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The Effect of Nutrition Education Based on BASNEF Model for Control of Blood Sugar Among Type II Diabetics

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Abstract

Introduction: Complication of diabetes mellitus (DM) is the most important impediment resulted from uncontrolled blood sugar. Effective control of blood sugar depends on a combination of diet. The purpose of this study was to determine the effect of nutrition education on BASNEF Model for control of blood sugar among type II diabetics. **Methods:** This is a perspective and quasi-experimental intervention study. The research population composed of 100 type II diabetic patients (50 cases and 50 controls), aged 40 to 65, with a history of at least 5 years of diabetes. The instruments for data collection were: a questionnaire established based on the BASNEF Model (Belief, Attitude, Subjective Norm and Enabling Factors), a self reporting checklist related to the patient practice and a checklist for recording the patients' HbA1c and Fasting Blood Sugar (FBS) levels. Data analysis was conducted using SPSS software, chi square-test, T-test for independent samples, matched T-test, and repeated measures ANOVA. **Results:** The findings indicated that the mean scores of BASNEF Model variables were significantly increased in the experimental group compared to the control group, after intervention. After the educational intervention, the mean scores of the patients' nutritional behaviour increased in the experimental group compared to the control group. Also, the rate of HbA1c (before intervention: %8.65, after three months: %7.47) and FBS level (before intervention: 207.08, after three months: 124.2) improved significantly among experimental group compared to the control group. **Conclusion:** Considering the results obtained in this study the application of BASNEF model is very effective in developing an educational program for diabetics. So applying educational program is recommended for diabetics in order to control their blood sugar and enhance their nutritional behaviour.

1. Introduction

Diabetes is the most prevalent disease which results from metabolism disorders and as stated by some scholars it is a disease of endocrines (1). It is a chronic disease which occurs as the result of disorder in glycoside-carbohydrate metabolism. 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 sign (2).

Who forecasts the population with diabetes in 2025 will increase 122% and in developing countries with 170% increase, the number of patients be changed from 84 million to 228 million (3).

A diabetic patient should follow an appropriate and exact food program, take medicine on a regular basis and control his or her blood sugar. It is a common belief that patients need instruction and assistance for realizing and understanding their health status, making decision for health care and changing health behaviours. 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 behaviours (4). Today, the focus of comprehensive health care should be on self-care and education rather than treatment and reliance. Also, effort should be made to increase the individual's capabilities for improvement, independence and non-reliance (5).

This is more important in patients with type 2 diabetes due to lower knowledge of control of disease (6). Previous studies pointed out the important role of education in controlling glucose in diabetic patients (7) and mentioned the key role of education for changing habits (8). The effectiveness of educational programs also is important. The value of health education programs depends on their effectiveness, and such effectiveness is dependent to a large extent on the correct application of theories and models of the health education (9).

Giving health instructions to diabetic patients may help those making effective decisions on their health; get self-confidence and essential skills to put decisions in to practice (10). 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 program (11).

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 behavioural action but also concentrate on the potential of interpersonal and inability of the person toward the behaviour (9).

A change of behaviour model that is suitable for nutritional educational programs is Hubly's change of behaviour model. This model includes beliefs, attitudes, subjective norms and enabling factors (BASNEF Model) (12). Behavioural attitude

is a product of one's belief; in fact, it is the positive or negative evaluation of behaviour. Subjective norms are one's belief towards the influential persons which depends on the social pressures and reflections. Enabling factors are skills and sources that allow person's aim or intention to change the behaviour (13).

Nutritional therapy is an essential component in diabetics Program. Using of nutritional methods is economic solution (effectiveness) in decreasing the complications of diabetes. Nutritional treatment program should be set based on the purposes and needs of each patient; In addition, patient education about how to implement this program is an important component from nutritional treatment program (14).

Therefore, educational interventions will be for diabetic patients familiar with the methods of prevention, treatment and control of their disease (15). The aim of this study was to the effect of nutrition education Based on BASNEF Model for control of blood sugar among type II diabetics.

