Research Article
Volume 7:11, 2022

Journal of Advanced Practices in Nursing

ISSN: 2573-0347 Open Access

The Effect of A Therapeutic Education Program on the Feeling of Self-Efficacy, Self-Care Behaviors and Glycemic Control (Hba1c) in Type 2 Diabetic Patients

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Abstract

Introduction: Diabetes represents a real public health problem due to its increasing frequency, morbidity, mortality and economic cost. The process of teaching individuals to manage their diabetes was considered an important part of clinical management. The objective of this study is to evaluate the effects of a therapeutic education program for type 2 diabetic patients on their sense of self-efficacy and on their self-care behaviors and on their glycemic control (HbA1c).

Methods: This quasi-experimental study was conducted on 120 patients with type 2 diabetes who were randomly divided into two groups, experimental group and control group. The study was carried out at the outpatient endocrinology department of La Rabta University Hospital in Tunis. Data were assessed by three tools, a questionnaire for sociodemographic data, DMSES for self-efficacy and DSCAS for self-care behaviors. The therapeutic education program was set up for the experimental group, then after the intervention, the results were analyzed by the Spss-22 software.

Results: Compared to the control group, participants in the experimental group showed an improvement in self-efficacy, self-care behaviors, and HbA1c levels.

Conclusion: The results showed an improvement in the experimental group in terms of self-care behaviors, feelings of self-efficacy and HbA1c levels. There is great interest in developing therapeutic education programs aimed at supporting patients in the management of their diabetes. These programs must be specific to each topic of diabetes, over a large hourly volume. It is desirable to evaluate the contribution of these programs in the short and long term.

Keywords: Type 2 diabetes • Self-efficacy • Self-care behavior • Therapeutic education • HbA1c

Introduction

Diabètes is one of the most common non-communicable diseases in the world [1]. It represents a real public health problem due to its increasing frequency, morbidity, mortality and economic cost [2]. In developing countries, the number of people with diabetes will increase by 109.1% in Africa and 96.2% in the Mediterranean region over the next 20 years. This increase is explained by the aging of the population, by the inappropriate diet, by obesity and by a sedentary lifestyle [3]. The World Health Organization (WHO) predicts a worldwide increase in the prevalence of diabetic patients, mainly T2D, from 135 million in 1995 to 300 million in 2025 [4]. Indeed, diabetes requires significant and complex behavioral changes in the lives of patients [5]. To manage this disease, diabetic patients must perform technical procedures themselves, make therapeutic decisions [6] and must have the knowledge required to participate in the decision-making process necessary for self-care [7]. In addition, in the writings, several studies indicate that it is difficult for the diabetic person to live with this chronic disease which produces great changes in their life [8]. This difficulty for patients to control their chronic disease can reduce their quality of life and their psychological well-being [7]. Hence the importance of the role of health professional with these people. He must be attentive and meet their needs. The acquisition and maintenance by the patient of self-care skills is one of the specific purposes of therapeutic patient education [9]. Thus, at the research level, several efforts have been made to develop and evaluate educational interventions that empower people with diabetes in the management of their health condition. In a meta-analysis carried out in 2002 on 31 studies, Norris and his colleagues show that education in the self-management of type 2 diabetes immediately improves HbA1c levels during follow-up [10]. Thus, the results of a literature review analyzing 50 articles on the impact of interventions aimed at improving the quality of care for diabetic patients, showed that among interventions based on education and emotional and behavioral support for patients type 2 diabetics, those involving the expansion of the roles of health professionals and telemedicine, improved the quality of diabetes care [11].

Purpose of the study

To evaluate the effects of a therapeutic education program for type 2 diabetic patients on their sense of self-efficacy and on their self-care behaviors and on their glycemic control (HbA1c).

Research hypotheses

Following the therapeutic education program: The feeling of self-efficacy of the participants will be higher in the experimental group than in the control group. The self-care behaviors of the participants will be higher in the experimental group than in the control group. The glycemic value (HbA1c) of participants in the experimental group will be lower than that of the control group.

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Date of Submission: 16 November, 2022, Manuscript No: APN-22-80067; **Editor assigned:** 18 November, 2022, PreQC No: P-80067; **Reviewed:** 02 December, 2022, QC No: Q-80067; **Revised:** 06 December, 2022, Manuscript No: R-80067; **Published:** 12 December, 2022, DOI: 10.37421/2573-0347.2022.7.292

Materials and Methods

Type of study

This study uses an experimental type by random assignment of diabetic patients. This type of study, called before/after with a control group, aims to examine a causal link between the intervention (therapeutic education program) and the improvement of self-care behaviors, the feeling of self-efficacy and glycemic control in type 2 diabetic patients.

