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The Effect of Oral Health Promotion Program on Early Dental Decay in Students: a Cluster Randomized Controlled Trial

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ABSTRACT

Introduction: The use of different models play a significant role in health education and its promotion. Therefore, the present study aims to investigate the effect of the Theory of Planned Behavior (TPB) on early dental decay in elementary students.

Methods: This study was a single-blinded, cluster randomized controlled trial, in which 470 elementary students in the fourth, fifth and sixth grades in Saveh, Iran were participated. A demographic questionnaire and a 5-item questionnaire consisting of questions on awareness, attitude, practice, tooth brushing, diet and referring to dentist, were used to data collection. The samples of the intervention (n=234) and control (n=236) groups filled out the questionnaires before intervention (pre-test), immediately after intervention and one month after intervention. The educational intervention based on the TPB was held in three 45-minute sessions. Finally, the data were analyzed, using the SPSS version 13. For analyzing, the Independent t-test, Chi-square, and repeated measures ANOVA were used.

Results: This study showed that there is a significant difference in the mean scores obtained from knowledge, attitude, subjective norm, perceived behavioral control, behavioral intention and behavior among students in the experimental group (immediately after and one month after the intervention) and students in the control group.

Conclusion: The results of this study showed that using of TPB, as a framework for providing behavior-led training, can be effective in promoting oral and dental health of students. Nurses as an important member of the treatment team can use the results of this study in school health programs.

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Introduction

Oral health can affect the life quality of individuals, their families, as well as, communities.[1] Oral health and its relationship with a healthy life is a multidimensional concept that covers systemic functioning, as well as mental and economic health.[2] Tooth caries is one of the most common infectious diseases that affects all races, ages, sexes and geographical areas.[1,3] According to the available statistics, the prevalence of dental caries among 12-year-old Iranian students is higher than the global average and, if left untreated, may lead to loss of teeth.[4] Given the importance of the teeth role from a variety of perspectives, attempts should be made to prevent dental Caries, gum diseases and tooth loss. The World Health Organization recommends that each country have regular careful oral and dental health programs to check the oral health status every 5 years.[5]

Various indicators are used to evaluate oral and dental health. Decayed, Missing, Filled, Teeth (DMFT) scale (in permanent teeth) and DMFT scale (in temporary teeth) are considered the best epidemiologic indicators in dentistry and can indicate the status of oral health in the community.[6] Dental problems are more severe in developing countries. The results of the studies on the oral health status show that Iranian children have 2 and 5 decayed teeth at the age of 3-5. The indicators reflecting the state of oral health in Iran during the years 1995, 1998 and 2005, are equivalent to 1, 1.5 and 1.8, respectively.[7] According to a study conducted in 2011 by Shariat et al., on elementary school students in Saveh, the mean value of this indicator was equal to 2.3 (8.7) percent.[8] Wrong dietary behaviors, for example, high sugar, sweets and chocolate consumption and low consumption of dairy products will lead to a relatively higher prevalence of dental caries in older ages.[9]

Moreover, failure to institutionalize habits such as tooth brushing and flossing leads to high prevalence of dental caries in children; thus it is necessary to make attempts to discover the origin of such problems and make interventional measure to reduce wrong nutritional and health behaviors.[10] Enabling people to properly use tooth brush and flossing and reducing the physical and psychological barriers in this regard, is the best strategy to encourage people to observe oral health.[11] Recent studies in the United States (U.S) have shown that training in preventive behaviors such as toothbrushes has led to a reduction in the incidence of

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dental caries over the past few decades.[12] Health education researchers have developed different models with different psychological and social applications in order to change behaviors.[13] Various trials on different aspects of health have demonstrated that, most of the interventional measures based on behavior change models have been more successful in achieving their objectives, and the efficiency of these models in behavior changing has already been proven.[3,14] The promotion of good oral health through evoking behavior changes requires a good insight in the determinants of the behaviors relevant to oral health.[15]

TPB is a Social-cognitive decision-making model that provides a useful framework to predict and explain health behaviors.[16,17] According to this model, individuals' plans to show a specific behavior are predicted by three factors: attitude toward behavior, subjective norms, and the perceived behavioral control.[18]

Subjective norms are normally formed under the influence of two factors known as normative beliefs and motivation for compliance. These norms tend to be largely influenced by the important people in the community, such as parents, teachers, doctors, religious leaders, etc. The perceived behavioral control shows the extent to which a person feels free to perform a particular behavior of their own accord. This factor, in turn, consists of two further factors known as the control beliefs and perceived ability.[19] The behavioral intention is one of the most basic constructs of the TPB through which we can realize the extent to which people tend to do a particular action or make an effort to plan for performing a particular behavior.[20] One of the most important approaches used to develop the education system and promote the dental health in the society is the design and implementation of the targeted educational and preventive programs in the society through preventive health and dentistry approach, using effective educational models.[20]

The most important way to reduce dental Caries is to turn to preventive measures and the first step in prevention is to promote the culture of health among people.[18] Selecting a training model starts the program in the correct direction and directs it in the right direction. This model, with components such as behavioral intention, increases the sensitivity of individuals to the problem and can multiply the effect of education. Thus, the aim of this study was to investigate the effects of TPB on the oral health behaviors among the elementary school students.

