

The effect of self-care education program on reducing HbA1c levels in patients with type 2 diabetes

Iraj Zareban, Mahmood Karimy¹, Shamsaddin Niknami², Alireza Haidarnia³, Fatemeh Rakhshani³

Department of Health Education, School of Health, Zahedan University of Medical Sciences, Zahedan, ¹Department of Public Health, School of Health, Saveh University of Medical Sciences, Saveh, ²Department of Health Education, School of Medical Sciences, Tarbiat Modares University, ³Department of Health Education, School of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

ABSTRACT

Background: Diabetes as the most common diseases caused by metabolic disorders is an important global challenge. This is a disease that requires lifelong self-care because self-care and improved quality of life is cost effective. This study is aimed to determine the impact of self-care education program on reducing HbA1c, type 2 diabetic patients and was conducted in Zahedan. **Materials and Methods:** This is an experimental study done on 138 diabetic female patients in Zahedan city, in 2011 (1390). This sampling method of patients was based on inclusion and exclusion criteria of the Diabetes Center, at Hazrat Ali Asghar Hospital (AS) in Zahedan. Samples were divided randomly in to two groups: 69 cases and 69 controls. Data collected included validity and reliability confirmed questionnaire. Checklist was based on patients 'performance of reporting and (HbA1c) testing. Before the educational intervention, the checklist of questions for recording the (HbA1c) test for both the groups were completed, and study samples received 5 sessions of education (with the group discussion and film show) for a month. However, the control group received only routine training. Three months after the educational intervention, both groups completed the questionnaire and the check list and data using SPSS software and the appropriate tests were analyzed. **Results:** Findings showed that the mean domain scores of area of knowledge, attitude and practice educational groups, were recorded as $(46.6 \pm 8.57, 46.5 \pm 0.86$ and $29.06 \pm 10.02)$, respectively. And after education scores of knowledge, attitude and practice were recorded as $(52.80 \pm 2.20, 12.98 \pm 1.02$ and $39.69 \pm 4.74)$, respectively, and in study group significant difference ($P < 0/001$) was seen. **Conclusion:** Self-care training in striation leads to improve knowledge, attitude and self-care performance of the study samples and also improves the average (HbA1c). Because it seems to increase the active participation of learners in their care that they have experienced with this training method and their motivation enhanced them to learn better self-care. So this type of care education should be given to the attention of nurses and healthcare's staff.

Key words: Diabetes, HbA1c, health education, self-care

Address for correspondence: Dr. Shamsaddin Niknami, Department of Health Education, School of Medical Sciences, Tarbiat Modares University, Tehran, Iran. E-mail: Niknamis@modares.ac.ir

Access this article online	
Quick Response Code:	Website: www.jehp.net
	DOI: 10.4103/2277-9531.145935

INTRODUCTION

Diabetes pandemic is associate with sedan tar life styles, notional changes, behavioral rich factors.^[1]

Diabetes is an obvious epidemic which is strongly related to changes in life styles and economic diabetes mellitus worldwide.^[2-3] 90 percent have type 2 diabetes and until the year 2030 AD, it will be reached to 439 million.^[4] Most of this increase with population growth is dependent on, aging; unhealthy dietary patterns, obesity and sedentary lifestyle, which will occurs in developing countries.^[5]

Copyright: © 2014 Zareban I. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

This article may be cited as: Zareban I, Karimy M, Niknami S, Haidarnia A, Rakhshani F. The effect of self-care education program on reducing HbA1c levels in patients with type 2 diabetes. J Edu Health Promot 2014;3:123.

