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The Effect of Blended Educational Program on Improving Health Promoting Behaviors in Patients with Type 2 Diabetes

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ABSTRACT

Diabetes is the most common endocrine disease worldwide and is responsible for around 4 million deaths per year. In general, diabetes is a chronic disease with different clinical manifestations and progression. In addition, it is the most common form of diabetes around the world. Considering the significance of health promotion behaviors in type 2 diabetic patients and high prevalence of type 2 diabetes in Iran, especially in the major metropolitan regions, the present study aimed to evaluate health promotion behaviors in type 2 diabetic patients. This randomized clinical trial study with pre and posttest design was performed on type 2 diabetic patients referred to Shahid Bahonar and Imam Khomeini hospitals in Karaj, Iran. For this purpose, 200 patients (100 males and 100 females from either hospital) were selected and randomly divided into four blocks of two training and comparison (control) groups. Then, the subjects in the comparison group proceeded to receive the common training program according to the previous procedure and separately completed the questionnaires (health promotion behaviors questionnaire). The patients in the intervention group were divided into two groups (25 males and females) and received the content of blended educational program based on the improvement of health promotion behaviors using lectures, slides, questions and answers and group discussion in 6 sessions of 60-90 minutes. Then, three months after the intervention, the subjects of both groups separately completed the questionnaires. The data were analyzed using descriptive and inferential statistics via SPSS20 software and the P value was set less than the significance level (0.05). According to the results, the subjects in the training group scored significantly higher than those in the control group (P = 0.001). Based on Spearman's correlation coefficient, there was a significant reverse correlation between age and all scores of both groups (P = 0.001). The variables of weight, height, duration of the disease were correlated with some factors. In addition, no relation was found between the HbA1C scores in the training group; however, the linear correlation was observed in the control group (P = 0.001). Further, the variables of gender, marital status, family history, occupation, and smoking did not correlate with any of the scores obtained in all groups (P> 0.05). The educational level had a significant correlation with all the scores obtained in the both groups (P = 0.001). Family income also had a significant association with the scores of many variables obtained in groups other than healthy diet and physical activity (P = 0.001). There was a significant relationship between the type of treatment with the most scores obtained from healthy diets and physical activity in the training group (P = 0.001), but no significant relationship was observed in the control group (P> 0.05). The results of this study indicate that the promotion of appropriate public knowledge can lead to behavioral changes and promotion of health among at-risk people. Furthermore, it seems that the application of interventions based on health education and promotion theories along with its environmental, social, cultural and behavioral aspects is essential for achieving these aims.

Key words: Type 2 diabetes, Health promotion behaviors, Blended education

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INTRODUCTION

Diabetes is the most common endocrine disease worldwide and is responsible for around 4 million deaths per year. According to World Health Organization, the worldwide prevalence of diabetes among adults (aged 20–79 years) will be 6.4%, affecting 285 million adults in 2010, and will increase to 7.7% and 439 million adults by 2030. The prevalence of diabetes in developing countries, including Iran, is higher than that in most developed countries (Shaw *et al*., 2010). According to the statistics, the prevalence of diabetes in Iran varies between 5.5-

