

The Effect of Educational Program Based on BASNEF Model for Eye Care in Non-insulin Dependent Diabetic Patients

Seyyed Mohammad Mehdi Hazavehei (PhD)^{a*}, Ali Khani Jeihooni (MSc)^b, Akbar Hasanzadeh (MSc)^c, Shahrzad Amini (MA)^d

^a Research Center for Health Sciences, Department of Public Health & Health Education, School of Health, Hamadan University of Medical Sciences, Hamadan, Iran

^b Department of Public Health and Nursing, Fasa University of Medical Sciences, Fasa, Iran

^c Department of Epidemiology and Biostatistics, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

^d School of Medicine Fasa University of Medical Sciences, Fasa, Iran

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* Correspondence

Seyyed Mohammad Mehdi Hazavehei (PhD)

Tel: +98 811 8260661

Fax: +98 811 8255301

E-mail 1: hazavehei@umsha.ac.ir

E-mail 2: hazavehei@hlth.mui.ac.ir

ABSTRACT

Background: The purpose of this study was to determine the effects of educational program based on the BASNEF (Belief, Attitude, Subjective Norm, and Enabling Factors) Model on eye care among patients with insulin independent diabetes mellitus in Shiraz City, Fars Province, Iran.

Methods: We enrolled 100 patients with non-insulin independent diabetes mellitus (Type II) fulfilling the inclusion criteria of this experimental study. The participants were randomly divided into two groups, one experimental, and one control group. All groups completed the questionnaires based on the BASNEF Model, a checklist related to patient's practice including patients' HbA1c and FBS levels, the pre-test results of an ophthalmologist's eyes examination and the results of three months follow-up. The experimental group participated in eight educational sessions during the interventional. The data analysis used including chi square-test, *t*-test, and ANOVA.

Results: The knowledge and all BASNEF Model components were significantly increased in the experimental group compared to the control group after intervention. In addition, behavioral eye care, such as physical activities, regular taking medicine, having eye examination, FBS checking, having appropriate diet, HbA1c level, and fasting blood sugar levels improved significantly among the experimental group compared to the control group.

Conclusion: Applying the BASNEF Model is very effective for developing an educational program for diabetic patients, in order to control their blood sugar and enhancing behavioral eye care. Besides such programs, follow up education on controlling and monitoring is highly recommended.

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Introduction

Non-insulin dependent diabetes mellitus (NIDDM) is the most prevalent disease, which results from metabolism or endocrine disorders¹. It is a chronic disease,

which occurs as the result of impairment in glycoside-carbohydrate metabolism². This problem causes change in all body organs and it may result in serious or sometimes dangerous

complications for the patients. Increase of blood sugar alone does not lead to any problem in patients but it progress toward its complications gradually without making any sign³. Despite efforts and various studies have conducted during past years, there is no prophylactic or effective treatment for diabetes, whereas it may create functional, financial, and social problems for patients. The diabetes complications are very different and various, such as ocular complication and changes in blood vessels (the veins and arteries). This condition damages eye retina slowly so that patients may not realize their diseases in the first stages⁴.

Several ocular complications may occur as the result of diabetes including refractive changes, extra ocular muscles paralysis, cataract, glaucoma, and retinopathy⁵. The incidence of blindness among the diabetic patient is 25 times more than other people⁶. Retinopathy is one of the most common causes of blindness worldwide in a way that it is considered as the most significant major leading cause of blindness among adults aged 20 to 74 years in USA⁷. Therefore, eyes care is considered as an important factor for preventing diabetic eye complications. Diabetic patients should improve their knowledge and ability in order to control their blood sugar as well as appropriate self-care management.

In order to prevent diabetic ocular complications, the diabetic patients should follow an appropriate and balance diet program, control their blood sugar, take necessary medicine on a regular basis, have regular exercise, and visit an ophthalmologist regularly⁸. It is generally accepted that patients need instruction and assistance for realizing and understanding their health status, making decision for health cares and changing health behaviors⁹. Today, the focus of comprehensive health care program should be on self-care and education rather than treatment and reliance. In addition, effort should be made in order to enhance the individual's capabilities for improvement, ability, independence, and non-reliance⁹.

