International Journal of Nutrition Sciences

Journal Home Page: ijns.sums.ac.ir

Review Article

Nordic Diet and Cardio-metabolic Diseases: A Review

Fatemeh Nouripour, Najmeh Hejazi*

Department of Clinical Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

ARTICLE INFO

Keywords:
Nordic diet
Cardiovascular diseases
Metabolic syndrome

**Corresponding author:*
Najmeh Hejazi,
Department of Clinical Nutrition,
School of Nutrition and Food
Sciences, Shiraz University of
Medical Sciences,
Shiraz, Iran.
Tel: +98-917-7020859
Email: najmehhejazi@gmail.com
Received: May 29, 2018
Revised: June 10, 2019
Accepted: June 20, 2019

ABSTRACT

Nordic Diet is a diet based on foods typically consumed in Nordic countries. This diet includes fruits (e.g. apple and pear); berries (e.g. blueberry, bilberries, lingoberries); vegetables; legumes; whole grains and dietary fiber from barley, oats and rye; low-fat dairy; fatty fishes (e.g. salmon, herring, mackerel); and rapeseed oil. On the other hand, Nordic diet provides small amounts of processed meats, sweets, salt and saturated fat .The Baltic Sea Diet Pyramid is a food pyramid based on Nordic foods. The pyramid illustrates the recommended amount of foods that should be consumed. Foods that are at the bottom of the pyramid should be consumed in higher amounts. Foods that are at the top of the pyramid should be consumed at least amounts. Studies have suggested that compliance with Nordic diet is associated with health benefits and might improve anthropometric measurements, lipid profile, blood pressure, low-grade inflammation and insulin resistance.

Please cite this article as: Nouripour F, Hejazi N. Nordic Diet and Cardio-metabolic Diseases: A Review. Int J Nutr Sci. 2019;4(3):105-108. doi: 10.30476/IJNS.2019.82686.1025.

Introduction

Nordic diet (ND) is a diet based on foods typically consumed in Nordic countries including Denmark, Norway, Sweden, Iceland, and Finland. This diet includes fruits (e.g. apple and pear); berries (e.g. blueberry, bilberries, lingoberries); vegetables; legumes; whole grains and dietary fiber from barley, oats and rye; low-fat dairy; fatty fishes (e.g. salmon, herring, mackerel); and rapeseed oil. Only small amounts of salt, added sugar, and saturated fats are included in this diet (1, 2).

According to a study, adherence to ND is associated with higher intakes of carbohydrates, fiber, iron, vitamins A, C, and D, and folate and also with lower intakes of saturated fat and alcohol (3). The Baltic Sea Diet Pyramid (Figure 1) is a food pyramid illustrating the recommended amount of foods that should be consumed. This food pyramid includes healthier foods typically consumed in Nordic countries. Healthy foods that should be consumed in larger amounts are placed at the bottom of the pyramid. These foods include Nordic vegetables, roots, cabbages, peas, Nordic fruits and berries. Common grains in Nordic countries (whole grain barley, oats, and rye) which have high amounts of fiber are placed at the middle of the pyramid. After that, there are fish, low-fat and fat-free dairy food, and rapeseed oil. Foods that should be consumed only in small amounts are placed at the top of the pyramid and include processed meats, butter, and sweets (3).

New Nordic Diet (NND) is a kind of local diet that considers food taste, health, food culture, and environment. This diet has principles including (i) receiving more calories from plant foods and less calories from meats (ii) taking more foods from sea and lakes, and (iii) taking more foods from the wild countryside (4). ND includes high amounts of fruits and vegetables (especially berries, cabbages, root vegetables and legumes), fresh herbs, potatoes,

Figure 1: The Baltic Sea Diet Pyramid (created by the Finnish Heart Association, the Finnish Diabetes Association and the University of Eastern Finland).

plants and mushrooms from wild countryside, whole grains, nuts, fish and shellfish, seaweed, free-range livestock, and game (5).

Health Effects of the Nordic Diet: Anthropometric Measurements

Health effects of the ND were assessed in numerous studies. In a clinical trial, NND adherence resulted in significant weight reduction in subjects with increased waist circumference. Weight loss in this study occurred, while participants were allowed to eat as much as they desired. Weight reduction in NND group was accompanied by reduction in waist and hip circumferences, sagittal diameter, and body fat mass. It is suggested that ND might lead to higher satiety, probably as a result of low calorie density and high fiber content of the diet (6). Improved anthropometric measurements including body weight, body mass index (BMI), fat mass, and waist circumference following ND was also reported in other trials (2, 7-10).

