AJKD
Editorial

DASH and Mediterranean Diets as Nutritional Interventions for CKD Patients

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Chronic kidney disease (CKD) and cardiovascular disease (CVD) share similar risk factors, many of which are closely related to lifestyle. Limited physical activity, smoking, and improper dietary habits are well-known risk factors for CVD, and CVD is directly linked to the development and progression of CKD.

The prevalence of CKD stages 3 to 5 varies across and within countries. In the United States, it ranges from 11.8% in the Midwest to 4.8% in the Northeast. In Europe, the overall prevalence is lower, but again, highly variable, ranging from 5.9% in the Northeast German Study of Health in Pomerania (SHIP) Study to as low as 1% in Italy.[1] Restricting the analysis to the population aged 45 to 74 years of the same countries, the prevalence of CKD stages 3 to 5 increases to 2% in Italy and to 11.5% in Germany. Although many factors differ by region, lifestyle and diet often have the greatest variation, suggesting that they may have a significant role in the development and progression of CKD and CVD in addition to other environmental and genetic factors.

The Dietary Approaches to Stop Hypertension (DASH) diet is a dietary pattern promoted by the US National Institutes of Health for prevention and control of arterial hypertension.[2] The DASH diet is rich in fruits, vegetables, whole grains, and low-fat dairy foods; it also includes meat, fish, poultry, nuts, and beans, whereas sugar-sweetened foods and beverages, red meat, and added fats are limited.[3]

When the DASH diet was designed, the chosen nutrition pattern had many similarities with the Mediterranean diet. In 2010, UNESCO (United Nations Educational, Scientific and Cultural Organization) acknowledged the Mediterranean diet as an "Intangible Cultural Heritage of Humanity".[4] Rather than a diet, it is considered a lifestyle, adapting to the different nutritional and socioeconomic contexts of the Mediterranean region.[5] The dietary component includes high consumption of olive oil, legumes, unrefined cereals, fruits, and vegetables; moderate to high intake of fish; moderate intake of dairy products and wine; and low consumption of red or processed meat. Other components include adequate intake of water and/or herbal infusions, small serving sizes, regular physical activity, adequate rest, conviviality, culinary activities, and use of traditional, local, and eco-friendly products, with attention to seasonality and biodiversity.[5]

Randomized controlled trials, observational studies, and meta-analyses demonstrate that the Mediterranean diet is beneficial for both primary and secondary prevention of CVD; however, no association has been found between the specific foods characterizing the Mediterranean diet and clinical outcomes.[6,7] In the randomized controlled PREDIMED (Prevención con Dieta Mediterránea) study,[8,9] in which no energy restriction and no special intervention on physical activity were applied, the Mediterranean diet supplemented with extra virgin olive oil, compared to a standard control diet with advice on low-fat food, was associated with a significant 30% reduction in CVD events and a 40% reduction in the incidence of type 2 diabetes mellitus during a median follow-up of 4.8 years. In a cross-sectional study of healthy people, higher adherence to the Mediterranean diet was associated with higher estimated creatinine clearance.[10] Although a randomized controlled trial would be needed to draw more firm conclusions on whether the Mediterranean diet has a protective effect on kidney disease, the complexity of the diet makes designing a high-quality randomized controlled trial difficult. Critically, other factors are at play given that Spain, with its extensive Mediterranean coast, has an adjusted prevalence of CKD stages 3 to 5 of 7.8% among individuals aged 45 to 75 years, exceeding many Northern European countries, such as Finland (4.5%), Norway (3.3%), and the Netherlands (2.7%).[1]

Overall, the DASH diet is very similar to the Mediterranean diet, although some differences are present (Table 1). Both diets are nutritionally balanced and flexible, because no food groups are strictly prohibited. In addition, both diets are sustainable over the long term, allowing for permanent nutritional changes. For both diets, emphasis is also placed on lifestyle, including moderate physical activity.

In this issue of *AJKD*, Rebholz et al[11] show that the DASH diet is associated with lower risk for CKD when compared to a typical Western diet. This protective effect was noted for the diet as a whole; however, no relationship emerged with individual nutrients. This study is of particular relevance given its ability to examine this longitudinal relationship for an extended (23 years) follow-up. An additional critical element is that the study emphasizes how important the dietary

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Table 1. Comparison Between a Representative List of Food Components and Servings of DASH and Mediterranean Diets

