Journal of Endocrinology, Metabolism and Diabetes of South Africa 2023; 28(3):105–110
https://doi.org/10.1080/16089677.2023.2241767

JEMDSA
ISSN 1608-9677 EISSN 2220-1009

RESEARCH ARTICLE

Effect of an educational intervention based on the Theory of Planned Behaviour in type 2 diabetic patients at a foot and eye care practice

B Pezeshki[1], S Orangi[2], SM Kashfi[3], P Afzali Harsini[4], F Mohammadkhah[5] and A Khani Jeihooni[6*]

[1]*Department of Internal Medicine, School of Medicine, Fasa University of Medical Sciences, Fasa, Iran*
[2]*Department of Public Health, School of Health, Fasa University of Medical Sciences, Fasa, Iran*
[3]*Department of Public Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran*
[4]*Department of Public Health, School of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[5]*Department of Public Health, Ramsar School of Nursing, Babol University of Medical Sciences, Babol, Iran*
[6]*Nutrition Research Center, Department of Public Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran*
Corresponding author, email: Khani_1512@yahoo.com

Background: Eye and foot problems are two of the most common consequences of diabetes. The goal of this study was to investigate the impact of an educational programme based on the Theory of Planned Behaviour (TPB) on foot and eye care among patients with type 2 diabetes mellitus in Fasa City, Fars Province, Iran.
Methods: A total of 100 individuals with non-insulin-dependent diabetes mellitus (Type II) who met the study's inclusion criteria were included. The participants were randomly assigned to one of two groups (intervention = 50, control = 50). The questionnaires were completed by all groups and included demographic information, TPB constructs, foot and eye care, and patients' HbA1c levels. Questionnaires were completed prior to, immediately following, and three months after the intervention by members of the experimental and control groups. During the intervention period, the experimental group attended 10 instructive sessions. SPSS 22 software was used to analyse the data. Paired t-tests, independent t-tests, chi-square, and RMA (Repeated Measurement ANOVA) were all used ($p < 0.05$).
Results: Knowledge and all TPB components were significantly increased in the experimental group compared with the control group after intervention. In addition, foot and eye care practice and HbA1c level improved significantly among the experimental group compared with the control group ($p < 0.001$).
Conclusion: Applying the TPB is quite helpful in designing an educational programme for diabetic people to control their blood sugar and improve behavioural foot and eye care. Aside from such programmes, follow-up education on regulating and monitoring is strongly advised.

Keywords: eye care, foot care, knowledge, Theory of Planned Behavior, type 2 diabetic patients

Background

Diabetes is one of the most prevalent chronic diseases on a global scale.[1] Due to the expanding number of affected individuals and the disease's severity, these individuals should seek immediate medical assistance.[2] Lack of precise blood glucose monitoring has been identified as a major issue for diabetics.[3,4] According to the World Health Organization (WHO), diabetes affects over 346 million people globally. Without intervention, this figure is anticipated to more than double by 2030.[5] By 2030, it is anticipated that 9.2 million Iranians will have diabetes.[6] Diabetes patients are at an increased risk of developing acute and fatal complications (diabetic retinopathy, peripheral neuropathy, myocardial infarction, peripheral vascular disease, end-stage renal disease, and diabetes-related foot problems and amputation) due to poor blood sugar control.[7] In the absence of therapy, diabetic foot is one of the most serious and debilitating complications of diabetes, resulting in infection, soft-tissue infection or necrosis, and amputation.[8] Jordan believes that with attentive care, 80–85% of diabetic foot amputations can be avoided. Optimal diabetic foot management entails doing daily self-foot inspections, frequently washing and drying feet, avoiding walking barefoot, using orthopaedic shoes, clipping toenails straight across, avoiding manipulation of calluses and corns, and consulting a doctor on a regular basis.[9]

Diabetic retinopathy is another condition that can occur as a result of diabetes. Diabetes can gradually damage the capillaries (small blood vessels) of the retina by altering the veins at artery–vein junctions. These blood arteries may become weaker and bulge, obstructing blood flow, which may be minor and go undiagnosed for extended periods of time.[10] According to studies, diabetes patients have a 25-fold increased risk of blindness compared with non-diabetics.[11] Diabetes, namely diabetic retinopathy, is the main cause of new incidents of blindness in Americans aged 20–74 years.[12] Blood glucose level, hypertension, triglyceride and cholesterol levels, sex, type of diabetes, duration of disease, and age are all major risk factors for diabetic retinopathy.[13] As a result, researchers should focus their efforts on diabetes and its consequences as a global public health priority.