Lipid Profile

Effect of ND on cardiovascular risk factors were also assessed in some studies. Results of these trials have indicated that ND might improve lipid profile. In other words, ND adherence may reduce total cholesterol, low-density lipoprotein cholesterol (LDL-C), very-low density lipoprotein cholesterol (VLDL-C), non-high-density lipoprotein cholesterol (non-HDL-C), triglycerides, LDL-C/HDL-C ratio, apo B/apo A_1 ratio. In addition HDL-C might increase following ND diet (2, 6, 7, 9, 11). ND brings about lower saturated fatty acid intake and higher polyunsaturated fatty acid (PUFA) intake which is reflected in fatty acid composition of serum cholesterol esters. Lower intake of high-fat dairy and meat in this diet and substitution of them with lower-fat equivalents, and also higher intake of fatty fish might be responsible for the changes in serum fatty acids (12).

Blood Pressure

In a study, the effect of ND on ambulatory blood pressure of participants with metabolic syndrome was evaluated over 12 weeks. The results showed that ND had favorable effects on ambulatory blood pressure and led to reduced ambulatory daytime and 24-hour diastolic blood pressure and mean arterial blood pressure (13). In a randomized controlled trial, ND resulted in 5.1 mmHg and 3.2 mmHg reduction in systolic and diastolic blood pressures, respectively; when compared to a control diet. Reduction in systolic blood pressure remained statistically significant even after adjusting for weight change (6). However, in a trial comparing the effect of a weight-maintenance ND with a controlled diet on blood pressure, there was no significant difference between groups (11). In other studies, reduction in blood pressure following ND was observed. Low sodium content of ND and high intake of fiber, vegetables, fruits, and nuts might contribute to reduced blood pressure (2, 6, 7).

Inflammation

ND may also have beneficial effect on low-grade inflammation. Reductions in interleukin-18 (IL-18), C-reactive protein (CRP) and cathepsin S were observed in some studies (6, 14, 15). Possible anti-inflammatory effect of ND might be due to characteristics of this diet which emphasizes on consumption of fruits, vegetables, whole grains, seafood, and rapeseed oil and restriction of processed meat (16). On the other hand, Adamsson et al. failed to detect significant effect of ND on CRP in heper-cholesterolemic subjects after 6 weeks of intervention (2).

In an interventional study by Uusitupa et al. about ND, IL- 1 Ra increased significantly in control group during the study, but IL-6 and hs-CRP (high-sensitivity C-reactive protein) did not change (11). In Fritzen et al. study, CRP level decreased significantly only in women after 26 weeks of ND. Overall, there was no difference between ND and control (Average Danish Diet) group. TNF-α had no change throughout the study (10). More studies are needed to clarify the effect of ND on different inflammatory markers.

Glycemic Control

Beneficial effect of ND on glycemic control has been observed in clinical trials. Reduction in fasting

blood glucose, fasting insulin, insulin resistance or glycated hemoglobin (HbA_1c) in addition to increased insulin sensitivity was reported following ND. These changes were mainly due to weight reduction (2, 6, 7, 9, 17). In a randomized controlled trial on participants with high waist circumference, fasting blood sugar decreased significantly in ND group compared with an average Danish diet after 26 weeks of an intervention. However after adjusting for weight reduction, this significant difference disappeared (6).

In another randomized controlled trial comparing the effects of ND with a Western diet in hyper-cholesterolemic subjects, ND resulted in a significantly higher improvement in insulin resistance partially due to higher weight reduction in that group (2). Higher fiber, fruits, vegetables, whole grains, polyphenols, antioxidants, PUFAs, and lower saturated fatty acids and added sugar may also play an important role in enhancing glycemic control (6, 18).

Conclusion

Nordic diet is a healthy diet including large amounts of fruits, vegetables, whole grains, legumes, low-fat dairy, and fatty fish. This diet provides small amounts of processed meats, sweets, salt, and saturated fat. Compliance with Nordic diet has beneficial effects on health and may result in improved anthropometric measurements, lipid profile, blood pressure, low-grade inflammation, and insulin resistance.

Conflict of Interest

None declared.

References

1 Adamsson V, Reumark A, Cederholm T, et al. What is a healthy Nordic diet? Foods and nutrients in the NORDIET study. *Food Nutr Res*. 2012;56:18189. DOI: 10.3402/fnr.v56i0.18189. PMID: 22761599.

2 Adamsson V, Reumark A, Fredriksson IB, et al. Effects of a healthy Nordic diet on cardiovascular risk factors in hypercholesterolaemic subjects: a randomized controlled trial (NORDIET). *J Intern Med*. 2011;269:150-9. DOI:10.1111/j.1365-2796.2010.02290.x. PMID: 20964740.

