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Effect of Educational Programs on the Knowledge, Attitude, and Practice of Foot Care in Patients With Diabetes

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Background: Among the complications of diabetes, foot problems are increasing due to nonconformity of preventive issues.
Objectives: The current study aimed to evaluate the effect of an educational intervention on knowledge, attitude and practice of foot care among the patients with type 2 diabetes.
Patients and Methods: In this randomized controlled clinical trial, 69 patients aged 30-60 years who were referred to an Iranian diabetes clinic were randomly selected and divided into two groups, intervention and control. The control group just received the routine training of the center. A three week educational program was held for the intervention group. Data were collected before and after the intervention by a researcher-made questionnaire and analyzed with SPSS version 19 to apply dependent and independent t-tests and chi-square test.
Results: There was insignificant difference between the two groups in terms of demographic variables and the mean scores of other assessed variables before the intervention ($p > 0.05$). After the intervention a significant increase was observed in the mean scores of knowledge, attitudes, and foot care practice of the intervention group compared to those of the control group ($p < 0.05$).
Conclusions: The educational program was effective on the foot care performance of the patients with diabetes.

Keywords: Attitude; Diabetes; Foot; Knowledge

1. Background

Today, diabetes is considered as a global epidemic (1). According to the latest statistics from the Iranian Diabetes Association, seven million Iranians (8.9%) have diabetes (2). On the other hand, the chronic nature of diabetes and the development of new treatments, which improve the longevity of the patients , can increase the risk of chronic complications which in turn can cause many problems for the patients with diabetes and impose a heavy economic burden on the healthcare system of society (3). Among the complications of diabetes, which are growing and require more urgent attention, are foot problems such as foot ulcers or infections and lower limb amputations resulting from non-compliance with safety and prevention issues (4). According to the studies conducted in Iran, the prevalence of diabetic foot ulcer and rate of the amputation due to it are approximately 10.9 ± 3.5% (5) and 30.6%, respectively, with the average of four weeks of hospitalization due to the complication (6). It is well known that diabetic foot ulcer is a common problem among the Iranian patients with diabetes (7), for which the minimum follow-up of diabetic foot complications is done. Since not much attention is primarily paid to this complication in Iran (8), and the knowledge and practice of foot care are generally not desirable among the patients with diabetes (7), diabetics and diabetic foot syndrome are among the priority research issues. Today, a study and understanding of clear and practical solutions to prevent and reduce amputations due to diabetes also show that health education on foot care is a common strategy to prevent diabetic foot and reduce 85% of lower limb amputations (9). Here are two questions: if education is an important therapy that is well placed in the care of patients with diabetes, why the debilitating complications of diabetes are still considered a major health problem, and why there is little awareness of the problems caused by diabetes? According to some studies, it may be greatly affected by the method of patient education (10). If education is aimed to increase knowledge, attitude, and practice of foot self-care behaviors among the patients with diabetes, it is the most cost effective way to prevent foot ulcers and the related complications (11). Also in their study that expresses poor self-care behaviors among patients with diabetes, Ayele et al. demonstrated that barriers for self-care behaviors should be well thought-out and self-care behaviors should be promoted through

sequential learning, motivation, and attitude conception of the patient to reduce the morbidity and mortality caused by diabetes (12). Regarding high prevalence of type 2 diabetes in Iran (2) and low knowledge and practice of foot care in the Iranian patients (7, 8), it is essential to evaluate different implemented strategies to promote self-care behaviors in patients with diabetes.

2. Objectives

The current randomized controlled clinical trial aimed to evaluate the effect of an educational program on the knowledge, attitudes, and practice of foot care in patients with type 2 diabetes.

3. Patients and Methods

3.1. Research Environment and Patients

Eighty patients with type 2 diabetes were selected to participate in the current randomized controlled clinical trial. The study was conducted from June to August 2012 in the Diabetes Clinic of Golestan Hospital, affiliated to Ahvaz Jundishapur University of Medical Sciences, Iran, which is a main referral center to provide medical and nursing services for patients with type 2 diabetes in Ahvaz. Considering the results of a pilot study on 15 subjects and based on the sample size formula (Equation 1) and the 20% possibility of exclusion, the number of subjects was determined 80.

$$\frac{\left(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta}\right)^2\left(S_1^2+S_1^2\right)}{\left(\bar{X}_1-\bar{X}_2\right)^2} \quad (1)$$

