

Effect of public health nurses' educational intervention on self-care of the patients with type 2 diabetes

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ABSTRACT

Background: Diabetes is the most common metabolic disease and the sixth cause of mortality in the world. Most of the conducted studies show that the only way to control this disease and prevent its disabling complications is constant administration of self-care. **Aim:** This study was conducted with the goal of determining the effect of public health nurses' educational intervention on the self-care of the patients with type 2 diabetes who referred to Hazrat Ali clinic in Isfahan. **Materials and Methods:** This is a two-group two-step clinical trial with a before-after intervention design in which 50 patients with type 2 diabetes and with a mean age of 40–70 years were selected and assigned to study ($n = 25$) and control ($n = 25$) groups by allotting them even and odd numbers. Educational intervention was conducted in the study group through seven educational sessions. Mean scores of self-care before and after interventions were compared by Toobert and Glasgow brief self-care activities questionnaire. **Results:** Results showed no significant difference in the self-care scores before intervention in the two groups ($P = 0.67$, $z = 0.43$), but the mean score of self-care showed a significant increase after intervention in the study group, compared to the control group ($P = 0.002$, $z = 3.14$). **Conclusion:** Based on the obtained results, it is suggested to provide constant education of self-care for diabetic patients in health care centers, with more emphasis on a change in self-care skills and behavior.

Key words: Diabetes, educational intervention, public health nurse, self-care

INTRODUCTION

Diabetes is one of most common metabolic diseases affecting majority of the world's population. This disease is the sixth cause of mortality in the world and has a higher incidence in developing countries.

Studies report that diabetes can reduce an individual's life expectancy by 5–10 years. Increased prevalence of the disease in Iran and other parts of the world has been found to be a potential risk factor for humans as a result of its acute and chronic complications.^[1] It was estimated that

about 124 million people were affected by the disease worldwide in 1997.^[2] The prevalence of type 2 diabetes is expected to increase from 171 million patients in 2000^[3] to 300 million in 2025^[1] and 366 million in 2030.^[3] Among diabetic patients, there is an increase of renal complications by 17-fold, cardiac diseases and CVA (cerebro vascular accident) by twofold, gangrene of limbs by fivefold, and the risk of blindness by 25-fold than that in individuals not affected by diabetes. Among the complications of diabetes, the causes of mortality are hypoglycemia (7%), ketoacidosis (10%), and hyposmolar coma (30%). About 25% of renal complications result from diabetes. In the 11th Iranian cardiovascular congress, diabetes was reported to be one of the risk factors causing one mortality and two new cases every 10 s in the world. About 7 million Iranians are suffering from diabetes and 1% is added to this

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estimate each year.^[1] According to Morowatisharifabad and Tonekaboni, the World Health Organization (WHO) reported the prevalence of diabetes in Iran as 5.5% and 5.7% in 1995 and 2000, respectively, and estimates this value to reach 6.8% in 2025, which means an increase from 1.9 million in the year 2000 to 5.1 million in the year 2025.^[2] Khezerloo and Feizi reported that a national study on the risk factors of non-communicable diseases estimated the prevalence of diabetes as 7.7% in Iran in 2008, and WHO has reported a 17% increase in the incidence of diabetes in developing countries. This issue reveals that 228 million diabetic patients live in developing countries and make 75% of diabetic population in the world.^[4] Most of this increase occurs in developing countries as a result of population growth, aging, unhealthy diet, obesity, and sedentary lifestyle.^[5] Nowadays, the main goal of national diabetes control programs is to prevent its chronic complications with regard to two basic elements of monitoring and controlling the blood sugar and educating the diabetic patients in order to promote their level of knowledge.^[1] An increase in age is among the factors effective on diabetes prevalence. For instance, in the US, diabetes is fourfold more in the age group 45–55 years compared to that in the age group 20–44 years. At least 20% of the individuals over 60 years of age are affected by diabetes.^[6] As only 50% of diabetic patients refer to health care centers to receive services, and based on statistics, their referrals are just 3–4 times in a year, even a high load of educational programs during the limited time of their referrals is not adequate and cannot prevent life-threatening complications of diabetes and fulfill the diabetic patients' educational needs.^[4] Research shows that prevalence of diabetes increases by 10–20% with increase of age. In addition, the study of Framingham showed that diabetic patients of 50 years of age live on average 7.5–8.2 years less than nondiabetic individuals, and are affected by specific problems and syndromes.^[2] Noohi *et al.* showed that the statistics released by Iranian food industry and nutrition sciences in 2006 reported the prevalence of diabetes to be 9.5% in the age group over 40 years, and based on the estimate of WHO experts, it imposes a burden of 100 billion dollars and causes 200,000 deaths in a year. In addition, this financial burden of the disease is so high for the society from the aspects of both direct treatment and management of complications and rehabilitation.^[7] This issue can be one of the reasons which shows that traditional care, administered so far, has not been adequate. Inadequate and irregular education and increased age of the patients lead to poor self-care among these patients.^[7] As the disease is so much lifestyle dependent, improper nutrition and lack of physical activity can increase its incidence.^[8] The most important factor to control diabetes, as a chronic disease, is self-care behaviors.^[9] As the main goal in treatment of diabetes is normalization of insulin activity and blood glucose level to reduce progression of the complications, self-care leads to promotion of quality of life and is efficient in reducing costs. It decreases the number of hospitalizations and postpones the complications through constant follow-ups.^[10] Self-care refers to timely and correct injection of insulin, following the related diet, having appropriate physical

