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# Comparing the Effectiveness of Face-to-Face and Non-Face-to-Face Training on Oral and Dental Health Behaviors in Patients with Type 2 Diabetes: A Randomized Clinical Trial

## ABSTRACT

**Objective:** Diabetes is closely related to oral and dental health. Several oral diseases and disorders are associated with diabetes. The present study was conducted to compare the effectiveness of face-to-face and non-face-to-face training of oral and dental health behaviors based on the Health Belief Model (HBM) in patients with type 2 diabetes.

**Materials and methods:** This study was conducted among patients with type 2 diabetes referring to comprehensive health centers in Andimeshk in 2021. One hundred twenty patients with type 2 diabetes were randomly divided into two groups: a face-to-face (60 patients) training group and a non-face-to-face (60 patients) training group. For the face-to-face training group, training programs were conducted through lectures with questions and answers, group discussions, and videos in three 60-minute sessions; and for

the other group through the presentation of patient education pamphlets. The results were collected in two stages before and two months after the intervention using a questionnaire. Then the data were analyzed using a chi-squared test, t-test, and paired t-tests in SPSS Statistics 22.0.

**Results:** A total of 120 patients participated in this study. The patients' mean age was  $51.5 \pm 8.57$  and  $51.9 \pm 10.1$  years in the control and the intervention group, respectively. In both groups, 60% of the participants were female and 95% were married. The duration of diabetes in 57.5% of them was 5–10 years. After the implementation of the intervention, a significant increase was observed in the mean scores of all HBM constructs in the face-to-face training group ( $p < 0.001$ ). However, there was no significant change in the mean scores of the HBM constructs in the non-face-to-face training group after the intervention ( $p > 0.05$ ).

**Conclusions:** This study showed that the design and implementation of an in-person training program had a positive effect on improving oral and dental health behaviors in patients with diabetes based on the HBM. (Clin Diabetol 2022; 11; 6: 379–386)

**Keywords:** type 2 diabetes, oral and dental health, Health Belief Model

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## Introduction

The prevalence of diabetes is increasing worldwide. Inflammation of the gums, infection of the tissues around the mouth (periodontitis), dry mouth, opportunistic infections, high plaque accumulation, delay in wound healing, itchiness and mouth sensitivity, changes in taste, and candidiasis are some of the effects of diabetes on oral health [1]. Periodontitis is very common in patients with diabetes, so the relationship between diabetes and periodontal diseases is two-way; that is, just as diabetes causes the exacerbation of periodontitis that per se will increase the blood glucose level [2]. Therefore, patients with diabetes have a higher risk of developing oral disorders [3].

Adults with HbA1c greater than 9% have a significantly higher prevalence of periodontitis than people without diabetes [4]. The relationship between periodontal health and behavioral factors leading to diabetes, such as diet, physical activity, and self-monitoring of blood glucose, has been well-proven [5]. Therefore, according to the dependence of the oral health of patients with diabetes on their behaviors [6], the most critical strategy for reducing oral diseases in these patients is prevention, which depends on the promotion of health culture, and the basis of all health promotion programs is the correct evaluation of influencing factors. Behavior is considered a necessary step in designing, implementing, and evaluating training interventions [7].

It is well established that periodontitis is one of the leading causes of tooth loss in people with diabetes [8]; diabetes and periodontitis have a bidirectional relationship. In people with uncontrolled diabetes, the risk of developing periodontitis is three times that of people without diabetes. Also, the progress of periodontitis in people with diabetes is faster and more intense than in others [9]. Health training is one of the most efficient methods of intervention to change health behaviors to promote and maintain health [10]. Utilizing behavior change models and theories increases the effectiveness of health training programs [11]. One of the training models proposed in health training is the Health Belief Model (HBM) [12]. This model is mainly focused on the prevention of diseases and the behaviors adopted to avoid the chain of ailments and diseases, and it is among the precise and essential models that are used to determine the relationship between health beliefs and behavior. In other words, the HBM is a comprehensive model that plays a major role in preventing disease and unhealthy behaviors, and the basis of this model is the motivation of people to act [13]. Therefore, the present study was conducted to compare face-to-face and non-face-to-face training methods on oral and

dental health behaviors in patients with type 2 diabetes using the HBM.

