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Literature Review

Defining DASH Diet: A Nutritionally Potent Dietary Plan for Hypertension Management

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Abstract

Hypertension is the major cause of cardiovascular diseases and death in the world. Hypertension is the most prevalent non-communicable disease in India. The overall prevalence of hypertension in India was 29.8%. DASH refers to Dietary Approaches to Stop Hypertension. The DASH diet is a healthy eating lifelong strategy that's designed for hypertension management. The DASH diet seeks to encourage reducing dietary sodium and eating a variety of nutrient-rich foods that helps in lowering BP, such as potassium, magnesium, and calcium. Previous research studies reported that the DASH diet may also aid in weight reduction and lowers risks of cancer, metabolic syndrome, type 2 diabetes and heart diseases. However, most of the DASH-related research has been done in the U.S.A. and secondly in Iran, since in India DASH diet, awareness seems to be low. Hence in India, treatment with DASH and control through DASH statuses are found to be low. The key fact is that this diet needs to be promoted as routine in patient care by healthcare personnel such as physicians, nurses, and dieticians to increase the awareness of the DASH diet among the public. It is considered as the dietary pattern of DASH can easily be adopted by all demographic groups and is cost-effective in the prevention (primary and secondary) of raised BP and its complications. The review aims to promote the DASH diet and its awareness among Indians to perform clinical trials from an Indian perspective as it may be an easy and effective way to reduce blood pressure.

Keywords: *Hypertension; Dietary Approaches to Stop Hypertension; Blood Pressure; Hypertension Management; DASH Diet*

Abbreviations

DASH: Dietary Approaches to Stop Hypertension; AMI: Acute Myocardial Infarction; ICMR: Indian Council of Medical Research; BP: Blood Pressure; DALYs: Disability-Adjusted Life-Years; HTN: Hypertension; NIH: National Institute of Health; mmHg: Millimeters of Mercury; mg: Milligrams; U.S.A: United States of America; FFQ: Food Frequency Questionnaire; VLDL: Very-Low-Density Lipoprotein; LDL: Low-Density Lipoprotein; GDM: Gestational Diabetes Mellitus; CKD: Chronic Kidney Disease

Introduction

Hypertension is the major cause of cardiovascular diseases and deaths in the world [1,2]. This is very prominent cardiovascular disease that enforces a tremendous burden on the health system [3]. Currently, it affects nearly half of the adults globally and its prevalence is increasing dramatically among all age groups [4].

The Indian Council of Medical Research (ICMR) estimated that hypertension is due to 16 percent of ischemic heart disease, 21 percent of peripheral vascular disease, and 24 percent of AMI (acute myocardial infarction) cases. The risk of the population attributable stroke is 29 percent due to hypertension [5]. Hypertension is accountable in India for 24 percent of the total deaths from coronary heart disease and 57 percent of the total deaths from strokes [6].

Several strategies such as lifestyle changes and medication use have been advised for the management of hypertension. It's also been shown that intake of healthy nutrition helps control blood pressure (BP) and reduce the risk of cardiovascular disease [7].

DASH eating style, is a diet enriched in fruits, veggies, whole grains and minimal fat dairy along with reduced sodium content, saturated as well as total fat content is adopted as a suitable diet for hypertension [8].

Current scenario

Prevalence: Hypertension is India's commonest non-communicable disease [9]. Overall, 7.1 million deaths (~12.8 percent of total deaths) and 64.3 million DALYs (disability-adjusted life-years) (4.4 percent of the global total) are projected to be due to hypertension, with a prevalence of 972 million in 2002, estimated to rise by almost 60 percent (1.56 billion) by 2025 [10].

Overall hypertension prevalence in India was 29.8 percent (confidence interval of 95 percent: 26.7 - 33.0). The prevalence of hypertension has been substantially variable among the rural and urban portions [27.6 percent (23.2 - 32.0) and 33.8 percent (29.7 - 37.8); P = 0.05].

