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The Dietary Approaches to Stop Hypertension (DASH) Eating Pattern in Special Populations

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Abstract

The Dietary Approaches to Stop Hypertension (DASH) trial showed that a diet rich in fruits, vegetables, low-fat dairy products with reduced total and saturated fat, cholesterol, and sugar-sweetened products effectively lowers blood pressure in individuals with prehypertension and stage I hypertension. Limited evidence is available on the safety and efficacy of the DASH eating pattern in special patient populations that were excluded from the trial. Caution should be exercised before initiating the DASH diet in patients with chronic kidney disease, chronic liver disease, and those who are prescribed renin-angiotensin-aldosterone system antagonist, but these conditions are not strict contraindications to DASH. Modifications to the DASH diet may be necessary to facilitate its use in patients with chronic heart failure, uncontrolled diabetes mellitus type II, lactose intolerance, and celiac disease. In general, the DASH diet can be adopted by most patient populations and initiated simultaneously with medication therapy and other lifestyle interventions.

Keywords

Hypertension; Prehypertention; Stage I hypertension; Blood pressure; BP; Diet; Nutrition therapy; Lifestyle interventions; Medication therapy; Combination therapy; Chronic kidney disease; CKD; Diabetes mellitus; DM; Cardiovascular disease; CVD; Renin-angiotensin-aldosterone system inhibitors; RAAS inhibitors

INTRODUCTION

Approximately 30% of US adults have hypertension [1]. It is well established that hypertension increases one’s risk for coronary artery disease, stroke, and cardiovascular (CV) events [2]. Fortunately, these risks are decreased with blood pressure (BP) reduction [3]. An effective non-pharmacologic strategy to lower BP is adoption of the Dietary

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Approaches to Stop Hypertension (DASH) eating pattern [4]. The DASH eating pattern, which is endorsed by several national guideline committees, is recommended for management of patients with above normal BP [5–7]. Patients are unique and have different lifestyle practices and comorbid conditions. As a result, clinicians often face situations that require them to re-evaluate the appropriateness of the DASH eating pattern for these special patient populations. This article will review the original DASH trial, paying close attention to its nutritional components and study population. Our knowledge of the effectiveness and safety of the DASH eating pattern is based on several randomized trials, but is limited to participants who met inclusion criteria for those trials. Thus, we will also highlight some of the excluded patient populations and not only explore common concerns that arise regarding the appropriateness of DASH in these patients but also recommend special dietary adaptations that may help facilitate its use. Also to be addressed is the effectiveness of the DASH eating pattern with other antihypertensive therapies.

The original DASH trial was a multicenter, randomized controlled-feeding study designed to evaluate the effects of two dietary patterns on BP [4]. Aspects of the DASH eating pattern that make it both unique from other diets and effective at lowering BP are easy to highlight if one revisits the rationale for its design. BP varies across different populations, and the dietary pattern is believed to be an associated factor. Consumption of fruits, vegetables, dairy, and reduced or no animal products (i.e., vegetarian diet) is associated with lower BP [8]. Observational studies reveal that fiber and protein intake is also associated with lower BP [9, 10]. In addition, prospective observational studies demonstrate that the intake of several minerals, such as magnesium, potassium, and calcium, has an inverse relationship with BP [11, 12]. Despite these findings, controlled studies that either isolated key components of the vegetarian diet, increased fiber, increased protein, or supplemented minerals to evaluate their individual effects on BP found only minimal benefit or conflicting results [13–15]. It was therefore hypothesized that the BP effect of these dietary interventions when provided individually may be too small to have clinical relevance and that certain nutritional components effectively lower BP when consumed in combination. The premise that a single dietary pattern that incorporates key nutrients of a vegetarian diet, increases fiber and protein intake, and provides a higher content of desired minerals could lower BP led to the design of the DASH diet. As a result, the DASH dietary pattern is rich in fruits and vegetables, low-fat dairy products, and complex carbohydrates (e.g., whole grains); it includes reduced quantities of meats, sweets, and sugar-sweetened beverages. Its nutrient profile is high in fiber, protein, magnesium, calcium, and potassium, yet low in total and saturated fats. In order to isolate the effect of these nutrients from the known BP effect of sodium restriction, the DASH dietary pattern is not a reduced sodium diet.

