



## Effect of precede model-based education on quality of life in patients with type 2 diabetes

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### Introduction

The increasing spread has made diabetes a world epidemic [1]. The International Diabetes Federation has estimated the number of diabetic patients as 387 million in 2013 which will hit about 592 million by 2035. Based on the statistics, the number of diabetic patients in Iran is 4.5-5 million which is expected to reach 6.5 million by 2035 [2].

Diabetes is among the costliest diseases all over the world charging high expenses on society [3]. Because of its high burden, lasting

### Abstract

The increasing prevalence rate has made diabetes a world epidemic. Considering diabetes complications and associated effects on patients' quality of life, this interventional study was performed to promote the life quality using education based on the Precede model in the rural areas of Andimeshk. This experimental study was conducted on 120 patients with type II diabetes who were randomly allocated to the experimental and control groups. The data were collected using two questionnaires including the Precede model framework and Short Form health survey (SF-36). The precede model-based intervention composed of six educational sessions (60 to 90 minutes a session). The patients were followed up for three months post-intervention and examined for glycosylated hemoglobin (Hemoglobin A1c or HbA1c). After educational intervention, the mean score of quality of life had a significant increase in the experimental group compared with the control group. The mean scores of Precede model constructs in patients of the experimental group increased significantly after the intervention compared with the before intervention. Moreover, the mean score of HbA1c improved significantly in the experimental group compared to the control group. The present study indicated that the educational intervention program based on the Precede model has a positive effect on quality of life among diabetic patients.

**Keywords:** Education, Quality of Life, Diabetes Type 2

effects, direct and indirect expenses on health system, and the great influence on quality of life, treating diabetes is of great importance. About 2.5 to 15 percent of health budget in countries is devoted to diabetes [4].

Education is a basic and supplementary measure for controlling diabetes [5]. International Diabetes Federation maintains that the disease side effects can be reduced by 80% provided that proper education is performed [6]. Many studies have revealed

the positive effect of education on controlling blood sugar, reducing the side effects, and amputation.

Agha Molaei et al [7] found the significant effect of education on the improvement of awareness, behavior, quality of life, and Hemoglobin A1c (HbA1c) level among diabetic patients. The results of Sadeghi et al [8] study showed the increased life quality in diabetic patients in terms of different constructs after an educational intervention. Also, in a study, Ferrer-Roca [9] indicated the positive effect of education on life quality of the patients and reducing associated expenses. The Matteucci's [10] findings also showed patient's blood sugar decrease before breakfast and better control of blood sugar because of education.

The aim of education is managing the disease and promoting quality of life imposed by the patients themselves [11]. Then, education plays an important role in the life quality of diabetic patients by means of theories and educational models designated to increase patients' awareness and change the attitudes through engaging patients in a healthy behavior [12]. Chronic diseases can affect the life quality of patients because of their lasting effect. The use of educational models is a considerable approach to promote life quality of the patients [13].

Choosing a health educational model is the first step in the process of designing an educational program. An educational model handles the program in the right path up to the evaluation stage [14]. Green and Kreuter [15] introduced PRECEDE model as the best way for designing an educational intervention aiming at promoting life quality related to health through changing and modifying unhealthy behavior. This model provides a framework in which, effective factors of behavior like predisposing and reinforcing factors are determined in the educational diagnosis step. The bottom line is that before a model is chosen for health educational program, its objectives and constituents should be determined. Some health educational models are related more

to philosophy and the way of education and less to design an educational program. For example, the model of Health Belief explains behavioral changes and focuses on the question why an unhealthy behavior is changed in a person while in another person it does not. In contrast, the Precede model emphasizes the process of designing of program [16].

This research was conducted on type II diabetic patients based on the Precede model in order to promote patients' quality of life.

