ORIGINAL ARTICLE

The Effect of Educational Intervention Based on Pender's Health Promotion Model for Distress Management in Patients with Type 2 Diabetes

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ABSTRACT

Background: The control and management of distress are essential to prevent the physical and psychosocial problems and complications of diabetes. The purpose of the present study was to determine the effect of the educational intervention based on Pender's Health Promotion Model for Distress Management in Patients with Type 2 Diabetes.

Method: This study is semi-experimental research with a control group that was conducted in two 50-diabetic patient groups in 2019. The data collection tool was a standard Diabetes Distress Score (DDS17) and a researcher-made questionnaire based on Pender's health promotion model that its validity and reliability were confirmed. The educational intervention was designed according to the pre-test results including five 60-minute educational sessions and it was performed for the test group. They were analyzed one and three months after data intervention using the SPSS software.

Results: The designed educational intervention reduced the distress in people with diabetes, and the results indicated a significant reduction (p<0.001) of stress score and related structures in the intervention group after the intervention, while this rate did not have a significant change in the control group. After the intervention, all the structures of the Pender's health promotion model changed in a positive direction and there was a significant statistical difference between the status of these structures before and after the intervention and between the intervention and control group after the intervention (p<0.005).

Conclusion: The designed educational program significantly reduced the distress among people with diabetes by changing people's behavioral and mental pattern, and improved the distress management in patients. **Keywords:** Distress, Diabetes, Health Promotion Model, Educational Intervention

INTRODUCTION

Diabetes is a chronic disease, which is caused by metabolic disorders and the most common endocrine disease^{1,2}. Increasing diabetes is the result of the demographic changes, the cultural transition of societies with the phenomenon of aging, urbanization, and modern lifestyle, as well as the diet caused by it³. Diabetes is the largest epidemic of the century as the fifth cause of death in the world and the fourth common cause of referring to clinic^{4,5}. It is predicted that the total number of people with diabetes to increase from 171 million in 2000 to more than 578 million in 2030^{6,7}. According to the last report of the International Diabetes Federation in 2019, of 5 billion people aged from 20 to 79 worldwide, 463 million people have diabetes. In Iran, 5, 387,200 people between the age of 20 and 79 have diabetes. In 2019, about 4.2 million people died due to diabetes and its complications. This rate has been 33037 people in Iran^{7,8}. Diabetes is very costly and allocates 11 percent of the total health costs in the world⁹. The cost of health care for a diabetic patient is about 4.6 times more than that of a non-diabetic person. In 2019, at least \$760 billion was spent for the prevention, treatment, and complications of diabetes in

the world, which will reach to more than \$824 billion by 2030^{7,8}.

Diabetes interacts with the physical and psychological phenomena in addition to economic losses. Among the psychological factors, it can refer to distress (mental pressure)^{10,11}. Distress is defined as a process that threatens the environmental events, welfare, and comfort of the organism¹². Distress can be considered one of the factors of creating and one of the outcomes of diabetes. Chronic stress and daily distress both play an important role in physical diseases and psychological distresses¹³. Distress and depression in people with diabetes are likely to be twice. Depressed diabetic patients adhere less to the medication and diet, which leads to poorer glycemic control. Evidence shows that treating psychological conditions can lead to positive treatment outcomes. Poor control of diabetes and lack of using insulin can increase the risk of depression and distress¹⁴. The results of studies have shown that distress can help to the persistence or worsening of depressive and anxiety symptoms¹⁵, reduce the treatment outcomes, accelerate the relapse of disease, and increase patients' suffering and reduce social and occupational performance¹⁶. So distress management can be a major step in managing diabetes. Distress management refers to the techniques

and methods used to reduce the distress experienced by individuals or increase their ability to cope with life's stresses. The goal of distress management training is to empower patients to cope with stress and the person will feel more comfortable with distress management training and he/she can better cope with the complications of chronic disease¹⁷.

