

## The Effect of Educational Program Based on Belief, Attitude, Subjective Norm, and Enabling Factors Model on Changing the Metabolic Indices in Elderly Patients with Type II Diabetes

### Abstract

**Background:** Diabetes is the most common disease related to metabolism disorders. Today, diabetes in the elderly is one of the major epidemics of the century. This study aimed to investigate the effect of nutrition and jogging-based Belief, Attitude, Subjective Norm, and Enabling Factors (BASNEF) model in changes in metabolic parameters that performed in elderly patients with type II diabetes in Fasa city. **Methods:** This study was a randomized clinical trial on 108 elderly patients with type II diabetes (54 patients in the experimental group and 54 in control group) referred to the diabetes center in Fasa City, Fars Province, Iran, in 2016. Data were collected using a valid self-reported questionnaire including demographic variables and BASNEF Model (knowledge, attitudes, subjective norms, and enabling factors), checklist for patient's practices nutrition and jogging based on self-reporting patients, assess the level of fasting blood sugar (FBS), low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglycerides (TG), and HbA1c patients which was completed by both groups before and 3 months after the intervention. The experimental group received the training in eight sessions; each session lasted for 70 min. Then, the data were entered into the SPSS 22 software (SPSS Inc., IBM, Chicago, IL, USA) and were analyzed using descriptive statistics, Chi-square test, independent *t*-test, and paired *t*-test.  $P < 0.05$  was considered as statistically significant. **Results:** The results showed that the mean scores of the BASNEF components (knowledge, attitudes, subjective norms, and enabling factors) in two experimental and control groups after intervention were a significant difference. After training program, nutritional and jogging performance in the experimental group was better than the control group. Furthermore, FBS ( $P < 0.001$ ), LDL ( $P < 0.001$ ), HDL ( $P < 0.001$ ), TG ( $P < 0.001$ ), and HbA1c ( $P < 0.001$ ) improved significantly in the experimental group compared to the control group. **Conclusions:** Plan and implement nutrition and jogging education using the BASNEF model to improve metabolic parameters in diabetic patients are very effective and beneficial. Moreover, in the implementation of these programs, control, monitoring, and follow-up educational are recommended.

**Keywords:** Belief, Attitude, Subjective Norm and Enabling Factors model, elderly, jogging, metabolic parameters, nutrition education, type II diabetes

### Introduction

Nowadays, the most important epidemic disease in elderly is diabetes.<sup>[1]</sup> This illness needs immediate attentions due to the high number of people affected within and its related complications.<sup>[2]</sup> Complications of diabetes can involve many body organs in the form of nephropathy, retinopathy, neuropathy, diabetic foot, and cardiovascular diseases. These complications result in a great human and financial burden on society.<sup>[3]</sup> It is predicted that the prevalence of type II diabetes increases from 171 million in 2000–366 million in 2030.<sup>[4]</sup> Iran, as a developing country, is facing an extensive and considerable increase in the population of diabetic patients which

is approximately 195% compared with the current prevalence.<sup>[5]</sup> The most recent studies conducted in Iran have reported the prevalence equal to 5.5–5.7% for diabetes in adults and argued that the disease burden in low- and middle-income countries is increasing.<sup>[6]</sup> Metabolic control is one of the important therapeutic targets in controlling diabetes. The aim of treatment is to decrease the blood sugar level and to optimize and improve the life quality of patients with diabetes. The most common test for metabolic control rating is measuring HbA1c.<sup>[7]</sup> HbA1c shows a person's average blood sugar level over 2–3 months.<sup>[8]</sup> The normal value of HbA1c is  $<7\%$ , and the values 5.8%–7% represent the border