## Materials and methods

Research ethics committee of Shiraz University approved the study (IR.SUMS.REC.1399.637). This study also is registered at the Iranian Registry of Clinical Trials (IRCT20160418027449N7).

## Study design

The present research is a clinical trial conducted in 2021 on a population of patients with type 2 diabetes who were referred to comprehensive rural health service centers in Andimeshk city, Khuzestan province, Iran.

## Participants and sample

The sample size was calculated at 60 participants (120 in total) for each of the two groups, a face-to-face training group and a non-face-to-face training group, based on a similar study [14] and the following formula, considering the 10% increase in the sample size due to non-randomness and attrition.

The inclusion criteria were: an age between 30-65 years, the ability to read and write, the physical ability to participate in the intervention sessions, and not having artificial teeth. Exclusion criteria included having severe psychotic depression, no consent to participate in the study, and being absent in more than two intervention sessions.

Figure 1 presents the CONSORT flow diagram of the participants throughout the study.

## Data collection tools

Prepared based on reviewing the resources related to the study subject, the data collection instrument consisted of three sections:

1. Demographic characteristics (age, gender, literacy level, marital status, employment status, economic status);
2. A Researcher-Made Oral and Dental Health Questionnaire based on the HBM; and
3. Performance checklist.

The Demographic Characteristics section of this questionnaire includes 21 questions; the HBM constructs section consists of 51 questions under the following categories: perceived susceptibility (5 questions), perceived severity (9 questions), perceived benefits (9 questions), perceived barriers (13 questions), guide-for-action (5 questions) and self-efficacy (10 questions). The scoring of this section is based on a 5-point Likert scale (strongly agree, agree, no idea, disagree, and strongly disagree).

