IAAOJ International Anatolia Academic Online Journal

Control of Diabetes Symptoms in Patients with Type 2 Diabetes Mellitus*

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ABSTRACT

This semi-experimental study was conducted to determine the effects of diabetes education on degree of suffering from and symptoms of diabetes in patients with type 2 diabetes mellitus (T2DM). This study was carried out in Muğla Sıtkı Koçman Training and Research Hospital Internal Diseases Clinic. Among the study population of 213 patients, 106 were in the control group and 107 were in the intervention group. A general questionnaire and the revised diabetes symptom checklist scale (DSC-R) were used for data collection. Among the study population, 56.3% were males and 36.2% were between 40 and 54 years of age. Statistically significant differences were found between the control and intervention groups in DSC-R scale and its hypoglycemia, hyperglycemia, psychology, and neurology subscales ($p<0.05$). According to the results, it was determined that the mean score of the pre-training score was higher than the post-training score. The diabetes education program led to remarkable improvements in "irritability just before a meal" among hypoglycemia subscale, in "very thirsty" among hyperglycemia subscale, in "alternating clear and blurred vision" among ophthalmology subscale, in almost all symptoms among psychology subscale, and in "aching calves when walking" among neurology subscale.

Efficacy of diabetes education on hypoglycemia, hyperglycemia, psychology, and neurology subscales was observed in patients with T2DM.

Key Words: Type 2 diabetes mellitus, patient, nurse, diabetes education

***** *This research was supported by Muğla Sıtkı Koçman University, Fund for Scientific Research Projects.*

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Tip 2 Diabetes Mellituslu Hastalarda Diyabet Semptomlarının Kontrolü

ÖZET

Araştırma, diyabet eğitiminin Tip II Diyabetes Mellitus (T2DM)'lu hastalarda görülen diyabet belirtileri ve yakınmaları üzerine etkisinin belirlenmesi amacıyla yarı deneysel olarak yapılmıştır. Araştırma Muğla Sıtkı Koçman Hastanesi eğitim ve araştırma hastanesi dahiliye kliniğinde T2DM tanısı ile yatan 213 hasta ile yapılmıştır. Hastaların 106'sı kontrol, 107'si müdahale grubundan oluşmaktadır. Veri toplamada, bir anket formu ve 'Diyabet Belirtileri Kontrol Listesi Diabetes Symptom Checklist- (DSC-R)' Ölçeği kullanılmıştır. Araştırmaya katılan hastaların %56,3'ü erkekti ve %36,2'si 40-54 yaş aralığındaydı.

Müdahale ve kontrol grubundaki hastaların ölçümlere göre DSC-R ölçeği ve alt boyutlarından hipoglisemi, hiperglisemi, psikoloji ve nöroloji boyutlarının puan ortalamasının istatistiksel açıdan anlamlı bir farklılık gösterdiği tespit edilmiştir ($p<0.05$). Sonuca göre eğitim öncesi ölçümün puan ortalamasının eğitim sonrası ölçüme göre daha yüksek olduğu belirlenmiştir. En fazla farklılık gösteren T2DM belirtisi hipoglisemi alt boyutunda "yemekten önce sinirlilik hali", hiperglisemi alt boyutunda "Aşırı susama", oftalmoloji alt boyutunda "bazen net bazen bulanık görme", Psikoloji alt boyutunda hemen her bir belirtide, nöroloji alt boyutunda ise "yürürken baldırlarda ağrı"dır.

T2DM'lu hastalara verilen diyabet eğitiminin hipoglisemi, hiperglisemi, psikoloji ve nöroloji alt boyutları üzerine etkili olduğu belirlenmiştir.

Anahtar kelimeler: T2DM, hasta, hemşire, diyabet eğitimi

Introduction

Type 2 Diabetes Mellitus (T2DM), which is one of the most important health problems among chronic diseases in today's world, increases healthcare costs (Sigurðardóttir, 2005; Brar & Sethi, 2015; Albuquerque, Correia & Ferreira, 2015). There is a marked increase in the incidence and prevalence of T2DM. According to the Diabetes Atlas which was published by International Diabetes Federation (IDF), 382 million patients suffer from T2DM (Sugüneş, 2013); and it is estimated that this number would reach 592 million by the year 2035. Despite

T2DM does not transmit from patient to patient, it caused a worldwide epidemic, especially among people of the adult age group (Brown, García, Zuñiga & Lewis, 2018). T2DM is well-known to result in substantial increase in mortality and morbidity (Eroğlu, Şensoy, Beydağ, & Kıyak, 2014). According to current reports of IDF about Turkey, 7 million of Turkey's population between the ages of 20-79 (approximately 15% of the adult population) have diabetes (Sugüneş, 2013).

Patients with T2DM present with certain classical and less commonly seen symptoms. The classical symptoms of T2DM include polyuria, polydipsia, and polyphagia. Anorexia, fatigue, easy fatigability, dry mouth, and nocturia are also among the classical symptoms. Less commonly seen symptoms include blurry vision, unexplained weight loss, persistent infections, recurrent fungal infections, and pruritus (Olgun, Yakın & Demir, 2011). Furthermore, these patients may also experience numbness, tingling, or burning sensations in their feet; urinary tract infections, dry skin, and weakness (Olgun, Yakın & Demir, 2011). However, these manifestations are harder to be noticed in T2DM (Selvais, Amoussou-Guenou & Hermans, 2008).