### Method

The current research was an experimental study conducted on 120 diabetic patients in rural areas of Andimeshk, the westsouth of Iran, in 2014. The sample size was determined according to the study of Rakhshanderou [17] and applying appropriate statistical formula. Hence, the sample size of 50 for any of experimental and control groups was calculated at the confidence level of 95% and power of 80%. Considering the drop-out rate of 20%, 60 patients were random allocated to each group. Two rural health & wellness centers, out of four, one as case and another as control were randomly selected. For selecting the participants, type II diabetic patients referred to each center having the inclusion criteria were listed and assigned numbers. Ultimately, 120 patients (60 in the experimental group and 60 in the control group) were randomly selected. Only the patients signing the consent form, aged between 35 and 65, having no other chronic or serious diseases, and being diagnosed with diabetes for at least a year involved in the study. The patients were excluded from the study if they changed their living place or were absent in the educational sessions.

Three questionnaires were used to gather the data. The first questionnaire was for demographic information (age, sex, marital status, etc.). The second questionnaire was devoted to the life quality assessed by Short-form Health Survey (SF-36) which examined the subject's quality of life in 8 constructs

(physical functioning, role limitations due to physical health, physical pain, energy/fatigue, general health, emotional well-being, role limitations due to emotional problems, and social functioning). The score of each dimension was calculated independently ranging from 0 to 100. A higher score indicated a better life quality. Validity and reliability of both questionnaires has been confirmed by Montazeri and colleagues [18]. The third questionnaire was prepared based on the precede model including questions related to predisposing factors (19 closed-ended questions on awareness, 10 questions with Likerts scale on attitude), enabling factors(10 questions), reinforcing factors (4 questions), and behavioral factors (12 questions). The scoring system was as follows. The choices of the awareness questions were scored as: Yes=1 point; I don't know and No=0 point, the total score ranging from 0 to 38 points. Each question in the attitude construct was scored in 5-point Likert scale from complete agree (5 points) to complete disagree (1 point), the total score ranging from 5 to 40. The enabling factors and reinforcing factors were scored as 1 for the choice Yes and 0 for the choice No. The attainable scores for these constructs were 0-10 and 0-4, respectively. The behavioral factor questions were scored as Always=2 points, Sometimes=1 point, and Never=0 point, the total score ranging from 0 to 24. The validity of the prepared questionnaire was evaluated by content validity based on the precede model, that is, the questionnaire was given to 10 professors to be finally evaluated and confirmed. The reliability of the questionnaire was determined by Cronbach's alpha (0.84). The questionnaires were completed during an interview performed by the researcher in two stages before and three months after the educational intervention. Before the educational intervention, all the patients were in traduced to a laboratory unit for HbA1c test which was determined using colorimeter method. Based on the guidelines of the laboratory kit, HbA1c level lower than 7.5 was considered favorable, between 7.6

to 9.5 acceptable, and equal to or above 9.6 unfavorable [19].

Since the behavior affecting factors like predisposing, enabling, and reinforcing factors are determined in the stages of educational/environmental diagnosis and evaluation of precede model, the objectives and the content of educational program were designed based on the constructs of precede model. Also, from the data obtained in the pretest, the educational intervention was designate to conduct in six weeks. For achieving group support, the experimental group was divided into four smaller groups of 15 members each of which passed an educational session of 60 to 90 minutes once a week for six weeks.

The intervention was carried out in two ways: direct as a combination of face to face dialog, lecturing, questioning and answering, and playing educational videos and indirect as pamphlets and educational texts. The content of the educational syllabus included topics like 'familiarity with diabetes', 'early and late signs and symptoms of the disease', 'normal level of blood sugar', 'significance of controlling diabetes', 'main elements of curing diabetes', 'cure objectives', 'exercising awareness', 'exercising role in controlling diabetes', 'nutritional skills and role in controlling the disease', 'medication procedures', 'self-monitoring blood sugar', 'stress control', 'effects of accepting the disease' and 'familial support'.

Instructors in the fields of health education, nutrition, nursing, and psychology had their roles in educating the patients. As we know, a major part of taking care of diabetic patients is inside their home while they are with their families. Hence, familial support is one of the most important sources of social support for diabetic patients that facilitates the adaptation to the disease, improves life quality and helps them control their blood sugar properly. As a result, we recommended that a family member accompany the patient in the educational sessions. Moreover, the patients were provided by pamphlets

and educational texts to be involved in the program at home. The control group received no treatment.