Giving health instructions to diabetic patients may help them making effective

decisions on their health; get self-confidence and essential skills to put decisions in to practice¹⁰. The value of health instruction programs is dependent on their effectiveness. On the other hand, such effectiveness is dependent on suitable application of theories and models used in health education program¹¹.

Educational interventions regarding diabetes are aiming at introducing preventive procedures as well as treatment and control of diabetes so that patients will prevent from chronic complications of diabetes such as ocular and renal complications, amputation and many other complication and side effects¹². Therefore, developing health education intervention programs based on Health Belief Model (HBM), Belief Attitude Subjective Norm and Enabling Factors (BASNEF) model, Reason Action theory, Social Support Theory, and PRECEDE Model could potential for diabetic patients¹².

Any of these models have advantage compare to the others, since the components of the BASNEF model not only address the individual ability regarding to the behavioral action but also concentrate on the potential of interpersonal and inability of the person toward the behavior.

The purpose of this study was to determine the effect of using educational intervention based on BASNEF model for increasing diabetic patients' knowledge and improve their insight into diabetic ocular complications and its prophylactic activities by presenting enabling factors such as sufficient information, instruction regarding preventing ocular complications, access to ophthalmologist and his cooperation and getting the patient's family involved in the process and intervention as the subjective norms. In addition, we helped diabetic patients to apply preventive methods for ocular complications and to control their disease.

Materials and Methods

We conducted an experimental study on NIDDM patients aged 40 and 60 years who had diabetes for over 5 years, exposed to danger of

ocular complications, and referred to Nader Kazemi Clinic in Shiraz City, Fars Province, Central Iran were enrolled in this experimental study. Those patients diagnosed with ocular or cardiac complications and also those who were not willing to attend in eyes diagnose checking or they could not participate at educational sessions were excluded from the study. Based on the study criterion, 250 cases of NIDDM who had record at the diabetes center were invited to participate in this study. Two hundred and fifteen patients participated in this experimental study and completed an inform consent. Then, they were examined by an ophthalmologist to rule out any possible retinopathy. During the eyes examination, 68 patients were detected to have ocular complications and therefore were excluded from the study. Thirty-seven patients were excluded from the study due to other reasons and finally the remaining 100 patients were randomly divided into two experimental and control groups (50 patients each). We used even numbers to assign the participants to the experimental group and the odd numbers to assign the participants to the control group.

The instrument for data collecting was a questionnaire established based on the BASNEF model components including demographic specifications (6 Qs), knowledge (11 Qs), beliefs in two parts of attitude toward behavior results (7 Qs) and attitude toward the action (5 Qs), enabling factors (6 Qs), behavior intention (5 Qs), normative beliefs (6 Qs), subjective norms (5 Qs). In addition, we used two checklists. The first one (6 Qs) was about patients' practice regarding to preventive behaviors for ocular complications (such as jogging at least 3 times a week and each time for 20 minutes, regular medicine consumption based on position prescription, visiting ophthalmologist every 3 to 4 month, having an appropriate prescribed diet program, visiting the clinic for measuring blood sugar control and consultation, and participating at educational classes) that were completed on the basis of self-reporting before the program and 3 month follow-up the intervention program.

The second checklist included the results of the patients' HbA1c and fasting blood sugar

(FBS) levels and condition of ocular complications based on the results of ophthalmologist's eyes examination. For evaluating the questionnaire's scientific validity, content validity method was used by panel of scholars and for measuring its reliability, the questionnaire was filled out by 20 diabetes patients (other than those who participated in the study). The reliability of the questionnaire was rechecked after necessary correction made in it. The score of Cronbach alpha for the questionnaire was 84%.