High glucose levels constitute a major problem in T2DM (Nicolucci, 2010). Uncontrolled hyperglycemia leads to microvascular complications including retinopathy, nephropathy, and peripheral and autonomic neuropathy. It can also result in earlier onset of coronary heart diseases, peripheral artery diseases, and cerebrovascular diseases, which are nonspecific to T2DM (Ejtahed, 2015; Mollaoğlu, & Beyazıt, 2009).

The patients are psychologically, socially, and biologically affected from T2DM (Karakurt, 2017). The main targets of care in T2DM are a good quality of life and metabolic control and avoidance of its complications as much as possible.

In patients with T2DM, providing education to facilitate self-management and medical treatment to prevent acute complications and attenuate chronic complications are of paramount importance (Mollaoğlu, & Beyazıt, 2009). Successful long-term management of diabetes requires active involvement of the patients in their treatment, adequate autonomy, and self-empowerment in addition to compliance and basic pathophysiological awareness (Selvais, Amoussou-Guenou & Hermans, 2008). Diabetes education increases awareness of the patients and have beneficial effects on glycemic control. Lifelong behavior change along with education and support is needed to enable self-management of a patient with T2DM (Paterson &Thorne, 2000; Grillo et al., 2013). While the management of diabetes is best performed by teamwork,

nurses play an important role in the disease course because they spend the most time with the patients, provide healthcare for them, and are involved in their follow up (Mollaoğlu, & Beyazıt, 2009).

It is suggested that nurses are very important in terms of compliance, self-management of treatment, implementation of a healthy diet, regular exercise, and prevention of future complications. Responsibilities of a diabetic patient are to provide control over his/her life, choices, and thoughts (Sigurðardóttir, 2005). The role of healthcare providers is to ensure that the patient acknowledge the risks and necessary changes associated with diabetes and perform required practices about them (Selvais, Amoussou-Guenou, & Hermans, 2008).

The nurses should provide diabetic patients and their family members with basic information and vital skills about prevention and management of T2DM, using their educative and counseling knowledge and skills.

The purpose of this research was to determine the effects of diabetes education on the symptoms of diabetes and the patients' degree of suffering from these symptoms. Accordingly, the aim of this study was to find answers to the following questions:

1- Is there a difference in the patients' awareness of the symptoms of diabetes with diabetes education?

2. Are there any differences in the symptoms of diabetes among the education and control groups?

Methodology

Study Design

This study was carried out as a quasi-experimental study in accordance with the pre-test and post-test model with the control group in order to investigate the effects of diabetes education on symptoms of diabetes and the patients' degree of suffering from these symptoms. Dependent variables are the patients' complaints of diabetes symptoms. The design of the study is given in Table 1. In the present study, the revised Diabetes Symptom Checklist (DSC-R) scale was used as a preliminary test at the beginning of the study in order to measure the patients' symptoms from diabetes symptoms. When the research was completed, the same scale was applied as a final test. The research was conducted based on the data collected.

Table 1. Study Design

Groups	Pre-test	Application	Post-test
Control	DSC-R scale	Follow-up of patients' routine controls (3 month)	DSC-R scale
Intervention	DSC-R scale	Follow-up of the patient's controls, initial training on diabetes, repetition of training when the patient comes to the controls (3 month)	DSC-R scale

Study Setting and Time

The study was carried out in Muğla Sıtkı Koçman University training and research hospital between August 2016 and August 2017.

Study Population and Sample

There was no specific sampling method. During the study period 670 patients were admitted to the internal medicine ward. Among these patients 213 were enrolled to this study because they provided consent, were able to understand and respond to the questions and had no significant communication problems. Of these patients 106 were included in the control group and 107 in the intervention group.

Data Collection Methods

Data were collected using a personal information form and a questionnaire which included the revised Diabetes Symptom Checklist (DSC-R). The personal information form consists of six questions about independent variables: gender, age, educational status, occupation, location of residency, and social insurance. Characteristics about the disease is questioned with four items, which are considered as dependent variables: duration of diabetes, medications, compliance with routine follow-up visits, and status of receiving medical aid about diabetes. The DSC-R was developed by Arbuckle et al. (2009) and Turkish validation and reliability study was performed by Terkeş et al. (2016). DSC-R is a six category scale with 34 items. Its subscales consist of hypoglycemia, hyperglycemia, cardiology, ophthalmology, psychology, and neurology.

Participants respond to each question with “yes” if they experienced each of these symptoms during the last four weeks or with “no” if they did not. The responses to the questions

are graded from 0 to 5 and participants choose the subjective degree of his/her symptom (range: 1-5) if he/she responded "yes" to that question. When the response is "yes" these grades indicate the following: 1 = not at all, 2 = a little, 3 = moderately, 4 = very, 5 = extremely. If the participant did not experience that symptom, the item's score is "0".

The study was carried out among patients with T2DM who were admitted to internal medicine ward when the chief of the clinic deemed it appropriate. The questionnaire was filled by the investigator with a face-to-face interview method. It takes approximately 15-20 minutes to fill in the questionnaire, and the scale was applied to all of the patients in the control and intervention groups. Afterwards, the patients in the intervention group received both a personal education and an education booklet and they went on their routine follow-ups. The control group only continued to attend their routine follow-ups. The DSC-R scale was applied again to all of the participants in both groups three months later.