Pender's health promotion model can be useful for recognizing and promoting the behaviors related to distress management in diabetic patients. This model is one of the most widely used models in the field of changing behavior, which shows the impact of three groups of factors that directly and indirectly affect the behavior of promoting health: individual experiences and characteristics (prior related behaviors, personal factors), behavior-specific cognitions and affect (perceived benefits of action, perceived barriers of action, perceived self-efficacy, situational influences, interpersonal influences, behavioral feelings), and behavioral outcomes promoting health (commitment, Immediate competing demands, and preferences)^{18,19}. In the theoretical principles of this model, it is considered that people are committed to performing actions that predict benefits with their personal value. Perceived barriers can prevent commitment for performing a particular action and the perceived self-efficacy increases commitment for action. Family, peers, and health care providers are important sources of interpersonal influence that can increase or decrease commitment for action^{19,20}.

Despite the fundamental importance and positive outcomes of the distress management in diabetic patients as a solution to control diabetes better, reduce it and prevent the physical and psychosocial problems and complications, there is no comprehensive and organized program based on an educational model in this regard. Given that there is a study gap in the control and management of stress in the diabetic patients based on Pender's model and the comprehensive research and theory-based interventions are not so many in this field, the main goal of this study was to determine the effect of the educational intervention based on Pender's Health Promotion Model for distress management in patients with type 2 diabetes. The results of this study could be used in the planning of promoting intervention in other diabetic patients.

METHODS

This study was an intervention study of the semiexperimental type with a control group. The statistical population of the study included all diabetic patients referring to the diabetes clinic of Khomein Health Center in 2019, who had a medical record and were under medical supervision.

50 people per group and a total of 100 individuals were selected who were randomly placed in two control and intervention groups to determine the sample size from the determination formula of the sample size based on the comparison of average in the two non-dependent groups considering the confidence limit of 95% and the error of 0.05 and the average distress control and standard deviation in Mohammadipour's study ²¹. The

sampling method was simple randomly so that the list of diabetic patients was determined and 100 patients were randomly selected. The inclusion criteria of the study included at least one year after the definitive diagnosis of type 2 diabetes, being under the treatment, and having minimal literacy. The exclusion criteria of the study were the unwillingness to cooperate, having psychological, speech, and hearing problems, and having gestational diabetes.

The tool of data collection included two questionnaires. The first questionnaire was the standard Diabetic Distress score (DDS17), which has 4 dimensions: emotional burden (5 items), physician distress (4 items), regimen distress (5 items), and interpersonal distress (3 items). The validity of this questionnaire has been confirmed in the research of Tel and colleagues (2012) in Iran. Cronbach's alpha of the four dimensions of this questionnaire was as follows. Emotional burden: 0.81, physician distress 0.71, regimen stress 0.78, and interpersonal distress 0.77²².

The second questionnaire was a researcher-made auestionnaire based on the structures of Pender's health promotion model, which had 7 main structures of the perceived benefits (4 items), perceived barriers (6 items), perceived self-efficacy (4 items), interpersonal influences (5 items), and situational influences (4 items), Immediate competing demands and preferences (4 items) and commitment (5 items) based on the 5-point Likert scale: always (score 5), often (score 4), sometimes (score 3), rarely (score 2), never (score 1). The validity of the content of the questionnaire was confirmed using a 12member panel of specialists (7 specialists of health education and health promotion, 2 psychologists, and 3 endocrinologists) with CVR more than 0.56 and CVI more than 0.79. The Test-retest method and alpha Cronbach were used to determine the reliability of the questionnaire. The final questionnaire was completed within two weeks with the participation of 20 people with diabetes from the statistical population of the study. The scores obtained in the two stages were compared by calculating the Pearson correlation coefficient, and the results showed that the correlation coefficient of the scores was 0.867 in the two stages. To calculate Cronbach's alpha, the results of the analysis of 24 questionnaires showed that the questionnaire has internal reliability. Alpha Cronbach was 0.71 for the structure of perceived benefits, 0.79 for the perceived barriers, 0.79 for the perceived self-efficacy, 0.79 for interpersonal influences, 0.79 for the situational influences, 0.79 for Immediate competing demands and preferences, and 0.73 for the commitment structure. The validity of the structure with the help of confirmatory factor analysis had appropriate fitness indicators (CFI and NFI more than 0.9 and RMSEA less than 0.07). The data collection method was a questionnaire with an interview, and two trained questioners (for the similarity of the data collected) were responsible for completing the questionnaires.

