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The Impact of Patient Education on Diabetes Empowerment Scale (DES) and Diabetes Attitude Scale (DAS-3) in Patients with Type 2 Diabetes

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Aim: This study was conducted to assess the impact of a brief, patient-centered education program on perceived self-efficacy and attitudes towards diabetes of patients with type 2 diabetes.

Materials and Methods: A randomized controlled study was designed and conducted to assess the impact of education using the DES (Diabetes Empowerment Scale) and DAS-3 (Diabetes Attitude Questionnaire-3), which were administered using a pre- and post-test design. A patient-centered education program was developed on the basis of the data supplied from patients' responses to a knowledge pre-test and the "Teaching Letters" prepared by the Diabetes Education Study Group (DESG) of the European Association for the Study of Diabetes (EASD).

Results: The intervention resulted in limited but some encouraging results, especially in perceived self-management of the psychosocial aspects of diabetes; assessing dissatisfaction and readiness to change; and setting and achieving diabetes goals.

Conclusions: The study revealed that limited changes in attitude and self-efficacy are possible with a brief intervention.

Key Words: Patient education, type 2 diabetes, Diabetes Empowerment Scale (DES), Diabetes Attitude Scale-3 (DAS-3)

Hasta Eğitiminin Tip 2 Diyabet Hastalarında "Diyabet Güçlendirme Ölçeği" ve "Diyabet Tutum Ölçeği" Üzerindeki Etkisi

Amaç: Bu çalışma, hasta odaklı eğitim programının tip 2 diyabet hastalarının algılanan öz yeterlilik ve diyabete ilişkin tutumlarına olan etkisini değerlendirmek için gerçekleştirilmiştir.

Yöntem ve Gereç: Bu amaçla randomize kontrollü bir çalışma planlanmış ve eğitimin etkisi, Diyabet Güçlendirme Ölçeği ve Diyabet Tutum Ölçeği-3'ün ön test ve son test şeklinde uygulanması ile değerlendirilmiştir. Hastaların ön teste verdiği cevaplar doğrultusunda ve Avrupa Birliği Diyabet Çalışma Grubu tarafından hazırlanan "Öğrenme Mektupları" ndan yararlanılarak hasta odaklı bir eğitim programı geliştirilmiştir.

Bulgular: Eğitim, özellikle diyabetin psikososyal yönleri ile ilgili öz yönetim; memnuniyetsizliğin değerlendirilmesi ve değişime hazırbulunuşluk; diyabet ile ilgili hedeflerin belirlenmesi ve bu hedeflere ulaşılması konusunda sınırlı fakat ümit verici sonuçlara yol açmıştır.

Sonuç: Çalışma, diyabet ile ilgili tutum ve öz yeterlilik ile ilgili sınırlı değişikliklerin, kısa bir eğitim programı ile de olsa gerçekleştirilebilmesinin mümkün olduğunu ortaya koymuştur.

Anahtar Sözcükler: Hasta eğitimi, Tip 2 diyabet, Diyabet Güçlendirme Ölçeği, Diyabet Tutum Ölçeği-3

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Introduction

Diabetes is a chronic disease that demands the patient's long-term and sustained attention to a constellation of self-care and preventive care behaviors. It is also an experience that occurs within the unique context of each patient's life and social circumstances (1).

The prevalence of type 2 diabetes is predicted to rise over the next decade (2), and according to the recent global estimates from the World Health Organization, there will be 300 million people with diabetes by the year 2025 (3).

The overall crude prevalence of diabetes in Turkey is 7.2% according to the Turkish Diabetes Epidemiology Study. Diabetes educators are challenged to develop culturally appropriate, integrated, behaviorally based, effective education programs (4).

Patients with diabetes must make a series of daily decisions involving nutrition, physical activity, medication, blood glucose monitoring, and stress management. Enhancing the perceived self-efficacy of patients to self-manage their diabetes is an important goal of diabetes care and education. Self-efficacy has been defined primarily as the perceived ability to engage in various situation-specific self-management tasks such as blood glucose monitoring, and has become an important and useful construct for the willingness and the ability of people to engage in various behavioral challenges, including preventive and disease management behaviors (5). Self-efficacy has also been reported to enhance self-managed diabetes (6).