The researchers randomly selected the subjects among the patients referring to the center, based on random number table, as follows: The researchers prepared a list of all candidates eligible to participate in the study, after assessing the patients' records according to the inclusion criteria. Samples were then selected based on a random number table. Finally, the subjects were randomly divided into two control (n = 40) and case (n = 40) groups. There were 40 subjects in each group, considering exclusion probability of 20, after a pilot study on 15 patients with inclusion criteria and calculation of sample size. However, finally 69 patients remained in the study, with the exclusion of 11 participants during the study period. The inclusion criteria were: age 30-60 years, residing in Ahvaz, being diagnosed with diabetes at least for six months, no diabetic foot ulcer confirmed by the clinic physician, no training (except for routine training of the diabetes center), no history of psychiatric disorders, and no use of psychotropic drugs, no uncontrolled underlying diseases such as blood pressure over 160/90 mm Hg with medications, cardiac and peripheral vascular disorders, and having the ability to read and write.

3.2. Intervention

At the beginning of the study, participants in the intervention and control groups were pre-tested by a structured interview and a researcher-made questionnaire (a 28-item questionnaire) in terms of knowledge, attitude, and practice of foot care. The control group received only the routine training of the clinic. The routine training included some general educational brochures and booklets about diabetes and treatment methods, which offered brief advice on the foot care; and according to center staff they are not usually given to all patients due to limitations. The pre-test results also found that more than half of the patients participating in the study had a low level of knowledge about foot care. Thus, the intervention group was provided with a learning pamphlet titled "What a Person with Diabetes Should Know about How to Care for the Feet". Methods used to teach the content required by the intervention group were: holding lectures and group discussions, answering questions and, watching PowerPoint slides, showing how to take care and practicing foot care procedures by patients in the presence of the instructors, and providing educational booklets. All the techniques used in the present study had been previously identified as potentially being linked to knowledge, attitude, and practice (13). To perform the educational program, participants in the intervention group were divided into four sub-groups of 10 people, to whom the materials were presented in two sessions of 60 minutes. In other words, each training session was repeated for each of the sub-groups, and a total of eight training sessions were organized for the entire intervention group. To raise knowledge and draw attention to the educational program, a 60-minute conference session was held for each subgroup using PowerPoint slides in the first week of the intervention, in order to emphasize the importance of foot care activities in patients with diabetes, and their positive impact on the emotional preparation of people to do and continue these activities. The slides contained photos related to foot care and complications arising from non-compliance with these behaviors, as well as showing of how to take care and practice foot care procedures by patients in the presence of the instructor. In the second week of intervention, a 60-minute session was also held for each subgroup. Contents of the session, which was held in the form of group discussions with question-and-answer periods, emphasized the attitude aspect, in order to create correct attitude, overcome negative attitudes and reinforce positive attitudes on foot care activities. Participants were asked to discuss their attitudes by asking questions such as "What is your comment and opinion about the impact of diabetes on the health of feet?" or, "Does compliance with the recommendations of the physician and medical staff about foot

care have positive effects on health?" At the end of this session, the materials presented in the first session were given to participants as an educational booklet to be read if a part of the training was forgotten. The educational content included information on the causes and factors associated with diabetic foot ulcers, shoulds and should nots which a patient with diabetes should be familiar with in order to take care of feet and legs, and daily activities of foot care, positive results of adherence to the treatment and negative consequences of non-compliance. The content of the educational program was developed according to the latest literature and international standard guidelines, after consultation with faculty experts. As the next step, to determine the effectiveness of the educational program, the questionnaire was completed by the researchers in the intervention and control groups four weeks after the intervention, and the results were evaluated. To observe moral considerations, the necessary training was also given to the control group using educational booklets at the end of the study. Exclusion criteria were: not participating in any of the training sessions, and hospitalization during the implementation of the study.