While in progress, the program was evaluated regularly regarding the predetermined objectives. After the last educational session, the patients were followed up by phone call for three months in order to make sure they continued the instructions. Later, the questionnaires were again administered in the two groups and HbA1c test was repeated. For ethical reasons, after gathering the data, the educational texts and pamphlets were given to the patients in the control group. Another ethical principal was the explanation of research objectives and details to the patients. Only the patients who announced their agreement by signing the consent form were enrolled in the study. Also they were free to leave the study in any stage they desired.

The obtained data were analyzed by SPSS-19 using descriptive statistics, independent sample t-test, paired sample t-test, and chi-square test.

## Results

In this study, the experimental and control groups had no significant differences regarding demographic variables such as age, sex, marital status, job, treatment type, and time of being affected by the disease (Table 1). The mean age was  $50.78 \pm 8.62$  years in the experimental group and  $51.61 \pm 9.34$  years in the control group ( $p=0.613$ ). The mean period of time being affected by the disease was  $5.26 \pm 3.01$  years in the experimental group

and  $5.11 \pm 1.85$  years in the control group ( $p=0.743$ ). The research findings showed that the experimental and control groups did not have any significant differences regarding the constructs of precede model including predisposing factors, enabling factors, reinforcing factors, and behavioral factors before the educational intervention, however, there were statistically significant differences between the groups in terms of the aforementioned factors after the educational intervention ( $p<0.05$ ). In awareness, attitude, enabling factors, reinforcing factors, and behavioral factors, the mean scores increased significantly in the experimental group ( $p<0.001$ ), while the findings indicated no significant changes after the intervention in the control group (Table 2).

In Table 2, the two groups are compared in terms of Hemoglobin A1c. The two groups were not different significantly in terms of HbA1c before the intervention ( $p=0.135$ ), while a significant difference created between the two groups after the intervention ( $p<0.001$ ). There was no meaningful difference in the control group before and after the intervention ( $p=0.851$ ). For life quality and all the dimensions, the two groups were not different significantly before the intervention ( $p<0.001$ ), while significant changes were observed in the experimental group after the intervention. The differences in the control group were not statistically significant ( $p<0.05$ ) (Table 3).

**Table 1** Comparison of demographic characteristics in the experimental and control groups

		Experimental group N(%)	Control group N(%)	p-value
Gender	Male	25(41.7)	18(30)	0.183
	Female	35(58.3)	42(70)	
Marital status	Married	55(91.7)	53(88.3)	0.543
	Single	5(8.3)	7(11.7)	
Employment	Employed	27(45)	18(30)	0.090
	Not employed	33(55)	42(70)	
Education	Underhigh school	37(61.7)	32(53.3)	0.1
	High school or upper	23(38.3)	28(46.7)	
Treatment method	oral hypoglycemic agent	53(88.4)	56(93.4)	0.395
	Nutritional regime	7(11.7)	4(6.7)	



**Table 2** Comparison of mean score of precede model constructs and HbA1c between groups before and after the educational program

Variable	Time	Experimental group Mean±SD	Control group Mean±SD	p-value*
Awareness	Before Intervention	7.83±2.10	8.31±3.28	0.512
	After Intervention	15.12±3.55	9.50±4.01	<0.001
	p-value**	<0.001	0.231	
Attitude	Before Intervention	31.38±4.38	29.98±5.17	0.113
	After Intervention	36.15±2.73	29.18±4.90	<0.001
	p-value**	<0.001	0.098	
Enabling factors	Before Intervention	6.80±2.53	7.17±2.01	0.399
	After Intervention	9.05±4.71	7.24±1.98	0.009
	p-value**	<0.001	0.252	
Reinforcing factors	Before Intervention	2.86±0.46	2.95±0.38	0.290
	After Intervention	3.11±0.45	2.83±0.58	0.004
	p-value**	<0.001	0.051	
Behavioral factors	Before Intervention	10.17±5.60	9.90±5.56	0.789
	After Intervention	17.42±3.48	9.71±5.17	<0.001
	p-value**	<0.001	0.606	
HbA1c level	Before Intervention	9.42±1.75	9.00±1.23	0.135
	After Intervention	8.01±1.57	8.98±1.23	<0.001
	p-value**	<0.001	0.851	

