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Original Article

The Effect of Nutrition Education Based on DASH Diet on Blood Pressure and Dietary Adherence Among Patients With Hypertension

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ABSTRACT

Background: High blood pressure is a major health threat and self-control has great importance in its management. Hence, a nutrition model is presented based on dietary approach to stop hypertension (DASH) diet. The present study aimed to investigate the effect of training on adherence to DASH diet on blood pressure among hypertensive patients in Rasht, North of Iran.
Methods: A total of 150 hypertensive patients visiting health care centers were randomly divided into education intervention and control groups. Food frequency questionnaire were completed before and 2.5 months after the intervention. Patients' blood pressure was measured at the same time interval. The post-baseline DASH diet components and blood pressure between the two study groups were compared using analysis of covariance.
Results: Participants' mean age was 56.08 ± 6.1 years and 76% of them were female. At baseline, the daily intake of dairies, fruits, and nuts and beans were significantly lower than the recommended DASH values in both groups. In contrast of fat, tea and salty food, all post-baseline DASH diet components in the intervention group were significantly higher than the control group. The intervention group had a significantly lower systolic blood pressure compared to control group 2.5 months after of the intervention.
Conclusion: Our results indicated that training nutrition based on DASH diet can be considered as a useful strategy to control high blood pressure among hypertensive patients.
Keywords: Blood pressure, DASH diet, Health education, Hypertension
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Introduction

Nowadays, hypertension is one of the most common and growing global health problems in the world, which is considered as one of the main risk factors for cardiovascular diseases (1, 2). Studies have shown that some non-pharmacologic approach through nutrition and diet control can appropriately reduce high blood pressure among hypertensive patients (3). The role of nutrition in the development of non-communicable diseases such as cardiovascular diseases and cancers is well demonstrated,

and chronic diseases caused by inappropriate nutrition and lifestyle are the leading cause of death (4, 5). In fact, one of the pillars of community health is the provision of physical and mental needs through proper nutrition (6).

Studies suggest that lifestyle interventions improve the control of risk factors for cardiovascular diseases (7, 8). A diet high in vegetables, fruits, low-fat dairy and restricted sodium prevents or treats hypertension (9). The Dietary Approach to Stop Hypertension (DASH) is recommended as a healthy diet for people with hypertension. The diet emphasizes the increase in the consumption of vegetables, fruits, whole grains, beans and low-fat dairy products. The dietary pattern is rich in magnesium, calcium, and potassium, with low saturated fats and cholesterol. The sodium content of this diet is restricted (less than 2400 mg per day). This diet is advised for controlling and lowering blood pressure in people with hypertension (10, 11). The studies on the therapeutic effects of the DASH diet suggests that following this diet can averagely reduce systolic blood pressure to 6-11 mm Hg (12).

Considering the fact that the DASH diet improves blood pressure control, the present study aimed to investigate the effect of nutrition education based on the DASH diet as one of the methods facilitating hypertension control on DASH diet components and blood pressure among hypertensive patients referring to health centers in Rasht, Iran.

Methods

The present study was a parallel group, controlled clinical trial among hypertensive patients referring to Health Centers in Rasht, North of Iran. This study was registered at Iranian Registry of Clinical Trials (N12016011622984) after approval by the Ethics Committee of Research Deputy of Guilan University of Medical Sciences. The statistical population consisted of 150 hypertensive patients referring to two Health Centers in Rasht, both of which were located in the suburbs of the city and covered similar communities in many respects. Those patients with the age of 45-65 years old, a history of hypertension for at least one year, local resident, receiving medical treatment, and having a health record were included to the study. Individuals who were absent for two sessions during the program of educational interventions or moved out of the study region were excluded. Eligible individuals were randomly assigned into two groups of intervention and control using a random number table and based on their health record number. After the participants were selected, they were briefed about the purpose of the study in a meeting and their informed consents were obtained. Patients' blood pressure was measured during their visit to the health center physician by the researcher using a calibrated mercury sphygmomanometer with a proper cuff. Systolic blood pressure (SBP) as the first hearing of Korotkov sounds and diastolic blood pressure (DBP) as the forth Korotkov sounds was recorded.

