

The Effectiveness of an Educational Intervention Based on Teach-back Method with Adherence to Treatment in Patients with Type 2 Diabetes

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Abstract

Background: Patients' adherence to the therapeutic regimen predicts the success of treatment and reduces the complications and severity of the disease. The purpose of this study was to determine the effectiveness of an educational intervention based on Teach-back method with adherence to treatment in patients with type 2 diabetes.

Methods: We performed a quasi-experimental study on 90 patients with type 2 diabetes in the control and experimental groups. Data collection tools were a two-part questionnaire which consisted of the demographic information and the Mandaloo treatment adherence questionnaire with 40 questions. An educational intervention was performed for the members of the intervention group. One week and forty days after the intervention, the two groups filled out the treatment adherence questionnaire again. The gathered data were analyzed in SPSS software version 22 using statistical tests of Wilcoxon, Chi-square, Makhli, Ben Feroni, the repeated-measures variance of analysis, and independent t-test. The significance level in this study was considered less than 0.05.

Results: The mean scores of adherence to treatment in the training group before the intervention, one week, and forty days after the intervention were 120.52±11.49, 157.60±17.96, and 140.65±18.80, respectively; also, in the control group, the mean scores were 113.38±16.89, 150.67±18.58, and 145.02±18.47, respectively. There was no difference in terms of adherence to treatment between the control and experiment groups (P=0.164).

Conclusion: The findings also showed that adherence to treatment in both groups in all three measurement times was at the fitness level.

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Introduction

Diabetes mellitus disease is one of the most common non-communicable metabolic diseases with debilitating complications that has a chronic and intangible course.¹ Statistical studies show that the number of people with diabetes in the world will increase from 171 million in

2000 to 366 million in 2030.² In Iran, the prevalence of diabetes was reported to be 9.4 (7.4-12.3) among the people aged 20–79 years in 2019.³ The prevalence of overt diabetes in Hormozgan province was reported to be 0.8% There are no sources in the current document.^{4,5}

Beside the severe microvascular complications, which become clinically evident as diabetic

nephropathy, retinopathy or neuropathy, macrovascular complications including coronary artery disease (CAD) are frequent among diabetic patients.⁶ DM leads to premature and accelerated atherosclerosis with an increased risk of cardiovascular events. Moreover, myocardial ischemia due to coronary atherosclerosis commonly occurs without symptoms in patients with diabetes.⁷ For this reason, successful prevention and treatment of complications are essential and require preventive and therapeutic measures such as physical activity, proper diet, and continued use of drugs. Therefore, one of the important factors that can affect the complications of diabetes is the patient's lack of adherence to treatment. A study by Aghaei et al. showed that a higher percentage of patients in a case-study showed poor adherence to treatment.⁸ Therefore, it can be said that patients' poor adherence to treatment is one of the main concerns and clinical problems that health system staff are faced with.⁹ Al-Majed et al. in their study have emphasized that the patients' education should be emphasized to create a desire for adherence to treatment.⁵ In addition, many other factors are twofold the necessity of patient education, which can be implied to diseases prevention, adaptation to chronic diseases and disabilities, ensuring continuity of care, reducing the incidence of disease complications, and increasing participation in care programs.¹⁰

Thus, organized education is important as much as, or more than, treatment for controlling this type of illness. The main purpose of education is to develop adherence to treatment among individuals. Providing effective education for people with diabetes improves treatment efficacy and treatment satisfaction and enhances compliance with the treatment plan.

This is because people with diabetes may have misunderstandings about their illness and the treatment plan.¹¹

In the year 2019, Yen et al. in their study concluded that patients had an important role in their health and their ability to understand health information has a significant impact on their health behavior and outcomes. In addition, teach-back training method is an effective and reinforcing factor in patients' educational programs.¹² In previous studies, teach-back methods have had positive or negative effects on adherence to treatment in type 2 diabetes.^{13, 14} Based on assessing the effectiveness of this educational method in the long term, the present study was designed with the aim of determining the degree of adherence to treatment and effect of education on adherence to treatment one week and forty days after the intervention.