The questionnaires were filled out by the patients and the first checklists were completed by the interviewers. Then patients were introduced to the same laboratory for testing HbA1c and FBS. There after, educational intervention was conducted for experimental group within six educational sessions during the first month using various forms of training including lecture, question and answer, group discussion and practical presentation. Each session took about 55-60 minutes. During these sessions, all necessary information and instructions were provided for patients regarding diabetes disease, how it affects eyes and different ocular complications, the effect of appropriate food program and regular medicine taking on preventing ocular complications, the importance of participating at educational sessions, the importance of physical exercise in controlling blood sugar, and the importance of visiting an ophthalmologist regularly.

The experimental patients' families also participated in one of the educational session. One of the sessions was held on effective subjective norms such as ophthalmologist, specialist in diabetes, nutrition expert etc. The patients in control group received only normal and ordinary observational diabetics' services by the center.

After the educational intervention, the second checklists and the questionnaires were completed for the both intervention and control groups. Two follow-up sessions were held in the next first and second months regarding patients' activities. Three months following the educational intervention, the questionnaires and the checklists were completed again by the two groups. They were examined by

ophthalmologist and were tested for HbA1c and FBS levels. In order to follow the control process, the patients were asked to do check and record their FBS levels themselves in four steps (baseline, and then one, two, and three months after the intervention).

We used various analytic methods for data analysis including chi square-test, *t*-test for independent samples, paired *t*-test, and repeated measures ANOVA using SPSS software version 13

Results

Based on *t*-test for independent samples there was no statistically significant difference between mean scores of age in the experimental and control groups (Mean=54.40, SD=7.52 versus Mean=54.24, SD=6.72 respectively).

Chi-square test showed no significant difference between experimental and control group regarding gender, occupation, and education characteristics (Table 1).

Patients' knowledge was low before intervention. However, mean scores of knowledge of experimental group was much higher than control group ($P < 0.001$) (Table 2)

Table 2 shows that the patients' knowledge was low comparing to the BASNEF components before intervention. paired *t*-test of experimental group showed that mean scores of knowledge increased significantly immediately after intervention and also 3 months following the intervention ($P < 0.001$) compared to the control group. Repeated measures ANOVA (RMA) also confirmed the above findings ($P < 0.001$).

Table1: Demographics characteristics of the participants in experimental and control groups

Variables	Level	Experimental group		Control group	
		Frequency	Percent	Frequency	Percent
Gender	Female	39	78	37	74
	Male	11	22	13	26
Occupation	Employee	6	12	9	18
	Self-employed	2	4	3	6
	Farmer	1	2	2	4
	Housewife	33	66	29	58
	Other	8	16	7	14
Education	Illiterate	14	28	15	30
	Primary school	19	38	18	36
	Secondary school	6	12	6	12
	High school/Diploma	4	8	5	10
	Academic	7	14	6	12

Independent *t*-test indicated that there was no significant difference between the mean scores of the evaluations of behavioral outcomes (EBO), the attitudes towards the behavior (ATB), enabling factors, normative beliefs, and subjective norms among the experimental and control group before the educational intervention ($P > 0.05$), while this difference was statistically significant immediately after the intervention ($P < 0.001$), and 3 months after the educational intervention ($P < 0.001$).

Paired *t*-test in experimental and control group indicated a significant difference between the mean scores of patients' EDO pre-test, post-test, and 3 months after the intervention ($P < 0.001$) (Table 2). RMA test indicated a significant difference between the mean scores of ATB pre and post intervention ($P < 0.001$). Paired *t*-test in experimental group indicated neither significant difference in three months after the educational intervention no between the mean scores of ATB in the control group pre- and post-test, while this difference

became significant three months after educational intervention ($P<0.001$) (Table 2).

RMA test indicated the significance of difference between mean scores of enabling factors in experimental group before and immediately after intervention and three months later ($P<0.001$). There was no significant difference between the mean scores of enabling factors in control group before and immediately after intervention while this

difference was statistically significant three months later ($P<0.001$) (Table 2).

RMA test indicated significant difference between mean scores of the normative beliefs in the experimental group pre and post educational intervention and three months later ($P<0.001$). This test also showed no significant relation between the mentioned data in the control group (Table 2).