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control, 5.8% shows poor control of blood sugar, and higher than 10% shows extremely poor control of blood sugar.<sup>[9]</sup> One of the reasons for the prevention and postponement of the acute and chronic complications of diabetes is the early diagnosis and proper self-care so that disease progression will be prevented.<sup>[10]</sup> The positive effects of regular physical activity and proper diet have been approved in controlling and preventing diabetes.<sup>[11]</sup> Therefore, three factors including physical activity, proper diet, and insulin injections are the pillars of the treatment and control of this chronic and prevalent disease.<sup>[11]</sup> Jogging is one of the effective physical activities for people with diabetes.<sup>[12]</sup> Nutritional therapy is an essential component in diabetics' program. The program of nutrition therapy should be set based on the objectives and needs of each patient. Moreover, training the patients on how to implement the program is an important component of nutritional therapy.<sup>[13]</sup> Previous studies referred to the role of training in nutrition and jogging in controlling the blood sugar and metabolic indices of elderlies with diabetes.<sup>[12,14]</sup> They indicated that elderlies need training to change their nutritional behavior and jogging.<sup>[15]</sup> On the one hand, the value of a training program depends on its effectiveness. On the other hand, the more a proper theoretical support adjusted to the health needs exists, the more effective are the training programs in changing the nutritional behaviors and hiking. Hubble is a behavior change model which is potentially appropriate for training in nutrition and jogging. The Belief, Attitude, Subjective, Norm, and Enabling Factors (BASNEF) model was presented through combining two components including the theory of reasoned action and proceed model. The components of BASNEF model include beliefs, attitudes, and subjective norms of the theory of reasoned action and the enabling factors of the proceed model.<sup>[16]</sup> According to this model, the most important determinant of a person's behavior is his/her aim. A person's aim leads to his/her behavior. It is a combination of his/her attitude and subjective norms. A person's attitude toward a behavior includes his/her attitude toward the results of the behavior. The values of the behavior's results and subjective norms involve normative beliefs and motivation for obedience. Another important factor in this model is the enabling factors.<sup>[17]</sup> A person may have the intention for behavior, but he/she may not be able to do it, due to the lack of enabling factors such as money, time, resources, specific skills, and accessible and appropriate health care. Abstract norms are also among the factors that influence an individual's behavior. They are a kind of social pressure enforced by those who are important for the patient (e.g., friends, acquaintances, family, religious leaders, and health-care systems).<sup>[18]</sup> In this study, it was tried to increase the awareness of diabetic patients and improve their attitudes toward the complications of diabetes, and preventive activities such as nutrition and jogging through training intervention based on BASNE model. Moreover, it was planned to increase the patients' ability in controlling diabetes through providing information on some enabling

factors such as training in nutrition and jogging, the benefits of self-monitoring, and proper method of measuring the blood sugar. Intervention in their abstract norms helped them in applying the prevention methods including proper nutrition and jogging and controlling their illness through engaging the patients' family. Considering the importance of diabetes, its control in all people, especially the elderly, as well as the lack of the theory-based interventions in the elderly with diabetes and lack of research in this area in the population of diabetic patients in Fasa City; thus, this study aimed to investigate the effect of training in nutrition and jogging, based on BASNEF model, on the metabolic indices of elderly with type II diabetes.

## Methods

This study was a randomized clinical trial in 2016. The population of the study included elderlies with type II diabetes in a diabetic center in Fasa, Fars province, Iran. One hundred and eight samples were randomly selected according to the file number of elderlies. They were assigned into two groups including experimental and control groups (each group included 54 patients). Sample size was estimated based on a previous study by Sharifirad *et al.*,<sup>[19]</sup> the standard deviation obtained was 9.5 and considering  $\alpha = 0.05$ ,  $\beta = 0.20$ , and  $d = 5$ . Finally, the 54 samples were allocated in each group.

## Inclusion criteria

The participants were over 60 years old, and at least 1 year had passed from definitive diagnosis of being affected by type II diabetes. Moreover, they lacked cognitive and movement disabilities.

## Exclusion criteria

Exclusion criteria were lack of consent to participate in the study and absence of >2 sessions in the training program.

Data collection instrument included a questionnaire, based on BASNEF model, asking questions about demographic characteristics, knowledge (15 items), attitude (10 items), enabling factors (5 items), and abstract norms (5 items). Moreover, a checklist on nutrition and a checklist on jogging were used. The checklist on nutrition consisted of six questions on the proper use of the determined diet. The patients were supposed to record their diet during a week in related forms consisted of six items. The checklist on hiking consisted of six questions on jogging at least three times a week, each session lasting for 20 min. The patients were supposed to record their jogging schedule during a week in the six-item form. This questionnaire was completed through a structured interview. As for scoring the questionnaire, in the awareness part, score 1 was assigned to the correct answers, and score 0 was assigned to the wrong ones. On the attitude part, which was designed based on Likert three choices range, the score ranged from 1 to 3, so that score 1 was assigned to "I disagree," score 2 was assigned to "I don't know," and

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score 3 was assigned to “I agree.” The questions on enabling factors and abstract norms were designed in the form of two options. Score 1 was assigned to option “Yes,” and score 2 was assigned to option “No.” After calculating all parts of the questionnaire, the score scale was considered out of 100.