2. Methods & Materials

This is a perspective and quasi-experimental intervention study. The research population consists of those referred to Nader Kazemi Clinic- Shiraz (2010) with type 2 diabetes, age of 40- 60, diagnosed over 5 years and exposed to danger of complications. Unwilling patients and those who could not participate in meetings were removed from the study. The reason for selecting the group 60-40 years: Since type 2 diabetes is directly related to aging and often people over 40 years are at higher risk of developing diabetes, group over 40 years was selected. On the other hand aging is defined as over 60 years that various factors such as dentures, digestive diseases, nutrition, inactivity, etc. can affect the tendency of a person's diet. Therefore middle age (between 60-40 years) was the most appropriate age for this research.

In this study, 100 patients were selected as sample population randomly and divided alternatively into experimental group (n= 50) and control group (n= 50). The sample size was calculated using the following formula; the result was 99, however we assumed it 100 subjects.

$$n = \frac{2\sigma^2(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{d^2}$$

The instruments for data collections were a questionnaire established based on the BASNEF model which contained demographic specifications (6 items), knowledge (11 items), beliefs in two parts of attitude toward behaviour results (7 items) and attitude toward act (5 items), enabling factors (6 items), behaviour intention (5 items), norm beliefs (6 items), subjective norms (5 items); and tow checklist. The first checklist was nutritional practice (with 6 items about having an appropriate prescribed food program). The second checklist was applied to record the patients' HbA1C and FBS levels.

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 questionnaire and the first checklist were completed before educational intervention by the experimental and control groups, and the patients were introduced to the same laboratory for HbA1c and FBS tests. Then educational intervention was conducted for experimental group within six 55-60 minute sessions during the first month using various forms of training including lecture, question and answer, group discussion and practical presentation. Patients were provided with necessary information and instructions about diabetes, symptoms of decrease and increase blood sugar and deal with it, set meal plan, how to use food composition tables, portion and replacing them with each other especially sources of carbohydrates in main meal and between snacks and proper use of fruits, vegetables and legumes as a source of dietary fiber. Patients should be record daily food consumption according to specified form.

Educational package were given to patients contains all recommendations about diet. For illiterate people was asked that one of their family literate participate in sessions. The control group was not any kind of educational during periods of nutritional intervention but after the intervention, the control group was trained in this field.

Immediately after the educational intervention, Nutritional performance checklist and the questionnaire were completed by the two groups' members. Two follow-up sessions were held in the next first and second months regarding patients' activities.

Three months after the intervention, the questionnaire and checklist were completed by the two groups' members and they were sent for HbA1c and FBS examinations and result was recorded. It worth to mention that their FBS levels were recorded in 4 steps (before intervention, one month after intervention, two months after intervention, and three months after intervention), in order to follow up their control process and self-care. Data analysis was conducted using SPSS13 software, Chi square-test, T test for independent samples, matched T-test, and repeated measures ANOVA.

3. Result

All 100 participants were included until the end of the study. 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)

Table 1. 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
Education	Other	8	16	7	14
	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

There was a significance difference between the mean scores of knowledge of the two groups, i.e. the mean score of the experimental group was higher than that of the control group ($P < 0.001$). Matched t-test of experimental group showed that the mean scores of knowledge significantly increased immediately and 3 months after the intervention ($P < 0.001$).

Independent T-test indicated that there was no significant difference between the attitude mean scores regarding the results of the two experimental and control group's behaviour before the educational intervention ($P = 0/692$), while the difference was significant immediately after the intervention ($P < 0.001$), and 3 months after the educational intervention ($P < 0.001$).

Matched T-test in experimental and control groups indicated a significant difference in the attitude mean scores

regarding the patients' behaviour before, immediately after and 3 months after the intervention ($P < 0.001$).

Before the educational intervention, there was no significant difference between the mean scores of attitude toward practice of the two groups; while the difference became significant immediately after ($P < 0.001$) and three months after the educational intervention ($P < 0.001$).

T-test for independent samples indicated no significant difference between the mean scores of enabling factors among the two groups before the educational intervention, but the difference was significant immediately after ($P < 0.001$), and three months after the intervention ($P < 0.001$).