Type of Food	Mediterranean Diet	DASH Diet
Fruits	2-3 servings/d	4-5 servings/d
Vegetables	4-5 servings/d	4-5 servings/d
Dairy foods (mostly low fat)	2 servings/d	2-3 servings/d
Fish, poultry, and lean meats	1 serving/d	≤2 servings/d
Legumes, nuts, and seeds	≥2 servings/wk of legumes; 1-2 servings/d of nuts and seeds	4-5 servings/wk
Bread/pasta/rice/couscous/other cereals (preferably whole grain)	6-8 servings/d	6-8 servings/d
Fats and oils (MED diet: extra virgin olive oil; DASH: margarine, vegetable oil, mayonnaise, salad dressing)	3-4 servings/d	2-3 servings/d
Wine	3 servings/d for men; 1.5 servings/d for women	2 servings/d for men; 1 serving/d for women
Red meat	≤2 servings/wk	As low as possible
Processed meat	≤1 serving/wk	As low as possible
Sweets	≤2 servings/wk	≤5 servings/wk

Abbreviation: DASH, Dietary Approaches to Stop Hypertension.
Source: Moore et al[3] and Bach-Faig et al.[5]

pattern is, superseding single nutrients, as a primary tool for potentially preventing both CVD and CKD. An intriguing aspect of the study is that the protective effect of the DASH diet is blunted in individuals who were overweight or obese at baseline. It is plausible that those individuals may benefit from more specific dietary and/or pharmacologic interventions for kidney protection, although the DASH or Mediterranean diet will likely still be beneficial as basic dietary patterns.

Of interest, the DASH diet does not specifically include extra virgin olive oil, which is a crucial component of the Mediterranean diet and may be associated with reduced incidence of CVD.[12] Olive oil is easily transported without losing its nutritional properties, and its incorporation into the dietary pattern of the DASH diet may be beneficial. Thus, both the DASH and Mediterranean diets appear to represent dietary patterns useful for primary prevention of CVD and/or CKD. Moreover, both the Mediterranean diet and the DASH diet appear to modify several cardiovascular risk factors,[8,13,14] and given the association between CKD and CVD, this may also benefit kidney disease risk factors.

Nutritional education leading to improved dietary habits also forms the basis for more specific dietary interventions in patients with CKD. More vegetable intake results in lower net production and retention of hydrogen ions, with better preservation of kidney function.[15] This may have important effects, both for prevention of kidney damage and kidney disease progression and also for attenuating protein catabolism and bone mineral abnormalities.[16] Increasing vegetable intake may also have favorable effects on phosphorus metabolism in CKD.[17] Phosphate from plant-origin foods is much less absorbed by the intestine due to the lower bioavailability of phytate compared to phosphate from animal-origin foods, in particular processed foods.[17,18] Thus, the source of protein is a crucial determinant of phosphate homeostasis in patients with CKD and dietary counseling must consider not only the amount of phosphate in the diet, but also the kind of food from which the phosphate derives.[17] Finally, the antihypertensive effect[19] and the favorable fatty acid composition of the DASH-Mediterranean diets may also contribute to the cardiovascular and kidney protection.

If these diets were applied extensively in the general and in the early-CKD populations, it could also be easier to further apply specific dietary manipulations when needed, as in the case of more advanced CKD stages (3b-5ND).[20] From this perspective, it is of interest the finding by Rebholz et al[11] that among the individual components of the DASH diet, red and processed meat intakes were adversely associated with kidney disease progression, whereas nuts, legumes, and low-fat dairy products were associated with reduced risk. Considering the specific components, protein intake was associated with higher risk, whereas magnesium and calcium intake were associated with reduced risk for kidney disease. Thus, the nutritional approach to the prevention of kidney disease appears to incorporate more than control of protein intake.

In our opinion, greater attention should be paid to safer dietary patterns, such as the DASH or Mediterranean diets, in Western countries, replacing diets rich in processed foods, red meat, and animal fats. Educational programs and nutritional interventions should be implemented as effective tools for primary and secondary prevention of cardiovascular and kidney disease, to be coupled with other lifestyle changes, including smoking discontinuation and increased aerobic exercise.[21] These changes appear to be worthwhile initial elements of multifaceted interventions to limit the growing worldwide epidemics of CKD in developed and low- to medium-income nations.[22]

Based on the available observational data, we see little risk and potentially marked benefits in promoting the DASH or Mediterranean diets in widespread nutritional education, as well as promoting these diets as a targeted intervention in people with or at risk for CKD. In addition, when CKD is clinically evident and nutrient-specific dietary interventions are indicated, it will be easier to achieve adequate results when transitioning from a DASH- or Mediterranean-based approach, rather than from a diet rich in animal proteins and fats.

The increasing incidence of end-stage renal disease in low- and medium-income countries, which have greater difficulty providing dialysis treatment to all patients in need, similarly requires increased scrutiny of affordable and meaningful preventive interventions. These observational data suggest that the DASH diet is one potentially effective approach, while the Mediterranean diet lifestyle can offer further insights on improvements of the dietary approach to preventing CKD.[23] The increasing attention of the scientific community on the nutritional aspects of prevention and treatment of chronic diseases, as represented in the study by Rebholz et al, is a very good sign and has been sorely needed.

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