By getting the approval of the ethics committee of Iran University of Medical Sciences (IR.IUMS.REC.1397.640) and coordination with officials of the university, the samples were selected and entered into two groups of intervention and control. The

questionnaires were completed after justifying the samples in the field of performing the project, the confidentiality of the information and the purpose of performing the project, and obtaining written consent from them. Then, the intervention was held in five one-hour sessions (Table 1) for the intervention group, which were invited as 25-people groups, in coordination with Khomein University of Medical Sciences and in Diabetes Center of Imam Khomeini Hospital based on the results of data analysis from the completion of questionnaires. The main methods of training were lecture and group discussion. The topic of the lectures and contents were educational booklets, posters, and educational pamphlets. The trainers were a specialist from health training and two assistants. The content provided was based on the structures of Pender's Health Promotion model with an emphasis on distress and its management. No specific intervention or program was performed on the control group during this time. Two more tests were completed in the post-test phase after performing the intervention on the intervention group.

Data were entered in SPSS software version 22 before one month and three months after the intervention and they were analyzed and compared using the descriptive statistical indicators (average, standard deviation, frequency, percentage) and analytical statistical tests (independent t-test, chi-square, Repeated Measurements ANOVA test, and ANCOVA).

RESULTS

There was no significant statistical difference between the two groups of intervention and control in terms of demographic variables (Table 2). Accordingly, the gender ratio between the samples of the two groups was almost equal and most of the people were married and housewives or retired in both groups. The number of people with diploma degree was higher than other groups among the people in the intervention group, while most people in the control group had primary education, but this difference was not statistically significant.

Table 3 shows the results of the status of the structures of Pender's health promotion model in the study groups during the measurement time (before the intervention, 1 month, and 3 months after the intervention). The results of the t-independent test showed

Table 1: Educational activities of intervention

that there was no statistically significant difference between the two groups of control and intervention in the pre-educational intervention in terms of the average score of the structures of perceived benefits, perceived barriers, perceived self-efficacy, perceived interpersonal influences, situational influences, Immediate competing demands, and preferences and commitment (p>0.05).

The results of the covariance analysis test showed that these differences between the two groups in 1 month and 3 months after the educational intervention were significant by controlling the effect of pre-test results. So following the implementation of educational intervention, the average score of the structures of Pender's health promotion model in the intervention group significantly increased compared to the control group (p <0.05).A repeated measurement test was used in the group to investigate the effect of the intervention on the status of each structure. The results showed that the difference in the average score in the intervention group was changed in all structures, which was statistically significant. However, no statistically significant difference was observed in any of the structures in the control group (p < 0.05).

Table 4 shows the results of distress management status and its dimensions in the study groups during the measurement (before the intervention, 1 month after the intervention, and 3 months after the intervention).

The results of the t-independent test showed that there was no statistically significant difference between the two groups of control and intervention in the preintervention stage in terms of the average score of emotional burden structures, physician distress, regimen distress, interpersonal distress and total distress (P<0.05). So following the implementation of educational intervention, the average score of distress management structures in the intervention group significantly decreased compared to the control group (p<0.05).

A repeated measurement test was used in the group to investigate the effect of the intervention on the status of each structure. The results showed that the difference in the average score in the intervention group was significantly reduced in all structures. However, no statistically significant difference was observed in any of the structures in the control group (p <0.0).