7.5% (Abazari *et al*., 2012). In general, diabetes is a chronic disease with different clinical manifestations and progression and is classified clinically into three types of insulin-dependent (type 1 diabetes), non-insulin-dependent (type 2 diabetes) and diabetes mellitus (Park, 2002). Type 2 diabetes is the most common form of diabetes around the world. It can cause significant changes in many systems, organs and tissues of the body, resulting in immediate or delayed complications, including cardiovascular complications, nephropathy, retinopathy, disability, increased medical costs and high mortality (Azizi *et al*., 2000; Shahbazian et al., 2006). Without proper management, these complications can lead to some disabilities such as blindness, renal failure, coronary artery thrombosis and amputation (Park, 2002; Azizi *et al*., 2000). In addition, some evidence suggests that there is a direct correlation between the prevalence of diabetes and depression, social issues, smoking, lack of mobility, exercise and obesity (Roupa *et al.,* 2009). Given the short and long-term diabetes-related health complications and direct and indirect medical expenditures spent on treating theses complications, the concept of self-care is considered essential in the optimal management of complications in patients with diabetes (Moini *et al.,* 2012). Health-promoting self-care behaviors refer to measures undertaken to increase or maintain the well-being and self-esteem of a person or group (Hatam Louie Sadabadi *et al*., 2011). Given the rising cost of health care, it seems essential to shift our focus away from treatment approach towards disease prevention methods. It is believed that education and health promotion behaviors can help people modify their health care behaviors, gain a better understanding of their disease, as well as prevent or delay the onset of disease-related complications (Kashfi *et al.,* 2009). The purpose of educational interventions in diabetes care is to familiarize these patients with preventive, therapeutic and disease management measures in order to prevent the complications of the chronic illness (Khani Kuihooni and Hazavehi, 2010). There are plenty of tools designed to measure health promotion, including Health Promoting Lifestyle Profile (HPLP) questionnaire, which has been developed by Chen et al. and has high level of acceptability. The questionnaire comprised a set of 40 items of health promotion behaviors encompassing six dimensions (6D): health responsibility, physical activity, spiritual growth, stress management, proper nutrition and social support (Ayyoubi *et al.,* 2012). Considering the importance of health promotion behaviors in type 2 diabetic patients and high prevalence of the disease in Iran, especially in major metropolitan regions, as well as the lack of a comprehensive survey and analysis in this regard, this study aimed to assess the health promotion behaviors including physical activity, risk-taking reduction, life satisfaction, stress management, health responsibility and healthy nutrition in patients referred to the diabetes clinic of Bahonar and Imam Khomeini hospitals in Karaj during 2014 to 2015.

MATERIALS AND METHODS

Study design

This was a clinical trial study with a control group design conducted over the course of 10 months. The statistical population consisted of type 2 diabetic patients referred to Shahid Bahonar and Imam Khomeini hospitals in Karaj during 2014 to 2015.

Sample volume calculation method

The main purpose of the study was to compare the mean scores of health in two training and control groups in order to determine the effect of training on the degree of disease management. For this purpose, a sample size formula (confidence level of 0.95 and test power of 80%) was used to compare the mean of the two groups in order to determine the number of subjects required for the study. According to this formula, if the mean difference is statistically 10 or larger, the range of the score lies between 0-152, and the standard deviation of 25.3, the number of samples required will be calculated based on the following formulas:

$$\sigma = \frac{152}{6} = 25.3$$

$$D = \frac{\mu 2 - \mu 1}{\sigma\sqrt{2}} = \frac{10}{25.3 \times 1.2} = 0.28$$

$$N = \frac{z1 - \alpha/_2 + z(1-\beta)}{d^2} = \frac{(1.96 + 0.84)^2}{(0.28)^2} = 100$$

According to the results, a total of 100 subjects were selected from each hospital and assigned in two control (n=50) and training (n=50) groups.

Statistical population

The statistical population consisted of 200 patients with type 2 diabetes referred to the diabetes clinic

of Bahonar and Imam Khomeini hospitals in Karaj, Iran. The Health Promoting Lifestyle Profile (HPLP) questionnaire (Chen et al., 2013) was used before and after the test. Subjects were randomly assigned to four blocks (100 males and 100 females) and divided into two training (n=50) and control (n=50) groups (Table 1). The inclusion criteria were as follows: the ability to read and write, a diagnosis of diabetes confirmed by the clinics' physician and willingness to participate in the study. The exclusion criteria included: unable to read and write, a diagnosis of mental illness confirmed by the clinics' physician, a history of gestational diabetes and unwillingness to participate in the study.

Table 1: Classification of participants in Bahonar and Imam Khomeini hospitals of Karaj

Shahid Bahonar hospital				Imam Khomeini hospital			
female		male		female		male	
50		50		50		50	
Training	Control	Training	Control	Training	control	Training	Control
25	25	25	25	25	25	25	25

Data collection tool

Health promotion behaviors questionnaire (Chen et al., 2013) was used to collect data. This questionnaire consists of two sections. The first section includes demographic information (age, sex, duration of illness, occupation, marital status, family history, educational level, family income, type of diabetes treatment, height and weight, HbA1C and smoking). The second section includes 28 items of health promotion behaviors encompassing six dimensions: physical activity (7 items), risk reduction (7 items), life satisfaction (3 items), stress management (5 items) , health responsibility (3 items) and healthy nutrition (3 items). Items were scored based on a 5-point Likert scale from 4 (always) to 0 (never). The highest score was 112 indicating greater health promotion behaviors. Additionally, in order to manage the diabetes, the HbA1C index of all subjects was measured. The Cronbach's alpha of Health promotion behaviors questionnaire (Chen et al., 2013) and each dimension was calculated 0.90, 0.63 and 0.88, respectively (Gallegos et al., 2006).