Methods

This research is based on a quasi-experimental intervention conducted in the year 2020. The case-study population of the patients with type 2 diabetes referred to Shahid Mohammadi Hospital Diabetes Center in Bandar Abbas city (Figure 1). The sample size was obtained by using mean and standard deviation indices of adherence to treatment in the study by Ghanbari et al. (2020); by considering the first type error rate of 0.05 and 80% power, 41 subjects were estimated for each group, but we increased it to 45 subjects in each group due to 10% probability of attrition during the study.¹⁵ The samples were randomly selected from among patients with type 2 diabetes referred to Shahid Mohammadi Hospital Diabetes Center based on the inclusion criteria.

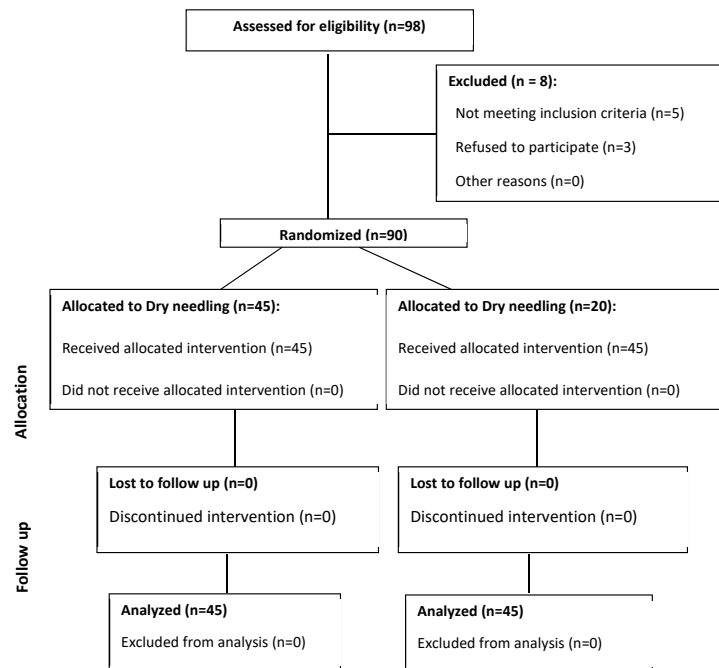


Figure 1: Consort diagram of the studied population

With random assignment, we gave all participants an equal chance of being assigned to each study group, regardless of how representative the participants were. A computer-generated randomization (www.randomizer.org) was used to create an allocation sequence with a block size of five to assign patients to the two study arms, while keeping sample sizes equal across the study groups. We began this process by giving each patient an identification number. If participant #1 in the first block was randomly assigned to the first study group, he/she left the other study group for the other participants in that block. Then, if participant #2 was randomly assigned to the second study group, he/she left the other two study groups for the remaining participants. Then, the process was repeated until all 90 participants had an assigned condition. Allocation concealment was ensured by giving identity numbers to the enrolled patients. Thus, we randomly allocated 90 patients to two equal groups (each group=45 participants): (1) intervention group (receiving educational strategy); (2) control group (receiving usual diabetes education).

Inclusion criteria included age above 30 years, passage of at least one year after their diabetes diagnosis, lack of any mental illness that interferes with the intervention, non-participation in similar educational programs, ability to understand conversation in the Persian language, and lack of difficulty in communication (such as loss of hearing and vision). Exclusion criteria included lack of participation in more than one training session and unwillingness to continue cooperation during the research process.

The data collection tool was a two-part questionnaire. The first part is related to the individual and social characteristics of the participants and has been designed by the researcher and approved by the relevant professors. This questionnaire asks about gender, literacy level, family history in first-degree individuals, diabetes mellitus, intervention, and family income level.

In the second part, the Madanloo treatment adherence questionnaire was used to determine the treatment adherence. This questionnaire was designed in the year 2013 by Madanloo in the field of chronic patients, which includes 40 questions in the areas of making effort for treatment (9 questions), adherence to treatment (4 questions), willingness to participate in treatment (7 questions), adaptability (7 questions), integration of treatment with life (5 questions), commitment to treatment (5 questions), and hesitation in performing treatment (3 questions). The items in this questionnaire are scored using a five-point Likert scale (Strongly 5 points - I agree 4 points - neutral 3 points - disagree 2 points and strongly disagree 1 point); at the end, the scores of all items are added together. The scores range from 0 to 100; scores 75-100 indicate adherence to very good treatment,

50-74 good adherence, 26-49 moderate adherence, and 0 to 25 adherence to poor treatment.¹⁶