The Cronbach alpha test was used to determine internal consistency of the scale and a Cronbach alpha level between 0.7-0.9 indicated an adequate internal consistency (Terkeş & Bektaş 2016). In this study the Cronbach alpha level was 0.821, thus it was found to be reliable. The DSR-C scale alpha coefficient was 0.79 and the subscale alpha coefficients were 0.6 for hypoglycemia, 0.61 for hyperglycemia, 0.37 for cardiology, 0.61 for ophthalmology, 0.75 for psychology, and 0.75 for neurology. The reliability alpha coefficients ranged between 0.37 and 0.79. Cardiology subscale was not included in the analyses because of its low level of reliability.

Written permission was obtained from Terkeş & Bektaş who performed Turkish validity and reliability study of the scale. The study protocol was approved by Human Studies Ethical Committee of Muğla Sıtkı Koçman University. Before the application of the questionnaires, required permission was obtained from the institution where the study was planned to be performed. All of the participants provided oral and written consent to participate in the study.

Statistical Analysis

The analyses were performed using Statistical Package for Social Sciences (SPSS) for Windows version 24.0 (IBM corp., Armonk, NY). Demographic characteristics of the participants were expressed as frequencies, percentages, and mean values. Comparison of the control and intervention groups were performed using Chi square and independent samples t tests. Comparison of baseline and follow-up test scores in each group was performed using paired samples t test.

Results

Table 2. Distribution of individuals in the intervention and control groups according to their characteristics

Features	Control (n=106)	Intervention (n=107)	Test Value and p
Gender			
Female	51(48.1)	42 (39.3)	X^2=1.700
Male	55 (51.9)	65 (60.7)	p=0.192
Age group			
25-39	7 (6.6)	12 (11.2)	
40-54	38 (35.8)	39 (36.4)	X^2=2.121
55-69	35 (33.0)	36 (33.6)	p=0.548
70-84	26 (24.5)	20 (18.7)	
Education status			
Illiterate	14 (13.2)	13 (12.1)	
Primary school	60 (56.6)	64 (59.8)	X^2=0.752
Middle school	11 (10.4)	13 (12.1)	p=0.945
High school	15 (14.2)	12 (11.2)	
University	6 (5.7)	5 (4.7)	
Job			
Housewife	47 (44.3)	60 (56.1)	
Retired	37 (34.9)	23 (21.5)	X^2=5.249
Officer/employee	11 (10.4)	14 (13.1)	p=0.154
Self -employment	11 (10.4)	10 (9.3)	
Residence place			
Province	39 (36.8)	42 (39.3)	X^2=1.527
District	42 (39.6)	47 (43.9)	p=0.466
Town / village	25 (23.6)	18 (16.8)	
Social security			
Available	104 (98.1)	101 (94.4)	X^2=2.039
No	2 (1.9)	6 (5.6)	p=0.153
Time of diagnosis			
1-5 year	38 (35.8)	40 (37.4)	
6-10 year	32 (30.2)	31 (29.0)	X^2=0.118
11-15 year	19 (17.9)	18 (16.8)	p=0.990
16 year and ↑	17 (16.0)	18 (16.8)	
Used treatment			
Diet	9 (8.5)	9 (8.4)	
OAD/diet	24 (22.6)	19 (17.8)	X^2=0.827
Insulin	4 (3.8)	4 (3.7)	p=0.843
Insulin, diet, OAD	69 (65.1)	75 (70.1)	
Health check-up			
Regular check-up	56 (52.8)	54 (50.5)	X^2=0.119
No check-up	50 (47.2)	53 (49.5)	p=0.730
Medical assistance			
Yes	85 (80.2)	91 (85.0)	X^2=0.876
No	21 (19.8)	16 (15.0)	p=0.349

In the study population, 56.3% were males and 36.2% were between 40 and 54 years of age. The mean age of the study population was 57.24±12.99. The rate of primary school

graduates was 58.2%; 50.2% were housewives; 41.8% lived in districts; and 96.2% had social insurance. Duration of diabetes was between 1-5 years in 36.6% and the mean duration of diabetes was 9.51±7.51 years. The rate of participants using insulin, diet, and oral anti-diabetics (OAD) was 67.6%. The rate of adherence to regular follow-up visits was 51.6% and 82.6% of the participants received medical care.

Among the control group, 51.9% were males; 35.8% were between the ages 40-54 years; 56.6% were primary school graduates; 44.3% were housewives; 39.6% lived in districts; and 98.1% had social insurance. Duration of diabetes was between 1-5 years in 35.8% for this group. The rate of participants using insulin, diet, or oral anti-diabetics (OAD) was 65.1%. The rate of adherence to regular follow-up visits was 52.8% and 80.2% of the participants received medical care (Table 2).

Among the intervention group, 60.7% were males; 36.4% were between the ages 40-54 years; 59.8% were primary school graduates; 56.1% were housewives; 43.9% lived in districts; and 94.4% had social insurance. Duration of diabetes was between 1-5 years in 37.4% of these patients. The rate of participants using insulin, diet, or oral anti-diabetics (OAD) was 70.1%. The rate of adherence to regular follow-up visits was 50.5% and 85% of the participants received medical care (Table 2).

These general characteristics were similar in control and intervention groups and there was no statistically significant difference between them.

