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The Effect of a Self-Management Education Program on Oral Health Self-Efficacy of Type 2 Diabetics: An Interventional Study

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Abstract

Background: Type 2 diabetes is a chronic condition significantly impacting oral and dental health. Education plays a crucial role in improving the quality of life for diabetic patients.

Aim: This study was performed with aim to investigate the effect of a self-management education program on self-efficacy related to oral and dental health in individuals with type 2 diabetes.

Method: This experimental study was conducted on 70 type 2 diabetic patients referred to the Tarafa Hospital in Tehran, Iran. The subjects were randomly assigned to the intervention and control groups. The intervention group received 12-session (8 sessions and 4 follow-up sessions) self-efficacy training and standard care, while the control group only received the standard care. The participants completed the scales before and after the intervention. Data were analyzed using SPSS statistical software (version 22) and chi-square, independent t, and paired t-tests. $p<0.05$ was considered statistically significant.

Results: The control group showed a non-significant increase of 1.90±1.2 in self-efficacy related to oral and dental health ($p>0.05$). However, the intervention group experienced a significant increase of 4.77±0.5 in self-efficacy related to oral and dental health ($p<0.05$).

Implications for Practice: The present study showed that a multifaceted self-management intervention, consisting of face-to-face, participatory training with feedback opportunities, can effectively improve self-efficacy related to oral and dental health in type 2 diabetic patients. This approach is recommended to enhance the quality of life related to oral and dental health in these patients.

Keywords: Dental health, Educational program, Oral health, Self-efficacy, Type 2 diabetes

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Introduction

Diabetes is a complex metabolic disorder characterized by elevated blood glucose levels, which can have detrimental effects on various body tissues, including the oral cavity and teeth (1). Type 2 diabetes mellitus is the most prevalent form of diabetes, accounting for approximately 90% of all diabetes cases globally (2). The high prevalence of type 2 diabetes is a significant public health concern, as the condition is often accompanied by a range of serious complications affecting multiple organ systems (3). Individuals with diabetes are at a higher risk of developing complications, such as retinopathy, neuropathy, nephropathy, and cardiovascular diseases (4).

One particularly concerning aspect of type 2 diabetes is its impact on oral and dental health (5). The elevated blood glucose levels associated with the disease can have detrimental effects on the oral cavity, leading to an increased risk of various oral and dental complications, such as gum disease, tooth loss, and dry mouth (6). The relationship between type 2 diabetes and oral health is well-established and the studies showed that individuals with the condition compared to their non-diabetic counterparts are more susceptible to developing oral complications (7, 8). Alarmingly, more than 90% of diabetic patients experience some form of oral disorder (9). Studies have shown that 45-88% of patients with type 2 diabetes and 38% of those with type 1 diabetes suffer from oral complications, compared to only 25% of non-diabetic individuals (10). This increased risk underscores the importance of integrating comprehensive oral health care into the overall management of type 2 diabetes (11, 12).

Despite the well-documented risks associated with diabetes, many patients remain unaware of its potential impact on oral and dental health (13, 14). Chronic bacterial infections, including periodontal diseases, can negatively influence the metabolic control of diabetes (15). Oral-dental complications of diabetes may include gingival enlargement, periodontitis, dental caries, candidiasis, xerostomia, acetone breath, burning mouth syndrome, glossodynia, lichen planus, sensory nerve dysesthesias, salivary dysfunction, and taste disorders (16). Diabetic patients are more susceptible to dental caries due to decreased saliva production and elevated salivary glucose levels, which promote the growth of cariogenic bacteria (17). Recent studies have highlighted the critical role of oral health in managing diabetes. The study in 2024 found that professional dental care and oral health education significantly improved periodontal health and self-management skills in patients with systemic diseases, including diabetes (18). Another study demonstrated that oral health behaviors were associated with factors such as good oral conditions, no diabetic retinopathy, self-care habits, and a positive relationship between oral conditions and diabetes (19). Furthermore, the other study showed that a lifestyle change plus dental care program was effective in improving glycemic and periodontal status in elderly patients with type 2 diabetes (20). These findings underscore the importance of integrating oral health care into diabetes management.

Self-efficacy refers to individuals' belief in their ability to successfully perform tasks and achieve goals (21). In the context of oral health, self-efficacy plays a crucial role in managing oral health particularly for patients with diabetes (22). Patients with higher self-efficacy are more likely to engage in proactive oral hygiene practices, adhere to dental care recommendations, and maintain regular dental check-ups (23). Although the importance of oral health in diabetes management has been studied, there remains a significant knowledge gap in understanding the relationship between self-management and oral and dental health self-efficacy in diabetic patients. Specifically, there is a need for further research on the impact of self-efficacy on oral and dental health behaviors in diabetic patients. Therefore, the present study was conducted with aim to investigate the effect of self-management education program on oral and dental health self-efficacy in people with type 2 diabetes.

