Effects of the Dietary Approaches to Stop Hypertension (DASH) Eating Plan on Cardiovascular Risks among Type 2 Diabetic Patients: A Randomized Crossover Clinical Trial

Citation
Azadbakht, Leila, Nafiseh Rashidi Pour Fard, Majid Karimi, Mohammad Hassan Baghaei, Pamela J. Surkan, Majid Rahimi, Ahmad Esmailzadeh, and Walter C. Willett. 2011. Effects of the Dietary Approaches to Stop Hypertension (DASH) eating plan on cardiovascular risks among type 2 diabetic patients: A randomized crossover clinical trial. Diabetes Care 34(1): 55-57.

Published Version
doi:10.2337/dc10-0676

Permanent link
http://nrs.harvard.edu/urn-3:HUL.InstRepos:8605323

Terms of Use
This article was downloaded from Harvard University’s DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA

Share Your Story
The Harvard community has made this article openly available. Please share how this access benefits you. Submit a story.

Accessibility
Effects of the Dietary Approaches to Stop Hypertension (DASH) Eating Plan on Cardiovascular Risks Among Type 2 Diabetic Patients

A randomized crossover clinical trial

LEILA AZADBAKHT, PHD1,2
NAFISEH RASHIDI POUR FARD, BSC3
MAJID KARIMI, MD3
MOHAMMAD HASSAN BAGHAEI, PHD3

OBJECTIVE — To determine the effects of the Dietary Approaches to Stop Hypertension (DASH) eating pattern on cardiometabolic risks in type 2 diabetic patients.

RESEARCH DESIGN AND METHODS — A randomized crossover clinical trial was undertaken in 31 type 2 diabetic patients. For 8 weeks, participants were randomly assigned to a control diet or the DASH eating pattern.

RESULTS — After following the DASH eating pattern, body weight (P = 0.007) and waist circumference (P = 0.002) reduced significantly. Fasting blood glucose levels and HbA1C decreased after adoption of the DASH diet (−29.4 ± 6.3 mg/dl; P = 0.04 and −1.7 ± 0.1%; P = 0.04, respectively). After the DASH diet, the mean change for HDL cholesterol levels was higher (4.3 ± 0.9 mg/dl; P = 0.001) and LDL cholesterol was reduced (−17.2 ± 3.5 mg/dl; P = 0.02). Additionally, DASH had beneficial effects on systolic (−13.6 ± 3.5 vs. −3.1 ± 2.7 mmHg; P = 0.02) and diastolic blood pressure (−9.5 ± 2.6 vs. −0.7 ± 3.3 mmHg; P = 0.04).

CONCLUSIONS — Among diabetic patients, the DASH diet had beneficial effects on cardiometabolic risks.

Cardiovascular complications are the most frequent problem among type 2 diabetic patients (1). Therefore, a therapeutic approach that can control cardiometabolic risks might have beneficial effects for diabetic patients (2).

Although the Dietary Approaches to Stop Hypertension (DASH) diet was originally developed to prevent or treat high blood pressure (2), it is now recommended as an ideal eating pattern for all adults (3).

From the 1Food Security Research Center, Isfahan University of Medical Sciences, Isfahan, Iran; the 2Department of Nutrition, School of Public Health, Isfahan University of Medical Sciences, Isfahan, Iran; the 3Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland; the 4Department of Nutrition, Harvard School of Public Health, Boston, Massachusetts; and the 5Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts.

Corresponding author: Leila Azadbakht, azadbakht@hlth.mui.ac.ir.

Received 8 April 2010 and accepted 3 September 2010. Published ahead of print at http://care.diabetesjournals.org on 15 September 2010. DOI: 10.2337/dc10-0676. Clinical trial reg. no. NCT01049321, clinicaltrials.gov.

© 2011 by the American Diabetes Association. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered. See http://creativecommons.org/licenses/by-nc-nd/3.0/ for details.

The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked “advertisement” in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

Diabetes Care 34:55–57, 2011

Copyright © 2011 American Diabetes Association. For details see http://care.diabetesjournals.org/ on 15 September 2010. DOI: 10.2337/dc10-0676. Clinical trial reg. no. NCT01049321, clinicaltrials.gov.