National Study of Risk Factors of Non-communicable Disease has estimated the prevalence of diabetes in Iranian 2008, as 7.7%. (With confidence interval of 95%:7.5-7.9.^[6] World Health Organization has estimated that the number of diabetic patients in Iran till 2030 AD will reach more than six million.^[6] The most common complications of diabetes have imposed high costs on individual and society. Onset of complications, especially if it is combined with large and small vessel, disease can lead to reduced quality of life.^[5] Pathogenesis and mortality due to these complications major health-care issues are considered in the world,^[6] and why considerable attention has shifted to the investment for diabetes control.^[7] Maintaining optimal levels of blood glucose is essential in diabetes care and reduce incidence of complications of diabetes.^[8] International Diabetes Federation recommends that patients should maintain good glycolic control, and self care measures. These measures include: 1-Follow a healthy diet, 2 -Regular use of drugs, 3 -Regular exercise, and 4 -Blood glucose monitoring. Although, the prevention of morbidity and mortality of these cases seems simple, many diabetic patients have not followed their physician's self care recommendation in diabetes. Although, little information about how the average blood sugar control in the hand of Iranian patients, increasing prevalence of diabetes, sound alarm of poor control of diabetes in Iranians.^[9,10]

Self care improved quality of life is effective in reducing costs.

Especially the number of hospitalized cases is reduced. With its continuous monitoring complications of acute and chronic diseases can be prevented or delay its onset.^[11] One of the basic theories is the nursing of diabetic patients, self care theory of Orem.^[12] This theory expresses the idea that human being serene individuals who are to some degree self thought.

This theory says, the patient is passive and not just recipient of health services, but a being strong, reliable and responsible, with power of decision making that can provide self health care responsibility, and can perform it well^[12] to increase its knowledge about various issues including diabetes self-care principles, and continuous control of blood glucose levels near normal in the prevention of early and late complications of the disease, ensures a longer life for the patient, and reduce health care costs. Undoubtedly, achieving such goals requires dynamic and continuous public participation.^[13] Without education and their participation in patient education and self care, more expensive health care costs, and quality of life will suffer further declines.^[14]

As the America Diabetes Association declare people with diabetes should care about treatment training that they are undergoing and for effective and appropriate treatment, patients adopt changes in their life style to prevent disease or delay its related complications.^[15]

Rubin performed a study of both the impact of training on self care behaviors and metabolic control, on 213 patients. After a training program on self care (exercise, nutrition, monitoring blood glucose and insulin pen values) and

metabolic control by measuring HbA1c were evaluated. Significant differences were seen in self care behaviors before and 6 months after training.^[16] Heisler studied the medical records of 1,032 diabetic patients, and concluded that the mean of HbA1c changed from 8.3% to 7.3%.

They found that self care behavior (drug use, self monitoring of blood sugar, diet, exercise and foot care) is associated with lower HbA1c. The test results showed that compared to the previous year tests, 15% HbA1c of 16% of eye exams and nephropathy screening test decreased to 13%.^[17]

Also, the results of this study show the importance of self care of diabetics on glycemic control.^[17] Diabetes is a chronic disease, specific self care behaviors are needed till the end of life. In addition to diabetes learn everyday skills, acute care to prevent fluctuations in blood sugar, should be employed in many health behaviors in their life style, till long term complications of diabetes are prevented.^[18]

Ahmad Khan, in a study entitled evaluation of awareness and self care rate in diabetic patients concluded only 56% of patients had sufficient knowledge of hypoglycemic, that too they gained it as more informal and more experimental. 15% regarding chronic complications, 76% about their insulin self injection, 10% regarding blood glucose using Glucometer and 6% were aware of the urine sugar tests.^[19]

Brown *et al.*, study conducted on 256 patients aged 18 years and older, regarding continuity of diabetes self care behaviors and glycemic control in type 2 diabetic patients, observed patients who had progressed by several times of regime change and continuity of self care had lower HbA1c levels. This relationship after controlling the number of visits, number of months from diagnosis, number of days of study and period of diabetes remained significant.^[20]

Diabetes is one of the diseases, its main treatment is the patient's own responsibility, and practically it is not feasible that all day the patient is under medical supervision and in treatment center. Therefore, conducting education in the field of self care reduce problems caused by the disease, appears to be essential.

