International Journal of Contemporary Medicine
Volume 12 No. 2, July-December 2024

Effect of DASH Diet Intervention on Hypertensive, Diabetic and Heart Ailments: A Systematic Review

Rameesha Shauket

Nutritionist, MS Scholar MPH, Armed Forces Post Graduate Medical Institute, National University Medical Sciences, Rawalpindi, Pakistan

How to cite this article: Shauket R. Effect of DASH Diet Intervention on Hypertensive, Diabetic and Heart Ailments: A Systematic Review. 2024;12(2):1-7.

ABSTRACT

Pakistan health sector still lacks the proper machinery to meet the requirements of the increasing population. The millennium is marked with lifestyle changes from high/ moderate activity to sedentary lifestyle. This has a negative consequence on the health on young and adults equally. The prevalence of hypertension is 35%, 3% diabetes and 29% cardiovascular diseases. The score is still not confirmed as the census is unbailable to grasp the local situation as experienced by medical staff on ground. In these conditions, nutrition therapy may play its pivotal role in the prevention and maintenance of current disease situation in the country. Dietary Approaches to Stop Hypertension, DASH diet, has shown remarkable effects in such patients. These menu guidelines help to stabilize the health balance of life through maintenance of weight, sodium levels in the body and bad fat deposition. DASH plans are recommended with slight dietary modifications and exercise to keep up with health goals. The major portion of diet is based on fruits and vegetables and plenty of water intakes daily. This intervention has promising effects till now.

Keywords: DASH diet, hypertension, cardiovascular diseases, diabetes mellitus

INTRODUCTION

DASH diet is popular among researchers and dietitians equally. DASH is the abbreviation for Dietary Approaches to Stop Hypertension. DASH eating protocol greatly improves the incidence of hypertension.[1] It improves good fat in the body i.e. high density lipoprotein and reduces the amount of bad fats i.e. low density lipoprotein.[2] DASH eating styles refer to Mediterranean style of food intake that constitutes more portions from fruits and vegetables group, whole grains, low fat dairy and meats.[3, 4] In some studies the percentages of unsaturated fats and meat portion are changed to check the effectiveness. The results were still in affirmation. Older adults are the victims of poor or inadequate eating habits. Diseases ratio increase with age as the nutritionally rich foods are consumed less.[5] They mostly suffer from adiposity and its related morbidities for example hypercholesterolemia, atherosclerosis, hypertension etc.[6] A way towards healthy eating in the daily lives of people heavily depends on environment-friendly behavior, health reforms, better and stable policies of food supply chain. By this method, many ailments can be prevented manifold times including diabetes and cardiovascular diseases. [7]

More than hundred million people are suffering from pre-hypertension or hypertension stage I all over the world. The most vital factor for hypertension that can be

Corresponding author: Rameesha Shauket , Rameesha Shauket, Nutritionist, MS Scholar MPH, Armed Forces Post Graduate Medical Institute, National University Medical Sciences, Rawalpindi, Pakistan

Email: rameeshashauket@gmail.com

considered in post-menopausal women is the decrease in the levels of estrogen. Estrogen may have Vaso-dilatory effects on pre-menopausal women.[8] High blood pressure can be controlled through medicines but first priority must be the lifestyle changes. [9] Diet intervention is thought to be the first 'medication' for the long-term effects as it has more promising long-lasting results than on pharmacological intervention alone. Blood pressure control is helpful to prevent later complications and initiation of CVDs. [10] Dietary factors include consumption of high fat diet rich in saturated fats, inactive lifestyle, processed and ready-made foods are mostly preferred over home based freshly cooked culinary practices.[11] Mediterranean diets are essential to control lipid profiles in patients that are at risk of developing CVDs at later stages of their life. [12, 13]

METHODOLOGY

The systemic review is based on research articles and clinical controlled trials. The collection period was from January, 2021 to April, 2021. More than eighty studies are included in this review from the library of hundred articles. The time range was from 2010 to 2020 to increase the efficiency of the systematic review while Google Scholar, PubMed and Research Gate were the databases we chose for the collection of our data.

Objectives

Dietary Approaches to Stop Hypertension is popular diet in Europe especially in Mediterranean population. The aim of this systematic review is to showcase light upon the effectivity of DASH eating practices with co- morbidities that are hypertension, diabetes mellitus and cardio vascular diseases.