Population

The study includes type 2 diabetic patients who went to the endocrinology department consultation at La Rabta hospital in Tunis, between December 2020 and March 2021.

Sampling and sample size

A non-probability convenience sampling technique was used to select 120 patients (50 experimental, 50 control). The patients were selected according to the following criteria: Type 2 diabetic subject treated with oral antidiabetics (OAD) for at least one year; person aged 18 and over; freely agreeing to participate in the study by signing the consent form and person with an HbA1c level ≥ 7% during the three months preceding the study. Patients fulfilling the selection criteria were recruited. Then they were contacted to ask for their consent to participate in the study. Those who agreed to follow the educational intervention, were considered as the experimenter group.

Measuring instruments

Data was collected using the following two instruments: The DMSES. This instrument was developed in 1999 by van der Bijl, van Poelgeest-Eeltink and Shortridge-Bagget [12]. It is made up of 20 items that assess the extent of a person's ability to manage their diabetes. The choice of answers is made from a scale ranging from 0 to 10. The sum of the values of the items varies from 0 to 200 points, a high score indicates a high level of self-efficacy. Cronbach's α internal consistency coefficient varied between .71 and .79 for all subscales. The DSCAS. This instrument was developed in 200 by Toobert, Hampson and Glasgow [13]. It is composed of 11 items evaluating five self-care behaviors which are: diet, physical exercise, measurement of blood sugar, foot examination and smoking. For each behavior, the participant was asked to indicate the number of days they performed the desired behavior during the week preceding the interview. Items are measured using a scale ranging from 0 to 7 days. A questionnaire including socio-demographic and clinical data. The measuring instruments: the DMSES and the DSCAS, were translated from English to dialectal Arabic and validated according to the transcultural validation method of Vallerand (1989).

Intervention

The educational intervention was therapeutic patient education (TPE) which was offered to the experimental group. The multidisciplinary team that carried out the intervention included a doctor, a nurse, a psychologist and a dietician. The number of patients was 15 to 20 per workshop. The intervention session lasted 120 minutes. Topics were definition of diabetes, types, causes, consequences and treatment; in addition to self-management in terms of medication compliance, self-monitoring of blood sugar, diet, physical activity, foot care. The teaching methods were video, brochures, demonstrations, role plays and lectures. Every two weeks, a phone call was made to the experimental group to check on their practices and to see if they had any questions.

Data analysis plan

The data were analyzed using SPSS 22 software. Descriptive analyzes were used to describe the socio-demographic characteristics of the sample and the variables of interest using percentages and mean, difference- type, minimum and maximum or frequency distribution. The hypotheses were tested using inference analyses. The evolution of the groups (GE *vs*. GC) over time (baseline and three months) with respect to the variables of interest, the feeling of self-efficacy, self-care behaviors and glycemic values (HbA1c) were analyzed/tested using repeated measures analysis of variance (two groups X two times).

Results

Compared to sociodemographic data for all study participants (Table 1), the average age of participants in both groups is 57 years. Note that the age of the participants ranges from 38 to 71 years old. The average duration of diabetes is 5 years in both groups. We note a male predominance (63.3%) in the GE and a female predominance (53.3%) in the GC. As for the level of education, most of the participants of GE and GC have a secondary education (GE: 35.0%; GC: 31.7%). For the socio-economic level, the majority of the two groups have an average socio-economic level (GE: 75.0%; GC: 68.3%) (Table 1).

The descriptive data related to the scores for the feeling of self-efficacy are presented in Table 3. The mean scores for the feeling of self-efficacy are high (184) in the GE and moderately low in the CG (62) considering that the values of the scale ranged from 0 to 200. To establish whether the two groups are equivalent at the start with regard to this variable, the Student t test was performed. A significant difference was detected between the two groups with regard to the self-efficacy score (Table 2).

Descriptive data related to self-care behaviors are presented in Table 3. The scale used assesses five self-care behaviors which are: diet, physical exercise, blood sugar testing, foot examination and smoking. The results for the five self-care behaviors show that GE participants followed the diet plan an average of 3 times per week and the GC an average of once per week. GE participants perform physical exercises an average of 3 times per week and GC participants perform an average of one day per week. Participants in the GE monitored their blood sugar two days per week while the GC performed their blood glucose test on average one day per week. The EG examined their feet and shoes 3 days per week, although the GC examined them less than one day per week. Regarding smoking, 20.83% of the GE and 40.83% of the GC are smokers.

