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Effect of BASNEF-based nutrition education on nutritional behaviors among elderly people and Mini Nutritional Assessment on nutritional status in elderly with diabetes with type 2 diabetes (A clinical trial intervention)

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Abstract:

INTRODUCTION: The number of elderly people is growing in different communities like Iran, increasingly. Malnutrition prevalence is unknown among elderly patients with diabetes. Malnutrition is a common risk factor in elderly people with diabetes that may affect their health.

SUBJECTS AND METHODS: This study is a random clinical trial. There are 200 samples in this study chosen randomly and divided into two intervention and control groups (100 each). Data of both groups were collected in the same way, before and 3 months after the intervention. Educational intervention was based on pretest, baseline BASNEF model, and Mini Nutritional Assessment questionnaire in four sessions.

STATISTICAL ANALYSIS USED: Descriptive indices were used to analyze the data while Chi-square, *t*-test, one-way ANOVA, and correlation tests were used to examine the relationship between variables.

RESULTS: The results were significantly different after intervention ($P < 0.05$), but they were not significantly different in control group after 3 months ($P > 0.05$). It was clear that 22% of samples had normal nutrition (score >24), 29% of participants were exposed to malnutrition, and 51% of samples were suffering from malnutrition. These numbers were 20% for normal nutrition, 30% for exposing to malnutrition, and 50% for suffering from malnutrition in the control group, respectively. Fifty percent of elderly people with diabetes suffered from malnutrition and almost half of them had normal nutrition that was 20%.

CONCLUSIONS: BASNEF-based nutrition education intervention improves nutritional behaviors in addition to knowledge and attitude of elderly people with type 2 diabetes. It led to improve indices of glucose control during 3-month intervention.

AIMS: The aim of this study was to investigate the nutritional status of elderly people with diabetes and the effect of educational intervention based on the BASNEF model on promoting nutritional behaviors in the elderly with type 2 diabetes in Babol city, Iran.

Keywords:

Elderly people, Mini Nutritional Assessment, type 2 diabetes

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Introduction

Diabetes is one of the most important problems in health system all over the world. Almost 90%–95% of patients with diabetes are suffering from type 2 diabetes. However, type 2 diabetes is the diseases of fat elderly people.[1] In addition, studies have shown that with increasing age, the prevalence of diabetes increases by an average of 10%–20%. Aging is one of the most important challenges in the world. Until 2025, about one-third of the European population will be 60 years old or above that. Growing the number of people aged above 80 years, as a demographic change, effects on main social domains such as economics and health.[2] Population aging is becoming a phenomenon by the name of "elderly population explosion." Today, >600 million people are above 60 years and it is predicted that it will be 1 billion and 600 million people by 2020 and >1970 billion people by 2025. In Iran, like other parts of the world, elderly population in increasing and the percentage of people aged above 60 years will increase to 9.4% and 9.1% in 2020, respectively.[3] Now, epidemiology of various diseases has been changed and chronic diseases are increasing while different factors make them happened. Unchangeable factors such as age, sex, and family background are not the only causes of contagious diseases, but other adjustable factors such as lack of physical exercise, abnormal diet, and overweight play an important role in the diseases.[4] Undesirable nutritional status results in diseases among elderly people such as diabetes and cardiovascular disease.[5] Malnutrition is a common problem affecting on 30%–50% elderly people with diabetes.[6] Nutrition is a considerably important variable for health care of elderly people.[7] Nevertheless, this procedure results in inappropriate defects among elderly patients while diabetes comes with malnutrition. Aging is followed by weight lose and decreased food intake.[8] Nutrition therapy plays an important role in controlling diabetes. The purposes of nutrition therapy in diabetes are keeping blood glucose in its normal level, improving blood lipid level, decreasing blood pressure, treating and preventing diabetes effects, and providing nutritional needs in people.[9] It is recommended to decrease simple sugars, saturated fats, cholesterol and increase fruits, vegetables, and dietary fibers. The interventions improve serum lipids, regulate blood glucose, keep or decrease body weight, and reduce diabetes side effects. Scientific evidence indicates that following the recommendations is effective in treating and preventing diabetes and reducing visits to doctors, requiring to drugs, hospitalizing, and other diabetes side effects.[10]