DASH Diet

DASH eating habits have potential benefits to health. [14] Dietary approaches to stop hypertension plans consist of various food groups mainly focusing fruits, vegetables, lean meats, unsaturated fat and fiber. The amount if sodium intake is kept at 1500 mg and 2300 mg according to patient's health condition. DASH plan are rich source of potassium, magnesium and calcium. [15]

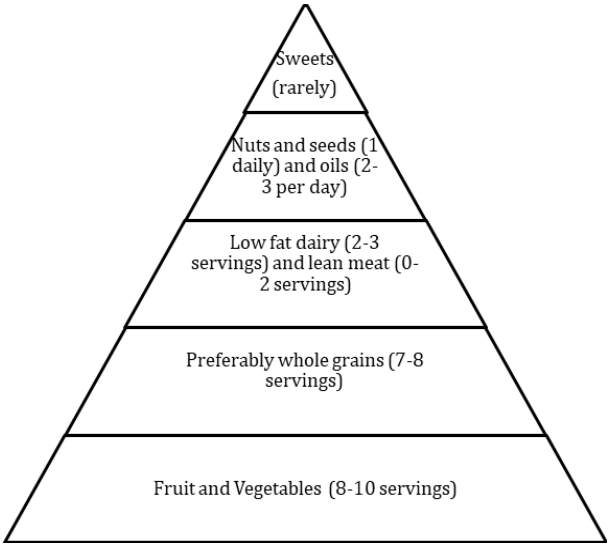

Fig. I: DASH Diet Pyramid Representation

It fulfills the recommended amount of fiber intake in adults with adequate protein intake for normal physiological functioning. [16] The high content of fruits and vegetables in the diet let people not only recover from high blood pressure but also other related diseases such as bad cholesterol, improved levels of HDL, LDL and VLDL; insulin resistance and heart issues. [17] Patients were sometimes unable to keep up with the menu plan due to less variety in recipes and foods available in DASH eating plan. [18]

Effect of DASH Diet on Hypertension

High blood pressure is dangerous for human health. The normal systolic pressure should be 120 mm Hg while diastolic at 80 mm Hg. The range 80 to 120 mm Hg is considered normal blood pressure.[14] Over 2500 participants were analyzed over the time in different study groups. DASH intervention helped patients in the reductions of both systolic and diastolic blood pressure. Population is divided in three major categories: the patients who are unaware of their existing condition of hypertension, those who do not take medication and the ones who are on prescribed pills.[19] In a 2012 study design, 144 patients were recruited on the basis of high blood pressure, inactive lifestyles and general adiposity. They were monitored after inculcating DASH eating plan for sixteen weeks. It was noted that DASH group systolic and diastolic pressures are improved than the previous records taken

before intervention. Control group was same as before. While the group who continued on DASH, weight management for long period of time was benefitted the maximum of all.[20]

In a randomized study conducted in 2016, positive results were concluded by the dietary intervention of DASH diet and high-fat DASH diet as compared to control group. 36 hypertensive patients were part of this three phase study. Patients on Dash diet have lower blood pressure, LDL levels with reduction in its size also. The high-fat group also dropped levels of triglycerides and VLDL but size of LDL particles becomes greater than DASH group. Both groups dropped blood pressure units equally. [(2)] Another sixteen week long study was conducted among 144 individuals having grade I obesity. The DASH group lowered systolic pressure by 16 mm Hg while the group having DASH plus weight management regime reduced to 3.4 mm Hg. The study went for the follow ups too. After eight months it was seen that only 21% individuals from the study were carrying out practices that they did during the randomized trial.[21]

In a 2012 randomized controlled trial including 144 participants; DASH diet; DASH-weight loss diet and control groups were divided. The participants' blood pressure improved in those having DASH eating plans.[20] A 2010 study signifies that DASH approach combined with reduction in weight and inclusion of physical activity daily helped the patients more in controlling high blood pressure than following DASH plans alone.[22] The randomized study consisting of 810 individuals showed the improvement in hypertension. The positive results were of the group having behavioral intervention with DASH plans than the participants having behavioral therapy alone.[23] 412 participants were observed in a 12 week study. The groups were divided into DASH group, low-sodium DASH group and control group having typical American diet. The blood pressure was monitored weekly and the measurements indicated that DASH improved the units of mm HG than the control group.[24] Type 2 diabetes patients were asked to follow DASH plan. The main focus was on the intake of fruits and vegetables. 225 patients were seen to have improved their blood pressure levels after the conclusion of study program. [25]