Session	Торіс	Strategies	Trainer	
First	Explaining distress and the importance of managing it, as well as explaining the structure of the perceived benefits regarding distress management	Lecture, group discussion, poster and pamphlet	Researchers (a colleagues)	and
Second	Explaining the status and rate of prevalence of distress in Iran and the world, its importance and role in diabetes and providing explanations about the structure of the perceived barriers	Lecture, group discussion, poster and pamphlet	Researchers (a colleagues)	and
Third	Providing explanations about people's ability to manage stress and their training to become self-efficient for distress management	Lecture, group discussion, poster and pamphlet	Researchers (a colleagues)	and
Fourth	Explaining the role of interpersonal influences (the role of friends, family, social acceptance, support/lack of support from others, etc.) in distress and its management	Lecture, group discussion, poster and pamphlet	Researchers (a colleagues)	and
Fifth	Explaining the commitment structures for planning and behavior, situational and interpersonal influences, and Immediate competing demands and preferences	Lecture, group discussion, poster and pamphlet	Researchers (a colleagues)	and

Voriable		Intervention group	control group	Duralius	
	Variable	n (%)	n (%)	P.value	
Sov	Male	23 (46)	24 (48)	0.04.8	
Sex	Female	27 (54)	26 52)	0.64 -	
	Single	2 (4.1)	3 (6)	0.94 ª	
Marital Status	Married	45 (91.8)	42 (84)		
	Dead wife	2 (4.1)	5 (10)		
	Illiterate	4 (8)	4 (8)	0.45 ª	
	Elementary	12 (24)	15 (30)		
	Secondary and high School	11 (22)	10 (20)		
Educational level	Diploma	14 (28)	12 (24)		
	Associate Degree	2 (4)	3 (6)		
	Bachelor's degree	6 (12)	6 (12)		
	MA	1 (2)	0 (0)		
	Employed	11 (22)	11 (22)	0.76 ª	
loh statua	Housewife	24 (48)	25 (50)		
JOD SIAIUS	Retired	15 (30)	13 (26)		
	Disabled	0 (0)	1 (2)		
Family history of	Yes	32 (64)	31 (62)	0.83 ª	
having diabetes	No	18 (36)	19 (38)		
		Mean±SD	Mean±SD	P.value	
Age		52.88±10.43	55.62±7.52	0.13 ^b	
Income		2243243±809849	1975609±851698	0.16 ^b	
The years of having diabetes		10.53±7.07	8.40±6.81	0.13 ^b	
	a: Chi-squared test	b: Independent T-te	st		

Table 2: Comparing the demographic information of the two groups under study

Table 3: Average and standard deviation of the studied structures in the two groups of control and intervention in the previous stage, 1 month, and 3 months after the educational intervention

		Intervention group		control group		
variables	Stages	Mean standard deviation	standard	Mean	standard	P.value
			deviation		deviation	
	Before intervention	16.14	3.02	15.60	2.83	0.72 ^a
perceived benefits	1 months after intervention	19.06	3.95	16.08	3.10	0.001 ^b
	3 months after intervention	20.85	4.52	15.95	2.99	0.003 ^b
	р					-
	Before intervention	27.26	4.62	22.97	3.97	0.42 ^a
perceived barriers	1 months after intervention	25.42	0.001 °	0.80 °	3.82	0.04 ^b
	3 months after intervention	23.60	3.99	23.52	4.01	0.001 ^b
	р	0.003 ° 0.12 °).12°	-	
norsolived colf	Before intervention	11.56	3.36	13.02	3.45	0.38ª
perceived sell-	1 months after intervention	14.23	3.80	12.99	3.55	0.03 ^b
enicacy	3 months after intervention	15.70	4.10	13.12	3.72	0.02 ^b
	р	0.04 ° 0.21 °).21 °	-	
internergenel	Before intervention	21.70	3.91	18.91	3.58	0.70ª
interpersonal	1 months after intervention	20.32	3.52	18.88	3.71	0.001 ^b
innuences	3 months after intervention	18.61	3.35	18.34	3.56	0.04 ^b
	р	0.	.001 ^c	().35 °	-
	Before intervention	16.13	4.12	13.30	3.32	0.06 ^a
situational influences	1 months after intervention	15.27	3.68	13.72	3.46	0.05 ^b
	3 months after intervention	45.56	3.42	13.21	3.81	0.002 ^b
	р	C	0.02 ° 0.47 °		-	
Immediate	Before intervention	12.75	3.07	14.73	3.07	0.81 ª
competing demands	1 months after intervention	14.02	3.43	14.93	3.33	0.001 ^b
and preferences	3 months after intervention	15.17	3.59	15.02	4.13	0.03 ^b
	р	0.	.001 ^c	().17°	-
	Before intervention	12.70	3.20	12.87	2.83	0.77 ^a
commitment	1 months after intervention	15.14	4.22	13.11	3.11	0.001 ^b
communent	3 months after intervention	16.28	4.36	13.25	3.05	0.03 ^b
	р	0	.001 ^c	().12 [°]	-
a: Independent T-test b: ANCOVA test c: Repeated Measurements ANOVA test						