Investigators of the DASH trial targeted for participation individuals who would benefit from BP reduction. It is estimated that 60% of US adults have either prehypertension or hypertension [16]. All are at increased risk for CV disease (CVD) [17, 18]. By selecting individuals ≥ 22 years of age with either prehypertension or stage 1 hypertension (SBP < 160, DBP 80–95 mmHg) for study inclusion, DASH had far-reaching implications for the majority of the US adult population. In addition, high BP disproportionately affects minorities [1]. Strategic recruitment efforts to increase diversity resulted in a study population that consisted of 60% African-Americans and 6% other minority groups.

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Therefore, DASH also had implications for a subset of the population at greatest risk for BP-related morbidity and mortality [19].

To reduce the risk of confounding because of medication adjustments during the trial, only individuals who were not taking anti-hypertensive medications were eligible to participate. Also excluded were individuals with comorbid conditions, such as uncontrolled hyperlipidemia (serum total cholesterol > 260 mg/dl or low density lipoprotein above national guidelines), poorly controlled diabetes mellitus (DM) (glycosuria or random blood glucose ≥ 180 mg/dl with a fasting blood glucose > 140 mg/dl or glycosylated hemoglobin > 8%), grade 2 obesity with a body mass index > 35 kg/m^2, chronic kidney disease (CKD) [estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73 m^2 or serum creatinine >1.2 mg/dl], or a CV event within the past 6 months. It was also important for the dietary intervention to be the sole source of nutrients during of the study. Thus, those who were taking vitamins, mineral supplements, or antacids were asked to stop or were excluded. These exclusion criteria created knowledge gaps regarding the safety and efficacy of the DASH dietary pattern in several unrepresented patient populations.

DASH diet in special patient populations

DASH and chronic kidney disease

BP control is a mainstay of treatment for patients with CKD to prevent both the progression of CKD and its associated CVD-related complications. The DASH diet, however, may not be an appropriate BP-lowering strategy for all patients with CKD because of its high content of potassium (4.5 g/day), phosphorus (1.7 g/day) and protein (1.4 g/kg/day). Metabolic complications of CKD, which can be observed as early as stage 2 (eGFR of 60 – 89 ml/min/m^2), become more prevalent with disease progression [20]. Setting restrictions based on eGFR, however, is difficult because the onset of these complications is quite variable per patient, and evidence to support the timing of dietary restrictions is lacking.

The National Kidney Foundation - Kidney Disease Outcome Quality Initiative (KDOQI) guidelines do not recommend the DASH eating plan for individuals with “advanced” CKD (defined as eGFR < 60 ml/min/1.73m^2) [21]. KDOQI guidelines suggest that non-dialysis patients with advanced CKD limit protein intake to 0.6 – 0.75 g/kg/day [22]. Reasons cited for this recommendation include observational studies that show an associated reduction in the generation of nitrogenous wastes products and inorganic ions with protein restriction. Also, protein restriction was suggested to slow the progression of CKD in post-hoc analyses of the Modification of Diet in Renal Disease (MDRD) study [23]. However, because the main results of the MDRD study failed to show a benefit of protein restriction, and results from other randomized controlled trials of protein restriction in adults with CKD are inconsistent, it remains controversial whether such measures are actually warranted [24, 25].

KDOQI further recommends that potassium and phosphorus intake be restricted to 2 – 4 g/day and 0.8 – 1 g/day, respectively [21]. Hyperkalemia causes life-threatening cardiac arrhythmias, while hyperphosphatemia causes secondary hyperparathyroidism and metabolic bone disease, and is associated with an increased risk of CV events [26]. The optimal daily intake of these minerals, however, is admittedly unknown. Because the DASH

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trial only enrolled participants with relatively preserved renal function (i.e., eGFR > 60 ml/min/1.73 m^2 (calculated by the Cockcroft-Gault equation) and a serum creatinine <1.2 mg/dl), the safety and efficacy of the DASH eating pattern for individuals with more advanced renal disease is not known. Therefore, discretion must be exercised in managing individual patients.