Materials and Methods

Patients and Research Design

A randomized controlled study was performed at the Diabetes Center (an outpatient clinic), Department of Endocrinology and Metabolism, University Hospital of Ankara, between 23 November 2005 and 12 April 2006. Patients were eligible for inclusion if they had been diagnosed with type 2 diabetes, had attended at least one follow-up visit, and informed consent was obtained.

During the recruitment phase, 80 patients agreed to participate and were randomly assigned to the intervention or control groups according to their recruitment number. The patients with odd recruitment number were assigned to the intervention group. The intervention and control groups each consisted of 40 patients.

Measures

In this study, Diabetes Empowerment Scale (DES-Attitudes Toward Diabetes) and Diabetes Attitude Scale (DAS-3) developed by the University of Michigan Diabetes Research and Training Center (7) were administered to patients in both the intervention and control groups in pre- and post-test design. Both scales were translated into Turkish. In order to validate the scales in Turkish, the recommendations of a professional English teacher from the University of Ankara were taken into consideration.

The DES includes 28 items and was developed to measure the psychosocial self-efficacy of people with diabetes. It contains three subscales: subscale I: *managing the psychosocial aspects of diabetes*; subscale II: assessing *dissatisfaction and readiness to change*; subscale III: *setting and achieving goals*. In order to assist with translation, items containing concepts that were addressed in more than one way were eliminated, leaving 21 items.

The responses to the items were rated between 1 and 5 with 1 equal to *strongly agree* and 5 equal to *strongly disagree*. Thus, the minimum score of the scale was 21 and the maximum score of the scale was 105. The reliability of the original scale was 0.96 and the reliability scores of the three subscales were 0.93, 0.81, and 0.91, respectively.

In our study, the internal reliability of the revised DES was Cronbach's alpha 0.75. The internal reliabilities of three subscales were 0.79, 0.79, and 0.87 Cronbach's alpha, respectively.

The DAS-3 was designed for use by both people with diabetes and health care professionals as a measure of general diabetes-related attitudes. It includes 15 Likert-style items[5]. The responses are rated between 1 and 5, with 1 equal to *very bad* and 5 equal to *very good*. The minimum score of the scale is 15 and the maximum score of the scale is 75. In our study, the reliability of the translated scale was Cronbach's alpha 0.62.

In order to plan the educational program, a knowledge test was developed and it was administered to 10 patients as a pilot. Based on their responses, the questionnaire was administered as pre-test to both the intervention and the control groups.

Education Program

The education program was developed on the basis of a) the data supplied from patients' responses to the pre-test and b) recommendations of two physicians, one diabetes education nurse, and one dietician from the Department of Endocrinology and Metabolism.

Based on areas indicated in the pre-test, the Teaching Letters nos. 2-6, 10, 16, and 27 (see Table 1) prepared by the Diabetes Education Study Group (DESG) of the European Association for the Study of Diabetes (EASD) (8-15) were used in the intervention.

Table 1. Education program content areas.

Teaching Letter	Content
2	Self monitoring of blood glucose
3	Weight control
4 and 10	Diabetic retinopathy
5	Counseling on late complications
6	Measuring blood pressure
16	Foot care
27	Preventing hypoglycemia

The education program included both diabetes-specific knowledge and self-management behaviors, including self-monitoring of blood glucose, hypo- and hyperglycemia, exercise, diet, management of excess weight, complications, foot care, and the importance of medical care.

The education was given by the researcher using a question-based, patient-centered approach. The format of the sessions included answering the patients' questions about diabetes and its care and providing feedback.

The program lasted 90 minutes and was given to a group of 7-12 patients in two sessions of 45 minutes each, with a one week interval between sessions. The program was repeated for each of the five cohorts of subjects.

Procedures

The DES and DAS were administered prior to the intervention. The education program began three months after these initial assessments because it was designed in order to coincide with the patients' medical visits and routine laboratory assessments.