The finding shows that this study can be used elaborately in the field of interventional education in other diabetes centers in order of better control of the blood sugar. It can be considered that diabetes self care is a very important issue in controlling the incidence of complications of the disease. Many problems and obstacles for its implementation, especially in our community are felt. And specific cultural features and characteristics governing the Sistan and Baluchistan province and Zahedan the investigation of this issue seem to be essential in diabetic patients.

MATERIALS AND METHODS

The aim of this experimental study is to determine the effect of education program as independent variable on knowledge,

attitude and self care behavior and HbA1c as a dependent variable on Diabetes female patients was carried out in Zahedan City, Iran, in 2011 (1390).

With regard to the study criteria inclusion, having at least one HbA1c test higher or equal to 7% during the past 3 months blood sugar investigation, be a clinical case of Zahedan having consent to participate in this study and not having complications kidney problems and maculopathy and resistance to insulin. Those who intended to get pregnant, persons suffering from diabetes type 1 and gestational diabetes, patients with severe impairment of vision and inability to speak, and failed to respond to questions, were not enrolled. Sample volume with significant level = 0.5 T, 100 people were calculated, applying easily selected method and random loss (one in the middle), and were divided into two (case and control) groups (each group $n = 69$).

For gathering information

Scales of the questionnaire with 41 questions knowledge (26 questions), attitude (5 questions) and self care behaviors (10 questions) were used. Demographic variables including age, marital status, education level, occupation, type of treatment, consumption or non consumption of (cigarettes, hookah or opium) for this study were prepared, and through interviews with mentioned people the questionnaires were completed.

To determine the validity, it was done in this way: To determine clarity of questionnaire items, questionnaires were given to the knowledge of 15 diabetic patients not included in the study population, and then comment on them were applied. The ratio of content validity and content validity index was determined by using the panel of experts and items that did not obtain required score were not selected. To determine the validity, questionnaires were distributed to 30 same individuals and the mean alpha structures based on the total sample volume was 76%. The second check list showed records associated with HbA1c levels of patients and their blood glucose levels.

Blood samples by syringe twice before and after the interventions were collected and transferred to laboratory immediately to test the glycol lysated hemoglobin by Tosoh Automated Glycohemoglobin Analyzer device. Moreover, during the collection of information and questionnaires of two groups of patients and controls, were not disclosed to the researchers. The laboratory also did not know about it. Before the educational intervention in control groups and target group the mentioned questionnaire form and check list were completed, and patients were referred to hospital laboratory for testing HbA1c.

Then educational intervention for the case group for one month in six training sessions in the form of lectures, film screenings, Q and A and group discussion was conducted. At this meeting about diabetes and its complications, proper diet, walking at least 3 sessions per week and each session was 30 min, taking education regularly as directed by the

physician, self monitoring patient's blood sugar, diabetic foot care and the not smoking trainings were recommended, as well as educational CDs and diabetes pamphlets were provided to patients to be worked out at home. Patients' Interest in education, management of self care behavior (how to cook food, sports and success in managing diabetes) were required from the patients in the training.

A follow-up 3 months after completion of the training data through questionnaires of both case and control groups were collected and HbA1c tests were done. Of course, during this period, patients were able to communicate with researchers through telephone and raise their questions. Collected data using SPSS software, in addition to inferential test sand Chi-square test in each group paired T-test and for comparison between groups T-test were used.

Findings

In this experimental study of women population of type 2 diabetes attending the hospital diabetes clinic of Hazrat Ali Asghar (AS), confidential sample size of 95% and attest power of 80% using the formula for sample size of 100 was calculated foreman comparison of two groups. Of 138 sample selected randomly among both cases and controls were included randomly in both cases. In this study, 138 female patients attending diabetes clinic of Hazrat Ali Asghar (AS) Hospital were studied in Zahedan. In case and control groups, in terms of individual characteristics and demographic variable including age, education, marital status, occupation, type of treatment received, smoking and the source of income were recorded, statistical similarity was observed ($P > 0.05$) and no significant difference was observed between the two groups. In this study, the mean and standard deviation of age in test group was (73.47 ± 3.7) and in control group it was (48.23 ± 0.2). The *t*-test results showed similarity in mean age of two groups ($P = 0.68$).