Table 1. Socio-demographic data of participants.

Variables	Experimental group (n=60)	Control group (n=60)	P
Age (in years)			
Mean, (standard deviation)	57.28 (7.97)	57.81 (7.58)	0.708[a]
(min-max)	(43 - 71)	(38 - 71)	
Gender (n, %)			
Male	38 (63.3)	28 (46.7)	0.067[b]
Feminine	22 (36.7)	32 (53.3)	
Marital status (n, %)			
Married	47 (78.3)	50 (83.3)	
Single	3 (5.0)	2 (3.3)	0.481[b]
Divorce	5 (8.3)	5 (8.3)	
Widow	5 (8.3)	3 (5.0)	
Level of education (n, %)			
Illiterate	14 (23.3)	14 (23.3)	
Primary	16 (26.7)	18 (30.0)	0.857[b]
Secondary	21 (35.0)	19 (31.7)	
University	9 (15.0)	9 (15.0)	
Socio-economic level (n, %)			
Down	11 (18.3)	16 (26.7)	0.282[b]
Medium	45 (75.0)	41 (68.3)	
Raised	4 (6.7)	3 (5.0)	
Work (n,%)			
Yes	42 (70.0)	32 (53.3)	0.75[b]
No	18 (30.0)	28 (46.6)	
Duration of illness (in years)			
Mean, (standard deviation)	5.75 (2.59)	5.70 (3.01)	0.923[a]
(min-max)	(1 – 13)	(1 – 15)	

Note: [a]Test t de Student, [b]Chi-deux de Pearson

A significant difference was observed between GE and GC regarding diet and foot examination and no significant difference was observed between the two groups regarding physical exercise, blood glucose monitoring, and smoking (Table 3).

The descriptive data related to the HbA1c level are presented in Table 4. The results indicate that the HbA1c level is greater than 8 in both groups. No significant difference was detected between the two groups with regard to the HbA1c level (p=.228) (Table 4).

Evolution at 3 months: An analysis of variance was carried out in order to test a difference in the evolution between the groups in relation to the score of the feeling of self-efficacy. The results are presented in Table 7. There is a significant difference in evolution between the groups over time. The self-efficacy score improves over time in the GE and does not change in the CG (Table 5).

As presented in Table 6, a significant difference in evolution between the groups was detected for all the self-care behaviors, i.e. by the presence of a group * time interaction. For the general diet, the GE improves over time and the GC does not change over time. For physical activity, the EG improves over time and the GC remains stable. For glucose monitoring, the EG improves over time and the GC deteriorates. The two groups differ in the end. For the foot exam, the GE and GC improve over time, but the two groups at the end differ. For the foot examination, there is no effect for the GC, but a significant increase on average in the GE was revealed (Table 6).

A significant difference in evolution between the GE and the GC at the level of the HbA1c level. An improvement in glycated hemoglobin was observed in the EG while no improvement was noted in the GC (Table 7).

Discussion

The results of this study showed an improvement in self-efficacy, self-care activities and better glycemic control after therapeutic education of diabetic patients among the experimental group. On the contrary, the control group did not experience any positive changes. This finding highlights the fact that particularly uncontrolled patients need to be closely monitored and educated by their physician and healthcare team in order to motivate them to increase their self-confidence in self-care. These results resemble the Elgerges study conducted in Lebanon among 100 type 2 diabetic patients and which aims to assess the effects of TPE in type 2 diabetic patients in Lebanon on their glycemic control, diabetes management self-efficacy scale and their self-care activities. The results of this study revealed that the experimental

Table 2. Descriptive data relating to the feeling of self-efficacy.

Variables	Experimental group (n=60)	Control group (n=60)	P
Feelings of self-efficacy (mean, standard deviation)	184 (14.91)	62.83 (15.69)	0.007[a]

Note: [a]Test t de Student, p< .05- scores possibles : 0-200

Table 3. Descriptive data relating to self-care behaviors.