Awareness level: In rural and urban India, the combined estimation for BP awareness was 25.1 percent (21.0 - 29.1) and 41.9 percent (35.1 - 48.9), respectively. The combined figures of 24.9 (16.7 - 33.0) and 37.6 (23.9 - 51.2) are of those identified with HTN diagnosis in rural and urban areas, respectively. The combined estimate was 10.7 (6.4 - 15.0) and 20.2 (11.6 - 28.8), respectively, for the percentage of hypertension patients in rural and urban India who have their BP under control [11].

History of DASH

The DASH diet originated in the 1990s. In 1992, the National Institute of Health (NIH), U.S.A. started funding for several research projects to see if specific dietary interventions were useful in treating hypertension. Subjects included in the study were advised to follow just the dietary interventions and not include any other lifestyle modifications to avoid any confounding factors. They found that only the dietary intervention alone was able to decrease systolic BP by about 6 to 11 mmHg. This result was visible in both hypertensive as well as normotensive people. In some instances, based on these outcomes, DASH has been advocated along with lifestyle changes as first-line pharmacologic treatment.

What does this diet include? DASH promotes the consumption of veggies and fruits, minimal fat dairy products and lean meat, and the including micronutrients in the menu. This also recommends reducing the salt in the diet to about 1500 mg/day. DASH emphasizes consuming minimally processed and fresh food. DASH diet has many similarities to some of the other dietary patterns which are promoted for cardiovascular health. The DASH diet is a product of the ancient and modern world. It was derived by scientists based on certain ancient dietary principles and was tailored to target some of modern society's leading killers [12].

What is a DASH diet?

Table 1: *The DASH diet.*

Food group	Daily servings*	Serving sizes, examples, and significance
Grains, grain products	7-8	**Serving sizes:** 1 slice of bread, 1 oz dry cereal,† 1/2 cup cooked rice, pasta, or cereal **Examples:** Whole wheat bread, English muffin, pita bread, bagel, cereals, grits, oatmeal, crackers, unsalted pretzels, popcorn **Significance:** Major sources of energy and fiber
Vegetables	4-5	**Serving sizes:** 1 cup raw leafy vegetable, 1/2 cup cooked vegetable, 6 oz vegetable juice **Examples:** Tomatoes, potatoes, carrots, green peas, squash, broccoli, turnip greens, collards, kale, spinach, artichokes, green beans, lima beans, sweet potatoes **Significance:** Rich sources of potassium, magnesium, and fiber
Fruits	4-5	**Serving sizes:** 6 oz fruit juice, 1 medium fruit, 1/4 cup dried fruit, 1/2 cup fresh, frozen, or canned fruit **Examples:** Apricots, bananas, dates, grapes, oranges, orange juice, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, prunes, raisins, strawberries, tangerines **Significance:** Important sources of potassium, magnesium, and fiber
Low-fat or fat-free dairy	2-3	**Serving sizes:** 8 oz milk, 1 cup yogurt, 1 1/2 oz cheese **Examples:** Fat-free (skim) or low-fat (1%) milk, fat-free or low-fat buttermilk, fat-free or low-fat regular or frozen yogurt, low-fat and fat-free cheese **Significance:** Major sources of calcium and protein
Meats, poultry, and fish	2 or less	**Serving sizes:** 3 oz cooked meats, poultry, or fish ***Note:*** Select only lean meats; trim away visible fat; broil, roast, or boil, instead of frying; remove the skin from poultry **Significance:** Rich sources of protein and magnesium
Nuts, seeds, and dry beans	4-5 per week	**Serving sizes:** 1/3 cup or 1 1/2 oz nuts, 2 Tbsp or 1/2 oz seeds, 1/2 cup cooked dry beans **Examples:** Almonds, filberts, mixed nuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils, peas **Significance:** Rich sources of energy, magnesium, potassium, protein, and fiber
Fats and oils‡	2-3	**Serving sizes:** 1 tsp soft margarine, 1 Tbsp low-fat mayonnaise, 2 Tbsp light salad dressing, 1 tsp vegetable oil **Examples:** Soft margarine, low-fat mayonnaise, light salad dressing, vegetable oil (eg, olive, corn, canola, safflower) ***Note:*** DASH has 27% of calories as fat, including that in or added to foods
Sweets	5 per week	**Serving sizes:** 1 Tbsp sugar, 1 Tbsp jelly or jam, 1/2 oz jelly beans, 8 oz lemonade **Examples:** Maple syrup, sugar, jelly, jam, fruit-flavored gelatin, jelly beans, hard candy, fruit punch, sorbet, ice ***Note:*** Sweets should be low in fat