Also, the highest frequency (2.94%) in both groups of housewives and; from the point of marital status, the most common (8.84%) was married. Most people (65.9%) in both test and control groups were illiterate. All patients were diagnosed with type 2 diabetes. And most patients (81.9) of case and control groups had used oral hypoglycemic. Most people (88%) had information about diabetes from doctors and health workers.

Thus, the value was obtained from in dependent T-tests; Chi-square and Fisher's exact test, of two groups. From the view-point of was 8 individual and base had no statistically significant difference [Table 1].

The results showed that the average and standard deviation score of test group about awareness before the educational intervention was (48.86 ± 4.64) and it reached (52.80 ± 2.20) 3 months after the educational intervention. Mean and standard deviation score of attitude of test group before the educational intervention was (16.55 ± 5.45) and it reached (21.16 ± 3.58) 3 months

Table 1: Individual and test group-based information

Variable	Intervention group		Control group		Type and test result
	Frequency	Percentage	Frequency	Percentage	
Married status					
Single	58	84.1	59	85.5	Exact fisher test $P > 0.5$
Married	11	15.9	10	14.5	
Education level					
Educated	46	66.7	45	66.7	Exact fisher test $P = 0.641$
Uneducated	23	34.8	24	34.1	
Occupational status					
House holder	65	94.2	65	94.2	Exact fisher test $P = 0.641$
Employed	4	5.8	4	5.8	
Type of treatment					
Regime activity	6	7.2	5	7.2	Pierson $P = 0.244$
Physical	4	5.8	4	5.8	
Oral drug	58	84.5	55	79.7	
Insulin	5	7.8	5	7.8	
Smoking					
Smoker	13	18.8	11	15.9	Exact fisher test $P = 0.823$
Non-smoker	56	81.2	58	84.1	
Sources of information					
Doctors	60	87	61	88.4	Exact fisher test $P > 0.5$
Health care staff	9	13	8	11.6	

after educational intervention. The self care behaviors in the group before the educational intervention was (29.06 ± 10) and it reached (39.69 ± 4.74) 3 months after educational intervention, so that the paired *t*-test showed statistically significant differences between them ($P < 0001$). Also, the findings of this study showed, mean HbA1c (9.7%) of the test group reached (8.30) 3 months after the educational intervention, paired *t*-test with 95% confidence showed significant difference between them ($P < 0001$).

The results showed the mean and standard deviations cores for areas of knowledge, attitude and performance of the control group before training (51.93 ± 5.40 , 17.83 ± 6.17 and 27.58 ± 8.94) changed to (51.87 ± 5.47 , 17.86 ± 6.17 and 27.79 ± 9.05) 3 months after the educational intervention, respectively and that the paired *t*-test showed no statistically significant differences between them. The control group mean and standard deviation of HbA1c (9.04 ± 1.54) reached (9.06 ± 1.52) 3 months after the educational intervention, paired *t*-test showed no statistically significant differences between them [Table 2].