Materials and methods

This study was a single-blinded, cluster randomized controlled trial, in which 470 elementary students in the fourth, fifth and sixth grades in Saveh, Iran were participated. The sample size was determined (n=516) (with probability of lost of 10% of samples) according to similar study (α= 0.05, β= 0.2, power= 80% and D_{eff}= 1.7).[20] After obtaining permission from the Education Department of Saveh, the sampling was done by a multi-stage sampling method, using cluster sampling. First, the clusters were selected from different regions of the city (north, south, east, west and center), then four schools were randomly selected from each cluster (20%). In each cluster, two schools were considered as intervention groups (n=234) and two schools were considered as control (n=236) groups using simple random allocation method. In the intervention group schools, all eligible students (fourth, fifth and sixth grades) were assigned to the intervention group and in control group schools, all students (fourth, fifth and sixth grades) were assigned to the control group. For making sequences, the heads surface of coin was assigned to the intervention group, and the tails surface of coin was assigned to the control group. This study was single-blinded and the data analyzer was not informed from the intervention and control groups.

Present study was approved by the ethics committee of Saveh University of Medical Sciences (IR.SAVEHUMS.REC.139407). Moreover, this study was registered in the Iranian Registry of Clinical Trial (IRCT2017012831522N5).Before intervention the purpose and process of study were explained to students, their families, and authorities of schools. Questionnaires were completed confidentially, without name and ID of participants.

Participants were informed that they could withdraw from the study at any time without loss of benefits. After completing the forms and completing the pretest, the educational intervention was held three times a week (Sunday, Monday and Wednesday), based on the TPB, during the 45 minute training sessions via lecture and group discussions.[21,22] The first session was held to raise students' awareness and attitude of the booklet through group discussions and Q and A technique. In the second session, based on the role and importance of the perceived behavioral control in empowering individuals to achieve the stage of behavior, role playing and practical work was used. The third session included a practical demonstration of the use of toothbrushes and dental floss, using dental arches, and with students practicing them on their teeth. The teachers attended all educational sessions held for the students. The booklet included materials such as dental work, the causes of dental caries, useful and harmful food for teeth, the use of toothbrushes and dental floss to make the topic more interesting with related stories and coloring. The control group received the standard training provided by school health coaches. A questionnaire was filled immediately after the intervention, and another one month after the intervention.[20,22] The data gathering tool was a demographic questionnaire and a questionnaire about oral health designed and developed by Rad and colleague for assessing knowledge, attitude and practice of 12-year-old Iranian children.[23] Internal consistency was performed using Cronbach's alpha (0.85) coefficients for reliability testing. In order to evaluate the face validity, the questionnaire was completed by 26 students and the questions were controlled in terms of comprehensibility. To determine the validity of the demographic information questionnaire, the face and content validity method was used. A questionnaire was developed, using authoritative scientific sources[15,18,20,22] and the corrections were made with the confirmation of

experts and professors. The reliability of the uestionnaire was also verified by the internal correlation (α= 0.87).

The questionnaire included a series of questions in five different domains (eight questions about knowledge, nine questions about attitude, five questions about the tooth brushing, eight questions about diet and a question about referring to the dentist). The range of knowledge, attitude and practice (tooth brushing, dietary regime and referring to dentist) items are 0-8, 0-12 and 0-60, respectively. Finally, the collected data were analyzed, using Statistical Package for the Social Sciences, developed by IBM co. (SPSS) version 13. Independent t-test, Chi-square, and repeated measures ANOVA were used. The Kolmogorov-Smirnov test was also used to check the normality of data. To compare effectiveness of educational intervention between the two groups, independent t-test was used. In addition, the repeated measures test was used to determine the effectiveness of the intervention over time. The significance level was considered 0.05.

Results

The samples included 470 elementary school students in Saveh city (in fourth, fifth and sixth grades), with an average age of 12.00 (0.6) , who were sampled on the basis of standardized reporting in clinical trials,[24] using consort check list and were then randomly divided into intervention (n= 234) and control (n= 236) groups (Figure 1). 35.58% (n= 168), 34.23% (n= 161) and 30% (n= 141) of students were fifth, sixth and fourth grade students, respectively. Also, 74.26% of the students had 1 to 5 decayed teeth and 25.74% of students did not have any decayed teeth. 77.6% of them visited dentists for periodic or annual examination. 58.45% of the mothers had elementary education and 41.55% had higher education. 79.91% of the fathers had elementary and 20.09% had higher education. 42.81% of the mothers and 91.04% of the fathers of the students were employed. 50.83% were female students and 49.17% were male students. (Table 1)

The statistical analyses results (analysis of variance with repeated measures) showed no significant differences between the intervention and control groups in the pre-test stage (P>0.05). However, a statistically significant difference was observed between the intervention and control groups, immediately and one month after the intervention, In other words, the results of the study showed that the educational intervention had a positive effect on promoting attitude and leading to behavior (P<0.05) (table 2).