3.3. Questionnaire

Data was collected through a structured interview to complete a researcher-made questionnaire, which consisted of two parts. The first part was related to demographic and clinical data, including age, gender, educational level, occupation, marital status, ethnicity, language, duration of diabetes, the type of medical treatment, the latest level of blood glucose, family history of diabetes, history of foot ulcer, family income and smoking. The second section included 28 questions divided into three sections: 10-, 14-, and 4-item sections to evaluate the level of knowledge, attitude, and practice of foot care, respectively. To assess the knowledge and attitude toward foot care, the researchers prepared a list of questions after consultation with faculty experts based on the most recent literature and international standard guidelines, including recommendations of the Surgeons American College of Foot and Ankle and Diabetes UK 2015 (A charity registered in England and Wales (no. 215199) and in Scotland (no. SC039136)). Knowledge of foot care was measured through 10 questions on how to prevent diabetic foot ulcers and possible environmental threats. In this area, the score one was given for each correct answer to each question, and the score zero was considered for the lack of answer or an incorrect answer. The next area, attitude toward foot care activities was assessed by 14 statements; with phrases such as "All diabetics are always at risk of foot ulceration and amputation". The scores in this section were calculated based on the five-degree Likert scale, from "I totally agree" (5) to "I totally disagree" (1). The maximum and minimum attitude scores were 70 and 14, respectively. If higher scores were obtained in the area of attitude, it could be considered a more positive attitude toward the foot care activities. The third part was related to the assessment of practice using the standard form of the Summary of Diabetes Self-Care Activities by Toobert et al. (part of foot care) (14), which included four questions using a scale of 0-7 based on the relevant activities in the last seven days with the self-report method and was measured by asking questions such as "How many times have you seen the inside of your shoes in the past seven days?" The maximum and minimum scores for this section were 28 and 0, respectively; showing good practice of foot care for scores over 21, mean practice for scores between 14 and 21, and weak practice for scores less than 14. To determine the reliability of the measuring instrument, Cronbach's alpha was calculated for each section of the questionnaire. The Cronbach's alpha was 0.71, 0.77, and 0.84 for the questionnaires of knowledge, attitude, and practice of foot care, respectively. The obtained results showed that the study questionnaires had acceptable reliability or validity, and internal consistency in a way that all were above 0.7 and at an acceptable level. The researchers examined the subjects and completed questionnaires when the patients were referred to the clinic for regular follow-up.

3.4. Ethical Considerations

After obtaining the permission from the Research Council and the Ethical Committee of the university (Ethical code: ajums. REC. 1392, 35), the current study was conducted after coordination with the authorities of Ahvaz Golestan Hospital and Diabetes Clinic of the center. Participants were briefed on how to perform the project, confidentiality, and inappropriate use of information as well as the objective of this project before completing the questionnaire, and then written consent was obtained for inclusion. The participants were assured of the right to withdraw anytime during the study period, and not incur any additional cost to them. The current study, was part of an Msc thesis in medical surgical nursing approved by Ahvaz Jundishapur University of Medical Sciences, Iran, registered in the Iranian Registry of Clinical Trials (IRCT ID: IRCT2013051113292N1).

3.5. Statistical Analysis

Data were analyzed by SPSS version 19. The chi-square test was used to compare nominal variables between the two groups, the paired t-test to compare pre-test and post-test mean scores of the knowledge, attitude, and practice of foot care variables in each group, and the t-test to compare scores between the control and intervention groups. Furthermore, $P < 0.05$ was considered significant.

4. Results

The final data analysis was performed for 69 patients.

Table 1 shows the demographic date of the groups participating in the study separately. Given that no significant differences were found between the two groups using the performed chi-square test after comparison of the demographic and underlying variables ($P > 0.05$), it can be concluded that randomization was successful in this study. Table 2 shows the mean scores and relative frequency distribution (%) of patients regarding the variables. Based on the pre-test results, the mean knowledge scores of foot care activities in patients with diabetes were 5.17 and 4.38 in the intervention and control groups, respectively; while based on the post-test results after the educational program, the mean knowledge score increased by 8.08 and 7.17 (high level) using foot care procedures in both intervention and control groups, respectively (Table 3).

Table 1. Characteristics of the Participants (n = 69) [a]

Variable	Intervention	Control	P Value
Age, y			0.79
30 - 40	8 (22.9)	6 (17.6)	
41 - 50	11 (31.4)	13 (38.2)	
51 - 60	16 (45.7)	15 (44.1)	
Gender			0.91
Male	19 (54.3)	18 (52.9)	
Female	16 (45.7)	16 (47.1)	
Marital Status			0.5
Married	30 (85.7)	32 (94.2)	
Single	5 (14.3)	4 (9.8)	
Diabetes duration, y			0.45
1 - 5	21 (60)	15 (44.1)	
6 - 10	8 (22.9)	9 (26.5)	
11 - 15	3 (8.6)	7 (20.6)	
16 - 20	3 (8.6)	3 (8.8)	
Employed treatment method			0.66
Oral	23 (65.7)	24 (70.6)	
Insulin	12 (34.3)	10 (24.9)	
Family history of diabetes	23 (65.7)	20 (58.8)	0.55
History of diabetic foot ulcers	15 (42.9)	16 (47.1)	0.72
History of other diseases	18 (51.4)	25 (73.5)	0.06
Smoking	7 (20)	12 (35.3)	0.15
FBS, mg/dL			0.47
60 - 150	8 (22.9)	8 (23.5)	
151 - 240	15 (42.8)	9 (26.5)	
241-330	8 (22.9)	10 (29.4)	
> 330	4 (11.4)	7 (20.6)	

[a] Data are presented as No. (%).