DISCUSSION

This study aimed to determine the impact of training programs on reducing HbA1c levels in type 2 diabetic patients in South East of Iran. One of the reasons for failure to achieve the desired outcomes in diabetic patients, the lack of patient participation in treatment. This participation is an important factor in the treatment of patients who are willing to follow a treatment plan problems throughout life.^[21] Researcher's expectation in this study was to base education on this model which increases knowledge, improve attitudes and

Table 2: Comparison of mean and standard deviation scores in the domains of knowledge, attitude and performance and the mean and standard deviation of hemoglobin, glycogen of intervention group and control group before and after training invention

Study group variables	Mean (\pm SD)			P
	Before intervention	After intervention	Difference after before	
Knowledge				
Intervention	46.46 \pm 5.66	52.80 \pm 2.20	6.34 \pm 3.46	$P < 0/001$
Control	48.59 \pm 4.41	48.69 \pm 5.47	0.1 \pm 1.06	$P < 0.832$
Attitude				
Intervention	8.57 \pm 0.86	12.98 \pm 1.02	4.41 \pm 0.16	$P < 0/001$
Control	9.02 \pm 0.95	9.11 \pm 0.94	0.09 \pm 0.01	$P < 0.205$
Practice				
Intervention	29.06 \pm 10.02	39.69 \pm 4.74	10.63 \pm 5.28	$P < 0/001$
Control	27.58 \pm 8.94	27.79 \pm 9.05	0.11 \pm 0.11	$P < 0.804$
HbA1c				
Intervention	9.63 \pm 1.83	8.30 \pm 1.17	1.33 \pm 0.66	$P < 0/001$
Control	9.04 \pm 1.54	9.06 \pm 1.52	0.02 \pm 0.02	$P < 0.233$

behaviors, ultimately leading to improved patients' self care. The study examined the efficacy of education based on HBM on improvement of knowledge, attitude and behavior, as well as self care. The finding showed that improved knowledge and skills of diabetic of after educational intervention led to promotion of necessary self control.^[22]

In this study, the knowledge of the intervention group significantly increased after the training. Education can enhance collaborative learning and collaboration and communication using video tutorial that because the patient

feedback was evident in subsequent meetings. Results obtained about the raise of diabetes awareness are comparable with other studies^[16-20] which showed that training is required for all diseases.

The first step in controlling disease is diabetes education that can be effective in improving patients self care. One of the reasons why patients do not take action to control their disease is because of lack of awareness.^[21] Several studies have concluded that the lack of knowledge about self care skills, and correct information or lack of understanding of the treatment program. One of the important aspects is non-compliance and adherence to the treatment plan.^[16] However, there should not be too much emphasis on knowledge. Because in many cases, people know what to do, but do not turn their knowledge into practice.^[17]

Normal blood glucose control significantly reduces cardiovascular and renal complications in patients by about 50%. This would not have happened if the patient did not have good self care and the most difficult part of this step is follow-up training.^[20,21]

One of the other dimensions examined in this study was patients awareness, knowledge and skill so brained through diabetes education, which is necessary to begin the process of self-control.^[22] Awareness of cases in this study significantly increases after training and can enhance call abortive learning and the use of video communication, because the next meeting was confirmed in the patient feedback. Results in increased awareness of diabetic patients are comparable with other studies.^[23-27]

The result obtained in this study, have showed statistically significant differences in the area of attitude scores of case group after the educational intervention, which is consistent with other conducted studies.^[23,28] The results showed that the patients' mean field performance of case group has improved after the intervention. Mean paired *t*-test showed that self care behavior scores in the intervention group had significant difference, but not in the control group. Results with diabetic patients in the studies carried out on physical activity^[29] taking medication on time^[30] appropriate diet^[31-33] were consistent with this study.^[34-36] Statistical analysis showed significant difference between HbA1c levels before and after intervention in the case group.