Due to the close relationship between the majority of health problems and human behaviour, behavioural theories and patterns can be utilised to understand better how to avoid and control health problems (including diabetes management and reducing its complications). Indeed, theories can provide answers to some concerns, such as why people behave poorly or what individuals must do to improve their conduct.[14] The Theory of Planned Behaviour (TPB) is one of the most influential and well-supported social psychological theories for forecasting human behaviour. It can be used to evaluate individuals'

subjective norms, values, and attitudes with an emphasis on behaviour prediction dimensions. According to this idea, the most critical determinant of an individual's conduct is behavioural intent, which is impacted by three factors: attitude, subjective norm, and sense of behavioural control.[15] Various studies have pointed to the effectiveness of TPB in explaining, predicting, and intervening in the self-care behaviours of diabetic patients.[16–21] Similarly, Chellan *et al*. noted that the patients in their study lacked awareness regarding proper foot care methods.[22] According to Ayele *et al*., education has a substantial effect on the self-care actions of people with diabetes.[23] Given the importance of promoting self-care activities in diabetic patients and the need for educational interventions in foot and eye care based on health education and health promotion models, the purpose of this study was to determine the effect of an educational intervention based on planned behaviour theory on foot and eye care practices in type 2 diabetic patients referred to Fasa diabetes clinic in Iran in 2019.

Methods

This quasi-experimental intervention study was conducted on 100 type 2 diabetes patients referred to the Fasa Shariati Hospital's diabetic clinic in Iran in 2019. Simple random sampling was used to choose samples based on the inclusion criteria (intervention = 50, control = 50).

The estimation of the sample size was calculated based on similar studies[16,17] and by considering the test power of 80%, the confidence coefficient of 95%, the accuracy of 0.05, and the sample loss of 10%, 50 people in each group.

$$n = \frac{s^{\text{Symbol}}\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^{\text{Symbol}}}{d^{\text{Symbol}}}$$

To enrol participants, we first validated referred patients' medical records against the inclusion criteria and created a sample list; subsequently, participants were randomly picked using random number generation. The following criteria were used to determine inclusion: the ability to read and write, a diagnosis of diabetes for at least six months, a minimum age of 30, the absence of diabetic foot ulcers confirmed by the clinic's physician, and the absence of uncontrolled underlying disease, such as hypertension or psychiatric disorders. Patients who refused to participate or were unable to attend a minimum of three training sessions were excluded from the trial. The study enrolled a total of 200 type 2 diabetic patients who met the inclusion criteria. The remaining 170 were referred to a clinic's expert for eye and foot assessments. Thirty individuals opted out of the trial and 40 participants were omitted from the trial due to issues with their eyes and feet. Finally, 100 individuals were randomly assigned to one of two groups: intervention or control; each group contained 50 people. It should be emphasised that this study was conducted with the approval of the Fasa University of Medical Sciences' research council and ethical committee (Ethical code: IR.FUMS.REC.1396.138). Additionally, participants were informed of their position in the study and the importance of maintaining the confidentiality of their data before providing signed consent for inclusion.

The data collection instrument was a well-validated questionnaire that had been utilised in earlier investigations.[16,17,24] The questionnaire was divided into three sections: the first section collected demographic data (age, gender, marital status, educational level, type of medical treatment, family history of diabetes, history of smoking, history of other non-diabetes diseases, and duration of diabetes by year); and the second section assessed participants' knowledge of foot and eye care practices (20 items). The second section included dimensions from the TPB (attitude = 19 items) (e.g. "all patients with diabetes are always at risk of foot ulcer and lower extremity amputation" or "I am able to prevent blindness by visiting an ophthalmologist on a regular basis"), subjective norm = 7 items (e.g. "My physician or nurse believes that I should perform daily foot and eye care practices"), and perceived behavioural control = 7 items (e.g. "It is difficult for me to do foot care activities on a daily basis". The third section assessed care practices via four questions (e.g. "How many times in the last seven days did you wash your feet?") and eye care via five questions (e.g. "Have you seen an ophthalmologist in the recent six months?"). The questionnaire items were developed using Ajzen and Fishbein's TPB,[25,26] and each section was rated separately using a five-point Likert scale ranging from "I completely agree"[5] to "I completely disagree".[1]