Data collection form had questions about demographic variables of age, sex, occupation, marital status, education, history of hypertension, and regular medication consumption. Food intake was examined by the food frequency questionnaire (FFQ) which contains 148 food items. FFQ has been validated by Nutrition and Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences (13) and has been used in several previous studies in Iran (14-16). Food intake was asked of the subjects in an interview by the researcher on a daily, weekly, and monthly basis according to FFQ, and the amounts were reported as servings per day (serving/day) based on eight main dietary groups of the DASH diet (bread and grains, vegetables and fruits, low-fat dairy products, meat, nuts and beans, fats and sweets). Salty food consumption was reported as the number of times per day, and tea consumption was reported as the number of cups per day.

According to the DASH diet, the recommended number of servings (serving/day) is as follows: 6-13 servings in the bread and grains group, 3-6 in the vegetables group, 4-6 in the fruits group, 2-4 in the dairy group, 1-3 in the meat and its substitutes group, 1 serving per day up to 3 servings per week in the nuts and beans group, and 2-4 servings per day in the oils and fats group (12). The educational contents were prepared according to the results of the preliminary analysis before the educational sessions. The educational program for the intervention group included three sessions of 45-60 minutes using educational methods of lectures and PowerPoint presentation, emphasizing food groups and pictures. Questions and answers, group discussions, brainstorming, and educational materials such as educational CDs, pamphlets and posters were also used. The control group received no educational program. According to the schedule, 2.5 months after educational interventions, the questionnaire was completed by the researcher in both groups, and their blood pressure was remeasured and recorded. Data from the questionnaires were coded and analyzed in SPSS software version 21. The Kolmogorov-Smirnov test was used to examine the normal distribution of data. Baseline characteristics were compared using chi-square, t-test or equivalent non-parametric test as appropriate. The DASH diet components were compared with recommended values using one-sample t-test. Within group comparison were made using paired t-test or Wilcoxon signed rank test as appropriate. The post-beeline DASH diet components were adjusted for baseline values of each covariate and compared between the two groups using analysis of covariance. The significance level for all tests was less than 0.05.

Results

The mean age of the participants was 56.08 (SD = 6.1) years. The majority of subjects were female and most of them were housewives (73%) and married (81%). Table 1 shows the demographic information, blood pressure, and DASH diet components in the two groups at baseline. There was no significant difference between the two groups in terms of gender and age distribution, education, marital status, occupation, and smoking. The mean of SBP and DBP was not significantly different between the two groups before the intervention. The consumption of salty foods and tea were also measured outside the DASH diet. The salty food group consisted of snacks, chips, salted fish, salted spawn, and pickled cucumber. There was no significant difference in dietary intakes among subjects in the intervention and control groups at the baseline. During the study, 3 subject in the control group and 4 subjects in the intervention group moved out of the area and did not complete the study.

Table 1. Demographic and Clinical Characteristics of the Participants According to the Study Groups