Despite the advisement of caution by KDOQI guidelines for patients with CKD of any degree, the DASH eating pattern for preventing or treating hypertension may be safe in patients with early stage kidney disease. It is this group of CKD patients who experience the lowest prevalence of metabolic complications and may be most likely to experience slower progression of CKD with adequate BP control [20, 21]. Although there are no data to determine a safe cutoff, in our opinion, the DASH diet may be safely adopted by individuals with eGFR < 60 ml/min/1.73m^2 if relevant serum electrolytes (potassium, phosphorus, calcium, magnesium) are normal and carefully monitored. Dietary recommendations in these patients should be individually tailored and guided by their individual laboratory trends. [This approach is similar to the situation in which a clinician evaluates the risks and benefits of initiating angiotensin-converting enzyme inhibitors (ACE-I) for CKD patients.] In fact, for some patients, the potassium and phosphorus content of the DASH eating pattern may actually be complimentary to other medical therapies. For example, individuals who become hypokalemic after initiating non-potassium-sparing diuretics could potentially avoid the need for potassium supplementation by following the DASH diet.

On the other hand, there are many instances when the DASH eating pattern may not be appropriate for patients with CKD. This occurs for individuals who have already experienced metabolic complications or are at high risk for their development. That is, if a patient has high-normal or elevated serum potassium and phosphorus values, the DASH eating pattern should not be initiated. These patients should be advised to follow a low potassium or low phosphorus diet, and the DASH eating pattern would negate those recommendations. Caution should also be exercised for patients who are prescribed renin-angiotensin-aldosterone system (RAAS) inhibitors and/or potassium-sparing diuretics, agents known to increase serum potassium. Before initiating the DASH eating pattern in CKD patients who have been prescribed these anti-hypertensive agents, it should first be confirmed that they are normokalemic and on a stable medication regimen. Otherwise, hyperkalemia may ensue, making it difficult to determine whether the pharmacologic agent or the DASH diet was the culprit. As a result, both interventions would likely be discontinued. This would be disadvantageous for the patient who may have actually been able to tolerate and benefit from one of these interventions if used alone.

Overall, although the DASH eating pattern has not been evaluated in patients with CKD, with careful patient selection and laboratory monitoring, the benefits of successfully treating hypertension could potentially outweigh the risks of developing metabolic complications from DASH. Ultimately, additional research is needed to determine when and in whom to recommend DASH in the setting of CKD.

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DASH and chronic heart failure (HF)

The DASH diet may be appropriate to use for the prevention of chronic HF as well as its management. Results from prospective observational studies of adults without HF have demonstrated an association between diets consistent with the DASH eating pattern and lower rates of both incident HF in women and incident hospitalizations for or death from HF in men [27, 28]. Reasons for this association have not been clearly elucidated. If the relationship is causal, it may be due to the lowering of BP, reduction in oxidative stress, and/or direct affects on volume status and vascular endothelium [29–32]. With regard to managing HF, clinical trial evidence is lacking on the efficacy of the DASH eating pattern for BP and symptom control. However, the content of the DASH diet is consistent with American Heart Association (AHA) recommended dietary goals to promote CV health [33]. Therefore, DASH may be appropriate for the management of this patient population.

In particular, when considering DASH in patients with HF, vitamin D intake deserves special attention. Evidence from prospective observational and cohort studies have found vitamin D deficiency to be independently associated with increased hospitalizations, reduced survival, and increased all-cause mortality in patients with HF [34–36]. Higher plasma renin activity and c-reactive protein levels in vitamin D-deficient HF patients suggest that increased RAAS activity and inflammation may play a role in their poor prognosis [34]. Double-blind, placebo-controlled studies have shown a reduction in markers of inflammation in adults after vitamin D supplementation [37]. Although observational data have demonstrated an association between vitamin D supplementation and improved outcomes for HF patients, more definitive studies are needed [35]. Nonetheless, low-fat dairy products in the DASH eating pattern serve as a good source of vitamin D.