The validity of questionnaire was measured according to the face validity and content validity. The reliability of questionnaire was confirmed by the test–retest for awareness questions ( $r = 0.77$ ) and the internal consistency for other parts of the questionnaire ( $\alpha = 0.8$ ).

The biochemical indices including fasting blood sugar (FBS), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides in milligrams per deciliter were assessed. The HbA1c level inpatients were also investigated before and 3 months after the training intervention in terms of percentage by the same laboratory.

The questionnaires were filled in before the intervention in both experimental and control groups, and patients were referred to the same laboratory with a referral letter. Then, the experimental group received the training in eight sessions (two sessions in a week); each session lasted for 70 min. The last session was conducted for the patients’ families or close relatives and in the presence of participating staff in patients’ treatment. The training content was presented through lecture, question and answer, and group discussion to the experimental group by researchers. Moreover, some images were used in the training sessions to facilitate the correct perception of content by elderly, prevent the incorrect perception of the content, and involve their sense of sight. In the training sessions, the presented content was about diabetes, symptoms of low and high blood sugar, how to deal with it, diet, how to use food composition tables, partitioning, and how to replace them with each other (particularly carbohydrates) in meals and snacks, and proper use of fruits, vegetables, and grains as sources of dietary fiber. The patients were to record their daily food consumption according to the designated form. Patients were taught about the importance of exercise on controlling the blood sugar. Patients underwent an exercise program. They were supposed to walk at least three times a week for 20 min each time. They were supposed to record their jogging activity during the week. In the training sessions, some pamphlets were given to families and relatives to engage them in the intervention at the end of the training sessions. The follow-up was conducted by telephone calls by the researchers (for 5–10 min) at weeks 4 and 8 after the intervention to emphasize on the provided training content, answer their probable questions, and emphasize on the family role in dealing with patients. Furthermore, training messages were sent to the patients each week. Three months after the training intervention, the questionnaires were filled in by both experimental and control groups, and blood test was done to reassess the metabolic indices of the patients. The researchers tried

to prevent the undesired possible effects in the control group by coordination performed with the medical staff in the health center. In addition, this study was certified and registered under number 94091 by Vice Chancellor for Research at Fasa University of Medical Sciences.

### Statistical analysis

Data analysis was conducted using SPSS 22 software. (SPSS Inc., IBM, Chicago, IL, USA). Quantitative variables (age and duration of disease) described with mean and standard deviation and qualitative variables (dependency, family history of diabetes, and level of education) described by frequency and percent. Normality of data has evaluated by Shapiro–Wilks test.

Analysis was done by Chi-square, independent *t*-test, and paired *t*-test. The significance level for all tests was considered as 0.05. For ethical considerations, informed consent was obtained from the participants before administration of the questionnaire.

### Results

All participants completed the study course. The mean age of the participants was  $66.45 \pm 3.40$  and  $67.11 \pm 3.25$  years in the intervention and the control group ( $P = 0.16$ ). The mean duration of disease was  $14 \pm 2.07$  and  $15 \pm 2.11$  years in the intervention and the control group ( $P = 0.23$ ). The two groups were similar in terms of the demographic features, and no significant difference was found between the two groups [Table 1].

The results of paired *t*-tests showed that there was a significant increase in the mean score of awareness, attitude, subjective, norms, enabling factors, and the nutritional performance and jogging after the intervention ( $P < 0.001$ ). Moreover, the mean 3-month changes showed that there

**Table 1: Demographic characteristics of the participants in the intervention and control groups**

Variable	Intervention group, n (%)	Control group, n (%)	<i>P</i> *
Gender			
Male	18 (33.33)	20 (37.03)	0.14
Female	36 (66.66)	34 (62.97)	
Dependency			
Independent	6 (11.11)	10 (18.51)	0.32
With family	48 (88.89)	44 (81.49)	
Family history of diabetes			
Yes	32 (59.25)	31 (57.4)	0.08
No	22 (40.75)	23 (42.6)	
Level of education			
Illiterate	2 (3.7)	3 (5.55)	0.31
Primary school	12 (22.22)	14 (25.92)	
Secondary school	16 (29.62)	14 (25.92)	
High school	18 (33.33)	16 (29.62)	
College	6 (11.13)	7 (12.99)	

\*Chi-square test

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was a significant difference between experimental and control groups ( $P < 0.001$ ), and it was higher in the experimental group [Table 2].