The mean scores of the subjective norms did not differ significantly in the two groups before the intervention, but this difference became significant immediately after and three months after the intervention ($P < 0.001$).

T-test for independent samples indicated that there was no significant difference between the mean scores of the norm beliefs among the two groups before the educational intervention; while, this difference was significant immediately after and three months after the intervention (P<0.001).

The mean score of the behaviour intention for the patients in control group was higher than that of experimental group before the educational intervention; but, immediately after

and three months after the intervention the mean score of behaviour intention and its changes was higher in experimental group compared to the control group (P<0.001).

Independent T-test showed no significant difference in the mean scores of the patients' practice among the two groups before the educational intervention, while the difference became significant three months after the intervention (P<0.001) (Table 2).

Table 2. Comparison of the mean scores of patients' knowledge and attitude with the results of behaviour, attitude toward practice, enabling factors, subjective norms, norm beliefs, and the patients' practice intention based on self-reporting.

Variables & Groups	Pre- Test M (SD)	Post- Test M (SD)	3 Months Follow-up test M (SD)	RMA Tests Result
Knowledge				
Experimental	17.27(11.93)□*	73.45(17.79)□***	84.90(12.12)□***	P<0.001
Control	24.90(13.72)	25.33(12.04)	25.95(12.69)	P= 0.50
Patients attitude towards results				
Experimental	27.35(8.58)□	77.42(10.56)□***	86.71(7.28)□***	P<0.001
Control	28.07(9.35)	29.85(8.85)	38.14(10.76)	P<0.05
Attitudes Towards the practice				
Experimental	34.60(14.10)□	82.0(8.32)□***	82.80(11.30)□**	P<0.001
Control	38.80(12.76)	39.70(12.71)	51.20(10.07)	P>0.05
Enabling Factors				
Experimental	22.66(18.38)□	77.66(12.19)□***	88.16(6.96)□***	P<0.001
Control	27.0(13.73)	28.66(11.43)	34.66(13.18)	P<0.05
Normative Beliefs				
Experimental	45.66(12.54)□	72.08(11.7)□***	79.16(9.59)□***	P<0.001
Control	47.83(12.03)	25.33(12.04)	25.95(12.69)	P= 0.50
Subjective Norms				
Experimental	36.30(15.21)□	60.90(18.8)□***	70.50(15.65)□***	P<0.001
Control	40.0(13.13)	47.08(11.04)	47.76(11.47)	P= 0.95
Intention Towards the behaviour				
Experimental	31.60(14.01)□*	85.40(9.02)□*	88.60(7.82) □**	P<0.001
Control	37.90(11.47)	42.0(13.36)	39.40(10.95)	P>0.05
Patients' operation- based self reporting				
Experimental	33.0(21.42)□	78.0(17.31)□*	88.0(10.66) □**	P<0.001
Control	38.33(17.57)	38.66(13.23)	39.66(12.54)	P>0.05

Independent T-test Results between the two groups; *P>0.05; **P<0.01; ***P<0.001

Mann-Whitney test showed no significant difference in the scores of the patients' nutritional performance among the two groups before the educational intervention (p=0.38), while the difference became significant immediately after and three months after the intervention (P<0.001).

Friedman test indicated significant difference in the mean

scores of the patients' nutritional performance among the two groups; before the educational intervention, immediately after, and three months after the educational intervention (P<0.001).But it showed no significant difference among the control group (P=0.7). (Table 3)

Table 3. Comparison of the mean scores of the patients' nutritional performance Based on self-reporting.

Variables & Groups	Pre- Test M (SD)	Post- Test M (SD)	3 Months Follow-up test M (SD)	Mann-Whitney Test Result	Friedman test Result
The patient's nutritional performance					
Experimental	1.4(0.85)	4.9(0.45)	5.1(0.39)	P<0.001	P<0.001
Control	1.69(0.77)	1.7(0.63)	1.73(0.54)	P=0.7	P=0.38

Independent T-test in the experimental group indicated that the mean score of HbA1C has decreased three months after the educational intervention (P<0.001).

The same test in control group indicated no significant difference in the mean scores of HbA1C before and three months after the educational intervention (P= 0.08) (Table 4)

Table 4. Comparison of the mean scores of HbA1C before and three months after the educational intervention.