In terms of knowledge evaluation, a score of one was assigned for each correct response to each question, and a score of zero was assigned for the absence of an answer or an incorrect response. Foot self-care was assessed using the Toobert *et al*.[27] Summary of Diabetes Self-Care Activities–Revised, which included four questions on a scale of 0–7 based on relevant activities in the preceding seven days and was quantified by asking questions such as "How many times have you seen the inside of your shoes in the preceding seven days?" The results were expressed as a percentage. Cronbach's alpha was calculated for each portion of the questionnaire to determine its reliability. Cronbach's alpha values were 0.71, 0.77, 0.86, 0.71, 0.87, 0.84, and 0.74 for knowledge, attitude, subjective norms, perceived behavioural control, behavioural intention, foot care, and eye care surveys, respectively. The gathered data indicated that the study questionnaires had an acceptable level of reliability greater than 0.7. Both groups completed the questionnaire, and participants were directed to the unit lab (Fatemiyeh Clinic) for HbA1c testing prior to and during the intervention. This intervention was based on TPB constructs.[17] The intervention group then received an educational intervention that included a lecture, group discussion, demonstration and practice of proper foot care practices, as well as question-and-answer sessions over the course of 10 training sessions, each lasting 55 minutes. These sessions were hosted at the Diabetes Centre Hall and included instructive videos, graphics, and PowerPoint presentations. Additionally, a meeting was organised in the presence of the Diabetes Centre's physician and staff, as well as a family member, to explain the subjective standards. The objective of these seminars was to convey information on diabetes, its influence on the eyes and feet, environmental neuropathy, damage to large and small capillaries, various ocular problems, and the impact of correct food and medication use. Additionally, patients received information and instructions on how to prevent ocular complications and foot ulcers, the importance of physical activity in controlling blood sugar levels, daily foot care, the importance of wearing certain types of shoes, the importance of washing and drying feet, and the importance of routine ophthalmologist visits. A learning leaflet was distributed to the intervention group. A telegram channel was established to share information and send weekly messages to patients. Additionally, a monthly follow-up meeting was arranged for care and discussion. Following

that, all subjects in both the intervention and control groups completed the questionnaire immediately. Three months after the intervention, individuals in both groups completed a questionnaire and were referred for HbA1c testing. The results were then documented. SPSS 22 software (IBM Corp, Armonk, NY, USA) was used to analyse the data. Paired t-tests, independent t-tests, chi-square, and RMA were all used.

Results

The mean age of the patients in the intervention group was 47.25 ± 7.14 years, and in the control group, it was 7.20 ± 47.44 years ($p = 0.176$). The mean diabetes duration in the intervention group was 8.55 ± 4.45 years, and for the control group, it was 4.26 ± 8.94 years ($p = 0.124$), showing no significant difference between the two groups. A chi-square test showed that there was no significant difference between the two groups in terms of sex ($p = 0.156$), marital status ($p = 0.452$), educational level ($p = 0.231$), type of medical treatment ($p = 0.155$), history of smoking ($p = 0.180$), history of non-diabetes disease ($p = 0.367$), and family history of diabetes ($p = 0.28$) (Table 1). According to the results, there was no significant difference between the two groups before the intervention in terms of knowledge ($p = 0.139$), attitude ($p = 0.195$), subjective norms ($p = 0.25$), perceived behavioural control ($p = 0.162$), behavioural intention ($p = 0.246$), foot care ($p = 0.170$), and eye care practice ($p = 0.183$). However, there was a significant increase in scores in each of the intervention group constructs compared with the control group immediately and three months after the intervention ($p < 0.001$). No significant change was observed in the control group (Table 2). Based on the results of the paired t-test in the intervention group, the mean value of HbA1c was found to decrease three months after the intervention ($p < 0.001$), while there was no significant difference between two groups in the mean value of HbA1c before the intervention and three months following the educational intervention ($p < 0.09$) (Table 3).

Discussion

The purpose of this study was to determine the effect of an educational intervention based on the TPB on foot and eye care practice in type 2 diabetic patients in Fasa, Iran. According to the results, a significant increase was observed in the mean score of the patients' knowledge in the intervention group compared with the control group immediately after the intervention and three months later, showing the effect of an educational intervention in increasing the knowledge level of patients and their ability to continue to perform the activities. In addition, it was shown that presenting educational content through film, group discussions to share the information, and a booklet improved the knowledge level of subjects in the intervention group. In the studies by Kashfi *et al.*,[28] Sharifirad *et al.*,[29,30] Pal *et al.*,[31] Khani Jeihooni *et al.*,[32] Chubbs,[33] and Hazavehei *et al.*,[34] educational interventions raised the knowledge level of diabetic patients.