Although, as noted above, sodium restriction is not part of the DASH dietary pattern, this micronutrient also deserves special attention when considering dietary recommendations for individuals with HF. Patients with HF are commonly instructed to restrict sodium intake. Evidence for sodium restriction is based on consensus expert opinion and limited trial data [38]. The AHA/American College of Cardiology (AHA/ACC) recommends “moderate sodium restriction” for patients with current or prior symptoms of HF [39]. The American Dietetic Association guideline for sodium in HF patients is < 2 g/day with the rationale of improving clinical symptoms (e.g., edema, fatigue) and quality of life [40]. The DASH diet plus reduced sodium intake lowers BP more than either intervention alone [41]. However, there is no evidence to indicate whether the combination is beneficial in the setting of HF. Although AHA/ACC guidelines state that is it prudent to manage HTN “in patients with HF as if the patients did not have HF”, more research is needed to determine whether sodium restriction alone or in addition to the DASH diet effectively lowers BP in this population.

The overall nutritional value of the DASH eating pattern is also of potential benefit to patients with HF. Maintenance of adequate nutritional status is imperative as the syndrome of HF progresses. Unintentional weight loss from anorexia, early satiety, and malabsorption, which commonly occurs in advanced HF, can be disruptive to the maintenance of all nutritional plans. Hence, any nutritional plan that helps an individual achieve and maintain an adequate nutritional status, optimize CV health, and prevent co-morbidities would be

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beneficial as medical nutrition therapy. Though not formally tested in HF patients, adherence to the DASH diet can help accomplish such goals.

DASH and diabetes mellitus

The DASH eating pattern is an appropriate BP-lowering strategy for individuals with type II DM. The American Diabetic Association recommends that at-risk and diabetic patients achieve the US Department of Agriculture's Dietary Reference Intake (DRI) for fiber, whole grains, and macronutrients. It is further recommended that these individuals limit saturated fat to < 7% total daily calories, minimize *trans* fat intake, reduce cholesterol to < 200 mg/day, and limit sugar-sweetened beverages [42]. Consumption of two or more servings of fish per week is also encouraged [43]. Because the DASH diet meets these recommendations, adherence in patients with DM should be advocated.

Although individuals with uncontrolled DM were excluded from participating in the original DASH trial, it is still quite likely that the DASH eating pattern will lower BP safely in this population. The only nutrient of potential concern is carbohydrate, which makes up 55% of total calories in the DASH diet compared to 48–51% of the typical American diet. Concerns about the carbohydrate content of the DASH diet may be mitigated in two ways. First, in a randomized, controlled study, a low-carbohydrate version of the DASH eating pattern, which substitutes protein or monounsaturated fat for a portion of the carbohydrate content, reduced BP to a similar degree as the original DASH dietary pattern [44]. Thus, this substitution can be recommended in patients with DM. Secondly, adoption of the DASH diet may be facilitated by selecting foods with a low glycemic index. The glycemic index measures the degree to which carbohydrate-containing foods raise serum glucose concentration. For example, fruits with a low glycemic index, such as cherries, grapefruit, and plums, will cause less of a rise in blood glucose than higher glycemic index fruits, such as watermelon, dates, and pineapples. Results of controlled studies to investigate whether consuming low glycemic index foods aids in glucose control are conflicting and have led to discordant recommendations by expert organizations [45, 46]. Results from meta-analyses of randomized, controlled studies have shown a modest improvement in glycated hemoglobin, fewer hypoglycemic episodes, and a lower proportion of participants experiencing hyperglycemia [47, 48]. Although it has not been definitively determined, the strategy of selecting foods with a low glycemic index may permit patients with DM to adopt the DASH eating pattern without concern about negatively affecting serum glucose.

Overall, although evidence for a BP benefit in patients with uncontrolled DM is lacking, the overall heart healthy nutritional profile of the DASH eating pattern (low cholesterol, lean meats, fish, nuts, and whole grains) makes its use highly appropriate for BP control in this high-risk patient population. However, clinicians may choose to recommend substituting protein or mono-unsaturated fats for some of the complex carbohydrates as well as selection of fruits with a low glycemic index. Additional research is needed to determine the ideal dietary pattern for both BP and glucose control.