Savoca and *et al*. applied educational intervention and found that mean knowledge score increased in test group significantly after gathering the questionnaires and 2 months after intervention ($P < 0.001$).[11] According to the studies, it is necessary to provide educational programs for controlling diabetes. Previous researches pointed to essential role of nutrition education in controlling blood glucose and metabolic indices among elderly people with diabetes[12] and stated that elderly people need to be trained for changing their nutritional behavior.[13] In addition, the value of nutrition education programs depends on the effectiveness of these programs. A behavioral change model that is potentially suitable for nutrition education programs is the model for changing the behavior of the Hubble. BASNEF model constructs include belief, attitude, subjective norm and enables factors of precede proceed model. Attitude toward behavior was defined as the result of personal reasonable belief. In fact, attitude toward behavior refers to people positive or negative evaluation about the performed activity. Subjective norms refer to how others whom we think they are effective would engage in a particular behavior; this happens based on social pressures and reflections. Enabling factors are the sources and skills that turn people intention and will to behavior and action.[14]

Assessing nutritional status is the first step in designing a successful nutritional care program and needs using appropriate tools for assessing nutritional status among elderly people. Applying useful tools can help to determine and prevent short- and long-term effects of malnutrition effectively. It is necessary to diagnose the problems to inform elderly people with diabetes about effective factors on their nutritional status and finding people at risk of malnutrition, suffered from malnutrition, and perform malnutrition interventions. As above-mentioned, few interventions were done on nutrition education for elderly people, so this study aims to investigate the effect of BASNEF-based nutrition education on improving nutritional behaviors among elderly people with diabetes. This study aims to determine the nutritional status among elderly people with diabetes in Babol city, Iran Interventions have been done for diabetic patients. However, first, nutritional status and then educational intervention with it have not been done and educational models are different. In this study, educational intervention was based on the BASNEF model. The aim of this paper was to determine the effect of intervention on the BASNEF model in assessing the nutritional status of the elderly.

Subjects and Methods

This study is a random clinical trial intervention. The community includes all elderly people with diabetes in health centers of Babol city, Iran. They are above 60 years old and the inclusion criteria were lasting 1 year since confirmed diagnosis and having no cognitive

problems. The exclusion criteria were as follows: Lack of desire to participate in the study and absence for two sessions of four ones. This study includes 200 samples that were chosen randomly in two intervention and control groups (100 each) through clustering sampling. Among the health care centers, eight ones were chosen randomly, four centers as intervention group and four ones as control group (100 samples each group).

As the clinics' principles allowed, we explained to elderly people and their attendants and assured that the questionnaires would be kept in secret. Then, they agreed orally and were informed that their participation is voluntarily. If the samples were illiterate or could not answer the questions, their attendants helped them. Collecting the data includes two questionnaires. The researcher-made questionnaire was designed based on BASNEF model and includes demographic features (14 questions), knowledge questions (15 questions), believes in two parts including attitude toward behavior results (5 questions) and attitude toward action (5 questions), enabling factors (5 questions), and subjective norms (5 questions).

$$n=\frac{(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta})^2\times 2\sigma^2}{\Delta^2}=\frac{(1.96+1.28)^2\times 2\times 20^2}{10^2}=200$$

The questionnaires were completed through organized interviews. Scoring was done in a way that correct answers took 1 and the incorrect ones took zero. Believes were assessed with 3-option Likert scale: 1-disagree, 2-no idea, 3-agree. Two-option questions were designed for subjective norms and enabling factors. Scores scale was 100 and the total score was determined after calculating all parts. Validity of the questionnaire was measured by content-validity and face-validity methods. While the questionnaire was provided according to reliable books and resources, then five experts expressed their opinions in person and correspondence. The authors studied them and some comments were applied in final questionnaire. The questionnaires were given to some elderly people with diabetes (assimilated and not participated in the study) to determine the face validity and find the defects from their viewpoints.[15] One of the most useful and suitable methods for this is using the Mini Nutritional Assessment (MNA) Summary Questionnaire, which has been confirmed in several studies on the nutritional status of the elderly for its validity and reliability. This questionnaire includes two parts: First part is screening including 6 questions, used for all participants. Scores under 11 indicate malnutrition and scores of 12 or above show good nutritional status. If the score was <11, interviewer should complete more evaluations. Malnutrition part of the questionnaire includes 18 questions and assessed malnutrition status. Scores <17 indicates malnutrition, scores between 17 and 23.5 indicate exposing to malnutrition and scores >23.5 indicate good nutritional status. United States Department of Health and Human Services, National Health Statistics Reports Center, Centers for Disease Control and Prevention confirmed the reliability of this tool and Cronbach's alpha coefficient was 98%.[16]