Comparison of DSC-R Scale and It's Subscale Scores between the Intervention and Control Groups

Table 3. Comparison of DSC-R and sub-dimensions of patient groups according to control and intervention groups before and after training

DSC-R and Sub-dimensions	Control (n=106)		Intervention (n=107)		Total (n=213)	
	Before Ort. ± SS	After Ort. ± SS	Before Ort. ± SS	After Ort. ± SS	Before Ort. ± SS	After Ort. ± SS
Hypoglycaemia	2.86±3.31	2.80±3.25 **p= 0.014**	4.11±4.11	3.99±3.99 **p=0.001**	3.49±3.78	3.40±3.68 **p=0.000**
Hyperglycaemia	7.72±5.34	7.42±5.24 **p=0.001**	9.44±5.26	7.32±4.11 **p=0.000**	8.58±5.36	7.37±4.70 **p=0.000**
Cardiology	1.91±2.73	1.91±2.73 p=1.000	1.92±2.39	1.93±2.37 p=0.657	1.91±2.56	1.92±2.55 p=0.656
Ophthalmology	2.94±3.60	2.94±3.60 p=1.000	4.61±4.29	4.61±4.29 p=1.000	3.78±4.04	3.78±4.04 p=1.000
Psychology	8.62±7.54	8.42±7.35 **p=0.003**	14.99±7.90	12.38±7.05 **p=0.000**	11.82±8.33	10.41±7.45 **p=0.000**
Neurology	7.83±6.64	7.75±6.56 **p=0.020**	13.79±9.62	13.40±9.33 **p=0.000**	10.82±8.78	10.59±8.53 **p=0.000**
DSC-R	31.88±16.45	31.24±16.35 **p=0.000**	48.85±19.84	43.62±17.83 **p=0.000**	40.40±20.08	37.46±18.16 **p=0.000**

The follow-up DSC-R scale score and its hypoglycemia, hyperglycemia, psychology, and neurology subscale scores of the control group were found significantly lower than the baseline scores (Table 3).

The post-education DSC-R scale score and its hypoglycemia, hyperglycemia, psychology, and neurology subscale scores of the intervention group were significantly lower than the pre-education scores in each of these comparisons (Table 3).

The follow-up DSC-R scale score and its hypoglycemia, hyperglycemia, psychology, and neurology subscale scores of the whole study population were significantly lower than the baseline scores in each of these comparisons (Table 3).

Frequencies of Responses to DSC-R Scale and It's Subscales in the Intervention and Control Groups

Table 4. Frequency distribution of hypoglycemia, hyperglycemia, and ophthalmology sub-dimensions of the patients in the control and intervention groups

	n=213			**Level of discomfort in those with symptoms**									
		Symptom not seen		**No**		**Some**		**Moderately**		**Very**		**Extremely**	
	Group	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Hypoglycemia		Emotional changes											
	Intervention	66	62.3	0	0.0	14	13.2	14	13.2	6	5.7	6	5.7
	Control	59	55.1	0	0.0	3	2.8	20	18.7	12	11.2	13	12.1
		Just before meals											
	Intervention	82	**77.4**	0	0.0	3	2.8	16	15.1	5	4.7	0	0.0
	Control	71	66.4	2	1.9	19	17.8	14	13.1	14	13.1	1	0.9
		Quick irritation											
	Intervention	76	**71.7**	0	0.0	4	3.8	15	14.2	9	8.5	2	1.9
	Control	71	66.4	0	0.0	2	1.9	18	16.8	12	11.2	4	3.7
Hyperglycemia		Excessive thirst											
	Intervention	58	57.5	0	0.0	4	3.8	15	14.2	17	16.0	9	8.5
	Control	51	47.7	1	1.9	10	9.3	17	15.9	17	15.9	10	9.3
		Dry mouth											
	Intervention	30	28.3	3	2.8	18	17.0	33	31.1	17	16.0	5	4.7
	Control	31	29.0	7	6.5	28	26.2	22	20.6	17	15.9	2	1.9
		Frequent urination											
	Intervention	39	36.8	1	0.9	6	5.7	24	22.6	29	27.4	7	6.6
	Control	32	29.9	3	2.8	16	15.0	28	26.2	23	21.5	5	4.7

		Drinking too much liquid											
	Intervention	63	59.4	0	0.0	3	2.8	18	17.0	17	16.0	5	4.7
	Control	56	52.3	2	1.9	16	15.0	19	17.8	12	11.2	2	1.9
Ophthalmology		Blurry vision that does not exceed when glasses are worn											
	Intervention	66	62.3	0	0.0	13	12.3	21	13.8	6	5.7	0	0.0
	Control	54	50.5	0	0.0	15	14.0	22	20.6	13	12.1	3	2.8
		Distortion in vision											
	Intervention	68	64.2	0	0.0	11	10.4	19	17.9	7	6.6	1	0.9
	Control	54	50.5	0	0.0	18	16.8	29	27.1	4	3.7	2	1.9
		Black spots or lightning flashes in the field of vision											
	Intervention	94	88.7	0	0.0	5	4.7	3	2.8	3	2.8	1	0.9
	Control	87	81.3	0	0.0	2	1.9	9	8.4	7	6.5	2	1.9
		Sometimes clear blurry vision											
	Intervention	89	84.0	0	0.0	6	5.7	9	8.5	2	1.9	0	0.0
	Control	69	64.5	2	1.9	8	7.5	23	21.5	5	4.7	0	0.0
		Sudden deterioration in vision											
	Intervention	104	98.1	0	0.0	2	1.9	0	0.0	0	0.0	0	0.0
	Control	105	99.9	1	0.9	0	0.0	1	0.9	0	0.0	0	0.0

Among the items in the hypoglycemia subscale, “irritability just before a meal” was the diabetic symptom with the greatest difference among intervention (77.4%) and control (66.4%) groups. Patients with “irritability just before a meal” was 11% lower in the intervention group than the control group. This symptom was a little troublesome in the control group and moderately troublesome in the intervention group (Table 4).