Study procedures

We used a randomized crossover design. After a run-in period of 3 weeks, patients were randomly assigned to a control diet or a DASH diet for 8 weeks. This was followed by a wash-out period of 4 weeks. The project dietitian enrolled participants and randomly allocated them to groups using random sequencing generated in SPSS at the end of the run-in period. Because this was a dietary intervention, patients were not blinded.

Diets

We prescribed two diets for each patient: the control diet and the DASH diet. The control diet included a macro-nutrient composition of 50–60% carbohydrates, 15–20% protein, <30% total fat, and <5% of caloric intake from simple sugars (11). This composition was more similar to the Iranian dietary pattern and dietary habits. The DASH
diet was rich in fruits, vegetables, whole grains, low-fat dairy products, and low in saturated fat, total fat, cholesterol, refined grains, and sweets. The amount of sodium intake was 2,400 mg per day (3). Patient adherence was assessed in terms of attendance at monthly visits and through analysis of the 3-day food diaries.

Measurements
All measurements were taken according to standard protocols. The laboratory staff was blinded to the treatment status.

Statistical analysis
We used general linear models (paired Student t tests) to globally compare means of the all variables at the end of the two different diet periods and the mean change for each variable in the two groups. Statistical analyses were performed using SPSS for Windows version 13.0 (SPSS, Chicago, IL).

RESULTS — Of the 44 participants, 31 type 2 diabetic patients (13 male and 18 female) completed the entire crossover study (one patient was diagnosed with cancer and one with anemia, and eleven patients did not follow the study protocol).

Analysis of the 3-day diet self-report showed that calorie intake of two the groups was not significantly different (2,165 ± 29 vs. 2,189 ± 35 Kcal/day in the control and DASH diets, respectively; P = 0.62). The results were the same regarding the actual protein intake (15 vs. 15%) and total fat intake (28 vs. 29%) as well as the percentage of the carbohydrate intake (57 vs. 55%) in the control and DASH diet groups, respectively. These two diets were different in sodium content (2,310 vs. 2,996 mg/day in the control and DASH diets, respectively). The DASH diet had higher amount of calcium (2,310 vs. 2,996 mg/day in the control and DASH diets, respectively)

Effects of the two diets on cardiometabolic risks are shown in Table 1, indicating a significant reduction in most risk factors from the DASH diet.

CONCLUSIONS — We found that the DASH-eating pattern had beneficial effects on type 2 diabetic patients’ cardiometabolic parameters. The prescribed caloric intake of both diets was the same, but the calorie density of food in the DASH diet was lower than that in the control diet. A long-term weight-loss trial over 18 months also indicated beneficial effects of using low-calorie–dense diets for weight loss (12). Furthermore, the dairy content, which might be related to weight reduction (13), was higher in the DASH diet was higher than the control diet. The DASH eating pattern also had a more beneficial impact on the patient’s glycemic control. More fiber, phytoestro-
The DASH eating pattern may play an important role in managing cardiometabolic risks among type 2 diabetic patients. Longer-term studies are needed to assess the sustainability of these effects.

Acknowledgments — This study was supported by the Isfahan University of Medical Sciences (primary sponsor). The facilities for conducting the biochemical experiments and sample recruitment were provided by Shahid Motahari Hospital of Fooladshahr, Isfahan Steel Company, Isfahan. All participants received health insurance from the Isfahan Steel Company and attended the Shaheed Motahari Hospital of Fooladshahr.

No potential conflicts of interest relevant to this article were reported.

L.A. and A.E. conceptualized and designed the study, performed statistical analyses, drafted the manuscript, and interpreted data. N.R.P.F. participated in data collection and entry and prescribed diets to the participants. M.K., M.H.B., and M.R. participated in data collection and took measurements. P.J.S. helped draft the manuscript and edited the English version of the manuscript. W.C.W. helped draft the manuscript and provided comments contributing to the interpretation of results. All authors approved the final manuscript for submission.

The authors thank the participants of the study for their enthusiastic support.

