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Review

Effectiveness of self-management program for people with type 2 diabetes mellitus based on PRECEDE PROCEED model

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ABSTRACT

Aims: Diabetes mellitus (DM) is one of the most common chronic diseases worldwide that requires a person with diabetes to make a multitude of daily self-management decisions. This study sought to evaluate the effectiveness of a self-management program based on PRECEDE-PROCEDE model on self-management behaviors in patients with type 2 diabetes.

Methods: This experimental study was conducted on 86 diabetic patients referred to the diabetes clinics in Ardabil, Iran, in 2017. From a total of 326 patients with diabetes medical records in those clinics, 86 (26.3%) patients agreed to participate in this study. They were then randomly divided into two groups; intervention (n = 43) and control (n = 43). The intervention group received eight sessions of PRECEDE model-based self-management education program while the control group did not receive any education program. Both groups were assessed at baseline and six months after the intervention.

Results: The mean age of the participants was 55.69 ± 12.04 years (range 32–86 years). 41 patients were men, and 45 were women. The mean time since the first diagnosis of diabetes was 8.6 years (SD = 5.2), and the mean BMI of the patients was 31.63 (SD = 4.20). At baseline, 35.01% of patients had poor self-management behaviors. All PRECEDE variables, including predisposing factors (knowledge, attitude, and self-efficacy), enabling factors, and reinforcing factors, as well as self-management behaviors, were significantly improved in those of intervention group after the education program.

Conclusion: Self-management education program substantially enhances the self-management behaviors in patients with type two diabetes.

1. Introduction

Type 2 diabetes (non-insulin-dependent diabetes mellitus, NIDDM) is an increasing global health problem [1]. Excess body weight and physical inactivity are known to be the leading cause of type 2 diabetes in most patients [2]. According to a global report on diabetes, 8.5% of adults aged 18 years and older had diabetes in 2014. In addition, diabetes and high blood glucose were the chief causes of 3.7 million deaths in 2012, with more than 80% of deaths occurring in low and middle-income countries [3]. The burden of diabetes will continue to increase since the number of diabetic patients in developing countries is estimated to rise by more than two-thirds between 2010 and 2030 [4].

Although chronic illnesses come on slowly, they last a long time without a definitive cure. Diabetes mellitus needs lifetime care and patients' active participation in the self-management of chronic conditions [5]. The American Association of Clinical Endocrinologists emphasizes the pivotal role that patients with diabetes can play in their self-management [1]. However, 50–80% of diabetic

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patients lack the necessary skills to take care of themselves and require appropriate education to learn how to manage the disease complications [5]. The effectiveness of educational programs for patients with diabetes has been reported by several studies [6–10].

Diabetes self-management education (DSME), "the ongoing process of facilitating the knowledge, skill, and ability necessary for pre-diabetes and diabetes self-care" [11] is an indispensable part of integrated diabetes care. DSME intervention help patients to manage daily diabetes care through the dissemination of information and the facilitation of self-care behaviors [11]. Self-management programs include skills such as problem-solving, decision making, resource utilization, and patient-provider relationships [12]. DSME is an ongoing process which facilitates the development of knowledge, skills, and abilities required for effective self-management of diabetes [11]. The American Diabetes Association 2015 Standards for Care recognize DSME as an integral aspect of the care for people with diabetes [13]. DSME has evolved from the primarily instructive training of the 1970s and 1980s into the collaborative, more theoretically based empowerment models of the 1990s [14]. DSME is a cost-effective diabetes intervention for reducing hospital admissions as well as the onset or development of diabetes complications [10,15]. It also significantly improves health outcomes among patients with chronic diseases [16].

There is now a wide range of online programs containing topics of motivation, readiness to change, goal setting, and peer support designed to give patients the tools needed to tackle barriers. Nevertheless, many diabetic patients still lack adequate knowledge and skills to control and prevent disease complications. In this study, using the variables of the PRECEDE-PROCEED model, we sought to evaluate the effectiveness of a self-management program for patients with type 2 diabetes who were referred to the diabetes clinics in Ardabil, Iran.

2. Methods

2.1. Participants and setting

This study was conducted among 86 type 2 diabetic patients referred to diabetes clinics in Ardabil, Iran. Out of all diabetes clinics in Ardabil, six were randomly selected. From the total of 326 patients with diabetes medical records in those clinics, 86 (26.3%) patients agreed to participate in this study. Next, they were divided into two groups; intervention (n = 43) and control (n = 43).