The results of this study indicated that the participants had a poor attitude towards eye and foot care practices before the intervention, but a significant increase was observed immediately and three months following the intervention, which is consistent with the studies of Maleki *et al.*, Raman *et al.*, Mirzaei-Alavijeh *et al.*, and Poore and Hosseini Nodbe.[21,35–37] In our study, TPB-based intervention and use of educational slides related to ocular and foot complications, as well as group discussion and question-and-answer techniques, improved patient attitudes in the intervention group.

The mean value for subjective norms increased in the intervention group following the educational intervention, which is consistent with the studies of Zeidi *et al.* and Sabouri *et al.*[38,39]

This can be attributed to holding an educational session for a family member, physician, and staff in the Diabetes Centre as well as the engagement of an ophthalmologist. Similarly, a study by Baghianimoghadam *et al.* showed that diabetic patients are greatly affected by physicians and health providers for the management and treatment of their illness, i.e. those other than the family and people without specialised knowledge.[40]

The findings of our study also showed that the mean score of the perceived behavioural control construct was significantly

Table 1: Frequency distribution of intervention and control group according to demographic characteristics

		Intervention group		Control group		
Variable		**No.**	**%**	**No.**	**%**	***p*-value**
Sex	Female	28	56	26	52	$p = 0.156$
	Male	22	44	24	48	
Marital status	Married	6	12	5	10	$p = 0.452$
	Single	44	88	45	90	
Educational level	Elementary school	6	12	5	10	$p = 0.231$
	Guidance school	10	20	12	24	
	High school	18	36	20	40	
	Academic Degree	16	32	13	26	
Type of medical treatment	Use of antidiabetic medications	41	82	43	86	$p = 0.155$
	Insulin	9	18	7	14	
History of smoking	Yes	12	24	10	20	$p = 0.180$
	No	38	76	40	80	
History of non-diabetic disease	Yes	16	32	18	36	$p = 0.367$
	No	34	68	32	64	
Family history of diabetes	Yes	20	40	17	34	$p = 0.128$
	No	30	60	33	66	

Table 2: Comparison of the mean score for knowledge, attitude, subjective norms, perceived behavioural control, behavioural intent, and foot and eye care practice in the intervention and control groups before and immediately after intervention, and three months after the intervention

Variable	Group	Before intervention M ± SD	Immediately after intervention M ± SD	Three months after intervention M ± SD	*p*-value test RMA
Knowledge	Intervention	83 ± 36	14 ± 31	14 ± 31	$p < 0.001$
	Control	67 ± 13	80 ± 95	80 ± 95	$p = 0.137$
	p-value	0.139	$p < 0.001$	$p < 0.001$	
Attitude	Intervention	26 ± 58	57 ± 38	57 ± 38	$p < 0.001$
	Control	88 ± 11	100 ± 91	100 ± 91	$p = 0.180$
	p-value	0.195	$p < 0.001$	$p < 0.001$	
Subjective norms	Intervention	29 ± 25	18 ± 39	18 ± 39	$p < 0.001$
	Control	82 ± 22	11 ± 2	11 ± 2	$p = 0.112$
	p-value	250/0	$p < 0/001$	$p < 0/001$	
Perceived behavioural control	Intervention	23 ± 56	43 ± 77	434 ± 77	$p < 0.001$
	Control	19 ± 98	66 ± 9	66 ± 9	$p = 0.286$
	p-value	0.162	$p < 0.001$	$p < 0.001$	
Behavioural intent	Intervention	2 ± 5	4 ± 24	4 ± 24	$p < 0.001$
	Control	2 ± 11	2 ± 15	2 ± 15	$p = 0.259$
	p-value	0.246	$p < 0.001$	$p < 0.001$	
Foot care practice	Intervention	1 ± 1	29 ± 1	29 ± 1	$p < 0.001$
	Control	1 ± 1	1 ± 1	1 ± 1	$p = 0.288$
	p-value	0.170	$p < 0.001$	$p < 0.001$	
Eye care practice	Intervention	1 ± 1	29 ± 1	29 ± 1	$p < 0.001$
	Control	1 ± 1	1 ± 1	1 ± 1	$p = 0.288$
	p-value	0.183	$p < 0.001$	$p < 0.001$	

*Repeated measurement.