\* Independent t-test

\*\* Paired t-test

**Table 3** Comparison of mean score of quality of life dimensions between groups before and after the educational program

Domain	Time	Experimental group Mean±SD	Control group Mean±SD	p-value*
Physical functioning	Before Intervention	54.33±12.40	51.91±10.41	0.250
	After Intervention	65.33±10.92	52.33±12.40	<0.001
	p-value**	<0.001	0.428	
Role limitations due to physical health	Before Intervention	50.41±18.69	49.58±18.69	0.808
	After Intervention	59.16±24.77	50.41±19.25	0.033
	p-value**	0.011	0.159	
Physical pain	Before Intervention	42.58±15.35	44.80±15.15	0.428
	After Intervention	52.41±14.12	45.04±18.07	0.014
	p-value**	<0.001	0.899	
Energy/fatigue	Before Intervention	47.45±8.54	48.23±9.83	0.644
	After Intervention	58.22±8.41	50.75±8.34	<0.001
	p-value**	<0.001	0.055	
Social functioning	Before Intervention	46.45±11.05	48.95±8.70	0.171
	After Intervention	51.60±10.80	47.50±10.98	0.042
	p-value**	<0.001	0.196	
Emotional well-being	Before Intervention	46.75±8.12	47.50±7.72	0.605
	After Intervention	51.41±9.30	48.00±7.43	0.028
	p-value**	<0.001	0.203	
Role limitations due to emotional problems	Before Intervention	47.37±21.97	48.88±24.90	0.724
	After Intervention	58.92±24.6	49.52±27.05	0.049
	p-value**	<0.001	0.793	
General health	Before Intervention	50.66±7.09	51.66±8.76	0.494
	After Intervention	58.22±8.41	50.75±8.34	<0.001
	p-value**	<0.001	0.748	

\* Independent t-test

\*\* Paired t-test

## Discussion

The results of the research indicated the effectiveness of precede model on the improvement of life quality in type II diabetic patients. The findings showed that after the educational intervention, the awareness in the experimental group increased significantly, indicating the positive effect of the educational program. This finding is in line with the obtained results of other researches based on the precede model [14,16,20-22].

Based on the findings, there was a significant increase in the mean score of attitude in the experimental group after the intervention, showing the positive effect of education. This result is in accordance with the findings of previous studies [20,22,23].

Enabling factors in this study included holding and participating in the educational sessions and presenting educational texts to the patients as well. This construct was evaluated by patients accepting the disease, ease of access to health centers and physicians, medicine availability, counseling chance, information sources, and skill level of health personnel. The results showed significant differences between the experimental and control groups after the educational intervention, which resemble those of other studies indicating the effect of precede model and precede-proceed Model in increasing enabling factors [24,25]. However, in the study conducted by Zigheimat et al [22], there was no significant difference in terms of enabling factors because of shortage of sources and health facilities related to epilepsy at social level as well a sun willingness of patients for subscribing to the Association of Epilepsy to receive educational health services.

In this intervention, involving family members in educational sessions in order to increase familial support for the patients were considered as reinforcing factors. These factors were evaluated by patient being accepted by family and receiving encourage, support, and approval from family and health personnel because of doing healthy behavior and the positive feeling of patients after behaving healthily. The research findings showed significant

differences between the experimental group and the control group, which is in agreement with the results of a study focused on calming patients in order to reduce their stress [26]. Our findings are also supported by the results obtained by Hazavehei [20], Dehdari [27], and Wright [28].