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DASH and Gastrointestinal Disorders

Chronic Liver Disease—The decision to advise a patient with chronic liver disease (CLD) to adopt the DASH eating pattern should be based on whether an individual has compensated or decompensated disease. Patients with compensated CLD are typically free to follow a well-balanced diet without restriction unless other comorbid conditions necessitate otherwise. Although not directly tested in this population, the DASH diet is likely to be safe and is therefore an appropriate strategy to lower BP. Current recommendations for nutritional therapy in patients with liver disease include small, frequent meals (to abate nausea and early satiety), daily energy intake of 35 – 40 kcal/kg, and 1.2 – 1.5 g/kg/day of protein [49]. The DASH eating plan falls well within these parameters.

Dietary intake becomes more important with disease progression. Advanced and decompensated liver disease is often accompanied by anorexia, early satiety, malabsorption, impaired protein synthesis, and hypermetabolism, all of which contribute to protein energy malnutrition (PEM) [50]. PEM is undesirable because of its association with higher rates of ascites, gastrointestinal bleeding, infection, hepatic encephalopathy, and mortality [51]. Although the DASH diet is capable of meeting the recommended protein-energy needs of this patient population, a few other concerns exist. Common therapy with spironolactone and beta blockers, as well as an increased risk for acute kidney injury and CKD raises the concern that additional potassium from the DASH diet may cause hyperkalemia. More importantly, patients with decompensated CLD tend to have low BP, which may preclude the need for the DASH diet and any other BP-lowering strategies altogether.

Few clinicians manage patients with CLD without addressing sodium intake. However, not all CLD patients require sodium restriction. Guidelines tend to recommend restricting sodium only in individuals with cirrhosis and moderate ascites [52, 53]. Therefore, the sodium content of the DASH diet is not problematic for hypertensive patients with compensated CLD. In our opinion, sodium restriction to < 2,400 mg/day, as recommended for the general population, may be considered as a separate BP-lowering strategy for these patients.

Although not evidence based, it is our opinion that the DASH diet can be safely adopted by patients with compensated disease. It is reasonable for the diet to be initiated alone or simultaneously with other BP-lowering therapies. On the other hand, the DASH diet should not be adopted by hypertensive patients with advanced, decompensated CLD. Use of medications known to increase potassium as well as the risk of acute kidney injury and CKD, with their associated complications, may cause the risk of acute complications to outweigh the benefits of BP control. Further research, however, would be helpful in this area to provide more evidence to guide management.

Diverticular disease—In general, the diagnosis of diverticulosis and/or diverticulitis should not preclude a clinician from recommending the DASH eating plan to a new patient. Historically, patients with diverticular disease have been advised to avoid small foods, such as seeds, corn, nuts, and berries, because of concern that these foods may block or irritate diverticuli and perpetuate inflammation. However, evidence supporting this theory is

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lacking, and such dietary restrictions are not currently recommended. Practice guidelines of the American College of Gastroenterology does, however, recommend a diet high in fruits, vegetables, and protein, which may be preventative of disease [54]. The American Dietetic Association also recommends consumption of 20 – 35 g of fiber daily. The DASH diet meets each of these recommendations and can be adopted as a strategy to lower BP in this patient population.

Lactose intolerance—Despite being rich in low-fat dairy products, it is possible for individuals with lactose intolerance (LI) to adopt the DASH eating pattern. The prevalence of LI varies among ethnic groups, occurring most frequently in Asians and African Americans, and least frequently in Caucasians [55]. Primary LI results from reduced genetic expression of the enzyme lactase. Lactase hydrolyzes lactose into absorbable monosaccharides. Low levels of lactase cause malabsorption of lactose-containing food products with associated nausea, flatulence, abdominal pain, and diarrhea. The severity of these symptoms depends on both the amount of lactose present in the food product and an individual's personal tolerance [56]. Individuals with primary LI will need to limit or avoid lactose-containing products for life to prevent symptoms. However, many options will allow them to follow the DASH diet.