Variables & Groups	Pre- Test M (SD)	3 Months Follow-up Test M (SD)	Tests Result
HbA1C Level			
Experimental	8.65(1.74)	7.47(1.58)	P<0.001
Control	8.57(1.35)	8.51(1.34)	P= 0.08

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.

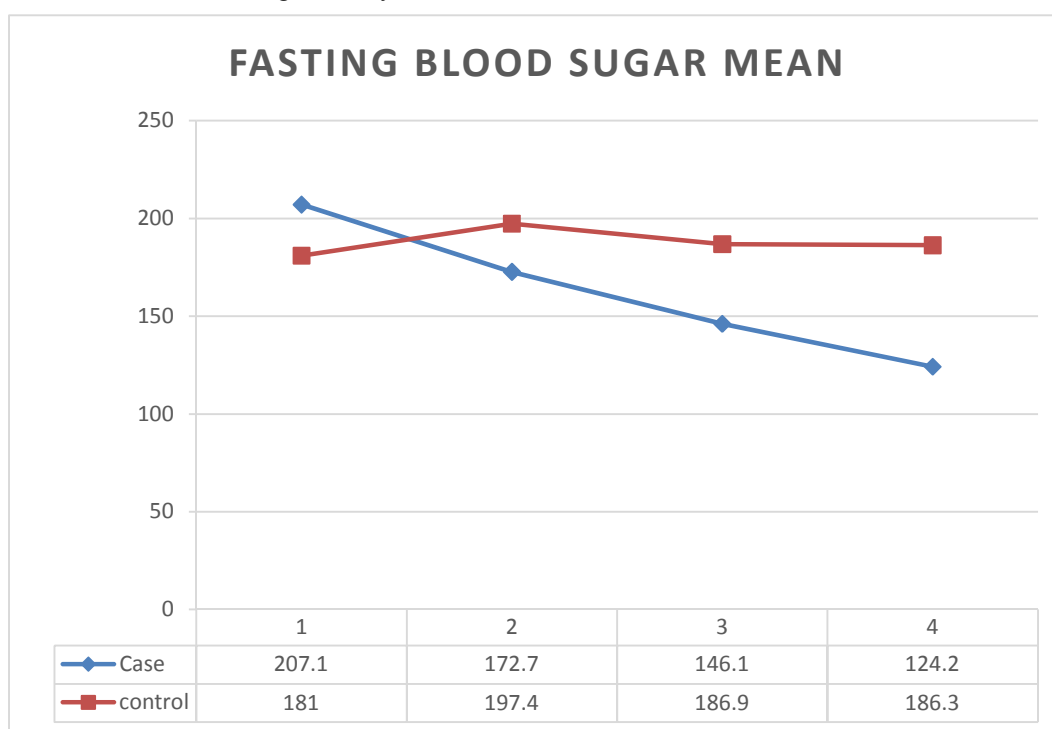


Figure 1. Comparison of fasting blood sugar level between case and control groups pre-intervention (1), one(2), two(3) and three (4) months after intervention.

4. Discussion

The aim of this study was to the effect of nutrition education Based on BASNEF Model for control of blood sugar among type II diabetics. Innovation: Considering the importance of diet in diabetes and also the lack of enough research in this field using Baznef Model to control diabetes through nutrition, the present study provides information and knowledge needed to design a suitable model to empower people suffering from diabetes. It is hoped that the results of current research be useful and to be used as a model for training other groups.

The low awareness of both experimental and control groups before educational intervention reveals the lack of information and the required instructions for blood sugar control in Diabetes Center. The mean score of the experimental group awareness compared to the control group, immediately after educational intervention and three months after remarkable increased; it proves the positive effect of educational intervention on patient's awareness and the process continuity. The findings of the present study are in conformity with the quality control study of diabetics, self-care, and the increase of awareness after educational intervention (16); prevention and control of diabetics (17); and the study of diabetics' knowledge of self-care (18). It also conforms to the increase of students' awareness based on the BASNEF model regarding the social skills after

educational intervention (19) and the increase of inter-personal skills after educational intervention (18).