Table 2: Comparison between the mean scores of patients' knowledge, BASNEF components, and behaviors based on self-reporting

Variables	Pre-intervention Mean (SD ^a)	Post-intervention Mean (SD ^a)	Three months later Mean (SD ^a)	RMA ^b tests result
Knowledge				
Experimental group	17.27 (11.93)	73.45 (17.79)	84.90 (12.12)	$P<0.001$
Control group	24.90 (13.72)	25.33 (12.04)	25.95 (12.69)	$P= 0.50$
Evaluation of behavioral outcomes				
Experimental group	27.35 (8.58)	77.42 (10.56)	86.71 (7.28)	$P<0.001$
Control group	28.07 (9.35)	29.85 (8.85)	38.14 (10.76)	$P < 0.05$
Attitude Towards the behavior				
Experimental group	34.60 (14.10)	82.00 (8.32)	82.80 (11.30)	$P<0.001$
Control group	38.80 (12.76)	39.70 (12.71)	51.20 (10.07)	$P>0.05$
Enabling Factors				
Experimental group	22.66 (18.38)	77.66 (12.19)	88.16 (6.96)	$P<0.001$
Control group	27.00 (13.73)	28.66 (11.43)	34.66 (13.18)	$P<0.05$
Normative Beliefs				
Experimental group	45.66 (12.54)	72.08 (11.70)	79.16 (9.59)	$P<0.001$
Control group	47.83 (12.03)	25.33 (12.04)	25.95 (12.69)	$P= 0.50$
Subjective Norms				
Experimental group	36.30 (15.21)	60.90 (18.80)	70.50 (15.65)	$P<0.001$
Control group	40.00 (13.13)	47.08 (11.04)	47.76 (11.47)	$P= 0.95$
Intention Towards the behavior				
Experimental group	31.60 (14.01)	85.40 (9.02)	88.60 (7.82)	$P<0.001$
Control group	37.90 (11.47)	42.00 (13.36)	39.40 (10.95)	$P>0.05$
Patients' Behavior				
Experimental group	33.00 (21.42)	78.00 (17.31)	88.00 (10.66)	$P<0.001$
Control group	38.33 (17.57)	38.66 (13.23)	39.66 (12.54)	$P>0.05$

^aSD: Standard deviation

^bRMA: Repeated Measures ANOVA

RMA test indicated significant difference in the mean scores of subjective norms in experimental group, pre and post educational intervention and three months later ($P<0.001$). This test showed no significant difference in

the mentioned data in the control group (Table 2). The mean score of the intention towards the behavior (ITB) for the patients in control group was higher than that of experimental group before the intervention, but, the mean score of

ITB and its changes was higher in experimental group compared to the control group post intervention and 3 months later ($P<0/001$). The result of paired t-test in control group indicated a significant difference between the mean scores of ITB pre and post intervention ($P<0/001$), but there was no significant difference in the three months later results (Table 2).

Independent t-test showed no significant difference in the mean scores of patients' practice in the two groups before the educational intervention, while this difference became significant three months later ($P<0/001$). RMA test indicated the significance of difference between the mean scores of practice in the experimental group pre and post intervention and three months later ($P<0/001$).

This test showed no significant difference in the mentioned data in the control group (Table 2).

Paired t-test in the experimental group indicated that the mean score of HbA1c decreased during the three months following the educational intervention ($P<0.001$). A same test in control group indicated no significant difference in mean scores of HbA1c pre intervention and three months later ($P= 0.08$) (Table 3).

Figure 1 shows that FBS levels have been lower in control group than that of experimental group before the educational intervention, but the FBS levels significantly decreased among the experimental group compared to the control group in 1, 2, and 3 months after the educational intervention.