Table 3 shows the biochemical indices of the participants before and 3 months after the training intervention. Paired *t*-test results showed the significant difference of FBS and HbA1c before and after the training intervention in experimental group ( $P < 0.001$ ). Furthermore, the independent *t*-test showed that the difference in fasting blood glucose test in control group and experimental group (after intervention) was significant ( $P < 0.001$ ).

Before and after the intervention, there were significant differences in the mean level of triglyceride and LDL in the experimental group ( $P < 0.001$ ). However, such a difference was not significant in the control group after the intervention ( $P > 0.05$ ). The independent *t*-test showed a significant difference in mean level of triglyceride and LDL in the participants in the experimental and the control group after the intervention ( $P < 0.001$ ). In addition, there was a significant difference between experimental and control groups in the mean level of HDL after the training intervention [Table 3].

## Discussion

The results showed the effectiveness of training in nutrition and jogging, based on BASNEF model, on improving the metabolic indices in elderly patients with type II diabetes. This investigation showed that, after the training intervention, the mean score of awareness of the participants in the experimental group increased significantly, whereas there was no significant change in the control group. The increased level of awareness in

the experimental group showed the significant effect of training intervention on improving the awareness of the experimental group. The effects of subjective norms as well as the enabling factors used in BASNEF model enhanced the awareness of the participants in the study. In other training interventions based on BASNEF model in diabetic patients, the effectiveness of the model in improving the awareness of diabetic patients was emphasized.<sup>[17,19]</sup> The attitudes of elderly patients with type II diabetes regarding the nutritional performance and jogging in the experimental group showed a significant improvement in comparison with those of the control group. Many studies noted the positive impact of training in improving the attitude of diabetic patients.<sup>[19-21]</sup> However, in a study conducted by Shabbidar and Fathi, there was no significant difference between the experiment and control groups after the training intervention.<sup>[22]</sup> It seems that theory-based intervention using BASNEF model, as well as using the training methods of group discussion and question and answer sessions could improve the attitudes of diabetic patients. Sharifirad *et al.* showed improvements in people's attitudes using BASNEF model and teaching methods of group discussion and questions and answers.<sup>[19]</sup> There was a significant increase in the mean score of enabling factors after the intervention in the experimental group in comparison to that of the control group. For the experimental group, the factors such as providing information, training in nutrition and jogging, and giving booklets helped the elderly patients with type II diabetes in changing their nutritional and jogging behavior. The findings of the present study are consistent with those of Khani Jeihooni *et al.*,<sup>[17]</sup> Zendehtalab *et al.*,<sup>[23]</sup> Faghihi *et al.*,<sup>[24]</sup> and Sharifirad *et al.*<sup>[19]</sup> After the training intervention, the mean score of subjective norms in the

**Table 2: Comparison of mean and standard deviation score beliefs, attitudes, subjective norms, and enabling factors components before and 3 months after intervention in the intervention and control groups**

Variables	Groups	Before the intervention	After the intervention	Mean difference	P*
Awareness	Intervention group	17.30±38.17	18.24±64.11	-25.94±18.36	<0.001
	Control group	18.24±41.25	18.22±42.16	-0.91±18.52	0.13
	P**	0.42	<0.001	<0.001	
Attitude	Intervention group	8.45±51.23	7.25±81.13	-29.9±8.52	<0.001
	control group	9.23±54.41	9.04±58.48	-4.07±9.24	0.09
	P**	0.09	<0.001	0.001	
Subjective norms	Intervention group	18.43±41.25	16.02±69.65	-28.4±19.02	<0.001
	control group	20.02±46.13	22.45±47.95	-1.82±22.39	0.59
	P**	0.22	<0.001	<0.001	
Enabling factors	Intervention group	21.25±34.22	21.42±68.28	-34.06±21.64	<0.001
	control group	21.21±37.25	16.26±40.21	-2.96±22.11	0.34
	P**	0.21	<0.001	<0.001	
Performance nutritional	Intervention group	14.30±32.15	4.25±71.15	-39.0±15.29	<0.001
	control group	13.81±35.24	13.24±36.14	-0.9±13.86	0.7
	P**	0.38	<0.001	<0.001	
Performance jogging	Intervention group	18.32±22.17	12.11±65.34	-43.17±19.14	<0.001
	control group	19.01±23.45	20.12±25.54	-2.09±20.51	0.09
	P**	0.24	<0.001	<0.001	