The mean scores of the attitude toward the results of behaviour immediately after educational intervention and after three months increased in both experimental and control group. But the mean variations and the increase of the scores has been considerably higher in the experimental group than that of the control group. The above findings reveal the effectiveness of the BASNEF model-based intervention in the area of belief and continuation, amending and promotion of the patient's attitude toward the blood sugar control behaviours. The patients of the experimental and control groups have been selected from the Diabetes Center and there was no restriction in prophylactic instructions access for control group; also the findings showed the promotion of the attitudes and beliefs of patients in control group toward the worthiness of blood sugar control behaviours. These findings conform to those obtained from case study of Diabetes Center of Sanandaj-Iran (20,21), regarding the diabetics' attitude toward self-care and the promotion in their attitude after education as well as the study on promotion of diabetics' attitude in Abhar-Iran (16) in this regard. Findings of this study also are in conformity with those of Baghiyani Moqaddam's study on the increase of the attitude score regarding the diabetic control behaviours after educational intervention based on BASNEF model (15).

The mean score of the patient's attitude toward practices to

control blood sugar immediately after intervention has increased in experimental group, but three months after intervention there has been no significant increase. These findings are confirmed with Raman's study on the patients' attitude toward retinopathy status and its increase after education in India (22) and other similar studies (23, 24). In the study of Rakhshanderou, the use of education theories have been emphasized for changing the attitudes (24) and in other studies, the role of educational methods of discussion and question and answers have been mentioned as an effective method in improving nutritional attitude (18-25).

There was no significant difference in the scores of the mean scores of the patients' nutritional performance among the two groups before the educational intervention. The mean scores of the patients' nutritional performance in the experimental group increased immediately after and three months after the intervention but in control group indicated no significant difference. The nutritional continuing education during the training period and follow-up afterwards indicate nutritional performance. These finding confirm with Mellati's study on the effects of controlling diabetes factors by using HbA1C values in Diabetes Center of Zanjan (26), Sharifian's study on diet for diabetic patients in Diabetes Center of Kurdistan (27), Heydari's study on efficacy of education of type II diabetic patients in relation to correct nutrition (28), Kamrani's study on educational program based on health belief Model on behaviour nutrition diabetic (29), Gucciardi's study on nutrition and blood sugar control diabetic patients in Canada (30) and Chapman's study on nutrition in diabetic patients (31).

Independent T-test in the experimental group indicated that the mean score of HbA1C has decreased three months after the educational intervention; therefore patients achieved appropriate therapeutic purposes. But in control group indicated no significant difference. So education leads to Proper control of Blood Sugar and consequently prevents from dangerous complications of diabetes. It is estimated each 1% reduction in HbA1c will decrease 37% from Micro vascular complications and 21% of Macro vascular complications caused by diabetes (32). In Syriala's study on diabetic patients, nutrition education was reduced HbA1c levels in patients (33). Turner's Study (1999) showed using therapeutic approaches, proper diet and regular physical activity reduced HbA1c levels in diabetes (34). All the above studies confirm the findings of our study.

A previous study used BASNEF model in diabetes center of Yazd indicated that the mean of HbA1v was 9.84 before the intervention, but it decreased to 7.28 after the educational intervention (9). 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 model (12), proper physical exercise (35), taking medicine to control blood sugar, following a proper food program (36), using treatment methods based on food program and physical exercise are among the most effective factors on decreasing HbA1c rate.

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. In other words, FBS levels were decreased within a certain process; the results of this research conform to other researches performed on the effects of diet on blood sugar (27, 37), and effect of the diet education on FBS (38).

The results of this study reveal that using the BASNEF model is effective on blood sugar control among the diabetic patients and it is highly recommended to apply the model in educating the diabetic patients for blood sugar control.

The present study had some limitation. First, the study period was short. Second, patients did not have an effective and proper diet. Third, Determine experimental group and control group from a specified center.

5. Conclusion

Applying the BASNEF Model is very effective in developing an educational program for diabetics. So applying educational program is recommended for diabetics in order to control their blood sugar and enhance their nutritional behaviour.

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