Table 3: Comparison between mean scores of HbA1c among the intervention and control groups pre-intervention and three month later

HbA1c level	Pre-intervention Mean (SD ^a)	Three months later Mean (SD ^a)	Independent t-tests result
Experimental group	8.65 (1.74)	7.47 (1.58)	$P<0.001$
Control group	8.57 (1.35)	8.51 (1.34)	$P= 0.08$

^aSD: Standard deviation

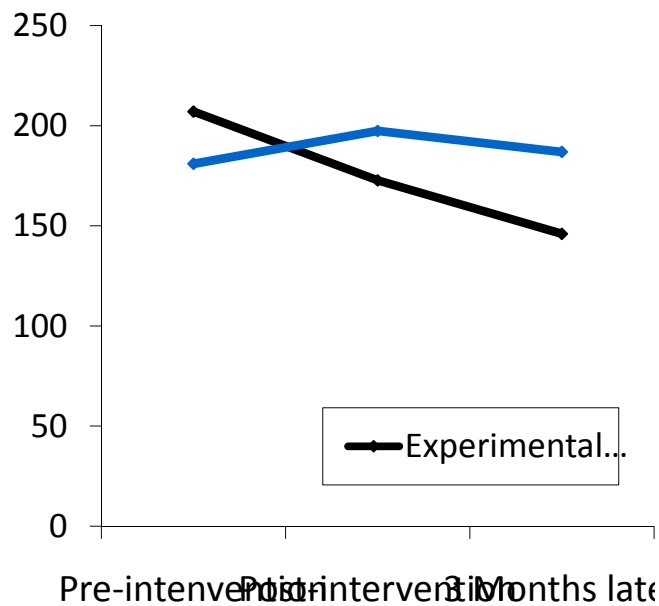


Figure 1: Comparison of fasting blood sugar level between experimental and control groups pre-intervention, post-intervention and three months later

Discussion

We detected 68 diabetic patients with initial ocular problem during ophthalmic examination who were not aware of their problem. This issue indicates that ocular complications in diabetic patients are not evident to the patient in the initial steps. Therefore, retinopathy screening is recommended for all patients.

The low level of awareness of both experimental and control groups before educational intervention indicates the lack of enough information among diabetic patients. The mean score of the awareness of experimental group compared to the control group immediately after educational intervention and three months later indicated the effect of educational intervention on the improvement of patient's knowledge and the robustness of this knowledge. These findings confirm the quality of self-care among diabetic patients, the increase of awareness after educational intervention¹³, the importance of prevention and control program in diabetic patients¹⁴ and the monitoring of diabetics' knowledge¹⁵. Our findings also confirmed the increase of students' awareness based on BASNEF model regarding the social skills after educational intervention compared to no educational intervention¹⁶ and the increase of intra-subject skills before and after educational intervention¹⁷.

The mean scores of EBO immediately after educational intervention and three months later compared to before intervention, increased in both experimental and control groups. However, the mean score of EBO so increased much higher in experimental group than control group. These findings confirmed the effectiveness of intervention based on BASNEF model on the area of belief and continuation, maintenance and promotion of patient's attitude to eye care behaviors. Similar findings were reported the previous case study of diabetic center in Sanandaj City^{18, 19}.

The mean score of patient's ATB regarding eye care immediately after intervention increased in experimental group, but three months later, no significant increase was seen. There was no increase in the mean score of

patients' ATB regarding eye care immediately after intervention in control group. However, the mean score of their ATB increased three months later due to access to ophthalmologist and eye care instructions and information. These findings confirm with Raman's study on the patients' attitude to retinopathy status and its increase after education in India²⁰ and other similar studies^{21, 22}.

Immediately after education and three months later, experimental group had significantly more mean score concerning enabling factors compared to control group indicating the robustness of enabling factors during study. The mean score of enabling factors also increased in control group three months later. It is to be Enabling factors included availability of enough information and instructions concerning eye care, holding educational classes, access to ophthalmologist and family cooperation and support.

Whereas ethically there was no restriction for control group to refer to ophthalmologist, they also had access to information, the score for enabling factors in this group increased three months after intervention. Based on "PERSID" model as enabling factors could have influence on potential and reinforcement factors, this factor may have an effect on awareness, attitude, and behavior of individuals in a way²³. Such a finding was reported by similar studies^{17, 21, 22}.