Fixed scale with 0.5 kg accuracy was used to measure samples weight and a cloth stadiometer with 0.1 cm accuracy for measuring samples height. A tape was used to measure mid-upper arm muscle circumference and gastrocnemius muscle circumference with 0.1 cm accuracy.[15] Author measured fasting blood sugar with a glucometer. A small drop of blood was tested by pinching the skin with a lens tick needle on a single-use screen, which was calculated using the device and blood glucose. Then, nutrition education intervention was done aiming to increase the number of meals, to decrease eating simple carbohydrates and fats, and to increase eating fruits and vegetables for elderly people with diabetes of intervention group for 1 month in four educational sessions. In addition, explanatory classes were held for doctors, nurses, and nutritionist. Each session took 70 min. Last session involved patients' family with nurses' presence.

Educational contents were provided for main group by lecturing, question and answer, and group discussion. Educational pamphlets were given to the families to engage them for last session. Phone following up in weeks 4 and 8 and after educational intervention (for 5–10 min) with patients and their families focused on educational issues. In these callings, the questions were answered and the roles of families in interventions were focused. Then, the questionnaires were completed 3 months after educating two intervention and control groups to determine the effect of educational intervention. We lost 10% due to lack of time and then the distance and disability of the elderly.

Results

As above-mentioned, the participants were above 60 years old and maximum age of samples in both intervention and control groups were 81 and 80 years old and average age were 68.09 and 67.36, respectively. The results of independent *t*-test did not indicate any significant difference between these two groups (P = 0.83). Moreover, the groups were similar for other demographic variables and there was no significant difference between them [Table 1]. There were no significant differences among participants of intervention and control groups for nutritional behavior, BASNEF constructs, fasting blood sugar, and glycated hemoglobin.

Table 1: Comparison of demographic variables between educational intervention and control groups

Records	Intervention group	Control group	*P*
Age	68.09±0.543	67.36±5.391	0.83
Sex			
Female	48	48	99%
Male	52	52	
Education			
High school	88	100	0.594
Graduated	80	20	
Duration of diabetes	13.95±4.217	14.42±4.661	0.521
Family history of diabetes	49	56	025

Scores of model constructs increased before and 3 months after intervention in the intervention group, significantly. Furthermore, the tests indicated that there were significant differences between control and intervention groups for mean knowledge score, attitude toward action, attitude toward behavior results, enabling factors, and subjective norms, after intervention ($P < 0.001$) [Table 2]. In control group, 20% of participants had normal nutrition (scores above 24), 30% were exposed to malnutrition (17–24), and 11% were suffering from malnutrition (<11). These numbers were 32% for normal nutrition,[11-17] respectively, in the intervention group, 22% of participants had normal nutrition (scores above 24), and 29% were exposed to malnutrition, and 51% were suffering from malnutrition. These numbers were 20% for normal nutrition, 30% for exposing to malnutrition, and 50% for suffering from malnutrition in control group, respectively [Table 3]. In intervention group, significant changes were observed in cereals decrease and fruits increase in daily food basket after educational intervention ($P < 0.001$).

However, there were no significant changes in using these two nutrients in control group. In intervention group, eating vegetables and milk and dairy products increased significantly after education intervention ($P < 0.001$).

Nevertheless, there were no significant changes in using these two nutrients in control group. In intervention group, eating meat and fats decreased significantly after education intervention ($P < 0.001$).

Nevertheless, there were no significant changes in using these two nutrients in control group. In intervention group, fasting blood sugar decreased significantly, 3 months after the first measuring ($P = 0.393$).

In this study, we used glucose control indices (fasting blood sugar and glycated hemoglobin) to evaluate exactly which were decreased after 3 months in intervention group. Findings are summarized in Table 4 ($P < 0.001$).

Discussion

According to the findings, a vast majority of the study participants suffered from malnutrition. Some had normal nutrition. Iizaka *et al*. indicated that 4% of studied elderly people had good nutrition, 12.6% were exposed to malnutrition, and no one suffered from malnutrition in their research.[17] Wyka *et al*. evaluated the nutritional status of above 60 years old people in rural areas and found that none of them were suffered from malnutrition because none of them had <17 scores in MNA model. In this regard, 16% old men and women were exposed to malnutrition.[18]

Sanz París *et al*. found that 39.1% of hospitalized old patients suffered from malnutrition and 21.2% were exposed to malnutrition.[7] Alfonso-Rosa *et al*. investigated 238 old people and indicated that 90% of the participants had malnutrition.[19] Our data were different from the rest of the country due to the lack of awareness and disability of the elderly and the lack of access because of the distance from the city.