activities, detection of hyperglycemic signs and improving the quality of life,^[9] as well as prevention of diabetic foot which is based on self-care educational programs.^[11] Self-care leads to patients' general health promotion, their active participation in the process of care, and ultimately, reduction of treatment costs.^[9] Therefore, blood sugar control and maintaining that in an appropriate range is essential to control the disease and prevent its disabling complications. Diabetic patients should be encouraged to follow the recommended therapeutic methods such as taking their diabetes medications, making a change in their lifestyle, and participating in regular sport activities and monitoring their blood glucose levels.^[12] Lydia showed that self-care indexes were low in Mexico and found a significant association between self-care behaviors and glycosylated hemoglobin, triglyceride (TG), and percentage of obesity.^[13] Morowatisharifabad and Tonekaboni showed that among the different domains of self-care, foot care, correct and orderly consumption of pills and insulin injection, and taking a daily walk had the highest frequency.^[5]

Meanwhile, the lowest level of self-care behaviors was reported for checking blood glucose, carrying carbohydrates, and consumption of fruits and vegetables. However, regular blood glucose control and carrying carbohydrates to prevent hypoglycemia are of great importance in diabetic self-care and more education is needed to be given to the patients. In addition, consumption of fruits and vegetables, following a low-fat diet, and reduction of red meat consumption are among the points, which, based on the results of their study, need special attention.^[5] As the main responsibility of blood glucose control lies with the patients themselves, their knowledge about the signs and complications and the methods of blood sugar control plays a key role in preventing the disease disabling complications. Now high attention and emphasis is paid on improving diabetic patients' knowledge and their education.^[1] Abasian showed that self-care was not appropriate among the patients, which could result in serious complications in the long term, and this issue reveals the importance of patients' education in relation with self-care behaviors and planning for their achievement to such behaviors.^[14] In a community-based survey conducted in a southern city of India, Gopichandran showed that self-care behaviors were very poor in the fields of diet and sport in the studied population, and self-care behaviors were efficient in blood glucose monitoring and medication adherence. The article suggested that development of self-care behaviors among diabetic patients in India should start with a purposive health education.^[15] Negelkerk reported that the obstacles were lack of awareness of an appropriate nutritional program, self-care program, and blood glucose control, as well as helplessness and hopelessness.^[16]

Cooperative communication with health care providers, a positive attitude, active education, and personal support were among the effective strategies of cooperative communications with health care providers.^[16] Bernal *et al.* investigated the factors associated with increase of self-efficacy self-care in insulin-dependent diabetic patients

and reported a high association between nurses' education on diet and insulin educational classes and the perception of self-efficacy self-care.^[12] Adherence to therapeutic diet programs is one of the most important self-care concepts in which the patient should be mastered. Most of the diabetic patients may need a nurse for education of wound care, insulin preparation, glucose monitoring, and follow-up.^[10] Therefore, nurses are the key elements in provision of education and psychological and mental support with the goal of developing knowledge and attitude which lead to improvement of self-care.^[7] Nurses should constantly investigate diabetic patients' self-care skills, as statistics show that 50% of these patients may make a mistake in their self-care.^[10] Nurses, who are considered to play a role in counseling and educating diabetic patients and their families, should know all aspects of this disease, and its complications and methods of control.^[9]