Method and intervention

Subjects were randomly assigned to four blocks (100 males and 100 females) using random sampling method and divided into two training (n=50) and control (n=50) groups. The control group proceeded to receive the most commonly used training at the center according to the previous procedure after the pretest. In addition, the intervention group of each hospital divided into two groups (25 males and 25 females) and received the necessary training to improve the behaviors of health promotion (including physical activity, stress management, healthy nutrition for diabetics, risk-taking reduction, life satisfaction, health responsibility and diabetic foot care) using lecture, slides, questions & answers, group discussion every other day in the afternoon in six sessions for 60-60 minutes. The subjects in the training group were asked to attend the study by phone. Six sessions were separately held for females and males. The educational content included seven dimensions such as physical activity, stress management, healthy nutrition for diabetics, risk-taking reduction, life satisfaction, health responsibility and diabetic foot care presented using slides. After three-month, the subjects in each group completed the post-test questionnaires separately and the results were then analyzed.

Statistical Analysis

The Cronbach's alpha of the whole questionnaire and each dimension was calculated 0.90, 0.63 and 0.88, respectively. The results were analyzed using SPSS version 20 software via ANOVA, independent t-test, Mann-Whitney, Spearman correlation coefficient and Kruskal-Wallis tests. The significance level was less than 0.05.

Ethical considerations

All necessary permissions were obtained from the Vice-Chancellor in Research Affairs at Alborz University of Medical Sciences, as well as Shahid Bahonar and Imam Khomeini hospitals in Karaj to undertake the study. Each participant was informed verbally about the aims of the study and written consent was obtained from each participant. They were assured that the data would be treated confidentially.

RESULTS

Analysis of demographic variables

The mean age of the patients was 54.7 ± 9.7 years (range, 30 to 80 years). Their mean height and weight were 165.8 cm and 67.5 kg, respectively. Moreover, the duration of the disease was 1.4 ± 5.3 years (less than one year to 25 years) and the mean hemoglobin A1C level was 6.9 ± 0.97 g / dl (range, 4.1 - 9.6) (Table 1).

In terms of job distribution, 10 patients (5%) were employees, 104 (52%) were self-employed and 86 (43%) were households. Nineteen (9.5%) of the

participants were single and 181 (9.5%) were married. According to the obtained data, 145 patients (72.5%) had a family history of diabetes. In terms of educational level, 83 patients (41.5%) had primary school level and below, 63 (31.5%) had secondary education and 54 (27%) had diplomas and higher. In terms of income level, 37 patients (18.5%), 118 (59%) and 45 (22.5%) were of low, moderate and high status. In addition, in terms of treatment method, 184 patients (92%) took oral medications, 6 (3%) used daily insulin injections and 10 (5%) both. 26 patients (13%) were smokers and 174 (87%) non-smokers.

Table 1: Frequency distribution of quantitative variables in patients under study

	Age	Duration of the disease	Height	Weight	Hemoglobin A1c level
Mean	54.75.	4.257.	165.86	67.56	6.928
Standard Deviation	9.728	3.8641	5.376	6.083	0.9718
Minimum	30	0	152	50	4.1
Maximum	82	25	178	88	9.6

Analysis of health promotion behaviors variables

The mean scores of physical activity, risk-taking reduction, life satisfaction, stress management, health responsibility, healthy diet and total scores were 27.5, 25.6, 8.9, 16.2, 9.3, 10.6, and 98.2, respectively. The distribution of all scores was normal except for total scores and P value was less than 0.05 in accordance with the KS test (P <0.05). The scores of the two groups (control and training) before receiving the intervention have been presented in Table 10. According to the Mann-Whitney test, both the training and control groups had about the same scores in all dimensions (P> 0.05) (Table 2).