Variables Behaviours	Experimental group (n=60)	Control group (n=60)	P
Diet (days/week) (mean, standard deviation)	3.25 (1.97)	1.76 (0.89)	0.000
Physical exercise (days/week) (mean, standard deviation)	3.34 (3.02)	1.34 (1.47)	0.15
Blood glucose monitoring (days/week) (mean, standard deviation)	2.87 (2.67)	1.07 (1.04)	0.07
Foot examination (days/week) (mean, standard deviation)	3.22 (3.09)	0.84 (1.07)	0.000
Smoking Smoking (n, %)	25(20.83)	49(40.83)	0.824

Note : [a]Test t de Student, [b]Chi-deux de Pearson, p< .05. Étendue : 0-7

Table 4. Descriptive data relating to the HbA1c level.

Variables	Experimental group (n=60)	Control group (n=60)	P
	HbA1c		
(mean, standard deviation)	8.48 (0.87)	9.11 (1.00)	0.228[a]
(min-max)	(7 – 11.5)	(7- 12.5)	

Note: [a]Test t de Student, p< .05

Table 5. The results of the analyzes of inferences relating to the feeling of self-efficacy.

	Experimental group (n=60)	Groupe témoin (n=60)	F	P
	Feeling of self-efficacy Mean (standard deviation)			
Pre	42.38 (7.04)	62.83 (15.69)	[a]*F* (1.105) = 174.82	<0.0001*
Post	184.03 (15.03)	55.55 (13.02)	[b]*F* (1.105) = 1.22	<0.0001*
			[c]*F* (1.105) = 228.00	<0.0001*
			[d]*F* (1.105) = 67.74	<0.0001*

Note: [a]F : Interaction group X time.
[b]F : Difference between times for the GC.
[c]F : Difference between times for the GE.
[d]F : Difference between the two groups in post *p< .05.

Table 6. The results of the analyzes of inferences relating to self-care behaviors.

	Experimental group (n=60)	Control group (n=60)	F et t	P
		Diet Mean(standard deviation)		
Pre	1.40 (0.56)	2.20 (0.82)	[a]*F* (1.105) = 69.48	<0.0001*
Post	5.10 (0.73)	1.32 (0.72)	[b]*F* (1.105) = 1.65	<0.0001*
			[c]*F* (1.105) = 116.82	<0.0001*
			[d]*F* (1.105) = 51.44	<0.0001*
		Physical activity Mean (standard deviation)		
Pre	0.45 (0.56)	1.66 (1.31)	[a]*F* (1.105) = 20.34	<0.0001*
Post	6.27 (0.92)	1.01 (1.55)	[b]*F* (1.105) = 0.76	<0.0001*
			[c]*F* (1.105) = 3.55	<0.0001*
			[d]*F* (1.105) = 7.66	<0.0001*
		Blood glucose monitoring Mean (standard deviation)		
Pre	0.40 (0.47)	1.33 (1.25)	[a]*F* (1.105) = 52.30	<0.0001*
Post	5.34 (1.37)	0.82 (0.70)	[b]*F* (1.105) = 2.03	<0.0001*
			[c]*F* (1.105) = 126.93	<0.0001*
			[d]*F* (1.105) = 13.04	<0.0001*
		Foot examination Mean (standard deviation)		
Pre	0.28 (0.36)	1.20 (1.37)	[a]*F* (1.105) = 32.51	<0.0001*
Post	6.15 (1.29)	0.49 (0.42)	[b]*F* (1.105) = 71.32	<0.0001*
			[c]*F* (1.105) = 230.14	<0.0001*
			[d]*F* (1.105) = 36.82	<0.0001*

Note : [a]F : Interaction group X time.
[b]F : Difference between times for the GC.
[c]F : Difference between times for the GE.
[d]F : Difference between the two groups in post *p< .05.

Table 7. Results of inference analyzes of glycemic value (HbA1c).

	Experimental group (n=60)	Control group (n=60)	F et t	P
		HbA1c Mean (standard deviation)		
Pre	9.03 (0.77)		[a]*F* (1.105) = 24.27	0.000
Post	7.92 (0.55)		[b]*F* (1.105) = 0.21	0.000
			[c]*F* (1.105) = 49.32	0.000
			[d]*F* (1.105) = 20.75	0.000

Note: [a]F : Interaction group X time.
[b]F : Difference between times for the GC.
[c]F : Difference between times for the GE.
[d]F : Difference between the two groups in post *p< .05.