Public health nurses as the main interdisciplinary team members play an important role in prevention and management of chronic diseases such as cardiovascular diseases, diabetes, respiratory diseases, and cancer. These nurses are at the front line and are the most reliable point of communication with the patients, and in most of the cases, are in the best situation to collect data about the patients' families and the effective socio-cultural and economic factors in designing interventional plans.^[17] Previously conducted research has emphasized on constant education of self-care. There are frequent hospitalizations and referrals of diabetic patients to hospitals, and thus, increase in costs and complications of uncontrolled diabetes. Lack of knowledge about diabetes self-care as one of the main reasons for disease relapse and its complications should not be ignored. Based on researcher's experience in research environment, it was shown that often the patients aged 40–70 years either poorly follow self-care education or are somehow ignored in being educated. Therefore, administration of an educational intervention and encouragement of participation by patients of this age group in self-care programs conducted by public health nurses, and reduction of financial burden imposed to the families under the coverage of above-mentioned centers which are mostly from low socio-economic class of the society seem essential. So, the present study aimed to determine the effects of educational intervention of public health nurses on the self-care of the patients with type 2 diabetes.

MATERIALS AND METHODS

Methods

This two-group two-step clinical trial with before–after intervention design was conducted on all patients with type 2 diabetes, with a mean age of 40–70 years, who had a medical record in the health care center, met the inclusion criteria, and were under the coverage of Hazrat Ali clinic. The effect of the independent variable of educational intervention on the dependent variable of subjects' self-care was investigated.

Study population and sampling method

After obtaining permission from the research environment, convenient sampling was conducted in such a way that firstly, the eligible medical files were selected, and then, convenient sampling was conducted based on the medical file numbers and through random numbers table. With the eyes blindfolded, a point was selected on the random numbers table, and then, sampling was continued from left to right by making the last digit of the numbers less or equal (N) even and odd horizontally. Sampling was completed and a total of 50 subjects were selected and assigned to two groups of study and control.

$$n = \frac{(Z_1 + Z_2)^2 (2S^2)}{d^2} = 25$$

Next, patients' phone numbers were extracted from a file containing the list of diabetic patients and their phone numbers. In the next stage, the subjects were called and necessary coordination for the date and time of the first session was made with the subjects after obtaining their consent. After the subjects agreed to attend and gave a written consent to join the study, questionnaire of demographic information was administered and diabetes self-care pre-test was conducted by the researcher and her colleague through a personal interview with each of the subjects, and the date and time of the next session were decided. Based on the clinical experience of the researcher and the research in this context, the educational needs of type 2 diabetic patients aged 40–70 years were classified as diet, sport that is considered as a determining factor in diabetes (only 14–16% of women aged 45–74 years had adequate physical activities),^[12] blood sugar tests, foot care, smoking, and meditational care and self-care recommendations.^[2,7,18] The educational intervention was planned in the form of seven 30–40 min sessions held twice a week on Mondays and Wednesdays. Each session was devoted to educate one of the above-mentioned skills to the patients. Before each session, the subjects were reminded about the time and place of the ongoing session and they attended the sessions punctually. In the seventh session, to evaluate the quality of education and its effects on improvement of self-care, the summary of diabetes self-care activities measure questionnaire as the post-test was filled by the researcher and her colleague through an interview.

After the end of intervention, to respect ethical considerations, the control group underwent an educational session and was given a self-care educational booklet. A post-test was conducted simultaneously with the study group.

Tools

The questionnaire included two sections. The first section contained demographic information such as diabetic patients' age, sex, length of the disease, weight, height, and body mass index (BMI), and the second comprised the summary of diabetes self-care activities measure questionnaire.

The second section included the self-care assessment tool. Self-care behavior scale designed by Toobert and Glasgow (1994)^[19,20] is a pen and paper questionnaire that is scored by a 7-point Likert's scale in which some items are scored inversely.^[20,21] These questions let the subjects report on the quality of their diabetes self-care activities during the past week. Having a healthy diet, playing sport, taking insulin injection or correct consumption of pills, blood sugar test, foot care, and smoking behaviors were among the inquired self-care behaviors.^[4,5,8] In this scale, each behavior is scored 0–7 points, and the total score is obtained by adding up the scores of each item, which varies from 0 to 100. To standardize the calculation, the score percentage was divided into five categories of 0% = very poor self-care, 25% = poor self-care, 50% = moderate self-care, 75% = good self-care, and 100% = excellent self-care.^[2,4,5,8]