Characteristics	Control group (n = 75)		Intervention group (n = 75)		P-value
	Mean (SD)	No. of persons (%)	Mean (SD)	No. of persons (%)	
Sex					
Female		59 (78.7)		55 (73.3)	0.44
Male		16 (21.3)		20 (26.7)	
Age (years)	58.1 (6.34)		56 (6.1)		0.05
Education					
Illiterate		46 (61.3)		55 (73.3)	
Primary school		26 (34.7)		16 (21.3)	0.34
High school		2 (2.7)		3 (4)	
Higher education		1 (1.3)		1 (1.3)	
Occupation (%)					
Housewife		57 (76)		55 (73)	0.15
Farmer		11 (14.7)		6 (8)	
Other		7 (9.3)		14 (18.7)	
Marital status (%)					0.43
Married		62 (86.1)		62 (86.1)	
Widow		10 (13.9)		10 (13.9)	
Systolic Blood pressure (mmHg)	132.9 (9.8)		129.3 (11.6)		0.05
Diastolic Blood pressure (mmHg)	78.5 (7.8)		80.1 (7.6)		0.05
Bread and grains (serving per day)	5.5 (2.6)		5.5 (2.7)		0.961
Meat and its substitutes (units per day)	1.1 (0.7)		1.1 (0.72)		0.679
Dairy (serving per day)	1.5 (0.93)		1.5 (0.93)		0.995
Vegetables (serving per day)	3.5 (1.8)		3.5 (1.87)		0.964
Fruits (serving per day)	1.45 (0.96)		1.5 (0.97)		0.885
Beans and nuts (serving per day	0.2 (0.31)		0.18 (0.31)		0.744
Unsaturated fats and oils	1.7 (1.6)		1.7 (1.8)		0.901
Saturated fats and oils	1.05 (0.94)		1.01 (0.97)		0.798
Sweet food (serving per day)	1.7 (1.40)		1.8 (1.6)		0.625
Salty food	1.06 (0.9)		1.05 (0.85)		0.914
Tea	2.07 (1.09)		1.9 (1.14)		0.27

Abbreviation: SD, standard deviation

The comparison of dietary intake with the recommended DASH diet showed that the average daily intake of 3 groups of dairies, fruits, and nuts and beans in both groups were significantly lower than the recommended DASH values. Also, the average intake of the two groups of vegetables and bread and grains were in the lower bound of the recommended DASH range. After obtaining the results in the educational interventions program, more attention was paid to these groups of foods.

Table 2 shows the adjusted values of DASH diet component after 2.5 months of study in the two groups. The results show that receiving the three groups of dairies, fruits, and nuts and beans in the intervention group was significantly higher that the control group. However they are still lower than recommended values of DASH diet. Intake of breads, meat, vegetables, and sweet foods in the intervention group was also significantly higher that the control group. In contrast, the intervention group had significantly lower intake of salty food compared to the control group.

Figure 1 shows the comparison of SBP and DBP before and 2.5 months after the intervention in the two groups. The post-baseline value of DBP was not significantly different between the two groups. But, adjusted post-baseline values of SBP showed a significant difference between intervention (129.3, 95%CI: 127.1-131.6) and control group (133.5, 95% CI: 131.3-135.7).

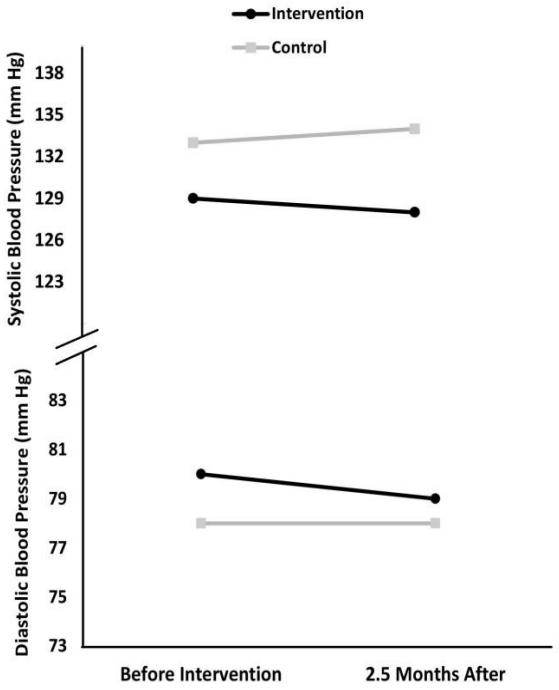

Figure 1. Systolic and Diastolic Blood Pressure Before and 2.5 Months After the Intervention According to the Study Groups

Table 2. Comparison of adjusted Post-Baseline Values of DASH Diet Components Between the Two Groups