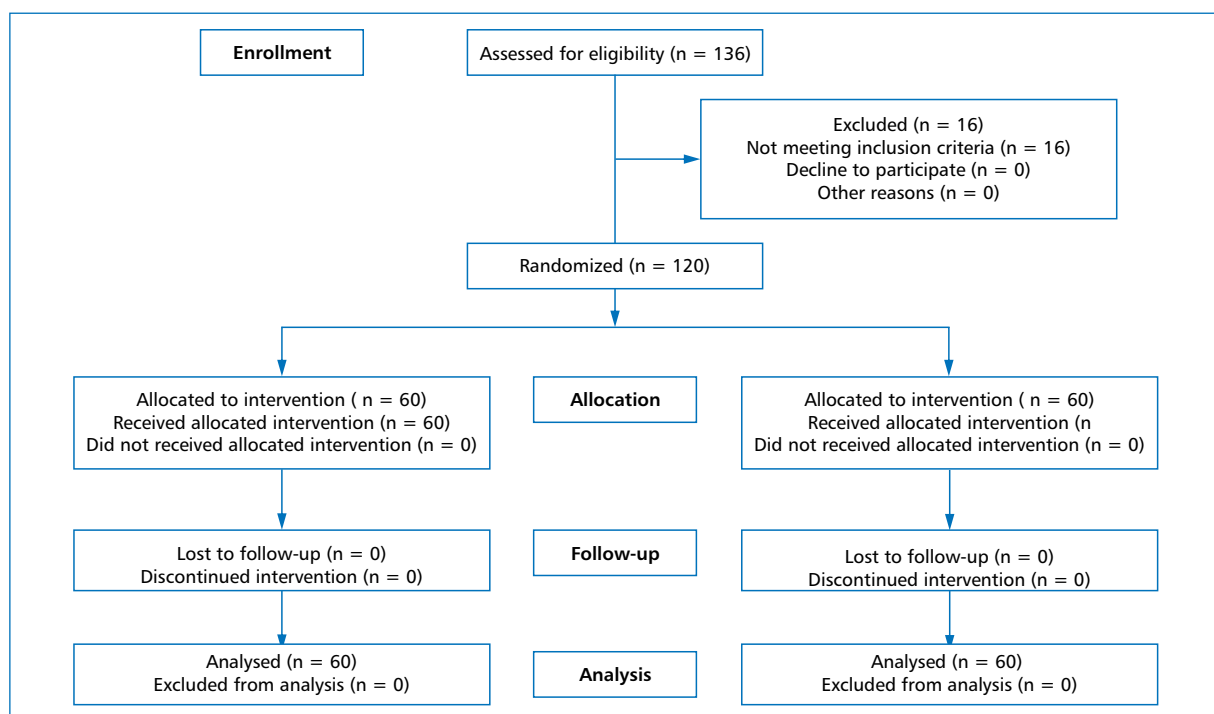


Figure 1. CONSORT Flow Diagram of the Participants

The performance checklist also consisted of six Yes/No questions, with a score of 1 for correct performance and zero for incorrect performance. The overall score of this section ranged from 0 to 6. The questionnaire was provided to ten clinical faculty members to examine its validity; their opinions were applied to the questionnaire, and its content validity was confirmed after solving the ambiguities and problems. The test-retest method was employed for assessing the questionnaire reliability: two times with an interval of two weeks, the questionnaire was given to 20 patients with type 2 diabetes who were similar to the samples concerning their conditions and characteristics. Using Cronbach's alpha, the questionnaire reliability was confirmed ( $\alpha = 0.79$ ). Cronbach's alpha for each HBM construct was achieved as follows: perceived susceptibility 0.77, perceived severity 0.79, perceived barriers 0.79, perceived benefits 0.80, self-efficacy 0.81, and Cues to action 0.78.

After introducing himself to the patients and justifying the project's goals, the researcher obtained written informed consent from them to participate in the study, and then the questionnaire copies were given to them. Data were collected in two stages before and three months after the training program implementation.

The study was performed by local health workers, due to their familiarity with patients' individual and cultural characteristics, to facilitate learning and

increase the effectiveness of education. In cases where the educational material was not understandable for the participants, it was explained to them in the local language. Also, attention was paid to learning differences, and various methods were employed to present educational materials.

### Training program

#### Training intervention in the face-to-face training group

It included lecture methods with questions and answers, group discussion, playing training clips, and using training aids (such as slides and video projectors) in three 60-minute sessions. The face-to-face training group was divided into four 15-subject groups to facilitate the transfer of materials and the opportunity for more interaction between the trainer and the patients.

Training clips and group discussion methods were employed to change the perceived threat in the face-to-face training group because group discussion, a successful training method for small groups, is widely used in attitude improvement and problem-solving.

Training clips, lectures, and group discussion methods were employed to express the perceived benefits and barriers. The methods were discussed by depicting the simplicity of brushing, flossing, and other oral and dental care techniques and the possible obstacles to

**Table 1. The Training Program Content Based on the Health Believe Model (HBM) Constructs**

Session	HBM constructs	Training content
1	Perceived susceptibility, perceived severity, perceived benefits	Introducing and familiarizing the patients with how teeth decay and gum disease (harmful food items, microbial plaque, and going to the dentist), warning them regarding the vulnerability of all people to tooth decay, preventing oral and dental diseases
2	Perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy	Doing behaviors that prevent tooth decay (brushing and flossing correctly and at the right time; visiting the dentist twice a year, changing the toothbrush every 3–6 months, consuming fruits, vegetables, milk, and dairy products; reducing the consumption of sweets and harmful or sticky food); performing the correct method of brushing and flossing with a tooth replica
3	Self-efficacy, all constructs	Practical skills of brushing and flossing, playing training videos

each of these behaviors. Also, they provided the opportunity to exchange opinions in the group. Bandura's 4 Sources of Efficacy Beliefs, including Performance Accomplishments, Vicarious Experience, Social Persuasion, and Physiological and Emotional States, were used to increase self-efficacy. The guide-for-action is a construct that reminds the patients to perform a new behavior. In this regard, a patient education pamphlet was provided to the family members to sensitize and familiarize them with the oral and dental health of patients with diabetes (Tab. 1).

### Training intervention in the non-face-to-face training group

In this research, the training intervention in the non-face-to-face training group was conducted via distributing a prepared training package, including patient education pamphlets. The training program presented to both groups had similar content extracted from reliable sources and approved by scientific authorities and the Ministry of Health and Medical Education (Iran).

### Ethical considerations

This study is extracted from a master's thesis on Community-Oriented Medical Education in the Health System at Shiraz University of Medical Sciences under the ethics code IR.SUMS.REC.1399.637. This study also is registered at the Iranian Registry of Clinical Trials (IRCT20160418027449N7).

### Statistical analysis

Data description and analysis were done through SPSS Statistics 22.0. Chi-squared test, t-test, and paired t-tests were employed to analyze the data. The sig-

nificance level of the above tests is considered smaller than 0.05 ( $p < 0.05$ ).