Behavioral factors were evaluated by questions on the patients' obligate to follow the medication and nutrition regime, involving in physical activities, self-monitoring of blood sugar, and taking care of their feet. The mean score of behavioral factors increased significantly in the experimental group after the intervention while it did not change meaningfully in the control group.

The results of a study conducted by Nazari [29] on the promotion of safe behaviors in primary students showed that designing and implementing education based on the precede-proceed model can lead to increasing safe behaviors. Bandora [30] says that implementing a behavior is the most valid source for the sufficiency of information because it originates from skillful experiences. People develop and modify the skills which are important in the frequent implementation of the behavior. The studies carried out by Chiang [31], Sharifirad [32], and Wright [28] support the above findings and emphasize the effectiveness of precede model in changing behavior.

Today, measuring HbA1c is accepted as a gold standard for examining blood sugar in long term. The level of HbA1c indicates the mean blood sugar in the two or three months before the measurement date [33].

In this study, Hemoglobin Alc mean value in the experimental group decreased significantly after the educational intervention, however, it did not change meaningfully in the control group.

The results of Shojaezadeh et al [34] showed that self-monitoring can lead to the normal levels of blood sugar or accepted levels of HbA1c. It also reduces nervousness caused by diabetes.

Salinero [35] also proved the effectiveness of precede model in metabolic controlling in diabetic patients, indicating that the model is effective in handling type II diabetic patients. In line with the present study, Litaker [36] and Hawthorne [37] showed that glycemic control in diabetic patients was improved as a result of education.

Improving the quality of life is a main objective in treating diabetic patients to have a normal life. Improving life quality not only benefits diabetic patients, but also decreases the expenses related to health and medical care [33]. Studies have shown that educating and supporting diabetic patients are effective in improving their life quality [38].

This study demonstrated the mean scores of all the constructs of life quality significantly increased in the experimental group after the educational intervention. The experimental group had the highest increase in the construct of role limitation due to emotional problems followed by physical functioning while the least increase belonged to social functioning and emotional well-being.

Rakhshanderou [17] and colleagues investigated the effect of health education on life quality of diabetic patients, showing an increase in the mean score of life quality from  $35.2 \pm 9.12$  before the education to  $53.6 \pm 9.69$  after the education. This finding is in line with the findings of our study.

The Takova's findings [39] also indicate the positive effect of educational intervention on life quality of diabetic patients, which are consistent with our findings. Dehdari and colleagues [27] in a study on improving life quality of patients after bypass coronary surgery proved the positive effect of education based on the precede model on life quality of patients.

Another study focused on education based on the precede model confirmed a significant increase in the physical construct of life quality, evaluation of life quality, and health status among type II diabetic patients. However, the latter study showed that the educational program resulted in a slightly increase in the

mean score of life quality, which was not statistically significant [14]. Of course, one defect of the latter study was the absence of a control group. As can be seen, the findings of our study are in line with the results of other studies based on the precede model.

One limitation of the present study was the fact that some patients did not attend the educational sessions on time. This problem was alleviated by following up the patients by phone call.

One of the limitations of this study was the very low age of the participants which might have resulted in some inaccurate responses in the questionnaires. Furthermore, adequate comparisons between our findings and those of previous research was not possible due to the absence of similar studies on the same condition.

### **Conclusion**

Diabetes is one of chronic diseases which affects all dimensions of life quality. Knowing about life quality of diabetic patients is of great importance. Low life quality leads to less self-caring, not controlling blood sugar and increasing the disease effects. Therefore, improving life quality not only benefits patients but also helps reduce health care and treatment costs. The role of educational intervention in improving life quality of patients can not be denied. Then, this program should be conducted through comprehensive and well-known models like Precede model in order to get better results. The obtained findings of the present study indicate that implementing an educational program based on the precede model has a positive effect on life quality of type II diabetic patients. Hence, this educational model can be used as an effective tool to investigate health needs of society.

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**Contribution**

Study design: AM, MM

Data collection and analysis: MM, MHH

Manuscript preparation: DSH, ZGH, AM

**Conflict of Interest**

"The authors declare that they have no competing interests."

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