The results of this study showed that there were no significant differences between the intervention and control groups in terms of field variables age, sex, and level of education, employment, and etc. (P>0.05).

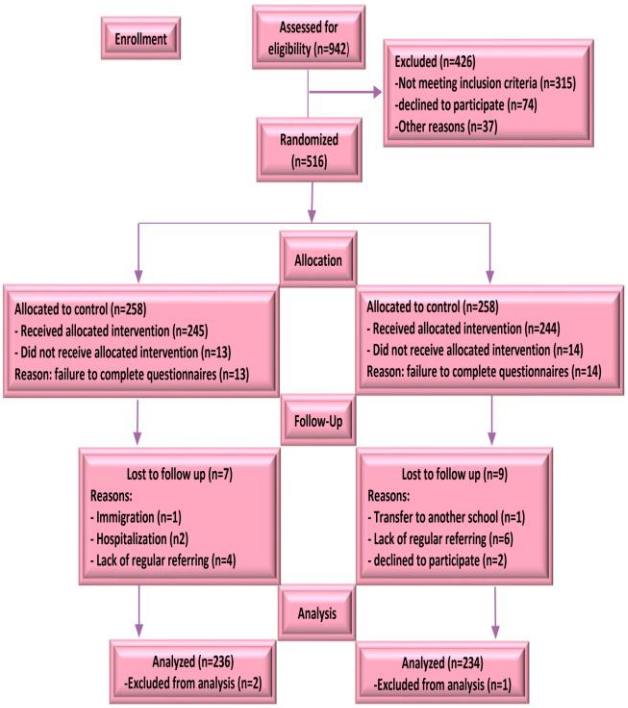

Figure 1. Consort flow diagram of the participants

Table 1. Demographic information of the intervention and control group samples.

Variables	Intervention (n=234) Mean (SD)	Control (n=236) Mean (SD)	P
Age	11.92 (4.3)	12.14 (4.8)	0.21*
Sex			
Girl	112 (23.93)	127 (26.90)	0.12**
Boy	122 (26.06%)	109 (23.09)	
Educational degree			
Forth degree	74 (15.81)	67 (14.19)	0.28**
Fifth degree	84 (17.79)	84 (17.79)	
Sixth degree	76 (16.23)	85 (18)	
Decayed and missing teeth			
0 tooth	62 (13.24)	59 (12.5)	0.13**
1 tooth	37 (7.90)	41 (17.37)	
2 tooth	34 (7.26)	32 (6.77)	
3 tooth	35 (7.47)	31 (6.56)	
4 tooth	41 (8.76)	40 (8.47)	
5 tooth	25 (5.34)	33 (6.99)	
Fathers level of education			
Primary education	185 (41.8)	173 (38.11)	0.21**
Academic education	36 (8.13)	54 (11.93)	
Mothers level of education			
Primary education	127 (27.84)	142 (30.61)	0.09**
Academic education	101 (22.14)	90 (19.39)	
Fathers job			
Employee	198 (44.79)	210 (46.25)	0.19**
Workless	23 (5.20)	17 (3.74)	
Mothers job			
Employee	96 (21.05)	101 (21.76)	0.26**
Housewife	132 (28.94)	131 (28.23)	
Visited by dentist			
Yes	179 (38.24)	186 (39.40)	0.18**
No	55 (11.75)	50 (10.59)	

*Independent t-test, **Chi-square

Table 2. Comparison of the intervention and control groups in terms of the TPB structural component