### Results

A total of 120 patients participated in this study. The mean age of the face-to-face training group was  $51.5 \pm 8.57$  years and the non-face-to-face training group was  $51.9 \pm 10.1$ ; no significant difference was observed between the two groups ( $p = 0.77$ ). In both groups, 60% of the participants were female and 95% were married. The duration of diabetes in 57.5% of them was 5–10 years. Also, both groups were homogeneous in terms of gender, education, marriage, employment status, and income status, and there was no statistically significant difference between them ( $p > 0.05$ ) (Tab. 2). A significant difference was observed between the mean scores of the HBM and the participants' performance before and after the training program implementation in the face-to-face training group ( $p < 0.001$ ). In contrast, there was no significant change in the mean scores of any HBM construct and the performance of the non-face-to-face training group before and two months after the training intervention ( $p > 0.05$ ) (Tab. 3).

### Discussion

The present study's findings showed that the design and implementation of a face-to-face training program compared to a non-face-to-face one had a higher effect on the HBM constructs. The results are consistent with Rasoli et al. [15] showing that face-to-face training had a more positive effect. The results are also consistent with Fani et al. [16] indicating a positive effect of training in improving HBM constructs. One of

Table 2. Participants' Characteristics of the Two Groups

Variables	Face-to-face education group N (%)	Non-face-to-face education group N (%)	P-value
Gender			
Male	22 (36.7)	26 (43.3)	0.56
Female	38 (63.3)	34 (56.7)	
Marital status			
Married	59 (98.3)	55 (91.7)	0.09
Single	1 (1.7)	5 (8.3)	
Education level			
Less than a diploma	43 (71.7)	41 (68.3)	0.69
Diploma and above	17 (28.3)	19 (31.7)	
Occupation			
Employed	24 (40)	20 (33.3)	0.45
Unemployed	36 (60)	40 (66.7)	
Income			
Sufficient	28 (46.7)	25 (41.7)	0.18
Insufficient	32 (53.3)	59 (58.3)	
Duration of diabetes (years)			
< 5	12 (20)	11 (18.3)	0.33
5–10	33 (55)	36 (55)	
> 10	15 (25)	13 (21.7)	
Treatment type			
Oral medication	52 (86.7)	55 (91.7)	0.66
Insulin	8 (13.3)	5 (8.3)	
Smoking			
Yes	4 (6.7)	6 (10)	0.76
No	56 (93.3)	54 (90)	

the HBM constructs in the present study was perceived sensitivity; if a person is sensitive to a health issue and believes that he/she can get a disease without having symptoms, this sensitivity can lead to the prevention of wrong behaviors and contracting that disease [17]. The HBM guides individuals to understand their vulnerability to disease and choose risk-reducing behaviors [18]. There was no significant difference in the mean scores of perceived susceptibility in the face-to-face and non-face-to-face training groups before the intervention; however, the mean scores of perceived susceptibility increased in the face-to-face training group after the intervention. An increase in mean perceived susceptibility scores after training has been observed in several studies. Mardani [19] and Zareban [20] also reached similar results.

The results of this study showed that the mean scores of perceived intensity before and two months after the implementation of the training program in the face-to-face training group increased significantly compared to the non-face-to-face training group ( $p > 0.001$ ). These findings indicate that awareness of

the complications and risks of the disease and the economic burden and costs of disease treatment have increased the perceived severity of the disease. These findings are consistent with the findings of Bastami et al. [21].

The perceived benefits construct is another HBM one intervened in this research. Perceived benefits are derived from the patient's understanding of the consequences of taking timely and appropriate care behaviors. Studies have shown that a person's understanding of benefits paves the path for action [22].

The present study's findings indicate that a significant increase in the mean scores of perceived benefits was observed after implementing the training program in the face-to-face training group compared to the non-face-to-face training group. These results are similar to the findings of Farahmand et al. [23].