Table 2. Mean Scores and Relative Frequency Distribution of the Patients for the Variables (n = 69)

Variable	Good	Average	Poor	Mean ± SD
Knowledge	5.7	40.5	53.6	4.78 ± 2.14
Attitude	79.71	20.2	-	49.32 ± 6.86
Foot care practice	30.4	26	43.47	17.04 ± 7.7

Table 3. Pre and Post Intervention Means of Patient's Knowledge, Attitudes, and Foot Care Practice Between Groups (n = 69)

Variable	Control (n = 34)	Paired t-test	Intervention (n = 35)	Paired t-test	Independent t-test
Knowledge					
Pre intervention	4.38 ± 2.85	0.0001	5.17 ± 2.1	0.0001	0.12
Post intervention	7.17 ± 1.91		8.08 ± 0.88		0.015
Attitude					
Pre intervention	48.44 ± 5.88	0.0001	50.12 ± 7.7	0.001	0.31
Post intervention	49.78 ± 7		54.18 ± 6.72		0.001
Foot care practice					
Pre intervention	17.76 ± 7.84	0.19	16.32 ± 7.76	0.001	0.45
Post intervention	18.96 ± 7.36		19.32 ± 6.48		0.0001

Changes in the mean knowledge score were significant in both groups, according to the paired t-test (P = 0.0001). It should be noted that the independent t-test showed no significant difference between the mean knowledge score in the two groups before the intervention (P = 0.12), while obtained results showed a significant difference in the mean knowledge score between the two groups after the intervention (P = 0.01). In addition, a statistically significant increase was observed in the mean knowledge score of people participating in the control group after the intervention (P = 0.0001), which can be justified by the effect of the test (15). Based on the pre-test results, it was found that in the current study, the mean attitude scores towards foot care activities were 50.12 and 48.44 in the intervention and control groups respectively, which rose to 54.18 and 49.78 after the educational intervention, respectively. Changes in the mean attitude scores of the two groups were statistically significant according to the paired t-test, P = 0.001, and P = 0.0001 for the intervention and the control groups, respectively. Furthermore, the independent t-test showed no significant difference between the mean attitude scores of the two groups before the intervention (P = 0.31), while the difference in the mean attitude score was statistically significant for both groups after the intervention (P = 0.001). The changes indicated the effect of designed intervention to improve the attitude toward foot care activities in the patients with diabetes. In addition, the practice of foot care in patients participating in the study was also evaluated for both intervention and control groups before and after the intervention; the results showed that the mean practice scores in the intervention and control groups changed from 16.32 and 17.76 to 19.32 and 18.96 before and after intervention, respectively. Changes in the mean practice scores in the intervention group before and after intervention was statistically significant according to the paired t-test (P = 0.001). According to the results of current study, the independent t-test showed no significant difference in the mean practice scores between the intervention and control groups before intervention (P = 0.82), whereas changes in the mean practice scores of foot care were statistically significant in the intervention group (P = 0.001). Hence, it can be concluded that the above intervention led to an increase in the foot care practices among this group of patients.

5. Discussion

According to the obtained results, the knowledge of foot care activities and methods were weak in more than half of the subjects (53.6%). In a study to assess the practice of foot care in a group of patients with diabetes, Chellan et al. reported that the knowledge level of patients participating in the study was at a weak level on foot care procedures (16), which was consistent with those of the current study. The study of Desalu et al. also found the knowledge of foot care procedures in 69.9% of patients with diabetes at a weak level (17), which was in line with the results of the current study. In their study, Bolourchifard et al. also reported that approximately 60%-65% of the study participants had an undesirable knowledge of foot care (18), consistent with the results of the present study, whereas Abu-Qamar (19) and Jinadasa and Jeewantha (20) reported a high level of knowledge among participants in separate studies aimed to assess the level of knowledge and practice of patients with diabetes in order to prevent the occurrence of diabetic foot ulcer (19, 20). The results also showed that the educational intervention affected the patients' knowledge regarding foot care. It should be mentioned that a person with diabetes will be successful in the patient care if he/she has the necessary knowledge of health-promoting behaviors. It was also found that the more knowledgeable the patients are regarding the disease and self-care methods, the more likely they are to adopt and maintain health-promoting behaviors (16). Educational intervention should begin with knowledge, and patients with diabetes should learn at least the basic skills necessary for survival (21). In a study by Dydarlu (21), the effect of an educational intervention designed to promote self-care behaviors in a group of females with type 2 diabetes was examined and the knowledge level of participants was evaluated in the training sessions held to increase their self-care knowledge. Finally, compared to before educational intervention ,he reported that the subjects' knowledge regarding self-care behaviors signifi-