*The DASH eating plan is based on 2,000 calories a day. The number of daily servings in a food group may vary from those listed, depending on the patient's caloric needs. Patients should use this chart to help plan their menus or take it with them when they go to the store. †Equals 1/2 to 1 1/4 cup, depending on cereal type. Check the product's nutrition label. ‡Fat content changes serving counts for fats and oils. For example, 1 Tbsp of regular salad dressing equals 1 serving, 1 Tbsp of low-fat dressing equals 1/2 serving, and 1 Tbsp of a fat-free dressing equals 0 servings.
Source: http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/index.htm [13]

Forms of DASH diet

1. **Standard DASH diet:** DASH diet with an intake of 2300 mg (milligrams) of sodium/day.
2. **Lower sodium DASH diet:** DASH diet with around 1500 mg (milligrams) of sodium/day.

A normal diet has over 3500 mg (milligrams) of sodium per day. Both the DASH diets have lower sodium in their regimen. The low sodium regimen is mainly used for patients who are more than 51 years, blacks, and patients with hypertension, diabetes and chronic kidney disease. To reduce weight the total calories should be less than 1600 per day. DASH diet has a calorie of 2000 per day.

One teaspoon of salt has 2300 mg sodium. For a low dietary sodium DASH, 2/3 teaspoon (tsp) of table salt would give 1500 mg (milligrams) of sodium. Table 2 below shows the changes that occur in blood pressure on adopting one of the lifestyle modification programs for the control of hypertension [14,15].

Table 2: *Changes that occur in blood pressure on adopting one of the lifestyle modification programmes for control of hypertension.*

Modification	Approximate SBP Reduction (range)
Weight reduction	5 - 20 mmHg/10 kg weight loss
Adopt a DASH eating plan	8 - 14 mmHg
Dietary sodium reduction	2 - 8 mmHg
Physical activity	2 - 9 mmHg
Moderation of alcohol consumption	2 - 4 mmHg
Source: DASH diet [16,17]	

Potential health benefits of DASH diet other than on hypertension

DASH diet affects multiple other diseases. The diet:

1. **May aid weight loss:** In addition, weight loss has been found to reduce blood pressure [18,19]. Some reports show that the DASH diet can help people lose weight [20-22].
2. **Decreases cancer risk:** A current review suggests that the risk of some cancers, such as colorectal and breast cancer, was lower for people following the DASH diet [23].
3. **Lowers metabolic syndrome risk:** Some researchers note that the DASH diet eliminates up to 81 percent of the risk of metabolic syndrome [24,25].

4. **Lowers diabetes risk:** The DASH diet has also been associated with a reduced type 2 diabetes risk. Some researches show it can also improve insulin resistance [26,27].
5. **Decreases heart disease risk:** In one recent study among females, a 20 percent lower risk of heart failure and a 29 percent lower risk of stroke were correlated with eating a DASH-like diet [28].

Materials and Methods

Study design: Narrative literature review.

Methods: The databases of Google scholar, PubMed, Web of Science, and MEDLINE databases were searched using the keywords hypertension, Dietary Approaches to Stop Hypertension, blood pressure, hypertension management, and DASH diet for reviews concerning the role of the DASH diet for hypertension management.