The Dietary Guidelines for Americans 2010 recommend that individuals with lactose intolerance consume smaller portions of lactose-containing products and/or choose lactose-reduced or lactose-free versions of the offending food [57]. Consuming lactose-containing products may be facilitated further with the supplementation of oral digestive forms of lactase. Many dairy products are manufactured with lactase as an additive. Lactase can also be taken in pill form simultaneously with lactose-containing foods. Alternatively, consuming products that are completely lactose free can also be accomplished without much difficulty. This is because the food industry is laden with abundant sources of dairy-substitutes. For example, soy, rice, and almond milks serve as widely available lactose-free milk substitutes, although the effect of these substitutions on the BP-lowering effect of DASH is unknown. Nonetheless, with these modifications and substitutions, the DASH diet can be adopted for most patients with LI.

Celiac disease—Celiac disease (CD), an autoimmune disease involving inflammation of the small intestines precipitated by ingestion of gluten in individuals with a genetic predisposition, does not preclude adoption of the DASH eating pattern. This, too, is a population for which focused research on the efficacy and safety of the DASH diet has not been conducted. However, the principle question that arises for these patients is whether the DASH eating pattern is compatible with already imposed dietary restrictions. There are two aspects of the DASH diet that require special consideration for this population. One is foods that contain gluten, a protein found in wheat and related grain species, such as barley and rye. The other is lactose-containing products.

The precipitant of intestinal inflammation in CD is gluten. Upon exposure to gluten, atrophic changes occur in villi lining the small intestines. Such damage results in malabsorption and subsequent deficiencies in multiple nutrients and fat-soluble vitamins. Although the intestines heal after gluten is eliminated from the diet, intolerance is permanent, and damage

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reoccurs if gluten is ever reintroduced [57, 58]. As a result, patients with CD should maintain a gluten-free diet for life. The DASH eating pattern contains seven to eight servings of grain, mostly whole grain, per day. Avoidance of prohibited grains, such as wheat, rye, and barley, is imperative for CD patients. Oat consumption should be limited to 50–60 g/day (~2 oz), and care should be taken to select from pure oat sources, which are free from cross-contamination with gluten [59]. There are many whole grain options that are compatible with both the DASH diet and dietary guidelines for CD patients. Safe whole grains include brown rice, corn, buckwheat, millet, and amaranth. Flours made from soybean, tapioca and potatoes are also safe. Being cognizant that gluten-free alternatives exist to permit dietary compliance with the DASH eating pattern will help facilitate its adoption.

Patients with CD may also acquire secondary lactose intolerance as a result of inflammatory damage incurred by the intestinal mucosa. Fortunately, inflammation abates after a period of gluten avoidance, allowing the mucosa to heal and lactase to be regenerated. Thereafter, dairy may be reintroduced in the diet. Patients with CD, who become temporarily intolerant to the DASH diet because of its dairy content, may choose lactose-reduced or lactose-free options as discussed above and/or derive calcium from other sources, such as leafy green vegetables, seeds, nuts, sardines, and fortified foods.

In general, meal planning and careful label reading will allow patients with CD to adopt the DASH eating plan. Selecting gluten-free foods and temporarily avoiding lactose if intolerance is acquired will be key.

Initiation of the DASH eating pattern

Most patients will require a combination of therapies to successfully achieve target BP. These strategies may include both lifestyle interventions and pharmacologic agents. Therefore, clinicians will need to determine whether it is appropriate to initiate the DASH eating pattern prior to, simultaneously with, or after other therapies. However, timing of the initiation of the DASH diet in relation to other therapies has not been assessed. Therefore, one must draw on clinical experience and knowledge of how various patient factors (i.e., comorbid conditions, prescribed medications) may conflict with its dietary components.