To determine the validity of the Madanloo treatment adherence questionnaire, we used face validity, content validity, and structural validity, the results of which caused the number of questionnaire items to reduce to 40 items. First, face validity was performed in two ways, quantitatively and qualitatively. To determine the qualitative face validity, ten experts examined the items of the questionnaire as to the ease of completing the questionnaire, readability, grammar, style of items, and ambiguity; 12 items merged and 11 items were removed. Finally, the number of items was reduced to the 104 items. In quantitative face validity, for each item, a five-point Likert scale questionnaire with scores from 5 to 1, respectively, with the options "Absolutely important, somewhat important, moderately important, slightly important, and not important at all." was considered and completed randomly by 10 patients; after calculation of the frequency multiplication in terms of percentage and significance, the items were reduced to 89 items. In the qualitative content validity, the opinions and experiences of 15 experts were used in the field of care and treatment of chronic diseases. After deleting and merging the items, their number was reduced to 70 items. Content validity ratio (CVR)¹ and content validity index (CVI)² were calculated to evaluate quantitative content validity. Because the CVR value in 15 items was smaller than the value in the table, then the items were reduced to 55 and after calculating the CVR to 48 items. To determine the structure validity, we also used exploratory factor analysis, which reduced the number of items to 40. Bartlett test result indicated that 25.683% of the common variance by the first factor (Making an effort for treatment), 6.330% by the second factor (Willingness to participate in treatment), 3.934% by the third factor (Adaptability), 3.764% by the fourth factor (Integration of treatment with life), 3.117% by the fifth factor (Treatment adherence), 3.050% by the sixth factor (Commitment to treatment), and 2.377% by the seventh factor (Hesitation in performing treatment) were explained. In the Madanloo treatment adherence questionnaire, also reliability was assessed using the retest method and internal consistency method ($r=0.875$).¹⁶

The reliability of the treatment adherence questionnaire was once again calculated for patients referred to Shahid Mohammadi Sampling Center. Reliability or the degree of internal coherence for 40 questions related to the Madanloo treatment adherence questionnaire was calculated 0.944; also, reliability scores for the scales of effort in treatment ($\alpha=0.863$), willingness to participate in treatment ($\alpha=0.982$), adaptability ($\alpha=0.955$), integration of treatment with life ($\alpha=0.958$), adherence to treatment ($\alpha=0.841$), commitment to treatment

($\alpha=0.908$), and hesitation in performing treatment ($\alpha=0.977$) were obtained. According to the calculated Cronbach's alpha results, this questionnaire has a high reliability.

To comply with ethical considerations, while obtaining permission from the ethics committee of Bandar Abbas University of Medical Sciences and Shahid Mohammadi Hospital Diabetes Center and also justifying the case-study individuals to obtain their consent to participate in the study, the goals, importance, and necessity of conducting a research project for samples were explained; also, written consent forms were signed by them, and they were assured that their information would remain confidential.

Before any intervention, the questionnaire of demographic characteristics and adherence to Madanloo treatment in both groups was completed.

Intervention

The researcher based his educational content on the standard guidelines for diabetes medical care and lifestyle management which has been set in the year 2019 by the American Diabetes Association.^{4,17} After translation, it was approved by the relevant professors and then compiled in a simple and understandable language in the form of an educational booklet. After compiling the educational content, the researcher provided the patients with this prepared content in the intervention group in a face-to-face manner; then, he asked the patient to understand the content as he understood it and express it in his/her language. If the

patient misunderstood all or part of the material, the researcher explained the same part to the patient again, and then he asked the patient to retell it; this cycle continued until the patient completely understood the educational content. The number of training sessions for each patient was one or two one-hour sessions, depending on his/her level of literacy and readiness to receive training. In the control group, the patients received the ordinary training provided by the staff of the diabetes clinic.

Data Analysis

Qualitative data were described using frequency (n) and percentage (%) and quantitative data using mean and standard deviation (SD) with range. Shapiro-Wilk test, Leven' test, and Machly' test tests were applied to assess normality, homogeneity of variance, and quantitative data, respectively. Repeated measures analysis of variance and independent sample t-test were applied to compare the means of adherence. All statistical analyses were done in SPSS software version 26. P value less than 0.05 was considered as statistically significant.

Results

The mean age of 45 patients in the training group was 50.46 ± 13.17 years (32-80), and in the control group, 49.42 ± 12.90 (minimum age 31 years and maximum age 90 years); the results of independent t-test showed that the mean ages of the intervention and control groups were not statistically significant ($P=0.705$).