According to the results of the Mann-Whitney test, the obtained scores of variables including physical activity (29% vs. 17.1%; P = 0.001), risk-taking reduction (30% vs. 18.6%; P = 0.001), life satisfaction (13.5% vs. 9.1%; P = 0.001), stress management (22.3% vs. 14.6% ; P = 0.001), health responsibility (13% vs. 8.8% ; P = 0.001), healthy diet (13.5% vs. 8.2%; P = 0.001) were significantly higher in the training group than those in the control group. Further, the total scores were significantly higher (121.5 vs. 76.1%) than those in the control group. The scores of health promotion behaviors dimensions have been shown in Table 2.

Table 2: Frequency distribution of scores in both control and training groups before the intervention

Group / Dimensions of health promotion behaviors	Training	Control	T Statistics	Significance level
	Mean ± standard deviation	Mean ± standard deviation		
Physical activity	27.51±3.812	15.23±2.431	2.49	12.985
Risk-taking reduction	25.64±4.033	15.47±2.547	2.55	12.985
Life satisfaction	8.93±1.623	7.75±1.447	3.91	12.985
Stress management	16.24±1.650	12.03±2.088	2.74	12.985
Health responsibility	9.34±1.560	8.08±1.977	2.07	12.985
Healthy diet	10.60±2.152	7.22±1.092	2.41	12.985
Total scores	98.25±76.66	76.66±/12.985	2.30	12.985

Table 3: Frequency distribution of scores of health promotion behaviors dimensions after receiving an intervention

Group / Dimensions of health Promotion behaviors	training	control	TStatistics	Significancelevel
	Mean ±standard deviation	Mean ±Standard deviation		
Physical activity	29.3±3.167	17.15±3.675	24.49	0.001
Risk-taking reduction	30.03±2.661	18.55±3.406	26.55	0.001
Life satisfaction	13.46±1.114	9.07±1.559	22.91	0.001
Stress management	22.29±1.924	14.56±2.626	23.74	0.001
Health responsibility	13.04±1.414	8.78±1.495	20.71	0.001
Healthy diet	13.45±1.167	7.22±1.092	23.41	0.001
Total scores	121.50±9.305	76.09±/13.781	27.31	0.001

According to the results of the Mann-Whitney test, there was no significant relationship between gender, marital status, family history of disease and smoking with the scores obtained from the health promoting behaviors variables and total score in both training and control groups (P > 0.05). In addition, no relationship was found between the job and the scores obtained from health promotion behaviors variables and the overall score in both groups based on Kruskal-Wallis test (P> 0.05). Further, educational level was significantly correlated with all the scores of health promotion behaviors variables and total scores (P = 0.001). There was a significant relationship between family income and risk taking reduction, life satisfaction, stress management, health responsibility and total score (P = 0.001), but they were not significantly associated with healthy diet and physical activity variables (P> 0.05). Furthermore, the form of treatment in the training group was significantly correlated with all the scores obtained from the variables of health promotion behaviors and the total score except for physical activity and healthy diet (P = 0.001); however, this relationship was not found in the control group (P> 0.05).