\*Paired *t*-test, \*\*Independent sample *t*-test

**Table 3: Comparison of biochemical markers before and 3 months after intervention in the intervention and control groups**

Variables	Groups	Before the intervention	After the intervention	Mean difference	P*
FBS (mg/dl)	Intervention group	26.15±154.55	15.25±140.01	-14.54±28.05	<0.001
	Control group	24.21±155.71	21.52±153.64	-2.07±24.92	0.25
	P**	0.61	<0.001	<0.001	
HbA1c (mg/dl)	Intervention group	1.72±8.65	1.58±7.47	-1.18±1.76	<0.001
	Control group	1.24±8.57	1.31±8.51	-0.06±1.33	0.81
	P**	0.09	<0.001	0.008	
TG (mg/dl)	Intervention group	45.25±198.21	36.91±181.12	-17.09±46.23	<0.001
	Control group	39.20±196.27	28.26±190.82	-5.45±40.25	0.28
	P**	0.54	<0.001	<0.001	
LDL (mg/dl)	Intervention group	14.22±119.35	12.18±110.65	-8.7±14.38	<0.001
	Control group	16.24±116.65	13.91±115.27	-1.38±17.12	0.53
	P**	0.28	<0.001	<0.001	
HDL (mg/dl)	Intervention group	7.25±42.16	8.16±49.23	7.07±8.45	<0.001
	Control group	9.11±43.51	9.65±43.44	-0.07±9.72	0.36
	P**	0.64	<0.001	<0.001	

\*Paired *t*-test, \*\*Independent sample *t*-test. FBS=Fasting blood sugar, LDL=Low density lipoprotein, HDL=High density lipoprotein, HbA1c=Hemoglobin A1c, TG=Triglycerides

experimental group increased significantly compared with the control group. In this study, the scores of subjective norms increased due to training the family members and forming a peer group and involving the therapy staff. Several studies have shown that family and peers play an important role in nutritional behavior and jogging in patients under study.<sup>[20,25]</sup> Family involvement helps the healing process of elderly patients with diabetes.<sup>[19]</sup> Rothschild *et al.* showed that training intervention using health staff can improve the glycemic index in patients with diabetes.<sup>[26]</sup> There was no significant difference in the mean scores of nutritional performance in experimental and control group before the training intervention. However, such a difference existed just in the experimental group after training intervention. Continuous training in nutrition and follow-up sessions supported the nutritional performance. Our findings regarding the nutritional performance in elderly patients with type II diabetes are consistent with those of other studies.<sup>[14,17,27-29]</sup> The mean score of jogging performance in the experimental group increased significantly after the training intervention. This increase is due to emphasizing on the fact that jogging is one of the least expensive, easiest, and most convenient exercises for elderly patients with type II diabetes. The patients organized the hiking program together. Our findings are consistent with the previous studies.<sup>[12,30]</sup> Three months after intervention, there was a significant decrease in the level of FBS and HbA1c just in the experimental group. Training intervention in experimental group could improve blood sugar indices through raising awareness, attitude, subjective norms, and enabling factors and observing the guidelines on nutrition and jogging. Elabbassy,<sup>[30]</sup> Burnett,<sup>[31]</sup> Afshari *et al.*,<sup>[32]</sup> Gallegos *et al.*,<sup>[33]</sup> Shahbodaghi and Borhani,<sup>[34]</sup> and Salinero-Fort *et al.*<sup>[35]</sup> showed that training intervention helped to reduce blood sugar and HbA1c, which is

consistent with the findings of the present study. However, Askari *et al.* showed that HbA1c did not change after the training intervention.<sup>[29]</sup> After the training intervention, there were significant differences between experimental and control groups in the mean level of triglyceride, LDL, and HDL. Our findings are consistent with those of Askari *et al.*<sup>[29]</sup> and Qian *et al.*<sup>[36]</sup> However, they are not consistent with those of Najimi *et al.*<sup>[37]</sup>

The limitations of this study included the elderly's self-reporting of nutritional and jogging operation through a checklist and questionnaire and their problem in participating in the training sessions, despite their desire.

One of the strengths of this study is the use of laboratory metabolic indicators for controlling blood sugar and community-based study.

## Conclusions

Training intervention based on BASNEF model on the operation of nutrition and jogging led to the improvement of metabolic indices in elderly patients with type II diabetes and also improved their awareness and other variables of the model, and it had an important role in reducing the complications of the disease and mortality rate in diabetic patients.

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## Conflicts of interest

There are no conflicts of interest.

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