In this study, 20% of participants had normal nutrition (scores above 24), 30% of them were exposed to malnutrition, and 50% of samples suffered from malnutrition, in control group.

Doostan, in their investigation in Kerman Province, found that research samples who referred to clinics continuously and applied specific treatment schedules, nutrition education, and consulting had normal nutrition, while they were exposed to malnutrition and its effects.[20] The study Joing has similar results with this study. This study showed that receiving energy, protein, fat, and vitamins is lower than the recommended dose for elderly people.[21]

This study found similar results and indicated that better-educated people are exposed to malnutrition less than others are, so education improves patients' status. In intervention group, 22% had normal nutrition (scores above 24), 29% of participants were exposed to malnutrition, and 51% of samples were suffering from malnutrition. BASNEF-based nutrition education was effective on increasing knowledge level.[22] In other studies, teaching methods for group discussion and question and answer have been described as effective methods for changing attitudes.[23]

Effective use of this model confirmed its effectiveness on people knowledge. Another result is improving attitudes after educational intervention that was aligned with Faghihi *et al*.'s study.[24] Attitude toward behavior is a prerequisite for behavior and should be made before behavior.[25] It seems that theory-based educations and

Table 2: BASNEF model constructs before and 3 months after educational intervention in both groups

Nutritional status	Variable	Before intervention	After intervention	*P*	*T*
Knowledge	Intervention	40.58±8.982	59.35±8.545	0.001>	15.651
	Control	40.57±8.777	40.91±8.792	0.042	2.064
Attitude toward action	Intervention	6.585±61.82	7.955±75.10	13.788	0.001>
	Control	60.08±7.136	61.84±6.755	1.886	0.062
Attitude toward behavior	Intervention	7.136±57.08	8.427±73.93	15.453	0.001>
	Control	7.342±56.30	7.075±58.13	1.654	0.101
Subjective norms	Intervention	38.69±4.939	67.97±7.954	0.001>	30.746
	Control	38.30±8.025	39.29±7.324	0.006	4.174
Enabling factors	Intervention	52.96±4.870	72.79±5.279	0.001>	27.246
	Control	52.66±4.926	53.97±4.939	0.634	6.029

Table 3: Nutritional status of the elderly people according to studied variables

Variable	Nutritional status			*P*
	Normal	Exposing to malnutrition	Suffering from malnutrition	
Sex				
Female	10	61	25	0.192
Male	19	51	34	
Marital status				
Single	10	47	24	0.928
Married	19	65	35	
Education				
Illiterate	13	59	30	0.038
Primary school	19	58	29	
Secondary school	3	29	3	
University	13	9	-	
Job				
Unemployed and retired	21	87	36	0.0109
Employed	23	25	8	
Lifestyle				
Independent	1	4	3	0.898
Family	26	104	51	
Center	2	4	5	

Table 4: Comparison of average food eating and glucose control indices before and 3 months after educational intervention

Nutrition group	Group	Before intervention	After intervention	*P*	*T*
Bread and cereals	Intervention	2.029±10.27	1.858±7.39	0.001>	10.040
	Control	2.029±9.73	1.986±9.79	0.222	1.228
Fruits	Intervention	0.882±2.01	1.096±4.46	0.001>	18.992
	Control	0.809±2.05	0.798±1.90	1.174	1.37
Vegetables	Intervention	1.182±2.58	1.123±4.54	0.001>	11.575
	Control	1.136±2.39	1.116±2.37	0.672	0.425
Milk and dairy products	Intervention	1.120±3.06	1.448±3.72	0.001	3.570
	Control	1.367±3.03	1.51±2.89	0.492	0.69
Meat	Intervention	1.478±4.09	1.155±2.6	0.001>	8.052
	Control	1.432±3.97	1.208±3.57	0.006	2.814
Fats	Intervention	1.428±2.95	1.128±2.40	0.004	2.982
	Control	1.432±2.94	1.208±2.44	0.007	2.751
Fasting blood sugar	Intervention	7.567±158.31	6.538±142.71	0.001>	15.659
	Control	6.411±158.55	10.798±159.56	0.393	0.858
Glycated hemoglobin	Intervention	2.002±7.99	1.477±7.02	0.001>	4.189
	Control	1.935±7.71	2.107±8.80	0.211	1.26

the applied educational methods played important roles in changing participants' attitude in this study.