Methods

This experimental study with a control group was conducted in 2023 on all type 2 diabetes patients attending the outpatient clinic at Tarfeh Hospital, Tehran, who were diagnosed with type 2 diabetes based on laboratory and clinical evidence and were under treatment. The inclusion criteria for the study were the participants aged 18 years old who were diagnosed with type 2 diabetes mellitus, and received care at the outpatient clinic of Tarfeh Hospital in Tehran. Additionally, participants provided informed consent to participate in the study and demonstrated a willingness to engage in the self-management education program, including attending all scheduled sessions. The exclusion criteria for the study included not having psychological problems requiring specialized psychological

interventions based on self-report and medical records, as well as missing more than two sessions, failing to complete homework, and withdrawing from the study.

The sample size was determined based on an estimated effect size (Cohen's d) of 0.5, a statistical power of 0.80, and a significance level (alpha) of 0.05 using a calculation formula for comparing two independent means. Therefore, the required sample size was confirmed to be 70 participants. The study subjects were placed in one of the intervention or control groups by random blocks of four. Code A was assigned to the intervention group and code B to the control group.

The intervention involved a 12-session self-efficacy training program for the intervention group, in addition to the standard care. The control group received only the standard care. Both groups completed questionnaires on demographic information and self-efficacy before and after the intervention. The training sessions were structured as presented in Table 1. The researchers followed up the intervention group through weekly visits, phone calls, and text messages to ensure the implementation of the practical program, which lasted 12 weeks.

Table 1. The contents of training sessions in rthe intervention group

Sessions	Contents
1	Explanation of the research objectives, familiarization with the study units, and identification of patient's problems, behaviors, and beliefs.
2	Examination of individual illness history, eating habits, lifestyle, medication adherence, and risk factors through face-to-face interviews.
3-4	Implementation of education on health risks, benefits of lifestyle modifications, and correction of abnormal behaviors.
5-7	Setting realistic goals, training on blood sugar control, vital sign monitoring, and emphasizing oral and dental care.
8-10	Performing follow-up through weekly visits, phone calls, or text messages.
11	Checking the agreed-upon behavioral goals and providing necessary additional training.
12	Re-administration of the self-efficacy and oral and dental health-related quality of life questionnaires to both groups.

The Oral and Dental Health Self-Efficacy Questionnaire (OHSQ) was used to assess the self-efficacy of individuals regarding oral and dental health (24). The questionnaire consists of a series of statements that participants respond on a Likert scale, typically ranging from "strongly disagree" to "strongly agree." Scoring is straightforward, with higher total scores indicating greater self-efficacy in managing oral health (21). The psychometric properties of the OHSQ was rigorously evaluated, demonstrating strong reliability and validity across diverse populations (24). The Persian version of the scale was evaluated in previous studies (21,25). In the current study, it had good internal consistency ($\alpha=0.78$).

Data were analyzed using SPSS software (version 22). The data normality was checked using the Shapiro-Wilk test. Descriptive statistics, chi-square test, Fisher's exact test, paired t-test, and two-way repeated measures ANOVA were employed for data analysis. The mean differences were compared between the two groups that have been split into two within-subjects factors and a dependent variable over two or more time points. $p<0.05$ was considered statistically significant.

Ethical Consideration

Participation in this study was voluntary and all data was collected and stored confidentially. Informed written consent was obtained from all participants. Patients providing feedback were not identifiable and their care was not affected by their participation. This study has been approved by the Ethics Committee of Arak University of Medical Sciences (ethical code: IR.ARAKMU.REC.1401.241).

