66	30.6
total	117	100	97*	100	214	100

X<sup>2</sup> test ( $P < 0.000$ ), \* 21 control students did not brush

## Discussion

In the case of having definite program of brushing, comparisons of the results of this research with other studies have shown the situation of students under study was better than the others were. In this study, 16.3% of case students and 13.9% of control students did not brush daily. However, in study of Chen, 51.9% of American white children did not have definite program for brushing (3).

This number in 12 yr old students of Tehran secondary school in 1991 was 22.2% (2). Seventy two percent of students in the last year of primary school in northeastern Ontario of Canada were brushing twice a day (6). Nevertheless, this number in studied children was 26.8% in case group and 25% in control group.

The situation of children studied in case of daily use of teeth dental floss was not satisfactory. This range in case and control children was respectively 10.9 and 11.7 percent. 6.4% of American children were using floss daily (3). Forty two percent of last primary school students in eastern Ontario claimed they use floss twice a week (13).

In case of last visit to a dentist, also children's situation was not desirable. 50.3% of white American children did not have definite program for visit to the dentist (3). Eighty four percent of last year primary school students in eastern Ontario of Canada claimed they visit to a dentist once a year (5).

The DMFTI means in case and control groups were similar to the DMFTI mean of 12 yr old children at Tehran secondary school in 1991 (3.10 and 3.06 in front of 3.09), but the percentage of cares free children was better (17.68 & 18.05% in front of 7.6%) (6).

Findings in first phase, confirm lack of usual educational efficiency in the field of oral health at

school level. The results in the second phase indicate the necessity of educational programming with supporting of appropriate models and activating the most important cue to action. Findings indicate application of health belief model in education of twelve-year-old girl students in the center of Tehran is appropriate.

Modification the perceptions in this model caused brushing behavior and use of dental floss. In addition, the corrected brushing behavior and use of dental floss correctly are affected by individual perceptions (sensitivity, severity, barriers and benefits perception). The powerful factor in this model for the two behaviors, is perceived sensitivity ( $r = 0.38$  and  $r = 0.29$ ).

This finding is match with Hollister and Anema's study entitled "health behaviors models and oral health". The study described health belief model is one of effective models on oral health (7).

Results of research about oral healthy behaviors in American white children and their family showed there is some relation between perceptions and the behaviors ( $r = 0.43$ ) and The powerful factor were perceived salience, perceived benefits and perceived barriers. This findings support the application of HBM (3).

Findings have shown workers in the field of oral health, should try for changing these four perceptions more because increasing such perceptions can be effective in behaviors, which prevent oral diseases. Also decreasing the DMFT index had been related to the increasing of individual perceptions about severity and barriers although the effect of barriers was more than the others. Decreasing the OHI also is affected by increasing individual perception about benefits of oral health behaviors.

## Ethical Considerations

All ethical issues including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc have been completely observed by the author.

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