Data Analysis

Data were processed by quantitative analysis using the Statistical Package for the Social Sciences (SPSS) for Windows version 11.5. Cronbach's alpha coefficient was processed for the reliability of the relevant scale. According to the sociodemographic characteristics and the items of DAS-3 between the intervention and control groups, repeated measurements of three-way ANOVA were used. To compare the mean scores before and after the education intervention, paired t-test was used for total DES and DAS-3. The differences were considered significant with the conventional $P < 0.05$ and the research hypotheses were tested two-sided.

Results

Diabetes Empowerment Scale (DES)

The DES consists of three subscales. Subscale I assesses the patients' *perceived ability to obtain social support, manage stress, be self-motivating, and make diabetes-related decisions that are "right for me"*. Subscale II assesses the patients' *perceived ability to identify aspects of caring for diabetes that they are dissatisfied with and their ability to determine when they are ready to change their diabetes self-management plan*. Subscale III assesses patients' *perceived ability to set realistic goals and reach them by overcoming the barriers to achieving their goals.*

The comparison of mean scores before and after education for the three DES subscales is presented in Table 2. No statistically significant differences were found in the DES scores before and after education.

The mean scores of the three subscales were analyzed based on sociodemographic characteristics of the patients, i.e. gender, age, level of education, body mass index (BMI), duration of diabetes, type of treatment, and attendance at a diabetes patient education program.

The effects of group and gender on the observed changes in the mean scores of the three subscales before and after the education are shown in Table 3. While the mean scores of subscales I and III of male and female patients in the intervention group did not change significantly after the education compared to the control group, the mean scores of subscale II of male patients in the control group showed a significant decrease in the post-test ($P = 0.027$).

Table 2. Comparison of mean scores before and after education for the DES in the intervention and control groups (n = 40).

Scales	Intervention Group	Control Group	P-value
Subscale I			
Before education	22.88 ± 4.23*	22.90 ± 3.79	0.978
After education	23.33 ± 3.35	22.58 ± 3.98	0.365
Subscale II			
Before education	24.63 ± 3.71	24.48 ± 3.46	0.852
After education	24.08 ± 3.06	23.15 ± 3.44	0.207
Subscale III			
Before education	34.58 ± 5.59	33.18 ± 5.79	0.275
After education	34.83 ± 4.79	33.58 ± 4.04	0.211
Total			
Before education	82.08 ± 12.15	80.55 ± 11.49	0.566
After education	82.23 ± 9.77	79.30 ± 10.05	0.191

*: Data are mean ± SD

Table 3. Mean scores of the three subscales with respect to gender of patients in the intervention and control groups.

Subscales of DES	Group[A]	Gender[B]	Time[C]		Interactions		
			Before Education	After Education	A*C	B*C	A*B*C
Subscale I	Intervention (n = 40)	Male (n = 19)	21.63 ± 4.73	22.58 ± 3.88	0.387	0.949	0.362
		Female (n = 21)	24.00 ± 3.46	24.00 ± 2.72			
	Control (n = 40)	Male (n = 18)	22.78 ± 4.43	22.00 ± 4.38			
		Female (n = 22)	23.00 ± 3.29	23.05 ± 3.66			
Subscale II	Intervention (n = 40)	Male (n = 19)	23.89 ± 4.82	23.74 ± 3.75	0.274	0.169	0.027*
		Female (n = 21)	25.28 ± 2.22	24.38 ± 2.31			
	Control (n = 40)	Male (n = 18)	25.17 ± 3.38	22.11 ± 3.22			
		Female (n = 22)	23.90 ± 3.49	24.00 ± 3.45			
Subscale III	Intervention (n = 40)	Male (n = 19)	32.63 ± 6.45	33.32 ± 5.61	0.988	0.552	0.199
		Female (n = 21)	36.33 ± 4.09	36.19 ± 3.53			
	Control (n = 40)	Male (n = 18)	34.22 ± 5.46	33.39 ± 4.06			
		Female (n = 22)	32.32 ± 6.04	33.73 ± 4.11			

The mean scores of the three subscales regarding marital status are shown in Table 4. According to the results, the mean scores of the three subscales of married patients in the intervention and control group remained almost the same, but the mean scores of the three subscales of single patients in the intervention group increased after the education. The increase in the mean score of subscale I of single patients in the intervention group was found to be statistically significant when compared to the mean score of single patients in the control group (P = 0.034).