In a randomized study of Brazil, 206 participants were included. After concluding the study at 6 month the systolic pressure reduced to 14.4 mm Hg and diastolic units dropped to 9.7 mm Hg.[26] Low sodium and DASH diet were intervened in the dietary routine of 412 individuals in a randomized controlled diet. Their baseline blood pressure readings were recorded before and after trial to reveal the significant reduction in blood pressure as low as 3.20 mm Hg to as high as 8.99 mm Hg in 4 weeks. [27]

Effect of DASH Diet on Insulin Sensitivity

Various clinical trials were concluded to reach on the agreement that insulin sensitivity can be improved if patients include DASH approaches for at least sixteen weeks in their lives.[28] Pre-prandial blood glucose levels showed decrease than usually levels recorded.[29)]

In a 2015 study of Z Asemi, 48 women were examined over 8 weeks with dietary intervention of DASH. The results showed decrease in serum insulin levels as well as reduction in the waist size of women. [(30)] In another clinical trial, 32 women were assessed that were having gestational diabetes. In comparison to control diet, the DASH eating menu decreased levels of insulin. [(31)] In a randomized study of 32 women having gestational diabetes mellitus were asked to eat DASH diet or control diet for 4 weeks. They were assigned randomly. Later on, they have reduced HbA1c levels, improved glucose tolerance, decrease in blood pressure, and improved cholesterol and high density lipoproteins levels. [(32)] A case cohort study was conducted across various countries. Over nine thousand cases were taken and their dietary scores for Healthy Eating Index and Dietary Approaches to Stop Hypertension were evaluated. The end result showed lower risk of incidence of type 2 diabetes. [(33, 34)] One-forty-four participants were divided into three groups to trial the efficacy of DASH on inulin sensitivity. The group with combination of DASH diet, physical activity and goal of losing weight marked improvement in the sensitivity of insulin, glucose levels, triglycerides and cholesterol levels as compared to DASH diet alone or control group.[35]

Effect of DASH Diet on Heart Diseases

Heart health is posed at risk if person is pre-hypertensive.[36] The ENCORE study in 2010 including 144 participants showed that biomarkers related to causing cardiovascular diseases were decreased in 4 months trial of DASH plan to the patients. [22] Dori Steinberg conducted a randomized trial on 304 patients at risk of heart related diseases. The study concluded that routine inculcation of DASH plans did not bring significant changes to the health of patients except weight loss.[36,37] DASH counselling was done in 209 individuals in Hong Kong that were either stage one hypertensive or normotensive. But there was no change in the risks of having CVDs.[38]

Older adults remain marginalized in terms of poor or inadequate eating routine specially those living in old homes. Half of 298 older adults received 7 DASH tailored meals weekly to examine the heart health. It was seen that their likelihood to become normotensive and balance their lipid profile may increase in future if the diet continues for more time.[39] In a multi-ethnic study of over 4500 people, it was seen that left ventricular function improved with the inculcation of DASH plans.[40]

In a Chinese study at basic health setting, grade one hypertensive patients were included for a year-long examination at 6 month interval and 12 month interval. The end results in the patients highlighted the reduction in lipid levels that are detrimental for the health of myocardial function. [41] The comparative study was conducted among youth of 10 to 22 years of age. The young adults were already suffering of type I diabetes. DASH food group were mentioned in the food frequency questionnaires to be filled by them. The evaluation of study told that more the following of DASH food groups lower the lipid profile, HbA1c and BMI and cardio vascular risk (Table 1). [42, 43]

RESULT

In this systematic review, we have analyzed the effects of DASH menu eating on the morbidities that can lead to further diseases in the life. It has been found that reduction of sodium in the diet of individuals have improved the levels of aldosterone and renin in the body. [44, 45] Sodium levels contribute to high blood pressure that remains uncontrollable until medicine is used daily. DASH strategies have helped the populations to manage hyper tension. [44] Prolong use and