b: ANCOVA test c: Repeated Measurements ANOVA test a: Independent T-test

	Stages	Intervention group		control group		
variables		Mean	standard deviation	Mean	standard deviation	P.value
	Before intervention	25.92	5.67	20.51	6.31	0.11 ^a
amotional burden	1 months after intervention	22.66	5.41	20.72	6.12	0.01 ^b
emotional builden	3 months after intervention	21.04	5.26	21.09	6.48	0.04 ^b
	р	0	.001 °	C).33°	-
	Before intervention	21.18	5.27	17.79	4.23	0.84 ^a
nhusisian distrass	1 months after intervention	19.83	5.12	18.02	4.33	0.03 ^b
physician distress	3 months after intervention	17.98	4.79	17.98	4.48	0.01 ^b
	р	0.04 °		0.63 °		
	Before intervention	24.65	4.87	21.06	4.27	0.98 ^a
rogimon distross	1 months after intervention	22.73	4.83	21.62	4.39	0.001 ^b
regimen distress	3 months after intervention	21.04	4.76	21.67	4.33	0.03 ^b
	р	0.001 °		0.71 °		
	Before intervention	17.33	3.52	12.08	3.34	0.87 ^a
interpersonal	1 months after intervention	14.16	3.47	12.28	3.55	0.001 ^b
distress	3 months after intervention	12.18	2.81	12.31	3.65	0.04 ^b
	р	0.01 °		0.42 °		
	Before intervention	76.70	16.17	71.40	15.74	0.50 ª
Total distross	1 months after intervention	74.33	15.96	72.01	15.85	0.05 ^b
i utai utstiess	3 months after intervention	72.24	15.78	71.95	15.92	0.02 ^b
	р	0	.001 °	C).57 ^c	

Table 4: Average and standard deviation of stress management structures in the two control and intervention groups in the measurement process.

a: Independent T-test b: ANCOVA test c: Repeated Measurements ANOVA test

DISCUSSION

The results of the study showed that both Pender's model structures and the distress management structures changed under the influence of the designed intervention.

No significant relationship was observed between the two groups before the intervention regarding the score of the structure of perceived benefits as one of the components of Pender's model, but the average score of the perceived benefits in the intervention group increased one month after the intervention. In addition, 3 months after the intervention, the difference between the two groups was significant with the control of the previous steps. In various studies that the Pender's model was used, change in the structure of perceived benefits has been observed after the intervention. In the study conducted by Noroozi et al. (2011), in the field of physical activity, the average score of participants' perceived benefits significantly increased from the physical activity and mobility after intervention ²³. In the study conducted by Dehdari et al. (2014), the results showed the significant effect of educational intervention on changing the perceived benefits¹⁸.

The average score of the perceived barriers in the intervention group was decreased after the intervention while this rate did not change in the control group. In addition, the difference between the two groups was significant with the control of the previous steps3 months after the intervention. In other studies that have used the Pender's model to intervene in other diseases and contexts, the reduction of barriers have been observed, including the study of the impact of an educational intervention to improve nutrition among students¹⁸, the impact of an educational intervention for improving physical activity²⁴, the effect of school-centered

intervention based on increasing physical activity of female students²⁵ and theory-based intervention based on the blood pressure management²⁶.