Result and Discussion

Table 3 below shows a brief of various clinical trials showing the effect of the DASH Diet among different groups with several methods and reached their respective results and conclusion.

Table 3: *Clinical trials showing the effect of DASH.*

S.No.	Topic	Study area	Target Group	Method	Result/Conclusion	References
1.	The DASH Diet and Sodium Reduction Improve Markers of Bone Turnover and Calcium Metabolism in Adults	U.S.A.	186 adults, aged 23-76 y	Two dietary patterns included a control diet typical of what many Americans eat, and the DASH diet	DASH diet significantly reduced bone turnover, which if sustained may improve bone mineral status. The DASH diet and reduced sodium intake may have complementary, beneficial effects on bone health.	[29]
2.	Effects on blood lipids of blood pressure lowering diet: DASH Trial	U.S.A.	436 participants of greater than equal to 22 y old African American	DASH diet	The DASH diet is likely to reduce coronary heart disease risk.	[30]
3.	Adherence to the Dietary Approaches to Stop Hypertension (DASH) diet in relation to obesity among Iranian female nurses	Iran	Female nurses (n 293) aged >30 years	FFQ	Adherence to the DASH diet was inversely related to central obesity among Iranian adult females.	[31]

4.	Comparison of the DASH diet and a higher fat DASH diet on bloodpressure and lipidsand lipoproteins: a randomized controlled trial	Califo-rnia	Healthy men and women, 21 y of age	A control diet, a standard DASH diet, and a higher-fat, lower-carbohydrate modification of the DASH diet (HF-DASH diet)	The HF-DASH diet lowered blood pressure to the same extent as the DASH diet but also reduced plasma triglycerideand VLDL concentrations without significantly in- creasing LDL cholesterol.	[32]
5.	Favourable effects of the DASH diet on glucose tolerance and lipid profiles in gestational diabetes: a randomized clinical trial	Iran	Pregnant women aged 18-40 years, diagnosed with GDM by a 100 g oralglucose tolerance test at 24-28 weeks of gestation	Control or the DASH diet	DASH eating pattern for 4 weeks among pregnant women with GDM resulted in beneficial effects on glucose tolerance and lipid profiles compared with the control diet.	[33]
6.	The DASH diet, Western diet, and risk of gout in men: a prospective cohort study	U.S.A.	44 444 men with nohistory of gout at baseline	DASH diet and Western diet	The DASH diet is associated with a lower risk ofgout, suggesting that its effect of lowering uric acid levels in individuals with hyperuricemia translates to a lower risk of gout.	[34]
7.	A Further Subgroup Analysis of the Effects of the DASH Diet and Three Dietary Sodium Levels on BP: Results of the DASH-Sodium Trial	U.S.A.	412 participants with systolic BP ranging from 120 to 159 mmHg and diastolic BP ranging from 80 to 95 mmHgwere enrolled	DASH diet or atypical Ameri-can diet	Reduced sodium intake and the DASH diet should be advocated for the prevention and treatment of high BP.	[35]
8.	Effects of dietary sodium and the DASH diet on the occurrence of headaches: results from randomized multicentre DASH- Sodium clinical trial	U.S.A.	412 adults (age ≥22years) with systolic BP between 120 and 159 mmHg and diastolic BP between 80 and 95 mmHg (i.e. pre-HTN or stage 1 HTN)	DASH or control diet	A reduced sodium intake was associated with a significantly lower risk of headaches, while dietary patterns did not affect the risk of headaches in adults. Reduced dietary sodium intake offers a novel approach to preventing headaches.	[36]
9.	The effect of the DASH diet on pregnancy outcomes ingestational diabetes: a randomized controlled clinical trial	Iran	52 women diagnosed with GDM	Control diet or DASH diet	Consumption of the DASHdiet for 4 weeks among pregnant women with GDM resulted in improved pregnancy outcomes.	[37]