While in control group, HbA1c levels before and after intervention, significant differences were not observed. These results are consistent with other studies.^[17,18,35-37] Reduction in hemoglobin A1c in the intervention group was comparable with other studies.^[35,36] Reductions in hemoglobin A1c, was mainly as a result of behavior change in the intervention group and the average of blood glucose levels in patients during past 6 to 8 weeks had been shown that hemoglobin A1c was closer to normal and in the long-term risk of complications was reduced to.^[36] Exercise has a major role in glucose metabolism and on the other hand

blood glucose self monitoring of the patients which gives the possibility to continuously be aware of their blood sugar and measures to reduce it or fix it at acceptable level including measures to reduce the consumption of carbohydrates daily. Accordingly, the relationship between reduced hemoglobin A1c and increased personal control of blood sugar was seen. Also because after interventional education one of the major barriers to behavior change in diabetic patient was self monitoring of blood glucose.^[37]

Despite training and advice given, still a significant proportion of patients in the intervention group did not attempt to self control their blood glucose accordingly, the major obstacles that existed in this case which was previously mentioned. Encouragement and support measures should be given to patients who are not able to provide a home blood glucose meter. As was mentioned that sports play an important role in reducing hemoglobinA1c, therefore, exercises appropriate to the age and physical condition of patients with diabetes and encouraging them to do the exercises regularly are recommended. Although, there is doubt about the relationship between training and metabolic control in diabetic patients in some cases, but some researchers have reported educating patients have positive effects in reducing hemoglobinA1c. ^[36-38] Maintaining low levels of hemoglobinA1c will prevent complications of diabetes.

It has been reported that the average hemoglobinA1c equal to 7.2. The results showed 76% in retinopathy, 60% in neuropathy, 50% in kidney disease and 35% reductions, in cardiovascular disease respectively.^[29,30,39] Hemoglobin A1c is a simple blood test that can be taken at the time of testing at any time of day without regard to meals or blood glucose.^[40]

The limitations of this study can be used to determine the cases and controls from specified enter and confine the control group of subjects and training sessions (morally) and record the behavior of people based on their own report. To compensate this limitation, after end of this project control group were give entraining CDs, so that they are not to be deprived of educational materials. Other limitations of this study include lack of timely cooperation of patients to participate in classes and also timely referring to conducted experiments can be mentioned. Giving gifts to participants that this problem was partly solved.

However, the study provided basic information which is of important to health policy workers.

CONCLUSION

The findings of this study showed that using this method (participatory and educational CD) can promote effectively training the patients on awareness, attitude changes and self care behaviors.

Considering that education is a major component of health care, more attention is needed in the design and planning

of cooperative education in the country, and interactive behavior change for health and health issues are suggested. The results of this study showed that training based on participation and learner's interaction, using a CD includes learners' attitudes and beliefs. In order to promote diabetes self care behaviors can be useful. Perhaps it could be based on needs assessment, learning content with collaborative and educational CDs used in the training process. So, it is suggested, offering training programs can be designed in accordance with the characteristics of the social and cultural center of the region, effective educational intervention using behavior patterns to reduce complication slate morbidity and mortality in diabetic patients is suggested. Future studies should be conducted.

ACKNOWLEDGEMENT

I have thanked all participants in this project respected hospital management of Hazrat Ali Asghar (AS) and diabetes clinic personnel who have contributed their sincere cooperation during execution of this project.

This project is part of the first author's PhD thesis at Terabit Modares University and also the Research Project of Zahedan University of Medical Sciences Research fund of this project has been paid by these two centers.

There is no conflict of interest in connection with the submitted manuscripts.