Results

A toal of 75 participants were randomly assigned to the intervention (n=37) and control groups (n=38). During the study process, 2 participants from the intervention group and 3 from the control group were excluded. Finally, 35 participants in each group completed the study (Figure 1).
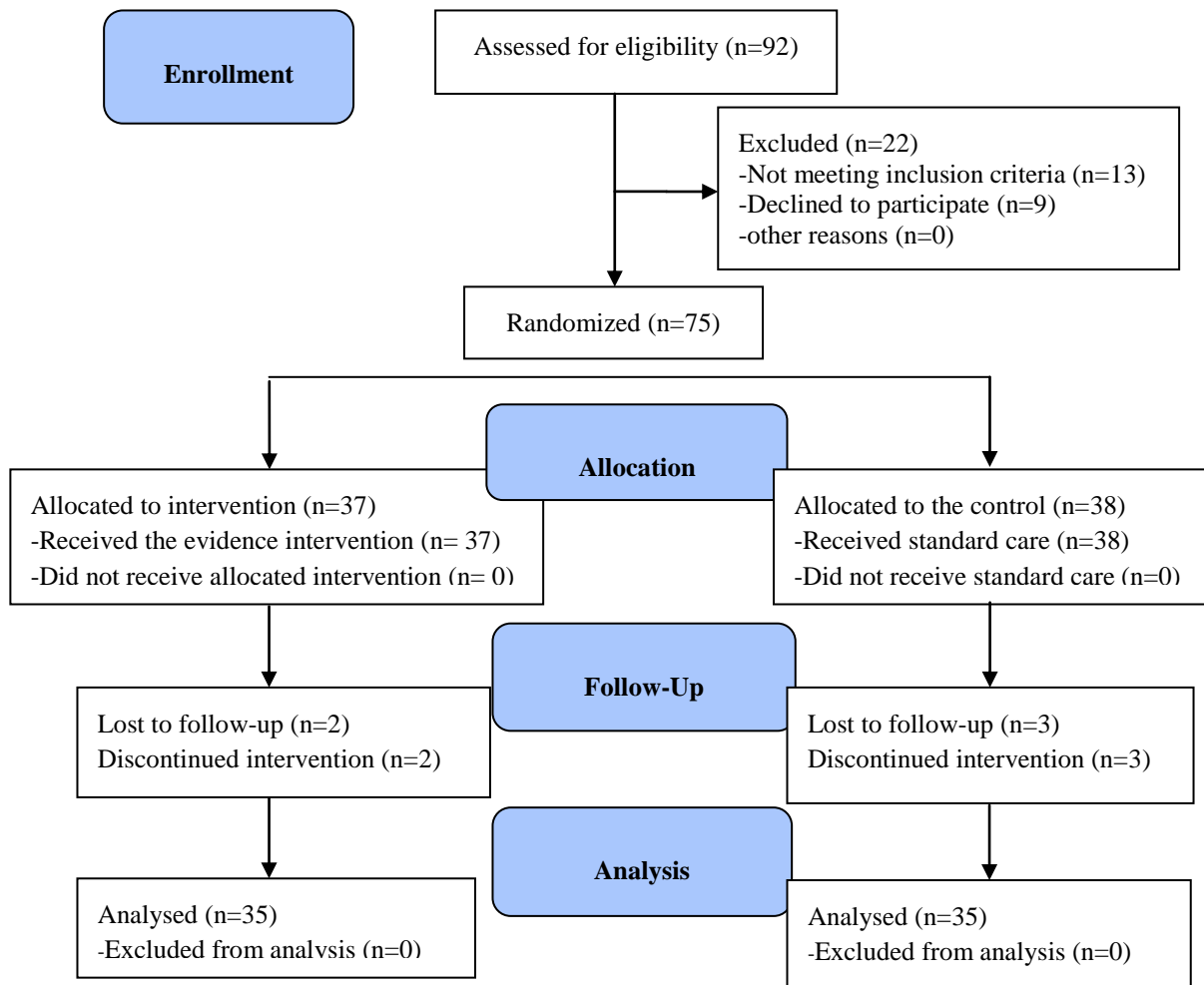
Enrollment

Assessed for eligibility (n=92)

Excluded (n=22)
-Not meeting inclusion criteria (n=13)
-Declined to participate (n=9)
-other reasons (n=0)

Randomized (n=75)

Allocation

Allocated to intervention (n=37)
-Received the evidence intervention (n= 37)
-Did not receive allocated intervention (n= 0)

Allocated to the control (n=38)
-Received standard care (n=38)
-Did not receive standard care (n=0)

Follow-Up

Lost to follow-up (n=2)
Discontinued intervention (n=2)

Lost to follow-up (n=3)
Discontinued intervention (n=3)

Analysis

Analysed (n=35)
-Excluded from analysis (n=0)

Analysed (n=35)
-Excluded from analysis (n=0)

Figure 1. Flow diagram of the study process

Table 2. Basic demographic information of the two groups

Variables	Control	Intervention	P-value
Gender			
Male	17 (51.4)	20 (65.7)	0.21
Female	18 (48.6)	15 (34.3)	
Age (years)			
<50	9 (25.6)	11 (31.4)	0.44
>50	26 (74.4)	24 (68.6)	
History of diabetes (years)			
Below 5	15 (42.9)	13 (37.1)	0.31
Above 5	20 (57.1)	22 (62.9)	
Job			
Jobless	6 (17.,1)	5 (14.3)	
Employed	16 (45.7)	18 (51.4)	0.62
Retired	1 (11.4)	7 (20)	
Housewife	9 (25.7)	5 (14.3)	
Economic status			
Weak	2 (5.7)	2 (5.7)	0.37
Moderate	25 (71.4)	24 (68.8)	
Good	8 (22.8)	8 (37.1)	
Underlying disease			
Yes	26 (74.4)	22 (62.9)	0.73
No	9 (25.7)	13 (37.1)	

The mean age in the control group was 55.42 ± 9.1 years and in the intervention group was 54.20 ± 9.2 years. The results of the independent t-test showed no statistically significant difference between the two groups regarding mean age ($p>0.05$). Other basic demographic information of the two groups was presented in Table 2.