Sr. #	Results	Author Name	Publication Year
1.	Systolic/ diastolic pressure improved, healthy weight management [20, 22, 25, 27, 33]	Interact study, Blumenthal JA, Epstein, de Paula, Juraschek	2014, 2010, 2012, 2012, 2017
2.	Dropped blood pressure units, LDL, VLDL and triglycerides [2, 39]	Chiu, Troyer	2016, 2010
	Reduction in blood pressure [24, 26]	Juraschek, Lima	2017, 2013
	Fasting blood glucose levels decreased [29]	Shirani	2013
3.	Decrease in serum insulin levels, waist size reduction [30, 31]	Asemi	2015, 2013
4.	Reduced HbA1c levels, improved glucose tolerance, decrease in blood pressure, and improved cholesterol and HDL levels. [22, 32]	Asemi, Blumenthal JA	2013, 2010
	Lower incidence of type II diabetes [33]	EPIC-Interact Study	2014
5.	CVD biomarkers decreased[35]	Blumenthal J.A	2010
	Weight loss[37]	D. Steinberg	2019
	Left Ventricular Function Improved[40]	Nguyen	2012
6.	Decreased lipid levels[41]	M.C. Wong	2015
	Lower the lipid profile, HbA1c and BMI and cardio vascular risk[42]	Liese	2011

inculcating major outlines of this diet therapy have improved the lipid levels among adults which was the major constituent in the formation of plague droplets. It is seen that improved weight goals have raised the insulin sensitivity levels. The insulin levels have balanced the diabetes and uncontrolled hyperglycemic conditions among patients.[28]

CONCLUSION

Dietary Approaches to Stop Hypertension eating approach has helped patients of hypertension, diabetes and cardio vascular disease. This has been concluded after reviewing clinical trials and randomized controlled studies but large-scale interventions may yield more efficient results than the trials conducted before. More studies may be needed to decrease CVDs risk by DASH intervention.

REFERENCES

1. Siervo M, Lara J, Chowdhury S, Ashor A, Oggioni C, Mathers JC. Effects of the Dietary Approach to Stop Hypertension (DASH) diet on cardiovascular risk factors: a systematic review and meta-analysis. British Journal of Nutrition. 2015;113(1):1-15.
2. Chiu S, Bergeron N, Williams PT, Bray GA, Sutherland B, Krauss RM. Comparison of the DASH (Dietary Approaches to Stop Hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: a randomized controlled trial1–3. The American Journal of Clinical Nutrition. 2016;103(2):341-7.
3. Kim HI, Song Y, Kim WY, Lee JE. Association of adherence to the seventh report of the Joint National Committee guidelines with hypertension in Korean men and women. Nutrition research (New York, NY). 2013;33(10):789-95.
4. Kim H, Andrade FC. Diagnostic status of hypertension on the adherence to the Dietary Approaches to Stop Hypertension (DASH) diet. Preventive Medicine Reports. 2016;4:525-31.
5. Steinberg D, Bennett GG, Svetkey L. The DASH diet, 20 years later. Jama. 2017;317(15):1529-30.
6. Roberts SB, Silver RE, Das SK, Fielding RA, Gilhooly CH, Jacques PF, et al. Healthy Aging—Nutrition Matters: Start Early and Screen Often. Advances in Nutrition. 2021.
7. Anderson CAM, Thorndike AN, Lichtenstein AH, Van Horn L, Kris-Etherton PM, Foraker R, et al. Innovation to Create a Healthy and Sustainable Food System: A Science Advisory From the American Heart Association. Circulation. 2019;139(23):e1025-e32.
8. Abramson BL SK, Davis L, Parapid B. . Women and Hypertension: Beyond the 2017 Guideline for Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. American College of Cardiology. July 27, 2018.
9. Hinderliter AL, Babyak MA, Sherwood A, Blumenthal JA. The DASH diet and insulin sensitivity. Current hypertension reports. 2011;13(1):67-73.
10. Teshome DF, Demssie AF, Zeleke BM. Determinants of blood pressure control amongst hypertensive patients in Northwest Ethiopia. PloS one. 2018;13(5):e0196535.
11. Fischer NM, Pallazola VA, Xun H, Cainzos-Achirica M, Michos ED. The evolution of the heart-healthy diet for vascular health: A walk through time. Vascular medicine (London, England). 2020;25(2):184-93.
12. Levitan EB, Lewis CE, Tinker LF, Eaton CB, Ahmed A, Manson JE, et al. Mediterranean and DASH diet scores and mortality in women with heart failure: The Women's Health Initiative. Circulation: Heart Failure. 2013;6(6):1116-23.
13. Molitor J, Brown IJ, Chan Q, Papathomas M, Liverani S, Molitor N, et al. Blood pressure differences associated With optimal macronutrient intake trial for heart health (OMNIHEART)–like diet compared with a typical American diet. Hypertension. 2014;64(6):1198-204.
14. Heller M. The DASH diet action plan: Based on the National Institutes of Health Research: Dietary approaches to stop hypertension: Amidon Press; 2010.
15. Harrington JM, Fitzgerald AP, Kearney PM, McCarthy VJ, Madden J, Browne G, et al. DASH diet score and distribution of blood pressure in middle-aged men and women. American journal of hypertension. 2013;26(11): 1311-20.
16. McGuire S. U.S. Department of Agriculture and U.S. Department of Health and Human Services, Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office, January 2011. Advances in Nutrition. 2011;2(3):293-4.
17. Hummel SL, Seymour EM, Brook RD, Sheth SS, Ghosh E, Zhu S, et al. Low-sodium DASH diet improves diastolic function and ventricular–arterial coupling in hypertensive heart failure with preserved ejection fraction. Circulation: Heart Failure. 2013;6(6):1165-71.
18. Juraschek SP, Miller ER, Weaver CM, Appel LJ. Effects of sodium reduction and the DASH diet in relation to baseline blood pressure. Journal of the American College of Cardiology. 2017;70(23):2841-8.
19. Mattioli AV, Palmiero P, Manfrini O, Puddu PE, Nodari S, Dei Cas A, et al. Mediterranean diet impact on cardiovascular diseases: a narrative review. Journal of Cardiovascular Medicine. 2017;18(12):925-35.
20. Epstein DE, Sherwood A, Smith PJ, Craighead L, Caccia C, Lin P-H, et al. Determinants and Consequences of Adherence to the Dietary Approaches to Stop Hypertension Diet in African-American and White Adults with High Blood Pressure: Results from the ENCORE Trial. Journal of the Academy of Nutrition and Dietetics. 2012;112(11):1763-73.
21. Hinderliter AL, Sherwood A, Craighead LW, Lin PH, Watkins L, Babyak MA, et al. The long-term effects of lifestyle