2.2. PRECEDE-PROCEED model variables

PRECEDE-PROCEED model is a framework which is widely used as a planning model for health promotion programs [17,18]. PRECEDE stands for Predisposing, Reinforcing and Enabling Variables in Educational Diagnosis and Evaluation. PROCEED stands for Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development. Predisposing factors are genetic and environmental factors such as knowledge, attitudes, and self-efficacy that affect human behavior [19]. Reinforcing factors are socio-cultural factors such as social and family support which facilitate repetition and consolidation of behavior [19]. Enabling factors are those factors such as availability of services, resources, and skills which pave the way for behavior change. The factors mentioned above lead to the development of incentives for behavioral change facilitation [18].

2.3. Measures

Data collecting instrument was a questionnaire consisted of three parts with 55 questions. The first part included six questions to assess background characteristics including age, sex, educational level, complication, marital status, and BMI. The second part included 34 questions to assess PRECEDE model variables. The knowledge of the patients was measured using eight questions; "Yes" response to each question was awarded one score and "No" response received no score. The attitude of the patients was measured using 14 questions on a Likert-type scale, ranging from "strongly disagree = 0" to "strongly agree = 5". The self-efficacy was measured using three questions on a Likert-type scale, ranging from "strongly disagree = 0" to "strongly agree = 5". The enabling and reinforcing factors were measured using nine questions.

The third part included 16 questions to assess self-management behaviors (healthy eating, being active, monitoring, taking medication, problem-solving, reducing risks, and healthy coping). Scoring was based on a 4-point Likert scale as 1 = never, 2 = rarely, 3 = sometimes, and 4 = often. The overall score was considered good if it was equal to or more than 56, average if it was between 36 and 56, and poor if it was equal to or less than 36.

Content validity of the questionnaire was assessed by a panel of ten experts, and the questions were modified according to their recommendations. The content validity index and content validity ratio obtained were greater than 0.77 and 0.63, respectively. Before conducting the main survey, a pilot study was carried out to assess the reliability of the questionnaire. The same questionnaires were administered to 35 patients with type two diabetes who were similar to those in the main survey. The Cronbach's alpha values were greater than 0.83 for all subscales, demonstrating that the questionnaire has excellent internal consistency.

2.4. Education program

The education program was based on the variables of the PRECEDE model and included eight weekly sessions. The results of linear regression analysis showed that self-efficacy had the strongest correlation with self-management (P = 0.001) (Table 1). Therefore, the education program was focused on improving the self-efficacy of patients. The two-session facilitator training workshops were also conducted among patients' families and health workers. Data were collected by trained interviewers. All patients were assessed at baseline and six months after the education program.

2.5. Statistical analysis

Data analysis was performed using SPSS 16, and a probability level of 0.05 was chosen for statistical significance. Chi-squared and t-tests were employed to compare the variables at baseline and six months after the education program.

2.6. Ethical considerations

The ethical approval for this study was obtained from the Iran University of Medical Sciences' institutional review board (IR.IUMS.REC.1395.221). In addition, all patients were provided

Table 1
Associations between PRECEDE model variables and self-management.

Variable	B	SE	Beta	T	P value
Knowledge	0.36	3.09	0.09	1.30	0.19
Attitude	0.04	0.03	0.10	1.36	0.17
Self-efficacy	1.33	0.18	0.53	7.10	0.001
Enabling factors	0.14	0.27	0.04	0.53	0.59
Reinforcing factors	0.01	0.41	0.002	0.03	0.97

Table 2
Background characteristics of the patients.

Variables	Intervention N (%) Mean (±SD)	Control N (%) Mean (±SD)	P value
Age	55.09 (13.41)	56.30 (10.62)	T = 0.46 P value = 0.64
Sex			
Men (%)	23 (53.5)	18 (41.9)	$X^2 = 0.46$
Women (%)	20 (46.5)	25 (58.1)	P = 0.4
Educational level			
Elementary school (%)	23 (53.48)	33 (76.74)	$X^2 = 0.55$
Middle school (%)	5 (11.6)	3 (7)	P = 0.53
Diploma or higher (%)	15 (34.92)	15 (16.26)	
Complication			
Yes (%)	11 (25.58)	13 (30.23)	$X^2 = 0.26$
No (%)	32 (74.42)	30 (60.77)	P = 0.62
Marital status			
Single (%)	13 (30.2)	12 (27.9)	$X^2 = 0.56$
Married (%)	30 (69.8)	31 (72.1)	P = 0.53

with a brief explanation regarding the purpose of the study and had a right to withdraw from the study at any time.