Table 3: Comparison of mean HbA1c values in patients in the intervention and control groups before and three months after the intervention

Variable	Group	Before intervention	Three months after intervention	Paired t-test
HbA1c	Intervention	69 ± 85	53 ± 36	$p < 0.001$
	Control	71 ± 79	69 ± 73	0.09
	Independent t-test	0.460	$p < 0.001$	

increased immediately and three months following the educational intervention in the intervention group. These results can be attributed to the use of TPB-based interventions, including training through educational videos and slides, providing foot care education and the necessary instructions for managing blood sugar level and eye care, periodic eye examinations by researchers, and establishing communication among the type 2 diabetic patients to facilitate caring practices as well as creating a telegram group for sharing information and sending educational and motivational messages. According to the results of the studies by Darker *et al.*,[41] Poore and Hosseini Nodbe,[37] and Dydarlu,[42] TPB-based intervention gave rise to an increase in perceived behavioural control score after intervention.

Although the scores at follow-up showed a significant increase in behavioural intention immediately and three months after educational intervention. In other studies by Poore and Hosseini Nodbe[37] and Maleki *et al.*,[21] TPB-based intervention has increased the behavioural intention of the subjects under study. It seems that promoting foot and eye care in diabetic patients under study, acquiring sufficient and appropriate knowledge along with a positive attitude towards preventable eye complications and diabetic foot injuries in diabetic patients led to the improvement of behavioural intention in the intervention group.

Although the scores at follow-up showed a significant increase in self-care behaviour immediately and three months after educational intervention, which is consistent with the studies of White *et al.*, Beiranvand *et al.*, Dydarlu, Yamaguchi, and Naderimagham *et al.*[18,23,42–45] Also in the current study, the average HbA1c level was found to decrease after 3 months, which is consistent with the studies of Sharifirad *et al.*, Hazavehei *et al.*, Naderimagham *et al.*, Shahbaz *et al.*, Afshari *et al.*, Salinero-Fort *et al.*, Burnett, Gallegos *et al.*, Shahbodaghi and Bohrani, Naderimagham *et al.*, and Elabbassy[29,34,45,46,47–53] According to the results of the present study, the use of the TPB can play an effective and beneficial role in the eye and foot care practice of diabetic patients. The major limitation of this study was the self-orientation of foot and eye care practice in diabetic patients, which made it impossible for the researcher to examine some behaviours objectively. However, this study makes a major contribution to research on diabetics by examining an HbA_1c indicator in patients for controlling blood glucose level and use of a community-based study.

Conclusion

The results of the present study support the idea that the use of an educational intervention based on the TPB regarding eye and foot care practice in diabetic patients not only improves the constructs of this theory but also enhances the performance of foot and eye care in patients and reduces the level of HbA1c

in patients with type 2 diabetes. In addition, it plays a significant role in reducing the complications of this disease and its mortality rate. Due to the lack of a national programme for the prevention and control of diabetes in Iran, a key policy priority should therefore be to plan for the long-term use of educational interventions based on the TPB to provide appropriate information for the public concerning diabetes and its complications through staff at health centres as well as mass media such as TV and radio. In addition, it is essential for diabetics to receive continuous foot and eye care training and regular examinations.

Acknowledgements

– This study is part of an MD thesis approved by the Fasa University of Medical Sciences. The authors' warm thanks go to the Research and Technology Department of Fasa University of Medical Sciences, as well as the diabetic patients of Fasa City for their participation in the study.

Funding – Research reported in this article was jointly supported by Fasa University of Medical Sciences. The funder approved the initial research proposal, cooperation with health centres, and played no further role in the design of the study or collection, analysis, and interpretation of the data.

Abbreviations – TPB: Theory of Planned Behaviour; RMA: Repeated Measurement ANOVA.

Declarations

Ethical approval and consent to participate – Ethical approval was obtained from the Human Research Ethics Committee at the Fasa University of Medical Sciences. All study participants provided written informed consent. Permission was also obtained to record all interviews digitally. Informed consent was obtained from legally authorised representatives for study participation for illiterate participants. Confidentiality and anonymity were ensured. The ethics committee approved the procedure for verbal consent because the study is observational and respected the code of ethics as stated in the Declaration of Helsinki.

Consent for publication – None.

Availability of data and materials – The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing interests – Not applicable.

Disclosure statement – No potential conflict of interest was reported by the authors.