REFERENCES

- Butt J. Media Backgrounder Diabetes in the developing world 2010. <http://www.world-diabetes-foundation.org>. [Last accessed 2011 May 02].
- Farshchi A, Esteghamati A, Sari AA, Kebriaeezadeh A, Abdollahi M, Dorkoosh FA, Khamseh ME, Aghili R, Keshtkar A, Ebadi M The cost of diabetes chronic complications among Iranian people with type 2 diabetes mellitus. *J Diabetes Metab Disord*. 2014; 13:42.
- Show JE, Sicree RA, Zimmer PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract* 2010; 87:4-14.
- Moradi S, Kerman SR, Rohani F, Salari F. Association between diabetes complications and leukocyte counts in Iranian patients. *J Inflamm Res* 2012; 5:7-11.
- Marshal SM, Flybjerg A. Prevention and early detection of vascular complications of diabetes. *BMJ* 2006; 33:475-80.
- World Health Organization and International Diabetes Federation. Diabetes action now: An initiative of World Health Organization International Diabetes Federation. Available from: <http://www.who.int/entity/diabetes/actionnow/en/consultation>. [Last accessed on 2012 May 02].
- Funnell MM, Brown TL, Childs BP, Haas LB, Hoseney GM, Jensen B, *et al.* National standards for diabetes self-care management education. *Diabetes Care* 2008;13 Supp11:97-104.
- Gagliardino JJ1, Etchegoyen G. A model educational program for people with type 2 diabetes: A cooperative Latin American implementation study. *Diabetes Care* 2001;24:1001-7.
- Shayeghian Z, Aguilar-Vafaie ME, Ali Besharat M, Amiri P, Parvin M, Roohi Gillani K, Hassanabadi H. Self-care activities and glycated haemoglobin in Iranian patients with type 2 diabetes: Can coping styles and social support have a buffering role? *Psychol Health*. 2014;8:1-20.
- Simmons D, Lillis S, Swan J, Haar J. Discordance in perceptions of barriers to diabetes care between patients and primary care and secondary care. *Diabetes Care* 2007;30:490-5.
- Zareban I, Niknami Sh, Hidarnia A, Rakhshani F, Karimy M, Kuhpayehzadeh J, Baradaran H. Predictors of self-care behavior and its effective factors among women's with type 2 diabetes patients in Zahedan via Health Belief model. *J Health Syst Res* 2014; Health Education supplement:1797-805.
- American Diabetes Association (ADA). Standard of medical care in diabetes. *V. Diabetes care*. *Diabetes Care* 2008;31:16-24.
- Tofighi S, Ahmad Kiadaliri A, Sadeghifar J, Raadabadi M, Mamikhani J. Health-Related Quality of Life among Patients with Coronary Artery Disease: A Post-Treatment Follow-Up Study in Iran. *Cardiol Res Pract* 2012. 2012;12:973-4.
- Jafari P, Forouzandeh E, Bagheri Z, Karamizadeh Z, Shalileh K. Health related quality of life of Iranian children with type 1 diabetes: Reliability and validity of the Persian version of the PedsQL™ Generic Core Scales and Diabetes Module. *Health Qual Life Outcomes* 2011;12:104.
- Painter JE, Borba CP, Hynes M, Mays D, Glanz K. The use of theory in health behavior research from 2000 to 2005: A systematic review. *Ann Behav Med*. 2008; 35:358-62.
- Rubin R. Differential effect of diabetes education on self regulation and life stage behaviors. *Diabetes Care* 1998;14:335-8.
- Heisler M, Smith DM, Hayward RA, Krein SL, Kerr EA. How well do patients assessments of their diabetes self management correlate with actual glycemic control and receipt of recommended diabetes services? *Diabetes Care* 2003;26:738-43.
- Khan LA, Khan SA. Level of knowledge and self-care in diabetes in a community hospital in Najran. *Ann Saudi Med*. 2000; 20:300-1.
- Courtenay M, Stenner K, Carey N. The views of patients with diabetes about nurse prescribing. *Diabet Med* 2010; 27:1049-54.
- Brown SA, Blozis SA, Kouzekanani K, Garcia AA, Winchell M, Hanis CL. Dosage effects of diabetes self-management education for Mexican Americans: The starr county border health initiative. *Diabetes Care* 2005;28:527-32.
- Tan AS, Yong LS, Wan S, Wong ML. Patient education in the management of diabetes mellitus. *Singapore Med J* 1997; 38:156-60.
- Norris SJ, Lau J, Smith SJ, Schmid CH, Engelgau MM. Self-management for adults with type 2 Diabetes: A meta-analysis of the effect on glycemic control. *Diabetes Care* 2002;25:1159-71.
- Whittemore R. Strategies to facilitate lifestyle change associated with diabetes mellitus. *J Nurs Scholarsh* 2000;32:225-32.
- Basa RP, McLeod B. Evaluation of a diabetes specialty center: Structure, process and outcome. *Patient Educ Couns* 1995;25:23-9.
- Sharifirad G, Entezari MH, Kamran A, Azadbakht L. The effectiveness of nutritional education on the knowledge of diabetic patients using the health belief model. *J Res Med Sci* 2009;14:1-6.
- Baghianimoghadam MH, Hadavandkhani M, Mohammadi M, Fallahzade H, Baghianimoghadam B. Current education versus peer-education on walking in type 2 diabetic patients based on Health Belief Model: A randomized control trial study. *Rom J Intern Med* 2012; 50:165-72.
- Campbell HM, Khan N, Cone C, Raisch DW. Relationship between diet, exercise habits, and health status among patients with diabetes. *Res Social Adm Pharm*. 2011;7:151-61.
- Choudhury SD, Das SK, Hazra A. Survey of knowledge-attitude-practice concerning insulin use in adult diabetic patients in eastern India. *Indian J Pharmacol* 2014;46:425-9.
- Aghamolaei T, Eftekhari H, Mohammad K, Nakhjavani M, Shojaeizadeh D, Ghofranipour F, *et al.* Effects of health education program on behavior, HbA1C and health-related quality of Life in diabetic patients. Available from: <http://journals.tums.ac.ir/>. [Last accessed on 2012 Sep 04].
- Baradaran HR, Shams-Hosseini N, Noori-Hekmat S, Tehrani-Banihashemi A, Khamseh ME. Effectiveness of diabetes educational interventions in Iran: A systematic review. *Diabetes Technol Ther* 2010;12:317-31.
- Sharifirad G, Najimi A, Hassanzadeh A, Azadbakht L. Does nutritional