cantly increased after the educational intervention (P = 0.0001), which had a good correlation with the results of the current study (21). Also in the study by Vatankhah et al. training sessions were held for the patients with type 2 diabetes; they evaluated its effects on the knowledge of foot care and found that the knowledge regarding foot care has increased in this group of patients (P < 0.0001) (22). Several studies conducted outside Iran, reported the effectiveness of training sessions on the knowledge of patients and their self-care behaviors (15, 23). Regarding participants' attitudes toward foot care activities, the results of the present study showed that 79.7% of the studied patients had high tendency toward foot care activities. The study by Chellan et al. also showed that 94.2% of the subjects had a positive attitude toward foot care activities (16). Bolourchifard et al. also found that 80%-85% of the participants had a positive attitude toward the practice of self-care behaviors in the prevention of diabetic foot ulcers (18). The above results were consistent with the results obtained in the current study. In addition, the results of the study showed that such educational interventions affect the attitudes of patients participating in the study, and help to improve attitudes toward foot care activities. In his study, Dydarlu argued that the attitudes of females with diabetes participating in the study significantly increased towards the practice of self-care behaviors after the educational intervention (P = 0.000) (21). In a study to assess the impact of an educational intervention to promote physical activity and healthy eating in adults with type 2 diabetes, White et al. (24) also reported that after an intervention prepared by holding training sessions aimed to improve attitudes, the attitude toward the practice of regular physical activity in the intervention group had a statistically significant difference with that of the control group (P < 0.05), which is consistent with the results of the present study; on the contrary, a significant change was reported regarding the attitude toward healthy eating after the intervention in the aforementioned study, which is in contrast with the results of the current study (24). Finally, a study on the state of the practice of foot care in this group of patients showed that 43.4% of the subjects had a weak practice. Desalu et al. found that 78.4% of patients with diabetes had a weak practice of their feet care (17), which was consistent with the results obtained in the current study, while the practice of foot care was reported, on average, 43.5%, 54%, and 85% among the participants in the studies by Chellan et al. (16), Bolourchifard et al. (18), and Hasnain et al. (25) respectively, which is in contrast with the results of the present study. Finally, it was found that the implementation of this intervention led to an increase in the practice of foot care in the group of patients with diabetes. Dydarlu (21) also stated that educational intervention theoretically can increase self-care behaviors (such as use of medicines, compliance with recommended dietary, exercise and physical activity, and self-monitoring of blood glucose), improve metabolic control (reduction in HbA1c), and enhance the quality of life. Bolourchifard et al. (18) and Anselmo et al. (15) also reported that training sessions held for patients with type 2 diabetes increased the practice of foot care in this group of patients. These results are in line with the results of the present study. The results of this study emphasizes the necessity of considering a series of effective factors on the behavior changes of patients with diabetes, and could be the basis of developing educational interventions aiming to improve the foot care.

5.1. Limitations and Recommendations

There were a number of limitations to the present study. The self-report nature of the SDSCA (The Summary of Diabetes Self-Care Activities) also presents a degree of bias inherent to survey research. Direct observation of participants` foot care practices would provide a more reliable source of measurement for this behavioral variable. Although most of the previous studies utilized this method for data collection (21, 24), however there was no possibility for more accurate assessment of participants by the current study researchers. Another limitation of the study was the psychological state of the participants that could affect their responses. Controlling the limitations was difficult for the researchers. Also considering the short-term follow up used in the current study it was difficult to determine the long-term effects of the program. However, it is interesting to note that several interventions used to promote some self-care behaviors among patients with type 2 diabetes maintained intervention effects over the medium to long term (21, 24). Further research is needed to determine whether the increases in foot care practices observed in the current study could also be maintained over time.

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