DISCUSSION AND CONCLUSION

According to the results, the scores of all variables including physical activity, risk-taking reduction, life satisfaction, stress management, health responsibility, and healthy diet, as well as total score in the training group were significantly higher than those in the control group. Age had a significant inverse correlation with all scores in the two groups. The variables of weight, height, duration of the disease were correlated with some factors. In addition, no relation was found between the HbA1C scores in the training group; however, the linear correlation was observed in the control group. Further, the variables of gender, marital status, family history, occupation, and smoking did not correlate with any of the scores obtained in all groups. The educational level had a significant correlation with all the scores obtained in the both groups. Family income also had a significant association with the scores of many variables obtained in groups except for healthy diet and physical activity (P = 0.001). There was a significant relationship between the type of treatment with the most scores obtained from healthy diets and physical activity in the training group, but no significant relationship was shown in the control group. The results of our study indicated that the mean scores of knowledge, model components, and behavior significantly increased in the intervention group, which is consistent with the results of study by Sharifirad et al. regarding the effectiveness of nutritional education on the knowledge of diabetic patients using the health belief model. Kashfie et al. (2009) also reported that self-care behavior training was effective in reducing HbA1c levels. Likewise, Skaine et al (2010) found that self-care education increased the mean scores of glycosylated hemoglobin in the intervention group compared to those in the control group (82). Additionally, in a study by Abedini et al. (2012), it was revealed that the use of a coherent educational program decreased the mean scores of HbA1C from 13.1% before the test to 10.5%, which were incongruent with those of our study. Concerning the perceived benefits of diabetic preventive behaviors, our results showed a significant increase in the mean scores of subjects after the intervention. That is, the subjects in the intervention group perceived the substantial benefits and roles of implementing diabetes prevention strategies and measures, suggesting that an understanding of the benefits of implementing a coherent educational program can pave the way for the implementation of health-related behaviors. Our results did not show a significant difference between the mean score of preventive behaviors before the intervention in the both groups. However, this difference was noticeable after implementing the educational intervention, indicating that the use of educational intervention may stimulate diabetic people to perceive the positive roles of implementing preventive behaviors in decreasing disease-related complications, which are in line with the results of the study by Shojafard et al. (2008). They showed that, after intervention, a significant increase was observed in the scores after receiving perceived benefits training (35.19%), self-care behaviors (5.74%), perceived benefits of these behaviors (35%. 19%) and perceived barriers to implementing these behaviors (76.27%) were significantly diminished. In this study, there was no direct relationship between interpersonal factors and health promoting behaviors, which is in agreement with Camille's (2012) results, suggesting no correlation between demographic characteristics except housing status and quality of life with health promotion behaviors. Similarly, Mahboubi (2012) did not show a significant relationship between the demographic characteristics of veterans with their spiritual health. In contrast, the results of the Ciyahong study (2008) in senior urban women in Taiwan

showed that personal factors have direct and significant effects on self-care behavior (93). The results of this study supported the finding that the promotion of appropriate public knowledge can lead to behavioral changes and promotion of health among at-risk people. Generally, perceived benefits of change behavior refer to one's beliefs about the effectiveness of various measures available to reduce the risk of a specific disease. Perceived barriers also represent the one's beliefs in the potential negative aspects of a particular health action. Perceived barriers and benefits signify individual health values and how to participate in health activities. In this regard, it is noticeable that demographic and related variables such as occupation, family history, intensity and type of physical activity, awareness of cardiovascular risk factors, and smoking are influential in understanding the barriers and benefits of adopting preventive behaviors for cardiovascular disease. However, since the majority of our subjects are aware of the risk factors for diabetes and demographic and health-related variables such as occupation, physical activity, type and duration of physical activity , as well as smoking have an impact on the understanding the barriers and benefits of adopting health promotion behaviors; therefore, the application of interventions based on health education and promotion theories along with its environmental, social, cultural and behavioral aspects is essential for achieving these health objectives. These results highlight the need for exercise as part of the treatment program in all diabetic patients along with other actions by authorities and therapists. They also support strong recommendations to offering a wide variety of exercise, educational tools and facilities at health centers at a broad level by trained people through mass media. Another important implication is that the use of nutrition experts and nurses trained in the delivery of services to diabetic patients will play a significant role in improving the management of the chronic disease. Furthermore, the health authorities are committed to developing a comprehensive action plan to improve the health status of these patients, strengthen their self-care behaviors, and provide the necessary resources for continuous implementation in health care centers. The American Diabetes Association has put a special emphasis on the need for professionals and diabetic people to refer psychiatrists as members of treatment group. However, given the high prevalence of diabetes and other chronic diseases, lack of psychologists and psychiatrists, and prevention of increased care costs for patients, provision of group training of stress management and in the short term can bring some benefits resulting in decreasing the health- related problems of the patients. Our study used a fairly comprehensive, active, and cognitive-behavioral group program for adults covering some problem-oriented coping approaches such as problem solving, time management, and cognitive reconstruction. In conclusion, given the high socioeconomic and psychological burden that diabetes imposes on individuals, families and society, these results can provide some important insights into the positive and promising roles of using an educational program for diabetic patients and mental health professionals.

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