Comparison of the self-efficacy of study participants before and after the intervention period between the two groups was shown in Table 3. The results showed that the intervention group had a significantly higher increase in the oral health self-efficacy of patients with diabetes type 2 ($p<0.05$).

Table 3. Comparison of oral health self-efficacy before and after the intervention between the two groups

Group/Time		Before	After	Change	*p*-value
Oral health self-efficacy	Control	53.31 ± 10.61	54.60 ± 9.40	1.90 ± 1.20	0.509*
	Intervention	54.20 ± 5.80	58.97 ± 5.30	4.77 ± 0.50	0.021*
Two-way repeated measures ANOVA	Time Effect	F (1, 68)= 28.96, p=0.001			
	Group Effect	F (1, 68)= 1.93, p=0.163			
	Time×Group	F (1, 68)= 9.59, p=0.001			

Discussion

The current study aimed to investigate the effect of a self-management education program on self-efficacy related to oral and dental health in individuals with type 2 diabetes. The results showed that the self-efficacy training program, consisting of 8 training sessions and 4 follow-up sessions, led to a significant increase in self-efficacy related to oral and dental health in the patients with type 2 diabetes. This finding is consistent with the results reported in the previous studies.

A randomized controlled trial was conducted in Iran by Malekmahmoodi et al. to evaluate the effectiveness of an educational intervention in promoting oral and dental health among patients with type 2 diabetes mellitus (T2DM) and periodontal disease. The intervention group showed significant improvements in oral health parameters, including a 25% decrease in plaque index, a 30% improvement in gingival index, and a 15% reduction in probing depth, compared to the control group. Additionally, HbA1c levels decreased by 0.5% in the intervention group, indicating better glycemic control. Their results showed that promoting oral hygiene and dental care as part of diabetes management can have a positive impact on overall health outcomes (26). Furthermore, other studies have demonstrated the positive impact of self-efficacy on the quality of life of diabetic patients. Hamidiet al. found that self-efficacy related to oral and dental health and physical activity led to an increase in the quality of life in diabetic patients (14). Other researchers also reported that self-care training and mood modification, as well as self-care training alone, resulted in increased quality of life and reduced depression in type 2 diabetic patients (15,16).

Another randomized controlled trial by Saffari et al. investigated the impact of a health-education program utilizing motivational interviewing on oral health behavior and self-efficacy among pregnant women. Their results indicated that the intervention group exhibited significant improvements in both oral health behaviors and self-efficacy compared to the control group, suggesting that motivational interviewing can be an effective strategy for enhancing oral health among pregnant women (27). A randomized controlled trial by Hashemi et al. assessed the effects of a combined learning approach, incorporating animations and games on oral health self-efficacy and self-care behaviors among students aged 6 to 12 years. Their results indicated significant improvements in the case group, with self-care scores increasing from 3.8 to 4.8, self-efficacy from 36.8 to 48.9, and behavior from 17.07 to 18.29. No significant changes were observed in the control group, highlighting the effectiveness of the combined learning strategy in enhancing oral health behaviors among students (28).

The limitations of this study include the small sample size, single-center design, reliance on self-reported measures, lack of long-term follow-up, potential confounding factors, and absence of objective oral health assessments, which may limit the generalizability of the findings and ability to draw definitive conclusions on the long-term effects of self-efficacy training program on the oral and dental health-related quality of life in type 2 diabetic patients. It is recommended to conduct future research with larger, multi-center samples, longer follow-up periods, and a combination of self-reported and clinical measures to address these limitations and provide a more comprehensive

understanding of the impact of self-efficacy training on the oral and dental health of this population.

Implications for practice

The findings of this study demonstrated that a multifaceted training program, consisting of face-to-face, participatory sessions with feedback opportunities, can effectively improve the oral and dental health self-efficacy in individuals with type 2 diabetes. This approach is recommended to enhance the oral and dental health-related quality of life in this population. The significant increase in self-efficacy and oral and dental health-related quality of life observed in the intervention group highlights the potential benefits of integrating comprehensive self-management education into the care of individuals with type 2 diabetes. The findings of this study are particularly relevant given the well-established link between diabetes and an increased risk of oral and dental complications. Improving self-efficacy in this domain can have far-reaching implications, as better oral and dental health can positively impact the overall management of diabetes and reduce the risk of associated complications.

Conflicts of interest

The authors declared no conflict of interest.

Authors' Contributions

Mahbobeh Sajadi and Ameneh Yaghoobzadeh: design and analysis of the results, Mohammadali Mardom: implementation of the interventions and data collection, Mohsen Shamsi: design and data analysis. All authors contributed to the writing of the manuscript and discussed on the manuscript.

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