There was no significant difference between the mean score of subjective norms in the control and experimental groups before educational intervention. However, the mean scores of subjective norms in experimental group increased immediately after intervention and three months later indicating further care of patients by family, specialists of diabetics, and ophthalmologists involved and also the effect of educational intervention.

There was no increase in the mean scores of subjective norms in control group immediately after intervention and three months later. Normative beliefs indicated that the view of in-charge persons for employing methods to prevent blindness is very important for the patient. The mean score of normative beliefs

had a significant increase immediately after intervention and three months later in the experimental group, but it did not increase significantly in the control group.

The significant improvement in the experimental group indicated the effect of educational intervention as well as appropriate involvement of family, in-charge physician, and the ophthalmologist in the educational program. In order to increase the scores of normative beliefs, much time should be spent on educating the individuals and giving explanations to them. In this regard, previous studies showed that teaching effective subjective norms including family, friends, and people of the same age, school in-charges¹⁶, or teachers and family girls²⁴ brings about the increase of participation in the process of behavioral change in the individuals studied in education based on BASNEF model.

Increase of the score of EBO of eyes care behavior and the increase of the patients' willingness to perform behavior happened largely in the experimental group but to a small extent in the control group. Increase of the score of normative belief and subjective norms was observed very much in the experimental group and it was not observed at all in the control group.

These findings were conformed to the previous studies, which were performed on the diabetics' intention to brush their teeth²⁵, nutritional education of the diabetic patients²⁶, retinopathy screening, and improvement of self-management behavior intentions²⁷. In this research, behaviors like jogging; having physical exercise, taking medicine regularly, visiting ophthalmologist on a regular basis, measuring blood sugar monthly, following an appropriate food program, and participating in educational classes were considered as operation. Before educational intervention, no significant difference was observed between the two control and experimental groups about mean scores of eyes care operation. Mean score of operation in experimental group increased immediately after educational intervention and three months later, but no increase was observed in that of in the control group. The operation also increased in the experimental

group due to the high mean score of knowledge, attitude, enabling factors, subjective norms, and patients' intention.

The results indicated that the mean of HbA1c in the patients increased from 8.65 before the intervention to 7.47 three months following the educational intervention, but, there was no significant difference between the mean of HbA1c before intervention and three months following the intervention in the control group. Through proper control of blood sugar, many dangerous diabetic complications could be prevented, in a way that any 1% decrease in HbA1c leads to about 27% decrease in microvascular and 21% decrease of macrovascular diabetic complications²⁸.

A previous study used BASNEF model in diabetes center of Yazd indicated that the mean of HbA1c was 9.84 before the intervention, but it decreased to 7.28 after the educational intervention¹². This significant decrease indicated the long duration of intervention (5 months). If the present study was performed for duration longer than three months, similar results would be seen. According to our findings, education based on BASNEF model²⁵, proper physical exercise²⁹, taking medicine to control blood sugar, following a proper food program³⁰, using treatment methods based on food program and physical exercise are among the most effective factors on decreasing HbA1c rate.

During the present research, FBS levels of the patients were recorded in order to examine the patients' self-care more carefully in applying the instructions. Before the educational intervention, the mean score of FBS level among the experimental group was higher compared to the control group. However, 1, 2, and 3 months following the intervention, the mean of FBS level was very lower in the experimental group compared to the control group. Similar findings were reported by other researches performed on effect of food on blood sugar³¹, and effect of food program education on FBS³².

The present study had some limitation. First, the study period was short. Second, patients did not report regular physical activity properly.

Third, they did not have an effective and proper diet.

Conclusion

The results of the present study indicated that using BASNEF model is effective in regard to eye care for diabetic patients and is recommended to use this model in educating patients for preventing ocular complications in non-insulin dependent diabetic patients. Furthermore, eye care education may be considered as an appropriate educational strategy to develop effective program for diabetic patients.

Conflict of interest statement

The authors declare that they have no conflicts of interest.

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