In the hyperglycemia subscale, “very thirsty” was the diabetic symptom with the greatest difference among the groups. In the intervention group “very thirsty” item was positive in 57.5% and while this rate was 47.7% in the control group. Thus, the intervention group had 9.2% lower rate of this symptom. This symptom was moderately troublesome in the both groups (Table 4).

In the ophthalmology subscale, “alternating clear and blurred vision” was the symptom with the greatest difference among the groups. In the intervention group this symptom was present in 16% and while this rate was 35.5% in the control group. The rate of this symptom was significantly higher in the control group compared with the intervention group. While this symptom was similarly moderately troublesome in both groups, its rate decreased to 21.5% in the control group and to 8.5% in the intervention group in the follow-up evaluation (Table 4).

Table 5. The frequency distribution of the responses to the psychology the sub-dimension of the patients in the control and intervention groups

n=213		Symptom not seen		Level of discomfort in those with symptoms									
				No		Some		Moderately		Very		Extremely	
	Group	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Psychology		Weakness											
	Intervention	43	40.6	2	1.9	14	13.2	20	18.9	20	18.9	7	6.9
	Control	25	23.4	6	5.6	20	18.7	19	17.8	32	29.9	5	4.7
		A feeling of general exhaustion / burnout											
	Intervention	51	48.1	0	0.0	15	14.2	18	17.0	15	14.2	7	6.6
	Control	24	22.4	0	0.0	5	4.7	20	18.7	26	24.3	23	21.5
		Sleepiness or dizziness											
	Intervention	69	65.1	0	0.0	9	8.5	11	10.4	14	13.2	3	2.8
	Control	47	43.9	1	0.9	12	11.2	18	16.8	25	23.4	4	3.7
		Difficulty in concentrating on a topic											
	Intervention	86	81.1	0	0.0	8	7.5	9	8.5	3	2.8	0	0.0
	Control	77	72.0	1	0.9	9	8.4	11	10.3	6	5.6	3	2.8
		Increased exhaustion during the day											
	Intervention	65	61.3	0	0.0	7	6.6	17	16.0	14	13.2	3	2.8
	Control	39	36.4	4	3.7	17	15.9	20	18.7	23	21.5	4	3.7
		Feeling exhausted when you wake up in the morning											
	Intervention	66	62.3	0	0.0	6	5.7	17	16.0	12	11.3	5	4.7
	Control	35	32.7	5	4.7	14	13.1	25	23.4	20	18.7	8	7.5
		Drowsiness in the head (difficulty in clear thinking)											
	Intervention	97	91.5	1	0.9	2	1.9	3	2.8	3	2.8	0	0.0
	Control	91	85.0	0	0.0	4	3.7	8	7.5	4	3.7	0	0.0
		Difficulty in collecting attention											
	Intervention	94	88.7	0	0.0	6	5.7	3	2.8	3	2.8	0	0.0
	Control	97	90.7	0	0.0	2	1.9	3	2.8	5	4.7	0	0.0

In the psychology subscale, there were significant differences in almost all of the items. The rate of patients without “lack of energy” was 40.6% in the control group and 23.4% in the intervention group. The difference was statistically significant ($p<0.001$). While most of the patients in the control group stated having moderately or very troublesome “lack of energy”, those in the intervention group mostly had very or a little troublesome “lack of energy”. The rate of this symptom was significantly higher in the control group compared with the

intervention group. While this symptom was similarly moderately troublesome in both groups, its rate decreased to 21.5% in the control group and to 8.5% in the intervention group in the follow-up evaluation (Table 5). Whereas 77.6% of the patients in the control group stated that they had "an overall sense of fatigue", the rate of this symptom was significantly lower (51.9%, p<0.001) in the intervention group (Table 5).

Table 6. Frequency distribution of the responses to the neurology sub-dimension of the patients according to the control and intervention group

n=213		Symptom not seen		Level of discomfort in those with symptoms									
				No		Some		Moderately		Very		Extremely	
	Group	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Neurology		Pain in the calf when walking											
	Intervention	58	**54.7**	0	0.0	14	13.2	18	17.0	13	12.3	3	2.8
	Control	32	29.9	0	0.0	7	6.5	29	27.1	30	28.0	9	8.4
		Numbness in feet (loss of sensation)											
	Intervention	67	62.3	0	0.0	11	10.4	13	12.3	11	10.4	4	3.8
	Control	47	43.9	0	0.0	6	5.6	23	21.5	22	20.6	9	8.4
		Numbness in hands (loss of sensation)											
	Intervention	75	70.8	0	0.0	7	6.6	19	17.9	5	4.7	0	0
	Control	60	56.1	1	0.9	20	18.7	15	14.0	8	7.5	3	2.8
		Tingling at night arms and legs											
	Intervention	80	75.5	0	0.0	5	4.7	16	15.1	5	4.7	0	0.0
	Control	58	54.2	1	0.9	9	8.4	21	19.6	17	15.9	1	0.9
		Pain in the form of burning at night											
	Intervention	66	62.3	1	0.9	5	4.7	10	9.4	17	16.0	7	6.6
	Control	48	44.9	1	0.9	6	5.6	14	13.1	23	21.5	15	14.0
		Sudden sinking pain in the legs and feet of the legs											
	Intervention	91	85.5	0	0.0	6	5.7	4	3.8	3	2.8	2	1.9
	Control	83	77.6	0	0.0	1	0.9	7	6.5	8	7.5	8	7.5
		Pain in the form of burning in the legs during the day											
	Intervention	82	**77.4**	0	0.0	4	3.8	7	6.6	11	10.4	2	1.9
	Control	59	55.1	0	0.0	4	3.7	14	13.1	22	20.6	8	7.5
		Tingling sensation and numbness in the hands or fingers											
	Intervention	86	81.1	0	0.0	6	5.7	13	12.3	1	0.9	0	0.0
	Control	70	65.4	2	1.9	12	11.2	15	14.0	8	7.5	0	0.0
		Feeling a different feeling in the legs and feet of the legs when touched											
	Intervention	100	94.3	0	0.0	1	0.9	4	3.8	0	0.0	1	0.9