The mean scores of the three subscales according to the age, educational level and BMI in the intervention group did not change significantly after the education when compared to the results of patients in the control group.

In addition, no statistically significant changes were found in the mean scores of the three subscales in the intervention group when compared to the results of the control group according to duration of diabetes, type of treatment (oral medications, insulin, or both), and attendance at a diabetes education program.

Diabetes Attitude Scale (DAS-3)

The comparison of mean scores of DAS-3 in the intervention and control group is presented in Table 5.

After the education, the mean scores of DAS-3 in the intervention group did not show a significant change when compared to the mean scores in the control group (P = 0.107).

Table 5. Comparison of mean scores of DAS-3 in the intervention and control groups.

	Intervention Group	Control Group	P-value
Before the education	14.75 ± 2.03*	14.25 ± 2.55	0.335
After the education	14.93 ± 1.85	14.20 ± 2.12	0.107

*: Data are mean ± SD

Table 4. Comparison of mean scores of the three subscales according to marital status of patients in the intervention and control groups.

Subscales of DES	Group[A]	Gender[B]	Time[C]		Interactions		
			Before Education	After Education	A*C	B*C	A*B*C
Subscale I	Intervention (n = 40)	Single (n = 3)	18.67 ± 4.73	24.67 ± 1.15	0.259	0.034*	0.367
		Married (n = 37)	23.22 ± 4.07	23.22 ± 3.46			
	Control (n = 40)	Single (n = 2)	25.00 ± 5.66	27.00 ± 0.00			
		Married (n = 38)					
Subscale II	Intervention (n = 40)	Single (n = 3)	23.33 ± 1.53	24.67 ± 2.89	0.200	0.942	0.316
		Married (n = 37)	24.73 ± 3.82	24.03 ± 3.10			
	Control (n = 40)	Single (n = 2)	28.00 ± 1.41	25.00 ± 2.83			
		Married (n = 38)	24.29 ± 3.44	23.05 ± 3.47			
Subscale III	Intervention (n = 40)	Single (n = 3)	28.67 ± 7.37	33.67 ± 3.21	0.894	0.073	0.785
		Married (n = 38)	35.05 ± 5.26	34.92 ± 4.92			
	Control (n = 40)	Single (n = 2)	31.00 ± 1.41	35.00 ± 2.83			
		Married (n = 38)	33.29 ± 5.92	33.50 ± 4.11			

Questions 5, 7, 14, and 15 of the DAS-3 scale were compared to the DES scale and significant findings are reported below:

Question 5 assesses: "*how able you are to fit diabetes into your life in a positive manner"*. The comparison of mean scores of the three subscales according to DAS-3 item 5 is presented in Table 6.

For subscale I, the patients who responded "moderate" to item 5 (*how often your diabetes prevents you from doing your normal daily activities*) increased their mean scores, but the patients who responded "good" decreased their mean scores after the education (p=0.048). For subscales II and III, the patients in the intervention group who responded "moderate" increased their mean scores, but the mean scores of patients who responded "good" for subscales II and III decreased after the education. Hence, the education resulted in a significant increase in the mean scores of patients who responded "moderate" and a significant decrease in the mean scores of patients who responded "good" to item 5 in the intervention group (p=0.008; p=0.012 respectively). The mean scores of the three subscales according to DAS-3 item 7: "*how would you rate your understanding of diabetes and its treatment*" are given in Table 7.

For subscale I, the mean scores of patients in the intervention group who responded "moderate" and "good" increased significantly after the education when compared to the mean scores of patients in the control group (P = 0.013). For subscale II, the mean scores of patients who responded "moderate" to item 7 in the intervention group increased, but the mean scores of patients who responded "very good" decreased after the education. The increase in the mean score of patients who

Table 6. Comparison of mean scores of the three subscales according to DAS-3 Item 5 in the intervention and control groups.