References

1. Kalofoutis C, Piperi C, Kalofoutis A, Harris F, Phoenix D, Singh J. Type II diabetes mellitus and cardiovascular risk factors: current therapeutic approaches. Exp Clin Cardiol 2007;12:17–28.
2. Vollmer WM, Sacks FM, Ard J, Appel LJ, Bray GA, Simons-Morton DG, Conlin PR, Svetkey LP, Erlinger TP, Moore TJ, Karanja N, DASH-Sodium Trial Collaborative Research Group. Effects of diet and sodium intake on blood pressure: subgroup analysis of the DASH-sodium trial. Ann Intern Med 2001;135:1019–1028.
3. Buse JB, Ginsberg HN, Bakris GL, Clark NG, Costa F, Eckel R, Fonseca V, Gerstein HC, Grundy S, Nesto RW, Pignone MP, Plutzky J, Porte D, Redberg R, Stitziel KF, Stone NJ, American Heart Association, American Diabetes Association, Primary prevention of cardiovascular diseases in people with diabetes mellitus: a scientific statement from the American Heart Association and the American Diabetes Association. Circulation 2007;115:114–126.
4. Azadbakht L, Mirrmanan P, Esmailzadeh A, Azi F, Azi Z. Beneficial effects of a Dietary Approaches to Stop Hypertension plan on features of the metabolic syndrome. Diabetes Care 2005;28:2823–2831.
5. Forman JP, Stampfer MJ, Curhan GC. Diet and lifestyle risk factors associated with incident hypertension in women. JAMA 2009;302:401–411.
6. Toledo E, de A Carmona-Torre F, Alonso A, Puchau B, Zulet MA, Martinez JA, Martínez-Gonzalez MA. Hypothesis-oriented food patterns and incidence of hypertension: 6-year follow-up of the SUN (Seguíimiento Universidad de Navarra) prospective cohort. Public Health Nutr 2010;13:338–349.
7. Levitan EB, Wolk A, Mittleman MA. Consistency with the DASH diet and incidence of heart failure. Arch Intern Med. 2009;169:851–857.
8. Liese AD, Nichols M, Sun X, D’Agostino RB Jr, Haffner SM. Adherence to the DASH Diet is inversely associated with incidence of type 2 diabetes: the insulin resistance atherosclerosis study. Diabetes Care 2009;32:1434–1436.
9. Fleiss JL. The Design and Analysis of Clinical Experiments. London, John Wiley and Sons, 1986, p. 263–271.
10. Harris TJ, Cook DG, Wicks PD, Cappuccio FP. Impact of the new American Diabetes Association and World Health Organisation diagnostic criteria for diabetes on subjects from three ethnic groups living in the UK. Nutr Metab Cardiovasc Dis 2000;10:305–309.
11. Anderson JW. Diabetes mellitus: medical nutrition therapy. In Modern Nutrition in Health and Disease. 10th ed. Shils ME, Shike M, Ross AC, Caballero B, Cousins RJ, Eds. Philadelphia, Lippincott Williams and Wilkins, 2006, p. 1051–1053.
12. Flood A, Mitchell N, Jaeb M, Finch EA, Laqua PS, Welsh EM, Hotop A, Langer SL, Levy RL, Jeffery RW. Energy density and weight change in a long-term weight-loss trial. Int J Behav Nutr Phys Act 2009;6:57.
13. Zemel MB, Thompson W, Milstead A, Morris K, Campbell P. Calcium and dairy acceleration of weight and fat loss during energy restriction in obese adults. Obes Res 2004;12:582–590.
14. Azadbakht L, Atabak S, Esmailzadeh A. Soy protein intake, cardioregional indices, and C-reactive protein in type 2 diabetes with nephropathy: a longitudinal randomized clinical trial. Diabetes Care 2008;31:648–654.
15. Appel LJ, Sacks FM, Carey VJ, Obarzanek E, Swain JF, Miller ER 3rd, Conlin PR, Elinger TP, Rosner BA, Lararojo NM, Charleston J, McCarron P, Bishop LM, OmniHeart Collaborative Research Group. Effects of protein, monounsaturated fat, and carbohydrate intake on blood pressure and serum lipids: results of the OmniHeart randomized trial. JAMA 2005;294:2455–2464.