3 Kanerva N, Kaartinen NE, Schwab U, et al. The Baltic Sea Diet Score: a tool for assessing healthy eating in Nordic countries. *Public Health Nutr*. 2014;17:1697-705. DOI: 10.1017/S1368980013002395. PMID: 24172174.

4 Mithril C, Dragsted LO, Meyer C, et al. Guidelines for the new Nordic diet. *Public Health Nutr*. 2012;15:1941-7. DOI:10.1017/S136898001100351X.

5 Mithril C, Dragsted LO, Meyer C, et al. Dietary composition and nutrient content of the New Nordic Diet. *Public Health Nutr*. 2013;16:777-85. DOI:10.1017/S1368980012004521. PMID:23089239.

6 Poulsen SK, Due A, Jordy AB, et al. Health effect of the New Nordic Diet in adults with increased waist circumference: a 6-mo randomized controlled trial. *Am J Clin Nutr*. 2014;99:35-45. DOI:10.3945/ajcn.113.069393. PMID:24257725.

7 Darwiche G, Hoglund P, Roth B, et al. An Okinawan-based Nordic diet improves anthropometry, metabolic control, and health-related quality of life in Scandinavian patients with type 2 diabetes: a pilot trial. *Food Nutr Res*. 2016;60:32594. DOI:10.3402/fnr.v60.32594. PMID:27664051.

8 Poulsen SK, Crone C, Astrup A, et al. Long-term adherence to the New Nordic Diet and the effects on body weight, anthropometry and blood pressure: a 12-month follow-up study. *Eur J Nutr*. 2015;54:67-76. DOI:10.1007/s00394-014-0686-z. PMID:24664189.

9 Holmer H, Widen C, Wallin Bengtsson V, et al. Improved General and Oral Health in Diabetic Patients by an Okinawan-Based Nordic Diet: A Pilot Study. *Int J Mol Sci*. 2018;19:1949. DOI:10.3390/ijms19071949. PMID:29970834.

10 Fritzen AM, Lundsgaard AM, Jordy AB, et al. New Nordic Diet-Induced Weight Loss Is Accompanied by Changes in Metabolism and AMPK Signaling in Adipose Tissue. *J Clin Endocrinol Metab*. 2015;100:3509-19. DOI:10.1210/jc.2015-2079. PMID:26126206.

11 Uusitupa M, Hermansen K, Savolainen M, et al. Effects of an isocaloric healthy Nordic diet on insulin sensitivity, lipid profile and inflammation markers in metabolic syndrome–a randomized study (SYSDIET). *J Intern Med*. 2013;274:52-66. DOI:10.1111/joim.12044. PMID:23398528.

12 Adamsson V, Cederholm T, Vessby B, et al. Influence of a healthy Nordic diet on serum fatty acid composition and associations with blood lipoproteins–results from the NORDIET study. *Food Nutr Res*. 2014;58:24114. DOI:10.3402/fnr.v58.24114. PMID:25476792.

13 Brader L, Uusitupa M, Dragsted LO, Hermansen K. Effects of an isocaloric healthy Nordic diet on ambulatory blood pressure in metabolic syndrome: a randomized SYSDIET sub-study. *Eur J Clin Nutr*. 2014;68:57-63. DOI:10.1038/ejcn.2013. PMID:24129358.

14 Nilholm C, Roth B, Hoglund P, et al. Dietary

intervention with an Okinawan-based Nordic diet in type 2 diabetes renders decreased interleukin-18 concentrations and increased neurofilament light concentrations in plasma. *Nutr Res*. 2018;60:13-25. DOI:10.1017/S1368980012004521. PMID:30527256.

15 Mehrabani G, Aminian S, Mehrabani G, et al. Dietetic plans within the multiple sclerosis community: a review. *Int J Nutr Sci.* 2019;4:14-22. DOI:10.30476/IJNS.2019.81531.1007.

16 Mehrabani D, Vahedi M, Eftekhari MH, et al. Food avoidance in patients with ulcerative colitis: a review. *Int J Nutr Sci.* 2017;2:189-95.

17 Ramezani-Jolfaie N, Mohammadi M, Salehi-Abargouei A. The effect of healthy Nordic diet on cardio-metabolic markers: a systematic review and meta-analysis of randomized controlled clinical trials. *Eur J Nutr*. 2018. Aug 20. DOI:10.1007/s00394-018-1804-0. PMID:30128767.

18 Zimorovat A, Mohammadi M, Ramezani-Jolfaie N, et al. The healthy Nordic diet for blood glucose control: a systematic review and meta-analysis of randomized controlled clinical trials. *Acta Diabetol*. 2019. DOI:10.1007/s00592-019-01369-8. PMID:31172295.