3. Results

The mean age of participants was 55.69 ± 12.04 years (range 32–86 years). The mean time since the first diagnosis of diabetes was 8.6 years (SD = 5.2). Regarding educational level, 43% (n = 37) had primary school or lower education, 29.1% (n = 25) had middle school education, and 27.9% (n = 24) had a diploma or higher education (Table 2).

Although not statistically significant, the slight decrease was observed in the mean BMI from 31.63 at baseline to 29.01 at six months after the education program. There were no significant differences between the intervention and control groups in background characteristics at baseline and six months after the education program. Six months after the education program, the mean

scores in all PRECEDE variables, as well as self-management behaviors, were significantly higher in the intervention group than in the control group (Tables 3 and 4).

4. Discussion

After the education program, the knowledge and attitudes of patients in the intervention group were significantly improved. Similar to our findings, Jalili et al. [20], and Hazavehei et al. [21] demonstrated the effective role of an educational program to modify patients' attitudes and beliefs. It is to be noted that the more positive the attitude, the more effective the self-control of the disease [19]. In addition, other studies have also shown that the education program could considerably improve the knowledge of patients with chronic diseases [22,23]. The higher the knowledge, the higher the self-efficacy [22]. After the education program, the self-efficacy of patients in the intervention group was significantly improved. Self-efficacy is a critical factor in the success or failure of the self-management behaviors [24]. Therefore, patients with higher self-efficacy are more likely to perform self-management behaviors.

After the education program, the higher level of predisposing factors was observed among patients in the intervention group. This result is in agreement with some other studies [20,25,26]. Furthermore, the higher level of reinforcing factors was observed among patients in the intervention group after the education program. In this study, support from family and health providers were considered as reinforcing factors. Extant research suggests that the presence of reinforcing factors improve self-management of chronic disease [27]. After the education program, the higher level of enabling factors was observed among those in the intervention group. Our findings appear to be consistent with those of Dehdari et al. [27], and Moshki et al. [28]. After the education program, we also observed significant improvement in self-management behaviors among patients in the intervention group. This finding is in agreement with those of other similar studies [21,28].

All PRECEDE variables, including predisposing factors

Table 3
The mean scores of the PRECEDE variables before and after the intervention.

Independent variables	Before the intervention Mean (±SD)	After the intervention Mean (±SD)	P value
Knowledge			
Intervention group	3 (1.34)	6.04 (1.58)	0.001
Control group	3.37 (1.44)	3.42 (1.23)	0.36
Attitude			
Intervention group	45.34 (11.01)	53.65 (5.07)	0.001
Control group	43.44 (9.84)	43.69 (8.62)	0.55
Self-efficacy			
Intervention group	9.74 (2)	15.11 (1.66)	0.001
Control group	9.47 (1.62)	9.40 (1.74)	0.28
Enabling factors			
Intervention group	2.39 (1.23)	8.76 (2.27)	0.001
Control group	2.83 (1.19)	3 (1.14)	0.24
Reinforcing factors			
Intervention group	0.9 (0.94)	1.74 (0.78)	0.001
Control group	0.83 (0.78)	0.88 (0.62)	0.43

Table 4
The mean scores of self-management behaviors before and after the intervention.

Independent variable	Before the intervention Mean (±SD)	After the intervention Mean (±SD)	P value
Self-management			
Control group	37.80 (4.54)	37.67 (3.58)	P = 0.001
Intervention group	38 (4.85)	54.72 (3.82)	t = 25.07

(knowledge, attitude, and self-efficacy), enabling factors, and reinforcing factors, as well as self-management behaviors, were significantly higher in those of intervention group after the education program. The higher level of PRECEDE variables is shown to be associated with better self-care behavior [29]. Our findings indicate that the PRECEDE model-based education program along with applications of appropriate training methods and effective communication can successfully improve self-management behaviors among patients with type 2 diabetes. Furthermore, PRECEDE model variables provided a useful framework for an educational program in patients with type 2 diabetes. We recommend that future studies should evaluate the effects of other theories and models on improving the self-management behaviors of patients with type 2 diabetes.

Conflicts of interest

There are no conflicts of interest reported by the authors.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2018.08.016.

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