group showed significant improvement in self-efficacy in managing their disease regarding general nutrition, specific nutrition, blood sugar control, physical activity, weight control and medical control (α<0.01); DMSES total score increased significantly from 5.02 to 8.28 in EG (α<0.01) compared to control group (CG) which decreased from 4.91 to 4.85 (α <0.05) [14]. In 2012, Abdel Razik, Moustafa Ragheb, and Abdel Aziz Mohammed conducted an experimental study that aimed to assess the effect of an educational program on self-efficacy in patients with type 2 diabetes. used the DMSES measuring instrument for data collection. The results of the study concluded that there were highly significant statistical differences in the total knowledge, practice and self-efficacy scores of the study sample after the implementation of the educational program [15]. Also, Bendik, et al. (2009) stated that a structured education program is able to improve quality of life, self-control and knowledge about diabetes in diabetic patients [16]. In addition, the ADA (2001) emphasized that behavior modification through education along with regular monitoring and appropriate management of blood sugar control are essential to improving the health of people with diabetes [17]. Participants who received therapeutic education engaged in all self-care behaviors at three months compared to participants who received usual follow-up. According to Reach (2006), one of the roles of therapeutic education is to make patients responsible for their treatment by ensuring a change in behavior, which this intervention seems to aim at Taha NM, et al. [18]. These results agree with the findings reported by Mohamed Taha and his colleagues. (2016). These authors revealed manifestly inadequate self-management behaviors and self-care practices prior to the implementation of an educational intervention. During the post-intervention phase of this study, significant improvements were observed in patients' self-management behaviors/practices. Similar success of a nursing intervention in improving the self-management of patients with T2DM was reported in a study in Korea, which concluded that promoting personal motivation and self-efficacy could lead to better health outcomes [19]. Along the same lines, Hunt (2013) published a literature review of 40 studies that assessed the ability of educational nursing interventions to improve self-management of type 2 diabetes. The results showed that nurses used a wide range of methods while teaching patients, such as individual or group sessions, or through the web or phone calls. The majority of nurse education plans were individualized and tailored to patient needs with a view to recommending tailored changes. The majority of these interventions had a positive impact on various indicators: increased patient knowledge of diabetes disease; improving 21 their commitment to self-management behaviors; correction of their clinical results, in particular HbA1c. Hunt concludes that the nurse, through her educational function, is a key player who contributes to improving the management of diabetes and reducing the onset of its complications. She emphasizes that these nursing interventions must be continuously supported and maintained and suggests conducting more research to show which of the nursing interventions are most relevant [20]. Participants who received therapeutic education had a significant decrease in their HbA1c

level compared to participants who received the usual follow-up. This agrees with data from the literature. For example, the study by Goudswaard, Stolk, Zuithoff, Valk & Rutten. (2004). This study aims to evaluate the short- and long-term effectiveness of a six-month self-management education program in people with type 2 diabetes treated in primary care, with doses maximal oral antidiabetics but poor glycemic control. The total study sample is 54 participants divided into the intervention group (n=25) and the control group (n=29). The intervention group received an individual educational program led by a diabetes nurse specialist. The educational intervention focuses on general information about diabetes, reinforcing medication adherence, the importance of physical activity and weight loss, and nutritional advice. The control group receives usual care. The HbAc1 level is measured at the start of the study, then 7.5 months and 18 months later. The results show that in the intervention group the HbAc1 level increased from 8.2% to 7.2% and in the control group from 8.8% to 8.4% [21]. Along the same lines, Walker, et al. (2013) examined the effects of behavioral interventions on glycemic control in patients with type 2 diabetes and which are reported in 10 experimental and quasi-experimental studies published between 2000 and 2012. Six of these studies mentioned that the intervention was carried out by a nurse. The characteristics of the methods used in these studies were: problem-solving technique and individual education. Five of these studies showed a drop in HbA1c levels in the experimental group after 6 to 12 months of education.

Conclusion

The results showed an improvement in the experimental group in terms of self-care behaviors, feelings of self-efficacy and HbA1c levels, which is an indicator of adequate metabolic control. There is great interest in developing therapeutic education programs aimed at supporting patients in the management of their diabetes. These programs must be specific to each topic of diabetes, over a large hourly volume. It is desirable to evaluate the contribution of these programs in the short and long term.

Limitations

The sample size of this research can be seen as a limitation. Although the number of type 2 diabetes patients recruited is not large, and the duration of measurement was short.

Recommendation

Long-term patient education programs should be developed based on patient needs and concerns for long-term follow-up and maintenance.

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How to cite this article: Abbassi, Amira. " The Effect of A Therapeutic Education Program on the Feeling of Self-Efficacy, Self-Care Behaviors and Glycemic Control (Hba1c) in Type 2 Diabetic Patients." *Adv Practice Nurs* 7 (2022): 292.