The results of the study showed that the designed intervention increases the perceived self-efficacy. Accordingly, although there was no significant relationship between the status of the two groups before the intervention, the average score of perceived self-efficacy was increased in the intervention group one and three months after the intervention, while this rate did not change in the control group. This result is consistent with the results of other studies^{23,24,27,28}.

Regarding the interpersonal influences and competing demands, the results showed that the difference in average score increased in the intervention group, which was statistically significant, but there was no statistically significant difference in the control group. Similar to our results, a study conducted by Ho et al. (2010) showed that Pender's model could facilitate and improve health promotion behaviors in diabetic patients in the structures of situational and interpersonal influences as an empowerment strategy²⁹. Other research has shown a change in the average scores of structures of situational and interpersonal influences and management strategy²⁹.

Noroozi et al. (2011) found in a study that the average score of immediate competing demands and preferences significantly increased after intervention²³. Aligned with the results of this study, the results in the present study showed that the average score of competitive demands in the intervention group increased after the intervention while this rate did not change in the control group and the difference between the intervention and control groups was significant.

The effect of intervention based on improving the physical activity of adolescent girls³², the effect of training

on the physical activity of students³³ and the effect of educational program on improving the health of obsessive-compulsive patients³⁴, the average score of the commitment structure increased after the intervention in the design and evaluation studies. In this study, after the intervention, the average score of commitment increased in the intervention group.

However, the status of distress management was examined and evaluated in three stages and based on data collected in the group according to the objectives of the study and in order to influence the intervention and alignment of changes in the behavior model with the distress management. The results showed that the distress management was improved in these individuals consistent with changes in behavior model, and the results showed a decrease in the distress score and related structures in the intervention group, while this rate did not significantly change in the control group. Aligned with these results, Vala et al. (2015) in a study showed that the severity of anxiety, stress, and glycosylated hemoglobin level was significantly lower and the confidence was higher than the control group in the experimental group after intervention ³⁵. Soo and Lam (2009) showed that the interventions related to stress management have been effective in managing diabetes, and it can significantly control the blood sugar and reduce health care costs by managing diabetes distress³⁶.

In a study conducted by Surwit et al. (2002), the results showed that distress management training had a significant relationship with decreasing hemoglobin HbA1c³⁷. In addition, the results showed that the average score in all stress structures (physician distress, regimen distress, interpersonal distress, emotional burden) changed after the intervention in the intervention group compared to pre-intervention. However, there was no significant relationship between the two groups before the intervention in all structures. These results showed the effectiveness of the educational intervention in reducing stress in diabetic patients.

This study, as a witness for performing distresscentered interventions, is one of the studies that designed a Pender model-based intervention by considering the research principles. It is suggested that the institutions and organizations continuously put the educational programs related to distress management in the agenda through which not only people with diabetes but also other people to be empowered and the productivity and efficiency to be increased based on the results. It should be noted that the present study, like other studies, had limitations that must be considered in interpreting the results. Among these limitations, it can be referred to the difficulty of the coordination process for holding the educational sessions and the satisfaction of participants and coordination for attending the meetings, noncooperation of some patients and their relatives, the challenges of data collection and completion of questionnaires, and change in some educational sessions.

CONCLUSION

The designed educational program based on Pender's health promotion model has been effective in increasing the distress management of diabetic patients. The designed program significantly reduced stress among these people by changing the behavioral and mental patterns of the individuals under study and caused them to manage their illnesses more and prevent distress as a risk factor to not intensify both illness and its complications. In addition, individuals in activities to achieve the goals try to the outcomes to be valuable and achievable for them. In order to correct and change people's behavior, it is necessary to understand how they think and to correct it. In this regard and according to the results of the present study, it is proposed that Pender's health promotion model in the design of distress management programs in these patients to be considered.

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Declaration of Conflicting Interests

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