change on blood pressure: One-year follow-up of the ENCORE study. Am J Hypertens. 2014;27(5):734-41.
22. Blumenthal JA BM, Hinderliter A, Watkins LL, Craighead L, Lin PH, Caccia C, Johnson J, Waugh R, Sherwood A. Effects of the DASH diet alone and in combination with exercise and weight loss on blood pressure and cardiovascular biomarkers in men and women with high blood pressure: the ENCORE study. Arch Intern Med 2010;170(2):126-35.
23. Lin PH, Appel LJ, Funk K, Craddick S, Chen C, Elmer P, et al. The PREMIER intervention helps participants follow the Dietary Approaches to Stop Hypertension dietary pattern and the current Dietary Reference Intakes recommendations. Journal of the American Dietetic Association. 2007;107(9):1541-51.
24. Juraschek SP, Woodward M, Sacks FM, Carey VJ, Miller ER, 3rd, Appel LJ. Time Course of Change in Blood Pressure From Sodium Reduction and the DASH Diet. Hypertension. 2017;70(5):923-9.
25. de Paula TP, Steemburgo T, de Almeida JC, Dall'Alba V, Gross JL, de Azevedo MJ. The role of Dietary Approaches to Stop Hypertension (DASH) diet food groups in blood pressure in type 2 diabetes. Br J Nutr. 2012;108(1):155-62.
26. Lima ST, da Silva Nalin de Souza B, França AK, Salgado Filho N, Sichieri R. Dietary approach to hypertension based on low glycaemic index and principles of DASH (Dietary Approaches to Stop Hypertension): a randomised trial in a primary care service. The British journal of nutrition. 2013;110(8):1472-9.
27. Juraschek SP, Miller ER, 3rd, Weaver CM, Appel LJ. Effects of Sodium Reduction and the DASH Diet in Relation to Baseline Blood Pressure. J Am Coll Cardiol. 2017;70(23):2841-8.
28. Campbell AP. DASH eating plan: an eating pattern for diabetes management. Diabetes Spectrum. 2017;30(2):76-81.
29. Shirani F, Salehi-Abargouei A, Azadbakht L. Effects of Dietary Approaches to Stop Hypertension (DASH) diet on some risk for developing type 2 diabetes: A systematic review and meta-analysis on controlled clinical trials. Nutrition. 2013;29(7):939-47.
30. Asemi Z, Esmaillzadeh A. DASH diet, insulin resistance, and serum hs-CRP in polycystic ovary syndrome: a randomized controlled clinical trial. Hormone and metabolic research = Hormon- und Stoffwechselforschung = Hormones et metabolisme. 2015;47(3):232-8.
31. Asemi Z, Samimi M, Tabassi Z, Sabihi SS, Esmaillzadeh A. A randomized controlled clinical trial investigating the effect of DASH diet on insulin resistance, inflammation, and oxidative stress in gestational diabetes. Nutrition. 2013;29(4):619-24.
32. Asemi Z, Tabassi Z, Samimi M, Fahiminejad T, Esmaillzadeh A. Favourable effects of the Dietary Approaches to Stop Hypertension diet on glucose tolerance and lipid profiles in gestational diabetes: a randomised clinical trial. The British journal of nutrition. 2013;109(11): 2024-30.
33. Adherence to predefined dietary patterns and incident type 2 diabetes in European populations: EPIC-InterAct Study. Diabetologia. 2014;57(2):321-33.
34. Asemi Z, Samimi M, Tabassi Z, Sabihi S-s, Esmaillzadeh A. A randomized controlled clinical trial investigating the effect of DASH diet on insulin resistance, inflammation, and oxidative stress in gestational diabetes. Nutrition. 2013;29(4):619-24.