Subscales of DES	Group[A]	Gender[B]	Time[C]		Interactions		
			Before Education	After Education	A*C	B*C	A*B*C
			Mean ± SD	Mean ± SD			
Subscale I	Intervention (n = 39)	Moderate (n = 19)	21.84 ± 4.17	23.42 ± 4.03	0.147	0.840	0.048*
		Good (n = 20)	23.50 ± 4.02	23.30 ± 2.75			
	Control (n = 37)	Moderate (n = 13)	24.15 ± 3.18	22.31 ± 4.03			
		Good (n = 24)	22.88 ± 3.39	23.21 ± 3.22			
Subscale II	Intervention (n = 39)	Moderate (n = 19)	23.32 ± 4.23	24.21 ± 3.68	0.128	0.955	0.008*
		Good (n = 20)	25.70 ± 2.77	24.15 ± 2.35			
	Control (n = 37)	Moderate (n = 13)	25.92 ± 3.04	23.08 ± 2.66			
		Good (n = 24)	24.17 ± 3.24	23.67 ± 3.32			
Subscale III	Intervention (n = 39)	Moderate (n = 19)	33.11 ± 4.89	34.26 ± 4.72	0.332	0.178	0.012*
		Good (n = 20)	35.65 ± 6.00	35.40 ± 5.04			
	Control (n = 37)	Moderate (n = 13)	35.85 ± 3.93	32.85 ± 3.98			
		Good (n = 24)	32.83 ± 5.01	34.46 ± 3.69			

* : "Never" and "low" were excluded from statistical analyses.

Table 7. Comparison of mean scores of the three subscales according to DAS-3 Item 7 in the intervention and control groups.

Subscales of DES	Group[A]	Gender[B]	Time[C]		Interactions		
			Before Education	After Education	A*C	B*C	A*B*C
			Mean ± SD	Mean ± SD			
Subscale I	Intervention (n = 40)	Moderate (n = 10)	21.70 ± 4.85	23.40 ± 5.29	0.188	0.013*	0.614
		Good (n = 24)	22.75 ± 4.15	23.13 ± 2.68			
		Very good (n = 6)	25.33 ± 2.80	24.00 ± 1.89			
	Control (n = 40)	Moderate (n = 18)	21.06 ± 3.95	22.72 ± 4.48			
		Good (n = 17)	24.24 ± 2.56	22.82 ± 3.13			
		Very good (n = 5)	25.00 ± 4.42	21.20 ± 5.22			
Subscale II	Intervention (n = 40)	Moderate (n = 10)	23.80 ± 3.52	24.20 ± 4.52	0.591	0.048*	0.700
		Good (n = 24)	24.08 ± 3.63	24.00 ± 2.43			
		Very good (n = 6)	28.17 ± 2.48	24.17 ± 2.99			
	Control (n = 40)	Moderate (n = 18)	23.83 ± 3.68	23.22 ± 4.12			
		Good (n = 17)	24.76 ± 2.84	23.23 ± 2.25			
		Very good (n = 5)	25.80 ± 4.71	22.60 ± 4.72			
Subscale III	Intervention (n = 40)	Moderate (n = 10)	33.00 ± 5.83	34.30 ± 6.82	0.802	0.097	0.523
		Good (n = 24)	33.96 ± 5.34	34.63 ± 4.16			
		Very good (n = 6)	39.67 ± 3.72	36.50 ± 3.51			
	Control (n = 40)	Moderate (n = 18)	31.50 ± 6.77	33.61 ± 4.05			
		Good (n = 17)	34.24 ± 4.28	33.35 ± 3.86			
		Very good (n = 5)	35.60 ± 5.90	34.20 ± 5.40			

* : "Never" and "low" were excluded from statistical analyses.

responded "moderate" and the decrease in the mean score of patients who responded "very good" resulted in a statistically significant change in the intervention group (P = 0.048). In addition, in the control group, the mean scores of patients who responded "very good" to item 7 decreased remarkably.