Another construct of the health belief model is perceived barriers. The present study observed a significant difference in the mean structure of barriers perceived before and after training in the face-to-face training group compared to the non-face-to-face group. So that

Table 3. Comparison of the Mean Scores of HBM Constructs and Performance before and after the Intervention in Two Groups

HBM components	Face-to-face group		Non-face-to-face group		Mean difference (95% CI)	Mean difference (95% CI)	P-value
	Baseline	Post-intervention	Baseline	Post-intervention			
Perceived susceptibility	15.28 ± 3.58	23.16 ± 1.55	14.34 ± 2.88	14.93 ± 1.24	8.23 (7.45 to 8.89)	0.59 (0.32 to 0.83)	< 0.001
Perceived severity	27.25 ± 6.92	44.78 ± 2.95	26.88 ± 6.74	27.85 ± 5.57	16.93 (14.62 to 19.41)	0.97 (0.64 to 1.23)	< 0.001
Perceived benefits	25.73 ± 8.91	44.73 ± 4.86	27.98 ± 6.03	29.03 ± 4.75	15.70 (13.73 to 22.11)	1.06 (-1.21 to 3.30)	< 0.001
Perceived barriers	61.51 ± 3.04	20.66 ± 2.56	62.08 ± 2.98	62.23 ± 3.14	-41.57 (-38.23 to -43.75)	0.15 (-0.33 to 0.42)	< 0.001
Self-efficacy	24.86 ± 2.36	38.63 ± 3.97	23.60 ± 4.59	23.78 ± 4.89	14.85 (9.26 to 15.21)	0.18 (0.03 to 1.91)	< 0.001
Cues to action	15.15 ± 1.94	22.98 ± 1.26	15.20 ± 1.47	15.46 ± 1.75	7.52 (5.34 to 9.44)	0.26 (0.0 to 1.12)	< 0.001
Performance	3.10 ± 0.83	4.86 ± 0.74	3.18 ± 0.79	3.21 ± 0.80	1.65 (1.30 to 2.20)	0.03 (-1.10 to 1.0)	< 0.001

CI — confident interval; HBM — Health Belief Model

in the intervention group, after the implementation of educational programs, the average score of perceived obstacles decreased, but in the non-attendance training group, no significant difference was observed. These findings indicate that the training have effectively reduced the perceived barriers of the face-to-face training group. Raising awareness and correcting false beliefs along with discussion can play an effective role in reducing perceived barriers [24].

The results obtained regarding reducing the perceived obstacles of patients with diabetes are consistent with Dastjani's study regarding the adherence to the drug regimen in patients with diabetes [25]. The guide-for-action is another construct of the health belief model that was intervened in this research. The study's results showed no significant difference in the mean scores of the guide-for-action in the face-to-face and non-face-to-face training groups before the intervention. Nevertheless, the mean scores of the guide-for-action construct in the stage after the intervention in the face-to-face training group increased significantly, which is consistent with the results of similar studies [23, 26].

Self-efficacy is a crucial HBM construct investigated in this research. Self-efficacy, as a principle connecting awareness and behavior, is insufficient for a person and what he should do, but he/she should consider himself/herself capable of doing that particular behavior. Perceived self-efficacy is regarded as a prelude to performing a behavior, so special attention should be paid to increasing self-efficacy [27]. The results of the present study showed that the mean self-efficacy score after the intervention in the face-to-face training group increased significantly compared to the non-face-to-face training group. These findings indicate the positive effect of the intervention. The results of the increase in self-efficacy of patients with diabetes are consistent with those obtained by Dastjani [25]. Reisi et al. [28] also confirm these findings. Khazaee-Pool et al. [29] also found that self-efficacy is a strong predictor of health behaviors.

In the present study, the mean scores of performance in the two groups before the training intervention did not show a statistically significant difference, but after the intervention, this difference was significantly evident. Also, the mean scores of performance in the face-to-face training group increased significantly after the intervention compared to before the intervention. Phetnin [30] and Malekmahmoodi [31] confirmed these findings.

The study only included people with diabetes who went to health centers to receive care and did not include other people who went to private clinics, and this issue can be a research limitation.

## Conclusions

Since training is the central pillar of health care, it is necessary to conduct training interventions in diseases based on training models and theories. The results of this study indicate that face-to-face training based on the HBM is more effective on oral and dental health in patients with type 2 diabetes than non-face-to-face training. Therefore, conducting HBM-based training interventions for patients by increasing susceptibility and intensity and perceived benefits, self-efficacy, and reducing perceived barriers is crucial. Considering the effectiveness of this model in preventing periodontitis and improving oral and dental health in patients with type 2 diabetes, HBM-based training interventions in health care centers can be effective.

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## Conflict of interest

None declared.

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