35. Blumenthal JA, Babyak MA, Sherwood A, Craighead L, Lin PH, Johnson J, et al. Effects of the dietary approaches to stop hypertension diet alone and in combination with exercise and caloric restriction on insulin sensitivity and lipids. Hypertension. 2010;55(5):1199-205.
36. Del Gobbo LC, Kalantarian S, Imamura F, Lemaitre R, Siscovick DS, Psaty BM, et al. Contribution of major lifestyle risk factors for incident heart failure in older adults: the Cardiovascular Health Study. JACC: Heart Failure. 2015;3(7):520-8.
37. Steinberg D, Kay M, Burroughs J, Svetkey LP, Bennett GG. The Effect of a Digital Behavioral Weight Loss Intervention on Adherence to the Dietary Approaches to Stop Hypertension (DASH) Dietary Pattern in Medically Vulnerable Primary Care Patients: Results from a Randomized Controlled Trial. J Acad Nutr Diet. 2019;119(4):574-84.
38. Wong MCS, Wang HHX, Kwan MWM, Li STS, Liang M, Fung FDH, et al. The effectiveness of Dietary Approaches to Stop Hypertension (DASH) counselling on estimated 10-year cardiovascular risk among patients with newly diagnosed grade 1 hypertension: A randomised clinical trial. International journal of cardiology. 2016;224:79-87.
39. Troyer JL, Racine EF, Ngugi GW, McAuley WJ. The effect of home-delivered Dietary Approach to Stop Hypertension (DASH) meals on the diets of older adults with cardiovascular disease. Am J Clin Nutr. 2010;91(5):1204-12.
40. Nguyen HT, Bertoni AG, Nettleton JA, Bluemke DA, Levitan EB, Burke GL. DASH eating pattern is associated with favorable left ventricular function in the multi-ethnic study of atherosclerosis. Journal of the American College of Nutrition. 2012;31(6):401-7.
41. Wong MC, Wang HH, Kwan MW, Fong BC, Chan WM, Zhang DX, et al. Dietary counselling has no effect on cardiovascular risk factors among Chinese Grade 1 hypertensive patients: a randomized controlled trial. European heart journal. 2015;36(38):2598-607.
42. Liese AD, Bortsov A, Günther AL, Dabelea D, Reynolds K, Standiford DA, et al. Association of DASH diet with cardiovascular risk factors in youth with diabetes mellitus: the SEARCH for Diabetes in Youth study. Circulation. 2011;123(13):1410-7.
43. Wessler JD, Maurer MS, Hummel SL. Evaluating the safety and efficacy of sodium-restricted/Dietary Approaches to Stop Hypertension diet after acute decompensated heart failure hospitalization: design and rationale for the Geriatric OUt of hospital Randomized MEal Trial in Heart Failure (GOURMET-HF). American heart journal. 2015;169(3):342-8. e4.

44. Juraschek SP, Miller III ER, Chang AR, Anderson CA, Hall JE, Appel LJ. Effects of sodium reduction on energy, metabolism, weight, thirst, and urine volume: results from the DASH (Dietary Approaches to Stop Hypertension)-Sodium trial. Hypertension. 2020;75(3):723-9.

45. Blumenthal JA, Sherwood A, Smith PJ, Hinderliter A. The role of salt reduction in the management of hypertension. Journal of the American College of Cardiology. 2018;71(14):1597-8.