Diet Components	Control (N = 72)		Intervention (N = 71)		P-value
	Adjusted Mean	95% Confidence Interval	Adjusted Mean	95% Confidence Interval	
Bread and grains	5.47	5.16-5.78	6.36	6.05-6.67	0.001
Meat and substitutes	1.09	0.99-1.19	1.4	1.29-1.50	0.001
Dairy (serving per day)	1.4	1.28-1.52	1.78	1.66-1.9	0.001
Vegetables (serving per day)	3.21	3-3.42	3.7	3.5-3.9	0.001
Fruits (serving per day)	1.45	1.32-1.57	1.71	1.59-1.8	0.003
Beans and nuts (serving per day)	0.17	0.06-0.28	0.51	0.41-0.62	0.001
Unsaturated fats and oils (serving per day)	1.8	1.6-1.9	1.97	1.8-2.1	0.127
Saturated fats and oils(serving per day)	1.1	0.9-1.25	0.9	0.8-1.12	0.312
Sweet food (serving per day)	1.62	1.41-1.8	1.98	1.8-2.2	0.006
Salty food	1.12	0.98-1.26	0.81	0.67-0.95	0.002
Tea	2	1.9-2.1	1.85	1.73-1.97	0.073

Discussion

According to this study, educational intervention improved the quality of diet among the hypertensive subjects and ultimately led to significant decrease in systolic blood pressure. Overall, the intake of bread and grains, meat, fruits, dairies, vegetables and, beans and nuts significantly increased after 2.5 months in the intervention group compared to the control group. It should be noted that despite the increase in consumption of meat, it was in the normal range of the DASH diet. This finding is in agree with previous study by Saneei et al. Who found that DASH diet in adolescents with metabolic syndrome compared with the usual dietary recommendations improved the quality of the diet, reduced the prevalence of metabolic syndrome, and decreased hypertension. They also showed that a healthy diet can be used as an appropriate treatment to correct metabolic syndrome and its components in adolescents (17). Valipur et al. showed that adherence to the DASH diet by the overweight individuals can lead to improve insulin sensitivity, increase in plasma antioxidant capacity, and decrease in oxidative stress after four weeks of applying DASH diet in hypertensive obese people (16). In an interventional study by Iso and colleagues, the effect of education focused on reducing the daily intake of sodium, increasing milk intake, jogging, and reducing the intake of sugar and alcohol was examined among patients with essential hypertension who did not receive any treatment. Their results showed that the use of nutritional and non-medicinal education was effective on systolic blood pressure control within six months and its continuation in 1.5 years after the education in the intervention group (18). The efficacy of following the DASH diet on controlling blood pressure is well demonstrated by previous studies (3, 19). DASH diet is rich in fruits, vegetables, and low-fat dairy product with reduced saturated fat.

In this study we found a clinical and significant difference in systolic blood pressure between intervention and control group after the educational intervention. However, the educational intervention did not significantly decrease diastolic blood pressure. In previous study by Apple et al, the effect of DASH diet on reducing systolic blood pressure was greater than diastolic blood pressure (3). In a systematic review study by Saneei et al, there was variation in the extent of the decrease in blood pressure among different studies (20).

There are possible mechanisms by which DASH diet can reduce blood pressure such as weight loss, decreased waist circumference, and further beneficial effects on the control of the glycemic index (15).

This study suffer from some limitations. First, it was not possible to blind the control groups because of the nature of educational intervention. So, the possible reason for significant increase in vegetables and low-fat dairies among control group might be due to receiving education of the control group and contamination between the two groups. Second, the duration of follow-up was limited to 2.5 months which might not be long enough to influence on diastolic blood pressure.

Conclusion

The results of this study showed that efforts to modify the dietary pattern of hypertensive patients through training about DASH diet were able to correct the dietary habits of patients to acceptable levels. Furthermore, patients' systolic blood pressure in the intervention group decreased compared to the baseline, which can be due to the modification of subjects' dietary patterns. Therefore, proper nutrition education can be an effective way to prevent and control hypertension. Hence, increasing attention to nutritional awareness of the community for the appropriate use of food groups is recommended.

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Ethical consideration

The study protocol has been approved by Ethical Research Committee of Guilan University of Medical Sciences and registered at Iranian Randomized Clinical Trial Registry. (Code: N12016011622984).

Conflicts of interests

Authors declared no conflict of interest.

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