Variables	Groups	Times			P*		
		Pre-test	Immediately after intervention	1 month after intervention			
		Mean (SD)	Mean (SD)	Mean (SD)			
Awareness	Intervention	3.96 (2.2)	7.34 (2.3)	7.18 (2.5)	0.001[b]	0.18[b]	<0.001[c]
	Control	4.68 (2.1)	3.89 (1.3)	2.52 (1.2)	0.62[b]	0.17[b]	0.10[c]
	P[a]	0.21	0.01	0.01			
Attitude	Intervention	8.61 (2.3)	11.61 (2.9)	10.94 (3.1)	0.01[a]	0.13[b]	0.001[c]
	Control	8.93 (2.3)	7.94 (2.3)	8.29 (2.3)	0.42[a]	0.86[b]	0.21[c]
	P[a]	0.19	0.001	0.01			
Tooth brushing practice	Intervention	9.61 (2.1)	13.35 (4.4)	12.68 (4.0)	0.001[a]	0.25[b]	<0.001[c]
	Control	10.12 (2.1)	8.27 (1.8)	7.39 (2.1)	0.24[a]	0.16[b]	0.76[c]
	P[a]	0.56	0.001	0.01			
Dietary regime practice	Intervention	26.29 (5.3)	39.21 (9.3)	37.24 (11.9)	<0.001[a]	0.12[b]	<0.001[c]
	Control	30.21 (3.1)	25.33 (2.9)	22.94 (3.0)	0.32[a]	0.38[b]	0.58[c]
	P[a]	0.85	0.001	0.01			
Referring to dentist practice	Intervention	3.62 (1.1)	5.97 (1.6)	4.16 (2.6)	<0.001[a]	0.27[b]	0.001[c]
	Control	2.86 (1.1)	3.09 (1.1)	2.12 (1.5)	0.37[a]	0.28[b]	0.19[c]
	P[a]	0.67	0.001	0.001			

*Repeated measure ANOVA, [a]t-test, [b]pre-test and immediately after intervention, [c]immediately after intervention and 1 month after intervention, [d]pre-test and 1 month after intervention

Discussion

The aim of this study was to determine the effect of oral health promotion program on early dental decay in students, using TPB. Analysis of variance with repeated measurements implies the effectiveness of education based on the TPB in promoting the scores in the awareness, attitude, subject norm, perceived behavioral control, intention and behavior among the intervention group students in comparison with the control group immediately and one month after the intervention. In this regard, the results of Peyman et al., study showed that the mean scores of TPB constructs in oral health education of students in the intervention group after the educational intervention increased significantly (P≤0.05).[20]

Goodarzi et al., also studied the effect of education on improving the level of oral and dental health in students. The results of the study showed that there was a significant improvement in health performance of students immediately and one month after the school education compared with the previous one.[25] It can be concluded that TPB-based education has a positive effect on improving the level of knowledge, attitude and practice (P<0.05). The study by Seon et al., also showed the positive effect of TPB-based education on oral and dental health of alcoholic patients. In this study, covariance analysis showed that oral health education by using the theory led to the improvement of explanatory abilities of the individuals from 60.3% to 96.6%.[26] The results of this study which are in line with the results Seon et al., seem to highlight the fact that education and its importance as part of an intervention related to the change of behavior is undeniable. Enabling people to have the necessary knowledge to change their lifestyles can make them prepared to accept the recommended changes. Expressing the benefits of a beneficial behavior or the dangers of an inappropriate behavior through different educational models provides a basis for changing the attitude about and the intention of doing a behavior. In this regard, the results of Peyman et al.,'s research on the use of health belief model in oral health education among elementary school students should be mentioned, too. The results of that study showed that the behavior of the students in the intervention group was significantly improved compared to that of the control group (P≤0.05) (P<0.05).[27] These findings are also consistent with the results of the study by Jeyhooni et al., Their study showed that health education based on the health belief model was effective on oral health behaviors in pregnant women in Fasa. The results of their study indicated that the level of knowledge, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, signs of action and function were improved four months after the intervention in the intervention group.[28]

The similarity of their study to the present study is in using an educational model on oral health. Many studies have been done on the effects of using educational models on improving the level of knowledge, attitude and practice of the elementary students.[29] The results of these studies have shown that the use of different health models has been effective in improving the performance of the students.[29,30] In a study by Haque et al., the effect of oral hygiene education in school was on preventing tooth decay and increasing knowledge, attitude and practice among adolescents in Bangladesh. The results of their study showed that education significantly influenced the improvement of the students' knowledge, attitude and practice (P <0.001), and the prevalence of dental caries decreased significantly (42.6%) after the intervention.[30]

This finding is also congruent with the results of the present study. Research's has shown that the most effective educational programs are theoretically-based approaches based on the patterns of behavior change. These patterns are useful to program designers, because they offer specific aspects for educational interventions.[31]

The limitations of this study include the time limit for its implementation and the close relationship between the

students of the two groups and the probability of transferring the contents between the intervention and control groups. Therefore, further studies with longer run times are suggested. It also seems that conducting the studies, using other health education models, especially native models, is essential.

Conclusion

The results of the present study highlighted the effect of oral health promotion on the students through educational programs based on the TPB. Therefore, it appears that the TPB could be an appropriate theoretical framework for designing and implementing oral health interventions. Interventions based on educational models proved to be more effective in achieving their goals associated with education and behavioral change in the society. Nurses as an important member of the treatment team can use the results of this study in school health programs.

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Ethical issues

None to be declared.

Conflict of interest

There are no any conflict of interest between the authors.

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