Reliability and validity of the tool

Toobert and Glasgow confirmed the questionnaire reliability and validity in numerous studies. Cronbach's alpha was calculated for internal consistency ($\alpha = 85\%$), and in validating studies, an internal correlation of over 0.5 was obtained. Toobert, Hampson, and Glasgow determined the validity and reliability of the questionnaire as valid indexes.^[20] Validity and reliability of this questionnaire were confirmed by Poorsharifi in Iran, and Cronbach's alpha was calculated as 0.82 in the study of Hatamlou *et al.*^[21]

RESULTS

In the present study, Chi-square test, Mann–Whitney test, and independent *t*-test showed no significant difference in demographic characteristics and variables such as age, sex, type of diabetes and the length of diabetes, height, weight, and BMI in the two groups. The groups were homogenous [Tables 1–4]. Independent *t*-test showed no significant difference in mean self-care scores in the two groups before intervention ($P = 0.92$); but after intervention, mean self-care score was significantly higher in the study group, compared to the control group ($P = 0.0001$). Paired *t*-test also showed that mean self-care score had significantly increased both in study ($P < 0.001$) and control ($P = 0.001$) groups. Independent *t*-test showed a significant difference in obtained self-care mean scores in the study (14.7 ± 2.4) and control (4.9 ± 1.8) groups. In other words, the increase in self-care score was significantly higher than in the control group ($P = 0.02$) [Tables 5 and 6].

Mann–Whitney test showed no significant difference in self-care status (level) before intervention in the two groups ($P = 0.67$, $z = 0.43$) [Table 6]. Mann–Whitney test showed that self-care status (level) was significantly higher in the study group compared to the control group after intervention ($P = 0.002$, $z = 3.14$) [Table 7].

In each group, there were 12 (48%) and 13 (52%) male and female subjects, respectively, and the groups were homogenous concerning subjects' sex.

Table 1: Frequency distribution of sex in the study and control groups

	Groups (%)		Total (%)
	Study	Control	
Sex			
Male	12 (48)	12 (48)	24 (48)
Female	13 (52)	13 (52)	26 (52)
Total	25 (100)	25 (100)	50 (100)

In each group, there were 12 (48%) and 13 (52%) male and female subjects, respectively, and the groups were homogenous concerning subjects' sex

Table 2: Frequency of distribution of occupation in the study and control groups

Occupation	Number (%)		Total (%)
	Study	Control	
Homemaker	10 (40)	8 (32)	18 (36)
Retired	5 (20)	2 (8)	7 (14)
Employee	5 (20)	5 (20)	10 (20)
Worker	1 (4)	4 (16)	5 (10)
Self-employed	4 (16)	6 (24)	10 (20)
Total	25 (100)	25 (100)	50 (100)

Chi-square test showed no significant difference in the frequency distribution of occupation in the two groups

Table 3: Frequency distribution of education

Education level	Number (%)	
	Study	Control
Reading comprehension	6 (24)	3 (12.5)
Reading and writing	6 (24)	3 (12.5)
Under diploma	3 (12)	8 (33.3)
Diploma and over	7 (28)	5 (20.8)
Bachelor and over	3 (12)	5 (20.8)
Total	25 (100)	25 (100)

Mann–Whitney test showed no significant difference in the education levels of the two groups ($z = 1.16$, $P = 0.247$)

Table 4: Mean age, length of disease, height, weight, and BMI in the two groups

Variable	Study		Control		Independent <i>t</i> -test	
	Mean	SD	Mean	SD	<i>t</i>	<i>P</i>
Age	51.2	14.03	48.7	11.3	0.684	0.497
Length of disease	5.6	4.2	6.1	5.2	0.367	0.715
Height	160.3	10.2	161.9	8.8	0.580	0.564
Weight	67.8	14.2	70.9	9.8	0.910	0.367
BMI	26.2	4.03	27.3	3.1	1.063	0.293

Independent *t*-test showed no significant difference in the mean variables of age ($P = 0.497$), length of the disease ($P = 0.715$), height ($P = 0.564$), weight ($P = 0.367$), and BMI ($P = 0.293$) in the two groups, and the groups were homogenous. SD = Standard deviation, BMI = Body mass index

Chi-square test showed no significant difference in the frequency distribution of occupation in the two groups.

Mann–Whitney test showed no significant difference in the education levels of the two groups ($z = 1.16$, $P = 0.247$).