We applied BASNEF model in planning and administering intervention and educational methods for group

discussion and question and answer in educational sessions to improve elderly people attitude. Kashfi *et al*. and Najimi stated using educational theories improved their studies.[22] However, Shabbidar and Fathi indicated that they could not change people attitude as it was difficult to change elderly people habits.[26]

The results of this study indicated that mean score of subjective norms increased after intervention while it was not significant in control group. Subjective norms are important believes and ideas of people.[24] Findings indicated that when someone is supported by his/her interested people socially in order to receive diabetes treatment, his/her behavior toward treatment is increased that is measurable by assessing blood glucose.[27] Trief *et al*. found that supporting by spouse is most important support for patients.[28]

Our findings indicated that enabling factors, as main constructs of intervention model, increased significantly. The factors include the preliminaries of behavioral change or environmental changes such as source, skill and information access, nutritional skills, nutritional education consulting, and other opportunities in intervention group that guided the attitude of elderly people with type 2 diabetes toward intended nutritional behaviors. The factor did not change in control group significantly and is aligned with Hazavehei *et al*.[29] This study aims to change elderly people's food habits and improve diets including increased number of meals, decreased amount of fats and simple carbohydrates, and increased consumption of fruits and vegetables. The number of means increased in intervention group. While average amount of consuming carbohydrates and fats decreased significantly, average amount of consuming fruits and vegetables decreased significantly, after nutrition education in intervention group. Eating dairy products increased in intervention group, too. Larijani *et al*. found no significant difference among consuming energy, macronutrients, and micronutrients in three studied groups. In addition to, specified ratios to saturated fatty acids and simple sugar in diets of the three groups were more than recommended ones.[30] Our findings are aligned with Najimi and Sharifirad's research.[10] In this study, we used glucose control indices (fasting blood sugar and glycated hemoglobin) to evaluate exactly which were decreased after 3 months in intervention group. There was a significant difference between the level of fasting blood glucose and hemoglobin glycosylated in the intervention and control groups after intervention ($P < 0.001$). Our findings indicated that BASNEF-based nutrition education affected on performance of patients with type 2 diabetes, according to the kind of consumed diet, and improved intervention group comparing to control group. While none of the participants, in both groups, had good performance before intervention, had good performance in following diets after intervention. We did not observe any progress in control group. It seems that the indicators of blood glucose control may be due to a reduction in carbohydrate intake and an increase in the consumption of fruits and vegetables in the intervention group. In support of this, a meta-analysis study showed that the decrease in high carbohydrate foods reduced the blood glucose control indexes.[31]

Borzu found that patients with diabetes had weak performance before intervention. Some studies investigated the role of educational interventions in using diets by 91 73-year-old patients with diabetes and concluded that the interventions improved nutritional behavior and controlled their blood glucose.[32]

Hence, some authors studied the effect of educational programs in applying suitable diets for patients with diabetes and stated that glycated hemoglobin increased to an ideal level by using the interventions.[33] Rezaei *et al*. investigated 30 patients with diabetes through interventions and concluded decreased glycated hemoglobin in intervention group comparing to control group.[34]

1. The lack of timely involvement of some individuals in the intervention group at designated training sessions due to diabetes-related health problems, such as physical problems
2. The lack of cooperation of some patients in pursuit of participation in educational sessions due to the frustration and specific nature of diabetes
3. The lack of attention of the elderly and the repeated content
4. Problems of forgetfulness
5. Lack of literacy and lack of mastery of some patients in Farsi and the problem of filling in the questionnaire and study materials.

Novelty: In addition, it measures the effect of training intervention and the amount of nutrition is also measured.

Conclusions

BASNEF-based nutrition education intervention improves nutritional behaviors in addition to knowledge and attitude of elderly people with type 2 diabetes. It led to improving indices of glucose control during 3-month intervention. According to the findings, this educational intervention enhanced status of patients with diabetes while exposing people to malnutrition and the ones who suffer from malnutrition should be paid attention.

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Conflicts of interest

There are no conflicts of interest.

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