No statistically significant changes were observed in the intervention group after the education when compared to the control group with respect to the mean scores of the three subscales according to DAS-3 item 14: "*how able you are to fit diabetes into your life in a positive manner*", and to item 15: "*how comfortable you feel asking your doctor questions about diabetes"*.

Discussion

According to the results, this study demonstrated limited improvements. To explain the results, we present three caveats about the approach employed in the education program. First, the length of the education program was 1.5 hours, and was perhaps not adequate to give the patients the chance to practice setting goals, evaluating the results, and obtaining feedback for their daily self-management behaviors relevant to the disease. For example, in the intervention that Funnell et al. (4) conducted, the length of the program was 10 hours in total, and lasted for six weeks.

Second, applying post-test two weeks after the education is probably not adequate to see changes in self-efficacy or attitude of the patients or to obtain positive improvements in self-management of the diabetes.

In the intervention group, the mean scores of patients who responded "moderate" to the DAS-3 items increased, but the mean scores of patients who responded "very good" decreased. In the control group, the mean scores of patients who responded "good" and "very good" decreased. This can indicate that in both groups the number of patients who believed they had a lot of knowledge of diabetes decreased. They perhaps learned enough to know that they had more to learn but it was not enough to make them feel that they had greatly improved their knowledge.

A third consideration is the lack of follow-up to evaluate the results of the program in the long-term. According to the results of Anderson et al. (16), significant improvements were maintained at six months and at one year. Despite the limitations mentioned above, there are some encouraging results from this program. For example, all single patients in the intervention group increased their mean scores in the three subscales after the education, particularly their perceived ability to obtain social support, manage stress, be self-motivating and make diabetes-related decisions that are "right for me", subscale I ($P = 0.034$). The mean scores of married patients remained almost the same. Thus, from this point of view, the education helped single patients to improve their perceived self-management of the psychosocial aspects of diabetes; assessing dissatisfaction and readiness to change; and setting and achieving diabetes goals. It is possible that married patients perceive that they already have adequate social support to make diabetes-related decisions, to identify aspects of caring for diabetes that they are dissatisfied with, and to set realistic goals and reach them by overcoming the barriers.

The other significant results concern the relationships between the scale of DES and DAS-3, which is related to general diabetes attitudes. The patients in the intervention group, who rated "moderate" on item 5: "*how often your diabetes prevents you from doing your normal daily activities*" increased their mean scores in three subscales after the education ($P = 0.048$, 0.008, and 0.012, respectively), while the mean scores of patients in the intervention group, who rated the item "good", decreased after the education. This result can indicate that patients might have gained a more realistic view when evaluating themselves.

A similar situation was also observed in evaluating the relationship between the three subscales and item 7 of the DAS-3. The patients who rated item 7, "*how would you rate your understanding of diabetes and its treatment",* as "moderate" increased their mean scores in perceived ability to obtain social support, manage stress, be self-motivating, and make diabetes-related decisions that are right for them (subscale I), and in perceived ability to identify aspects of caring for diabetes that they are dissatisfied with and their ability to determine when they are ready to change their diabetes self-management plan (subscale II) after the education ($P = 0.013$, 0.048, respectively). In this case, the mean scores of patients who rated the item "very good" decreased. This change also indicates a realistic assessment made by the patients in the intervention group after the education. The same decrease was also observed in the control group in the post-test.

Another remarkable point of this study is that the administration of the pre-test facilitated the interaction between patients and the instructor during the education program. Because the content of the education was prepared based on patients' responses and on the issues revealed to be important to the patients, they actively participated in the education program and shared their experiences about diabetes care and glucose monitoring, asked questions about their self-management challenges, and learned from each other's experiences.

This study revealed that changes in attitude and self-efficacy take time to achieve. Hence, an appropriate educational approach and follow-up have to be employed in order to improve self-management behaviors of diabetic patients, and the patients' characteristics have to be taken into consideration. However, this short program might be offered to those who have lived with diabetes rather than to those who are newly diagnosed and who may require a longer program to make progress.

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