Funding – Research reported in this article was jointly supported by Fasa University of Medical Sciences. The funder approved the initial research proposal, cooperation with health centres, and played no further role in the design of the study or collection, analysis, and interpretation of the data.

Authors' contributions – BP, SO, SMK, PAH, and AKhJ assisted in the conceptualisation and design of the study, oversaw data collection, conducted data analysis, and drafted the manuscript. AKhJ and SO conceptualised and designed the study, assisted in data analysis, and reviewed the manuscript. BP, SO, SMK, PAH, and AKhJ assisted in study conceptualisation and reviewed the manuscript. All authors read and approved the final manuscript.

References

1. Mardani Hamuleh M, Piri AR. Effects of education based on health belief model on dietary adherence in diabetic patients. *Iranian J Diabetes Lipid Disord*. 2010;9:1–6. https://doi.org/10.1186%2F2251-6581-12-45
2. Zareban I, Niknami S, Hidarnia A, et al. Effective intervention of self-care on glycaemia control in patients with type 2 diabetes. *Iran Red Crescent Med J*. 2014;16:8311. https://doi.org/10.5812/ircmj.8311
3. Guillausseau P. Influence of oral antidiabetic drugs compliance on metabolic control in type 2 diabetes. A survey in general practice. *Diabetes Metab*. 2003;29:79–81. https://doi.org/10.1016/S1262-3636(07)70011-3
4. Chao J, Nau DP, Aikens J, et al. The mediating role of health beliefs in the relationship between depressive symptoms and medication adherence in persons with diabetes. *Res Social Adm Pharm*. 2005;1:508–525. https://doi.org/10.1016/j.sapharm.2005.09.002
5. Mazloomi MahmoodAbad SS, Hajizadeh A, Aalaei M, et al. Status of preventive behaviors in individuals at risk for type 2 diabetes: application of the health belief model. *Iranian J Diabetes Lipid Disord*. 2012;11(6):544–550.
6. World Health Organization. *Prevalence of diabetes in the WHO eastern Mediterranean region*. Geneva: Diabetes Programme the Institute; 2010.
7. Alavi Nia M, Ghotbi M, Mahdavi Hezaveh A, et al. The National Program to Prevent and control type 2 diabetes, implemented in urban areas. Tehran: Sepid Barg; 2012:22–29.
8. Yudovsky D, Nouvong A, Schomacker K, et al. Assessing diabetic foot ulcer development risk with hyperspectral tissue oximetry. *J Biomedical Optics*. 2011;16(2):1–8. https://doi.org/10.1117/1.3535592
9. Jordan ND, Jordan LJ. Foot self-care practices among Filipino American women with type 2 diabetes mellitus. *Diabetes Ther*. 2011;2(1):1–8. https://doi.org/10.1007/s13300-010-0016-2
10. Agha Dost D, Rezaei Degghane A. *Eye nursing (translated)*. Estalre R. 1st ed. Kashan: Morsal Publisher; 2003. p. 292–293.
11. Deputy of Research and Technology. *View of national health*. 2nd ed. Tehran: Tabalvor Publisher; 2003. p. 59.
12. Davidson MB. *Diabetes mellitus diagnosis and treatment*. 4th ed. Philadelphia: Philadelphia Saunders Company; 1998. p. 267–311.
13. Fonseca V, Munshi M, Mandeta L. Diabetic retinopathy. A review for the primary care physician. *South Med J*. 1996;89(9):839–850. https://doi.org/10.1097/00007611-199609000-00001
14. Saffari M, Shojaeizadeh D, Ghofranipour F, et al. *Health education & promotion: theories, models & methods*. Tehran: Sobhan Pub; 2009.
15. Glanz K, Lewis M, Rimer BK. *Health behavior and health education: theory, research and practice*. San Francisco: Jossey-Bass; 2008.
16. Biranvand S, Fayazi S, Asadi zaker M, et al. Evaluation of patients with type II diabetes foot care: theory planned behavior. *J Clin Nur Midwifery*. 2014;2(3):57–66. https://doi.org/10.17795/jjcdc-30622
17. Khani Jeihooni A, Eskandarzadeh N, Dehghan A, et al. Investigation of the performance of foot and Eye care in patients with type II diabetes in Fasa: An application of the theory of planned behavior. *JECH*. 2016;3(3):37–44. https://doi.org/10.21859/jech-03036
18. White KM, Terry DJ, Troup C, et al. An extended theory of planned behavior intervention for older adults with type 2 diabetes and cardiovascular disease. *J Aging Phys Act*. 2012;20(3):281–299. https://doi.org/10.1123/japa.20.3.281
19. Grimshaw J, Presseau J, Tetroe J, et al. Looking inside the black box: results of a theory-based process evaluation exploring the results of a randomized controlled trial of printed educational messages to increase primary care physicians' diabetic retinopathy referrals. *Implement Sci*. 2014;9:86. https://doi.org/10.1186/1748-5908-9-86
20. Ferreira G, Pereira G. Physical activity: The importance of the extended theory of planned behavior, in type 2 diabetes patients. *J Health Psychol*. 2017;22(10):1312–1321. https://doi.org/10.1177/1359105315626787
21. Maleki F, Hosseini Nodeh Z, Rahnavard Z, et al. Effectiveness of training on preventative nutritional behaviors for type-2 diabetes among the female adolescents: examination of theory of planned behavior. *Med J Islam Repub Iran*. 2016;30(4 April):349.
22. Chellan G, Srikumar S, Varma AK, et al. Foot care practice: the key to prevent diabetic foot ulcers in India. *Foot*. 2012;22(4):298–302. https://doi.org/10.1016/j.foot.2012.08.007