For most patients, it is acceptable to initiate the DASH eating pattern simultaneously with other lifestyle interventions. As noted above, DASH combined with reduced sodium intake is more effective at lowering BP than either lifestyle intervention alone [41]. In addition, lifestyle studies that combine DASH with weight loss suggest that the effects on BP are at least subadditive (i.e., greater than either intervention alone, but not completely additive) [60–63]. In addition to combining DASH with other lifestyle treatments, it is critically important to consider combining it with pharmacologic antihypertensive therapy: most patients with hypertension will require at least one BP medication. However, to our knowledge, only one trial has evaluated the combined effect of the DASH diet with a pharmacologic agent. The DASH-losartan trial showed a greater BP-lowering effect of the DASH diet plus the angiotensin receptor antagonist (ARB), losartan, than when either intervention was used alone [41]. Evidence concerning the effect of DASH combined with

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other classes of antihypertensive agents, with multiple antihypertensive agents simultaneously, or in more severe hypertension is entirely lacking. Nonetheless, given the consistent BP-lowering effect of DASH alone or in combination with ARB, recommending the DASH diet at the same time with other therapies is an acceptable and preferred strategy to lower BP.

There is one occasion when it may be prudent to delay initiation of the DASH eating pattern until after medical therapy is established. Patients in whom RAAS inhibitors is initiated may have an increased risk of developing hyperkalemia, especially if they also have DM, CKD, or CVD [64, 65]. In these patients, the DASH diet should not be initiated until the goal dosing of RAAS inhibitors is achieved and normokalemia is confirmed (Table 1).

CONCLUSION

The DASH eating pattern, like other lifestyle interventions, is important for optimal management of elevated BP. Quite often behavioral changes are recommended as an afterthought to anti-hypertensive medications, when in fact, they should be regarded as a cornerstone of therapy. The DASH eating pattern, which is rich in fruits, vegetables, low-fat dairy products, whole grains, lean meats and fish, with reduced sugar sweetened desserts and beverages, effectively lowers BP alone and in combination with other therapies. Although caution should be taken in patients with CKD, DM, CVD, or those prescribed RAAS inhibitors, the DASH eating plan can generally be adopted by most patient populations and started simultaneously with medication therapy.

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Table 1

Summary of dietary concerns of special patient populations and recommended treatment strategies

Special patient population	Conflicts with DASH diet	Treatment strategies
Chronic kidney disease	High potassium (fruits and vegetables), high protein (meats, fish, legumes, nuts), and high phosphorus (protein, low-fat dairy products) content for those with advanced CKD	Frequently monitor potassium, phosphorus, calcium, magnesium. If high normal or elevated: do not start DASH, discontinue DASH
Chronic heart failure	None	In addition to starting the DASH diet, restrict sodium intake (although research is lacking) per guideline recommendations for the general population
Diabetes mellitus type 2	Carbohydrate content may be higher than what is prescribed for some patients	Adopt a low-carbohydrate version of the DASH diet by substituting protein or monounsaturated fat for a portion of the carbohydrate content. Select foods with a low glycemic index
Chronic liver disease	Compensated: none Decompensated: high potassium content (fruits and vegetables) for patients with cirrhosis and moderate ascites	Compensated: DASH with no alterations. Also consider, sodium restriction (although research is lacking) per guideline recommendations for general population. Decompensated: DASH not recommended in this population
Diverticulitis	None (avoidance of seeds, corn, nuts, and berries is not currently recommended)	DASH with no alterations
Primary lactose intolerance	Lactose-containing products (low-fat dairy products)	Reduce intake of lactose- containing products and select lactose-reduced or lactose-free products. Supplement with oral digestive forms of lactase when consuming lactose-containing products
Celiac disease	Gluten-containing products (whole wheat)	Avoid gluten-containing grains, such as, wheat, rye, and barley. Select gluten-free foods, such as pure oats (limit to 50–60 g/day), brown rice, corn, and tapioca. Soybeans and potatoes can also be good sources of carbohydrates
	Lactose-containing products (low-fat dairy products)	Temporarily limit lactose- containing products and select lactose-reduced or lactose-free products. See above recommendations for “primary lactose intolerance”
Use of renin-angiotensin-aldosterone system (RAAS) antagonists	High potassium content (fruits and vegetables)	Delay initiating DASH until the goal dose of RAAS inhibitor is achieved and normokalemia is confirmed