- education improve the risk factors for cardiovascular diseases among elderly patients with type 2 diabetes? A randomized controlled trial based on an educational model. *J Diabetes*. 2013;5:157-62.
32. Bayat F, Shojaeezadeh D, Baikpour M, Heshmat R, Baikpour M, Hosseini M. The effects of education based on extended health belief model in type 2 diabetic patients: A randomized controlled trial. *J Diabetes Metab Disord*. 2013; 28:45.
 33. Kashfi SM, Khani Jeihooni A, Rezaianzadeh A, Amini Sh. The effect of health belief model educational program and jogging on control of sugar in type 2 diabetic patients. *Iran Red Crescent Med J* 2012; 14:442-6.
 34. American diabetes Association (ADA). Standard of Medical Care for patient with diabetes Mellitus. *Diabetes Care* 2002; 25:533-49.
 35. Hee-Sung K. Impact of Web –based nurse’s education on glycosylated hemoglobin in type 2. *J Clin Nurs* 2007; 16:1361-6.
 36. Diabetes Prevention Program Research Group Within- trial cost-effectiveness of life style intervention or metformin for the primary prevention of type 2 diabetes. *Diabetes Care* 2003;26:2518-23.
 37. Harvey JN, Lawson VL. The importance of health belief models in determining self-care behaviour in diabetes. *Diabet Med* 2009 Jan; 26:5-13.
 38. Montazeri A, Yavari P. Association between Health-Related Quality of Life and Glycemic Control in Type 2 Diabetics. *Iran J Endocrinol Metab* 2012; 14:318-24.
 39. Mohamed H, Al-Lenjawi B, Amuna P, Zotor F, Elmahdi H. Culturally sensitive patient-centred educational programme for self-management of type 2 diabetes: A randomized controlled trial. *Prim Care Diabetes*. 2013;7:199-206.
 40. Tankova T, Dakovska G, Koev D. Education of diabetic patients – A one year experience. *Patient Educ Couns* 2001;43:139-45.

Source of Support: Nil, **Conflict of Interest:** None declared