23. Ayele K, Tesfa B, Abebe L, et al. Self care behavior among patients with diabetes in Harari, eastern Ethiopia: The health belief model perspective. *PLoS One*. 2012;7(4):1–6. https://doi.org/10.1371/journal.pone.0035515
24. Hazavehei MM, Khani Jyhouni A, Hasanzade A, et al. The effect of educational program based on BASNEF model on diabetic (type II) eyes care in Kazemi's Clinic (Shiraz). *J Endocrinol Metab Shahid Beheshti Univ Med Sci Health Serv*. 2008;10(2):145–154.
25. Francis JJ, Eccles MP, Johnston M, et al. *Constructing questionnaires based on the theory of planned behavior: a manual for health services researchers*. 1st ed. Newcastle, UK: University of Newcastle; 2004.
26. Ajzen I. Constructing a TPB questionnaire: Conceptual and methodological considerations. September 2002 (Rev. January 2006). http://www.people.umass.edu/aizen/contact.html
27. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care*. 2000;23(7):943–950. https://doi.org/10.2337/diacare.23.7.943
28. Kashfi SM, Khani Jeihooni A, Rezaianzadeh A, et al. 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(7):442–446.
29. Sharifirad G, Najimi A, Hassanzadeh A, et al. Application of BASNEF educational model for nutritional education among elderly patients with type 2 diabetes: improving the glycemic control. *J Res Med Sci*. 2011;16:1149–1158.
30. Sharifi Rad GH, Hazavehei MM, Mohebi S, et al. The effect of educational program based on health belief model on foot care in patients with type 2 diabetes. *Iranian J Endocrinol Metab. Univ MediSci Health Ser*. 2007;8(3):231–239.
31. Pal R, Pal S, Barua A, et al. Health education intervention on diabetes in Sikkim. *Indian J Endocrinol Metab*. 2010;14(1):3–7. https://hehp.modares.ac.ir/article-5-7002-en.html
32. Khani Jeihooni A, Kashfi SM, Hazavehei SMM. Effects of the BASNEF model-based educational programs on blood sugar control (type 2 diabetes). *Health Edu Health Promo*. 2013;1(1):49–33.
33. Chubbs DO. Primary care provider adherence to the Canadian diabetes association clinical practice guideline for chronic kidney disease. *DNP Projects*. 2017;112.
34. Hazavehei SM, Khani Jeihooni A, Hasanzadeh A, et al. The effect of educational program based on BASNEF model for eye care in non-insulin dependent diabetic patients. *J Res Health Sci*. 2010;10:81–90. https://pubmed.ncbi.nlm.nih.gov/22911929
35. Raman R, Paul PG, Padmajakumari R, et al. Knowledge and attitude of general practitioners towards diabetic retinopathy practice in south India. *Community Eye Health*. 2006;19:13–14. https://pubmed.ncbi.nlm.nih.gov/17491739
36. Mirzaei-Alavijeh M, Karami-Matin B, van Lieshout S, et al. Appling intervention mapping approach to promoting healthy diet intention among diabetic patients: an efficacy study. *Arvand J Health Med Sci*. 2016;1(4):243–250.
37. Pooreh S, Hosseini Nodbe Z. Impact of education based on Theory of Planned Behavior: An investigation into hypertension-preventive self-care behaviors in Iranian girl adolescent. *Iran J Public Health*. Jun 2015;44(6):839–847.
38. Zeidi IM., Morshedi H., Otaghvar HA. A Theory of Planned Behavior-enhanced intervention to promote health literacy and self-care behaviors of type 2 diabetic patients. *J Prev Med Hyg*. 2020; 61 (4):601–603. https://doi.org/10.15167/2421-4248/jpmh2020.61.4.1504