Table 5: Mean scores of self-care (out of 100) in the two groups before and after intervention

Groups	Before intervention		After intervention		Paired t-test	
	Mean	SD	Mean	SD	t	P
Study	43.4	12.7	58.2	10.02	6.11	<0.001
Control	43.8	11.3	48.6	9.8	2.79	0.01
Independent t-test						
T	0.1		3.39			
P	0.92		0.001			

Independent t-test showed no significant difference in the mean self-care scores in the two groups before intervention ($P=0.92$), but the mean self-care score was significantly higher in the study group compared to the control group after intervention ($P=0.001$). Paired t-test showed a significant increase in the mean self-care scores both in study ($P<0.001$) and control ($P=0.001$) groups. Independent t-test showed a significant difference in self-care score changes found in the study (14.7 ± 2.4) and control (4.9 ± 18) groups. In other words, the increase in self-care score was significantly higher in the study group compared to the control group ($P=0.02$). SD = Standard deviation

Table 6: Frequency distribution of self-care status in the two groups before intervention

Self-care status	Number (%)	
	Study	Control
Very poor	0	0
Poor	8 (32)	9 (36)
Moderate	14 (56)	14 (56)
Good	3 (12)	2 (8)
Excellent	0	0
Total	25	25

Mann-Whitney test showed no significant difference in the self-care status (level) before intervention in the two groups ($P=0.67, z=0.43$)

Table 7: Frequency distribution of self-care status in the two groups after intervention

Self-care status	Number (%)	
	Study	Control
Very poor	0	0
Poor	0	7 (28)
Moderate	13 (53)	14 (56)
Good	12 (48)	4 (16)
Excellent	0	0
Total	25	25

Mann-Whitney test also showed a significant increase in self-care status (level) in the study group compared to the control group ($P=0.002, z=3.14$)

Independent t-test showed no significant difference in the mean variables of age ($P = 0.497$), length of the disease ($P = 0.715$), height ($P = 0.564$), weight ($P = 0.367$), and BMI ($P = 0.293$) in the two groups, and the groups were homogenous.

Independent t-test showed no significant difference in the mean self-care scores in the two groups before intervention ($P = 0.92$), but the mean self-care score was significantly higher in the study group compared to the control group after intervention ($P = 0.001$). Paired t-test showed a significant increase in the mean self-care scores both in study ($P < 0.001$) and control ($P = 0.001$) groups.

Independent t-test showed a significant difference in self-care score changes found in the study (14.7 ± 2.4) and control (4.9 ± 18) groups. In other words, the increase in self-care score was significantly higher in the study group compared to the control group ($P = 0.02$).

Mann-Whitney test showed no significant difference in the self-care status (level) before intervention in the two groups ($P = 0.67, z = 0.43$).

Mann-Whitney test also showed a significant increase in self-care status (level) in the study group compared to the control group ($P = 0.002, z = 3.14$).

DISCUSSION

This study aimed to define the effect of public health nurses' educational intervention on the self-care of the patients with type 2 diabetes who referred to Hazrat Ali clinic in Isfahan. Based on the obtained findings, the subjects were homogenous concerning demographic characteristics and variables such as age, sex, length of the disease (years), height, weight, and BMI, which is consistent with Mahmoodi's^[22] study. The t-test also showed no significant association in self-care status and variables such as age, sex, education level, length of disease (years), height, weight, and BMI, which is consistent with Morowatisharifabad *et al.*'s report.^[8] Meanwhile, Baghaei reported a significant association between self-care status and length of the disease, education, and marital status. There was no association between self-care status and sex and the type of treatment; with an increase in length of the disease, the level of self-care increased, and illiterate subjects had an appropriate level of self-care.^[23] Also, the intervention (self-care education of diabetes) was effective on self-care. To control blood sugar, active participation of the patients is essential, and treatment, diet, sport, and education are the basic elements. Mahmoodi showed that administration of self-care was efficient in recovery of diabetic foot, and diabetes control had an important and positive effect on the control of complications.^[22] In the present study, intervention for self-care was an important element in the study group which affected the self-care status, compared to the control group ($P = 0.002, z = 3.14$). The results showed no significant difference in the self-care mean scores before intervention in the two groups ($P = 0.92$), but the self-care mean score was significantly higher in the study group compared to the control group ($P = 0.00$). These obtained results show the benefits of self-care educational intervention and constant education of diabetic patients. As self-care is one of the major actions that bring diabetes under control, self-care educational programs can positively affect patients' ability in diabetes control and improvement of self-care skills among these patients.

CONCLUSION

Based on the results, it can be concluded that educational intervention of public health nurses plays a key role in

diabetic patients' self-care status. Therefore, education of self-care seems essential and it is suggested to provide regular and constant education for the patients of this age group in diabetes centers, with more emphasis on making a change in their self-care behaviors.

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Conflicts of interest

There are no conflicts of interest.

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