	Control	100	93.5	0	0.0	2	1.9	3	2.8	1	0.9	0	0.9
		Sudden sinking pain in the legs and feet of the legs											
	Intervention	91	85.5	0	0.0	6	5.7	4	3.8	3	2.8	2	1.9
	Control	83	77.6	0	0.0	1	0.9	7	6.5	8	7.5	8	7.5

Among the items in the neurology subscale, "aching calves when walking" was the symptom with the greatest difference among the groups. In the intervention group this symptom was present in 45.3% and while this rate was 70.1% in the control group. The rate of this symptom significantly decreased after the intervention (%54.7, $p<0.001$). While this symptom was very troublesome in the control group, it was moderately troublesome in the intervention group. Another item in this subscale with significant difference was "burning pain in the legs during the day". The rate of this symptom was 22.6% in the intervention group and 44.9% in the control group. The degree of suffering from this symptom was similar in both groups and was very troublesome (Table 6).

Discussion & Conclusions

Type 2 diabetes mellitus is the fourth leading cause of mortality worldwide. Every year, 3 million people die of complications associated with T2DM (Olgun, Yakın & Demir, 2011). T2DM requires regular treatment; so provision of healthcare to diabetic patients is of paramount importance. Furthermore, patient education is a priority for diseases such as diabetes which requires a long-term follow up (Cooper, Booth & Gill, 2003). It is also one of the targets of St Vincent Declaration (The St Vincent Declaration, 1989). The aim of education is to teach the patient regarding maintenance of self-care, avoidance of trauma, prevention of lesions on their body, coping with adverse events, and prevention of hospitalization. Ridgeway et al. (1999) investigated the effects of education in T2DM and reported that the patients have a greater knowledge level about diabetes even one year after the education and also that weight loss was maintained (Ridgeway et al. 1999).

In this study, the baseline average DSC-R scale scores were found to be moderate. While the control group had a small decrease in the degree of suffering from symptoms of diabetes, the intervention group had a greater decrease. Bayrak and Çolak (2012) reported that education of diabetic patients and their relatives decreased the rate of patients who experienced hypoglycemia and they concluded that hypoglycemic attacks could be more quickly and effectively treated if education is provided (Bayrak, & Çolak, 2012). İnkaya and Karadağ

(2016) reported that patients with diabetes, who took more responsibility in self-management of diabetes, had significantly lower bouts of hypoglycemia, a substantial improvement in quality of life, and satisfaction with their treatment (İnkaya, & Karadağ, 2016). Norris et al. (2002) reported that 50-80% of patients with diabetes had lack of information and skills about diabetes and that less than half of these patients had an ideal glycemic control (Norris et al., 2002). In line with these reports, the findings of our study also clearly indicate that provision of education has a beneficial effect on hypoglycemia.

Deterioration of health may lead to inability to maintain self-care. In this situation, information, guidance, and partial or complete support may be needed (Lin et al., 2004). In our study symptoms of hyperglycemia were moderately troublesome in both the control and intervention groups. Yavuz et al. (2013) reported that hospitalized patients with known diabetes had lower glycemic levels at the time of discharge from hospital and concluded that application of treatment modalities during hospitalization such as regular diet, OAD, and insulin might have led to this improvement. Nathan et al. (2009) reported that hyperglycemia could be controlled with medical treatment (Nathan et al. 2009). Spann et al. (2006) reported that even when health professionals, dietitians, and diabetes trainers worked in order to control hyperglycemia, only 40.5% of the patients could reach target levels of glycemia (Span et al. 2006). These findings also support the findings of our study.

The results of this study indicate that even there is improvement in diabetic symptoms with education, these symptoms were very troublesome for the patients in both of the groups. It is well-known that the frequency of depression among diabetic patients is nearly 3-4 times that of the general population (Asghar et al., 2007). In our study there was statistically significant differences in psychology subscale scores between baseline and follow-up assessment in the control and intervention groups. There were substantial differences in nearly all of the items in the psychology subscale. Several studies examined the effects of T2DM on psychological status. Depression negatively affects patient adherence, quality of life, response to treatment, prognosis, mortality, and morbidity and makes it harder to control the disease when it is concomitant with T2DM. Aba & Tel (2012) found various degrees of depressive symptoms in 87% of their study population (Aba & Tel, 2012). In the present study statistically significant differences were observed in psychology subscale scores between the control and intervention groups ($p<0.05$). This finding indicates that education led to marked reduction in symptoms in the psychology subscale. Other studies about symptoms of diabetes generally

found a high rate of depressive symptoms in patients with T2DM. Gonzalez et al. (2007) found that 19% of the patients with T2DM had major depression and 66.5% of their patients expressed at least one depressive symptom (Gonzalez et al., 2007). Mezuk et al. (2008) found that depression and T2DM were interrelated and 60% of patients with T2DM were at the risk of depression (Mezuk, Eaton, Albrecht & Golden, 2008). Saatçi, Friedman & Gross (2009) found a positive relationship between psychosocial status of the patients and their well-being. (Scain, Friedman & Gross, 2009). These findings are in line with the findings of our study.