10.	Effects on blood pressure of reduceddietary sodium and the dietary approaches to stop hypertension (DASH) Diet	U.S.A.	412 participants, 22 years old men, and women	Control diet or the DASH diet	The reduction of sodium intake to levels below the current recommendation of 100 mmol per day and the DASH diet both lower blood pressure substantially, with greater effectsin combination than singly.	[38]
11.	Dietary Interventions on Blood Pres-sure: The Dietary Approaches to Stop Hypertension (DASH) Trials	U.S.A.	459 participants: men and women	1) The controlor average American diet, 2) a fruit and vegetablediet, or 3) a combination diet, hereafter known as the DASH diet	The DASH diet with low- sodium intake lowered blood pressure in all subgroups studied, including non-hypertensiveindividuals.	[39]
12.	A Study To Assess The Knowledge on Dash Diet Among Hypertensive Patients In A SelectedVillage Kanchipuram District Tamil Nadu	India	50 hypertensive adult patients of age group 30-60 years	Structure inter-view technique	This study shows people have less knowledge of the DASH diet for hypertension. This studycan be used by the health care personnel as a guide for their research and as routine in patient care to increase the awareness ofthe DASH diet among the public.	[40]
13.	DASH Intervention Reduces Blood Pressure among Hypertensive African American Patients in a Neighborhood Health Care Center	U.S.A.	Low-income African American adults (N =82) with poorly controlled bloodpressure	Intervention to promote the DASH diet	Extension of the DASH- Dinner model could improve blood pressure control among low- income hypertensive African Americans and reduce health disparities.	[41]
14.	The role of Dietary Approaches to Stop Hypertension (DASH) diet food groups in blood pressure in type 2 diabetes	Brazil	Patients with type 2 diabetes, defined as subjects over 30 years of age at the onset of diabetes	3-day weighed-diet records	Fruit and vegetables were the food groups of the DASH diet associated with reduced BP values in patients with type 2 diabetes and their consumption might play a protective role for increased BP values.	[42]
15.	Short-term effects of the DASH diet in adults with moderate chronic kidney disease: a pilot feeding study	U.S.A.	11 adults with an estimated glomerular filtration rate of 30-59 mL/ min/1.73m^2 and medication treated hypertension	Reduced sodium, run-in diet for 1 week followed by reduced sodium, DASH diet for 2 weeks	Reduced-sodium DASH dietary pattern does not cause acute metabolic events in adults with moderate CKD and may improve nocturnal BP.	[43]

The above table 3 shows that a maximum number of trials are done in the U.S.A. and secondly Iran and also clarifies that apart from Hypertension, DASH has a beneficial role in various issues such as improving bone health, reducing plasma triglyceride and VLDL concentrations without significantly increasing LDL cholesterol, lowering the risk of gout i.e. lowering uric acid levels, reducing coronary heart disease risk, etc. suggesting to spread awareness about DASH and more and more clinical trials to be conducted in India.

Conclusion

The DASH diet is a life-long healthy eating approach that's been well researched in several clinical trials and found that it is a nutritionally based approach for the management of blood pressure and its benefits may extend beyond BP management. The DASH diet tends to encourage a reduction in dietary sodium and various type of nutrient-enriched foods that help in lowering BP such as potassium, calcium, and magnesium.

However, in India treatment with DASH and control through DASH statuses are found to be low. The key fact is that this diet needs to be promoted as routine in patient care by healthcare personnel such as physicians, nurses, and dieticians to increase the awareness of the DASH diet among the public. It is considerable because All population groups can easily adopt the DASH dietary pattern and it could cost-effectively aid in the prevention (primary and secondary) of the raised BP and its complications. Nevertheless, DASH could be a safe option in case of elevated blood pressure or salt sensitivity. The DASH diet may be an easy and effective way to reduce blood pressure.

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Conflict of Interest

The authors declare no conflict of interest.

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