Table 1: Comparison of the frequency distribution of demographic variables in the two training and control groups

Variables	Intervention group		Control group		P value	
	Frequency	Percentage	Frequency	Percentage		
Gender	Female	24	53.3	26	57.80	0.67
	Male	21	46.7	19	42.20	
Job	Housewife	17	37.8	17	37.80	0.98
	Worker	5	11.1	6	13.30	
	Employee	11	24.4	9	20.00	
	Self-employment	9	20.00	9	20.00	
	Unemployed	3	6.70	4	8.90	
Marital status	Single	10	22.20	9	20.000	0.64
	Married	25	55.60	29	64.40	
	Divorce	10	22.20	7	15.80	
Education level	Illiterate	11	24.40	14	31.10	0.60
	Under diploma	11	24.40	11	24.40	
	Diploma	11	24.40	13	28.90	
	University	12	26.70	7	15.60	
Income	Low	13	28.90	15	33.30	0.54
	High	22	48.90	24	53.30	
	Very high	10	22.20	6	13.30	
Family history	Has	29	64.40	30	66.70	0.82
	Has not	16	35.60	15	33.30	
Diabetes	Has	21	46.70	19	42.20	0.67
Complications	Has not	24	53.30	26	57.80	
Smoking history	Has	25	55.60	36	80.00	
	Has not	20	44.40	9	20.00	

According to the results shown in Table 1, in the training group, most patients were female (24; 53.3%), housewives (17; 37.8%), and married (25; 55.6%); and had academic education (12; 26.7%), a good income level (22; 48.9%), a positive family history of diabetes (29; 64.4%), and a positive history of smoking (25; 55.6%), and complications of diabetes (25; 55.60%). In the control group, most patients were female (26; 57.8%), housewives (17; 37.8%), married (29; 64.4%), and illiterate (14; 31.1%); and had a good income level (24; 53.3%), a positive family history of diabetes (30; 66.7%), a positive history of smoking (36 people), and complications of diabetes (36; 80%). Comparison of the frequency distribution of demographic variables in the two groups using the Chi-square test showed that in all the mentioned variables, except for the history of smoking in the two groups, the frequency distribution was heterogeneous, so that the history of smoking in the control group was observed significantly higher than in the training group (P=0.01).

Based on the results shown in Tables 2 and 3,

comparison of adherence to treatment during the three measurement times in the two training and control groups showed that one week and forty days after training compared to before training, treatment adherence increased in both groups, and this increase was less than forty days later than a week later.

The results of Table 4 show that in the training group a significant relationship was observed between job variables and adherence to treatment (P=0.049). In the control group, there was a significant relationship between job variables (P=0.016) and education level (P=0.018) with treatment adherence.

Discussion

This study examined the teach-back method with adherence to treatment in patients with type 2 diabetes. The comparison of adherence to treatment during the three measurement times in the training and control groups shows that one week and forty days after training, compared to before training, the treatment adherence

Table 2: Adherence to treatment one week after the intervention

Group	Before intervention	One week after intervention	F	P value
Training	11.49±120.52	18.80±140.65	1.973	0.164
Control	16.89±113.38	18.47±145.02		

Table 3: Adherence to treatment forty days after the intervention

Group	Before intervention	Forty days after intervention	F	P value
Training	11.49±120.52	18.80±140.65	122.85	0.001
Control	16.89±113.38	18.47±145.02		

Table 4: The relationship between demographic variables with adherence to treatment and perception of disease in the two intervention and control groups

Demographic		Intervention group		Control group	
		Mean±SD	P value	Mean±SD	P value
Gender	Female	-4.91±18.11	0.928	7.80±23.29	0.637
	Male	-2.62±27.64		11.93±34.55	
Job	Housewife	-6.35±18.75	0.049	6.94±21.01	0.016
	Worker	0.±23.00		12.16±23.33	
	Employee	-3.54±14.64		12.33±23.21	
	Self-employment	-6.55±31.8		30.22±31.32	
	Unemployed	35.66±14.46		15.25±27.29	
Marital status	Single	3.20±22.99	0.462	6.55±24.89	0.672
	Married	-1.44±23.00		7.34±26.68	
	Divorce	-9.50±23.36		7.28±22.96	
Education level	Illiterate	2.72±5.23	0.770	19.85±6.03	0.018
	Under diploma	-5.90±10.60		19.45±8.34	
	Diploma	027±5.90		0.69±7.53	
	University	-5.58±5.06		12.57±7.68	
Income	Low	-0.53±26.15	0.945	12.73±19.80	0.488
	High	-2.45±21.31		10.00±31.28	
	Very high	-3.80±24.50		-3.00±26.51	
Family history	Yes	-196±23.41	0.982	7.80±23.29	0.637
	No	-2.62±22.88		11.93±34.55	
Diabetes Complications	Yes	-3.20±19.29	0.748	11.05±52.62	0.361
	No	-60.20±18.62		1.66±33.52	
Smoking history	Yes	-3.20±19.29		11.05±52.62	0.361
	No	-0.95±27.36		-10.02±25.5	