In this study, the education intervention was effective and led to decrease in the patients' degree of suffering from diabetic symptoms. The effects of education in diabetic patients have been investigated in several studies. Acemoğlu et al. (2006) reported that only a small proportion of the patients received education about diabetes and that healthcare professionals did not provide their patients with adequate recommendations (Acemoğlu et al., 2006). In the same study, only 17% of the patients reported that they participated in any diabetes education program in the past and that patients with a history of participation in such programs had improvements in their healthy life behaviors such as weight loss and exercise (Acemoğlu et al., 2006). Eroğlu et al. (2014) reported that 44.3% of their patients received education about diabetes from nurses and that 67.6% of the patients wanted to receive such education (Eroğlu et al., 2004). The issues these patients wanted to receive education about were diabetes and exercise, hyperglycemia, specific diet for diabetes, and hypoglycemia (Eroğlu et al., 2004).

Among the limitations of this study were inclusion of only patients hospitalized in an internal medicine ward; their ages were over 18 years; patients' awareness of their diagnosis; and exclusion of patients who were unable to respond to the questions because of physical or psychological barriers or communication problems such as hearing or pronunciation disorders; and those who did not provide informed consent.

To conclude, the essential modality which improves the quality of care and self-management of diabetes is a regular follow up and education. Diabetes education may include explanatory information about diabetes and exercise; symptoms and signs of diabetes; diet; treatment; and diabetes management. A follow-up program with the following features may be developed: paying attention to patients' statements, established goals, problem solving manners, dynamic learning, and skill enhancing. Maintenance of an education program to provide these features may be beneficial.

References

Aba, N.,& Tel, H. (2012). Depression and Self-Care Agency Among the Diabetes Mellitus Patients. *Cumhuriyet Nursing Journal*, *1*(1), 18-23. Turkey.

Acemoğlu, H., Ertem, M., Bahçeci, M., & Tuzcu, A. (2006). Levels of Health Care Utilization in Patients with Type 2 Diabetes Mellitus. *The Eurasian Journal of Medicine EAJM, 38,* 89-95.

Albuquerque, C.,Correia, C., &Ferreira, M. (2015). Adherence to the therapeutic regime in person with type 2 diabetes. *Procedia-Social and Behavioral Sciences*, *171*, 350-358. https://doi.org/10.1016/j.sbspro.2015.01.132

Arbuckle RA, Humprey L, Vardeva K, Arondekar B, Danten-Viala M, Scott JA, Snoek FJ. (2009) Psychometric evaluation of the diabetes symptom checklist revised (DSC-R)-A measure of symptom distress. *Value in Health*, 12 (8): 1168- 1175. https://doi.org/10.1111/j.1524-4733.2009.00571.x

Bayrak, G., & Çolak, R. (2012). Patient education in treatment of diabetes. *Journal of Experimental and Clinical Medicine*, *29*(1s), 7-11. http://doi:10.5835/jecm.omu.29.s1.003

Brar, B. K.,& Sethi, N. (2015). Skin manifestations of diabetes mellitus from dermatology OPD of a tertiary care Hospital of North India. Scholars *Journal of Applied Medical Sciences (SJAMS),* 3(8A):2786-2789.

Brown, S. A.,García, A. A., Zuñiga, J. A., &Lewis, K. A. (2018). Effectiveness of work place diabetes prevention programs: A systematic review of the evidence. *Patient education and counseling*. 1036-1050. https://doi.org/10.1016/j.pec.2018.01.001

Cooper, H. C., Booth, K., & Gill, G. (2003). Patients' perspectives on diabetes health care education. *Health education research*, *18*(2), 191-206. https://doi.org/10.1093/her/18.2.191

Diabetes Care and Research in Europa: The St Vincent Decleration Action Programme 1989 and Istanbul commitment 1999. http://www.codex.vr.se/texts/SVD.pdf (date of access: 02.08.208)

Erer, S., Bakar, M., Turan, F., Akgöz, S. (2007). Evaluation of cognitive functions in patients with diabetes mellitus by neuropsychological-neurophysiological tests. Turk J Neurol. 2007; 13(6): 400-408 Turkey

Ejtahed, H. S.,Naslaji, A. N., Mirmiran, P., Yeganeh, M. Z., Hedayati, M., Azizi, F., & Movahedi, A. M. (2015). Effect of camel milk on blood sugar and lipid profile of patients with type 2 diabetes: a pilot clinical trial. *International journal of endocrinology and metabolism*, *13*(1). Int J Endocrinol Metab. 2015 Jan; 13(1): e21160. https://doi: [10.5812/ijem.21160]

Eroğlu, S. Ç., Şensoy, F., Beydağ, K. D., & Kıyak, M. (2014). Compliance with diabetic patients with diabetes and requirements of taking education. *Procedia-Social and Behavioral Sciences*, *152*, 457-464. https://doi:10.1016/j.sbspro.2014.09.231

Gonzalez, J. S.,Safren, S. A., Cagliero, E., Wexler, D. J., Delahanty, L., Wittenberg, E., Blaıs, M., Meigs, J.,& Grant, R. W. (2007). Depression, self-care, and medication adherence in type 2 diabetes: relationships across the full range of symptom severity. *Diabetes care*.1-14. https://doi.org/10.2337/dc07-0158