39. Sabouri M., Shakibazadeh E., Mohebbi B. et al. Effectiveness of an educational intervention using theory of planned behavior on health care empowerment among married reproductive-age women: A randomized controlled trial. *J Educ Health Promot*. 2020:9:293. https://doi.org/10.4103/jehp.jehp_751_20
40. Baghianimoghadam MH. The study of BASNEF model effectiveness in controlling Yazd diabetic patients [dissertation]. Tehran: Tarbiatmodares University; 2001.
41. Darker CD, French DP, Eves FF, et al. An intervention to promote walking amongst the general population based on an 'extended' theory of planned behaviour: a waiting list randomised controlled trial. *Psychol Health*. 2010;25(1):71–88. https://doi.org/10.1080/08870440902893716
42. Dydarlu A. *Effect of educational intervention based on the theory of developed reasoned action to promote of self-management in women with type 2 diabetes*. Tehran: Tehran University of Medical Sciences; 2011.
43. Beiranvand S, Asadizaker M, Fayazi S, et al. Efficacy of an intervention based on the theory of planned behavior on foot care performance in type II diabetic patients. *Jundishapur J Chron Dis Care*. 2016 Jan;5 (1):e30622.
44. Yamaguchi Y. Diabetes education program promotes behavioral intention to employed males with type 2 diabetes. *J Jap Soc Nurs Res*. 2010;33(5):565–574.
45. Naderimagham S, Niknami S, Abolhassani F, et al. Development and psychometric properties of a new social support scale for self-care in middle-aged patients with type II diabetes (S4-MAD). *BMC Public Health*. 2012;12:1035. https://doi.org/10.1186/1471-2458-12-1035
46. Shahbaz A, Hemati Maslak Pak M, Rahimnejad R, et al. Effect of self-care program implementation based on Orem's pattern on behaviors self-care in patients with diabetic foot ulcer. *J Orumia Nursing Midwifery Faculty*. 2017;14(2):108–117. https://unmf.umsu.ac.ir/article-1-2180-en.pdf
47. Afshari M, Tol A, Taghdisi MH, et al. The effect of BASNEF-based blended educational program on diabetes control among type 2 diabetic patients referred to diabetes clinic of Samirom City. *Razi J MedSci*. 2015;22(132):55–62.
48. Salinero-Fort MA, Carrillo-de Santa Pau E, Arrieta-Blanco FJ, et al. Effectiveness of PRECEDE model for health education on changes and level of control of HbA1c, blood pressure, lipids, and body mass index in patients with type 2 diabetes mellitus. *BMC Public Health*. 2011 Apr 28;11:267. https://doi.org/10.1186/1471-2458-11-267
49. Burnett SM. A Nutrition and Diabetes Education Program Improves A1C Knowledge and A1C Blood Levels. Published Master of Science Thesis. Georgia University. 2013. http://athenaeum.libs.uga.edu/bitstream/handle/10724/6883/burnett-sarah
50. Gallegos EC, Ovalle-Berúmen F, Gomez-Meza MV. Metabolic control of adults with type 2 diabetes mellitus through education and counseling. *J Nurs Scholarsh*. 2006;38(4):344–351. https://doi.org/10.1111/j.1547-5069.2006.00125.x
51. Shahbodaghi Z, Borhani F. The effect of empowerment program on hemoglobin A1C in type 2 diabetes patients. *Med Surg Nursing J*. 2012;1(2):23–29. https://doi.org/10.34172%2Fjcs.2021.001
52. Elabbassy AA. The use of high-definition video technology on diabetes management. *J Nurs Educ Pract*. 2015;5(7):109–122. https://doi.org/10.5430/jnep.v5n7p109
53. Askari F, Rabiei S, Rastmanesh R. The effects of nutrition education and diet therapy on glycemic and lipidemic control in Iranian patients with type 2 diabetes. *J Obes Weight Loss Ther*. 2013;3 (5):1–6. https://doi.org/10.4172/2165-7904.1000186

Received: 21-06-2023 Accepted: 24-07-2023