SD=Standard deviation

increased in the two groups, and this increase was less than forty days later than a week later. In the studies of Ghanbari et al., treatment adherence increased one week and thirty days after training, and this increase was more thirty days after training than one week later. In the mentioned study, the reason for this trend has been reported to be the impact of demographic variables such as age, gender, education on adherence, long duration of education, and a short period of assessment in the second stage.¹⁵ Therefore, for more accurate comparison and accurate results, more studies are suggested to be conducted in this field. In this study, a comparison of control and training groups in general and without considering the time showed that there is no statistical relationship between two training and control groups in terms of treatment adherence. In other words, it can be said that these two groups in terms of treatment adherence haven't any difference together. Patients in two training and control groups in three time periods before training, one week after training, and forty days after training had good adherence to treatment. The study of Tanharo et al.¹⁸ was performed to determine the degree of adherence to treatment of patients with Diabetes disease.

The results show that most patients had poor treatment adherence, and very few patients had very good treatment adherence which is consistent with the results of a study by Vermeire et al.¹⁹ and inconsistent with our study. The results of this study show that there was no different in demographic variables in two intervention and control groups. The results of the present study are consistent with the results of the study of Shojaeizadeh et al.²⁰ and the study of Khosravi Benjar et al.²¹ The results of the present study showed that the distribution of other variables, except for the history of smoking, is almost the same in the two intervention and control groups. The present study, the history of smoking is high in the control group. The present study showed that marital status and gender haven't any effect on adherence to treatment in none of the intervention or control groups. While the results of the study of Jokar et al.²² show that women have more adherence than men. The results of another study indicate that men with diabetes have better drug adherence. Regarding the history of smoking, the results of our study showed that there is no significant relationship between the history of smoking and adherence to treatment in the two intervention and control groups. While in the study of Jokar et al.²² it was found that there is an inverse relationship between the history of smoking and adherence to treatment. Regarding the job variable in the present study, there was a significant relationship between job and adherence to treatment in the training group and the control group. Regarding the education variable, the results show that in the control group, there is only a significant relationship between the level of education and adherence to treatment. In terms of

income level, there was no significant relationship between this variable and adherence to treatment in the two groups. While in the study of Jokar et al. there was an inverse relationship between economic status and adherence to treatment.²²

Conclusion

The present study showed that during three times (Before training, one week after training, and forty days after training) the rate of adherence to treatment for one week and forty days after the intervention is higher than before the intervention. Regarding the comparison of the control and intervention groups, the two groups didn't have much difference in adherence to treatment, and in terms of treatment adherence, the two groups had good adherence to treatment in all three measurement times. Regarding the relationship between demographic variables and treatment adherence, it was found that there is a significant relationship between job and adherence in both groups and also between education and adherence in the control group.

Limitations of the Study

The limitation of this study is the mental and emotional condition of patients at the time of completing the questionnaire, which may affect the findings of the study.

Recommendations for Further Research Work

Future studies are required to strengthen the evidence on effects of the teach-back method. Larger randomized controlled trials will be needed to determine the effectiveness of the teach-back method in quality of life, reduction of readmission, and hospitalizations.

Strengths and Weaknesses

Evidence from this article supports the use of the teach-back method in educating people with chronic disease to maximize their disease understanding and promote knowledge, adherence, self-efficacy and self-care skills. The number and hours of training sessions were small, which could affect the outcome of the study

Acknowledgment

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Ethical Confirmation

To conduct this research, the necessary permission was received from the ethics committee of Bandar Abbas University of Medical Sciences (Ethics code: IR.HUMS.REC.1399.282) and Shahid Mohammadi Hospital Diabetes Center of Bandar Abbas.

Conflict of Interest: None declared.

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