Grillo, M. D. F. F.,Neumann, C. R., Scain, S. F., Rozeno, R. F., Gross, J. L., & Leitão, C. B. (2013). Effect of different types of self-management education in patients with diabetes. *Revista da Associação Médica Brasileira*, *59*(4), 400-405. http://dx.doi.org/10.1016/j.ramb.2013.02.006

İnkaya, B. V.,& Karadağ, E. (2016). Review of disease self-management strategies among diabetic individuals and their caretaker nurses: a qualitative study/Diyabetli bireyler ve onlara bakım veren hemşirelerin hastalık özyönetim stratejilerine bakışı: kalitatif bir çalışma." *Journal of Education and Research in Nursing*, *14*(1), 31-37. https://doi:10.5222/HEAD.2017.031

Karakurt, P., Aşılar, R. H., Yıldırım, A., & Sevinç, H. (2017). Knowledge levels and attitudes of diabetic patients about their disease European Journal of Therapeutics, 23: 165-172. https://doi: 10.5152/EurJTher.2017.67

Lin, E. H.,Katon, W., VonKorff, M., Rutter, C., Simon, G. E., Oliver, M., ... &Young, B. (2004). Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes care*, *27*(9), 2154-2160. https://doi.org/10.2337/diacare.27.9.2154

Mezuk, B.,Eaton, W. W., Albrecht, S., & Golden, S. H. (2008). Depression and type 2 diabetes over the lifespan: a meta-analysis. *Diabetes care*, *31*(12), 2383-2390. https://doi.org/10.2337/dc08-0985

Mollaoğlu, M.,& Beyazıt, E. (2009). Influence of diabetic education on patient metabolic control. *Applied nursing research*, *22*(3), 183-190. https://doi.org/10.1016/j.apnr.2007.12.003

Nathan, D. M., Buse, J. B., Davidson, M. B., Ferrannini, E., Holman, R. R., Sherwin, R., & Zinman, B. (2009). Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes care*, *32*(1), 193-203. https://doi:10.2337/dc08-9025

Nicolucci, A. (2010). Epidemiological aspects of neoplasms in diabetes. *Actadiabetologica*, *47*(2), 87-95. https://doi:10.1007/s00592-010-0187-3

Norris, S. L.,Lau, J., Smith, S. J., Schmid, C. H., &Engelgau, M. M. (2002). Self-management education for adults with type 2 diabetes: a meta-analysis of theeffect on glycemiccontrol. *Diabetes care*, *25*(7), 1159-1171. https://doi.org/10.2337/diacare.25.7.1159

Olgun, N., Yakın, H., & Demir, H. G. (2011). Diagnosis And Risk Determination Of Diabetes Dealing With Diabetes. *Turkish Family Physcian*, *2*(2), 36-44. Turkey

Paterson, B.,&Thorne, S. (2000). Expert decision making in relation to unanticipated blood glucose levels. *Research in Nursing & Health*, *23*(2), 147-157. https://doi.org/10.1002/(SICI)1098-240X(200004)23:2<147::AID-NUR7>3.0.CO;2-S

Ridgeway, N. A.,Harvill, D. R., Harvill, L. M., Falin, T. M., Forester, G. M., &Gose, O. D. (1999). Improved control of type 2 diabetes mellitus: a practical education/ behavior modification program in a primary care clinic. *Southern medical Journal*, *92*(7), 667-672. PMID:10414474

Saatci, E.,Tahmiscioglu, G., Bozdemir, N., Akpinar, E., Ozcan, S., & Kurdak, H. (2010). The well-being and treatment satisfaction of diabetic patients in primary care. *Health and quality of life outcomes, 8*(1), 1-8. https://doi.org/10.1186/1477-7525-8-67

Scain, S. F., Friedman, R., & Gross, J. L. (2009). A structured educational program improves metabolic control in patients with type 2 diabetes. *The Diabetes Educator*, *35*(4), 603-611. https://doi:10.1177/0145721709336299

Selvais, P. L.,Amoussou-Guenou, K. D., & Hermans, M. P. (2008). Belonging to a diabetes patients' association is predictive of better metabolic control. *Diabetes & metabolism*, *34*(3), 279-282. https://doi.org/10.1016/j.diabet.2008.01.006

Sigurðardóttir, Á. K. (2005). Self-care in diabetes: model of factor saffecting self-care. *Journal of clinical nursing*, *14*(3), 301-314. https://doi.org/10.1111/j.1365-2702.2004.01043.x

Spann, S. J., Nutting, P. A., Galliher, J. M., Peterson, K. A., Pavlik, V. N., Dickinson, L. M., & Volk, R. J. (2006). Management of type 2 diabetes in the primary care setting: a practice-based research network study. *The Annals of Family Medicine*, *4*(1), 23-31. https://doi:10.1370/afm.420.

Sugüneş, T. (2013). Uluslararası Diyabet Liderler Zirvesi, SGK, https://www.diabetesforum.com/ (date of access: 10.08.208)

Terkeş, N., Bektaş, H. (2016). Psychometric evaluation of the Diabetes Symptom Checklist–Revised in patients with type 2 diabetes in Turkey. *Japan Journal of Nursing Science*, 13, 273–283. https://doi:10.1111/jjns.12104

Ünal, E., Akan, O., & Üçler, S. (2015). Diabetes and neurological diseases. *Okmeydanı Medical Journal*, *31*, 45-51. https://doi:10.5222/otd.2015.045