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Review of the applicability of the DASH diet for patients with chronic kidney disease and chronic liver disease

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Abstract. Hypertension is a significant risk factor for cardiovascular diseases, and the DASH diet effectively lowers blood pressure. However, individuals with Chronic Kidney Disease (CKD) and Chronic Liver Disease (CLD) need adaptations in potassium and sodium/water intake to adhere to the DASH diet. This literature review examines the applicability of the DASH diet for patients with CKD and CLD by analyzing findings from a comprehensive search of relevant academic databases. The review explores various sources, including clinical studies, research articles, and expert recommendations, to assess the effectiveness and suitability of the DASH diet in managing the dietary needs of individuals with CKD and CLD. The review reveals that the DASH diet, with its emphasis on reduced sodium intake and increased consumption of fruits, vegetables, whole grains, and lean proteins, shows promising results in managing blood pressure and improving overall cardiovascular health in individuals with early stage CKD and CLD. Furthermore, the review concludes that individuals with advanced CKD and CLD should exercise caution when considering the DASH diet, as modifications are necessary to accommodate their specific conditions. For patients with advanced CKD, careful management of potassium intake is essential to prevent hyperkalemia; while individuals with late-stage CLD should monitor both sodium and water intake to avoid dilutional hyponatremia. Additionally, the review also emphasized the importance of individualized dietary modifications and consultations with healthcare professionals for optimizing the benefits of the DASH diet, especially for those patients with later stages of CKD and CLD.

Keywords: hypertension, DASH diet, excessive sodium intake, chronic kidney disease (CKD), chronic liver disease (CLD).

1. Introduction

Hypertension, also known as high blood pressure, is a leading risk factor for cardiovascular diseases. Aptly nicknamed the "silent killer," hypertension can be particularly dangerous because an undiagnosed individual would die from its effects without experiencing any warning symptoms in advance. Previously, extensive studies have investigated the risk factors associated with this condition, particularly excessive sodium intake. Research findings consistently demonstrate that a reduction in dietary sodium intake can decrease diastolic blood pressure [1]. One effective approach for reducing sodium intake is known as the Dietary Approaches to Stop Hypertension (DASH) diet. The DASH diet is a nutritional approach that emphasizes dietary options rich in potassium, calcium, magnesium, fiber, and protein (such as vegetables, beans, fruits, low-fat or fat-free dairy products, etc.) while reducing

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sodium intake [2]. However, individuals with hypertension and certain medical conditions may face challenges when strictly adhering to the DASH diet. Therefore, adjustments to the DASH diet are necessary to accommodate the diverse needs of different cases. To date, there is limited literature summarizing the specific adjustments required for the DASH diet in various scenarios, especially for individuals with Chronic Kidney Diseases (CKD) and Chronic Liver Disease (CLD). Therefore, the primary objective of this essay is to discuss the adaptations needed for individuals following the DASH diet in different circumstances. Specifically, it will focus on hypertensive patients with Chronic Kidney Diseases (CKD) and Chronic Liver Disease (CLD).

2. Introduction to dietary approaches to prevent hypertension (DASH)

According to the National Heart, Lung, and Blood Institute (NHLBI), a DASH diet is a flexible eating plan that is designated to lower blood pressure and promote overall cardiovascular health [2]. To accomplish that, the diet emphasized minimizing sodium intake, saturated fats, and sweets while promoting the consumption of fruits, vegetables, whole grains, lean proteins, and low-fat dairy products. The NHLBI provides an illustrative example of a 2000-calorie-per-day nutrition plan, recommending the following daily servings: 6-8 servings of grain products; 4-5 servings of vegetables; 4-5 servings of fruits; 2-3 servings of low-fat dairy or fat-free dairy products; 6 or fewer servings of meat, poultry, or fish; and 2-3 servings of fats and oils. Additionally, the plan advises limiting sweets and added sugars to 5 servings or less per week, and nuts, seeds, or dry beans, and peas to 4-5 servings per week [3]. To make the DASH diet effective, it is crucial for individuals to adhere to the plan consistently on a daily basis and be prepared to maintain this dietary approach over the long term. For specific patient populations with unique dietary concerns, the following outlines the necessary alterations and adaptations to the DASH diet.

3. Adapting the DASH diet for individuals with chronic kidney disease (CKD)

Chronic Kidney Disease (CKD) refers to a gradual loss of kidney function over the long term. Normally, the kidneys play a crucial role in filtering waste products and excess fluids from the blood, maintaining electrolyte balance, and producing hormones that regulate blood pressure. However, patients with CKD are unable to carry out those events effectively due to damage to the kidney [4]. In the DASH diet, one approach to lowering blood pressure is by taking more minerals such as potassium, calcium, and magnesium in daily eating plans. In individuals with CKD, however, the damaged kidneys have the possibility of being unable to effectively process extra potassium in the body, leading to an accumulation of potassium in the bloodstream. This condition is called hyperkalemia. On the other hand, an insufficient amount of potassium in the body would cause poor cardiovascular function, which can further cause kidney damage [5]. Therefore, it is crucial to maintain potassium levels within a range that can be effectively processed by the kidneys of CKD patients.

The ability of individuals with CKD to process potassium depends on the specific stage they are in. In other words, individuals with different stages of CKD have different recommendations for potassium intake to fulfill their daily body needs. Evidence suggests that in the short term, the DASH diet does not induce significant changes in metabolic events among individuals with moderate CKD [6]. Furthermore, adopting a plant-based DASH diet can help promote cardiovascular health in CKD patients. Emerging evidence also suggests that CKD patients can use newer potassium-binding agents to reduce the risk of recurrent hyperkalemia that can possibly be caused by the high-potassium contents of the DASH diet. However, further studies are required to confirm the efficacy and safety of this approach [6].

On the other hand, the Kidney Disease Outcome Quality Initiative (KDOQI) guidelines from The National Kidney Foundation do not suggest advanced CKD patients pursue the DASH diet without consulting healthcare professionals [8]. An advanced CKD patient is defined by a severe reduction in glomerular filtration rate (GFR < 30 ml/min), while the normal GFR range is 90-120 ml/min for a healthy individual [7]. In the DASH diet, a recommended daily intake of 4,700 mg of potassium is suitable for healthy adults with normal kidney function [2]. However, KDOQI guidelines suggest a 2000 mg-4000 mg intake of potassium per day [8]. In order to ensure that advanced CKD patients do not

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exceed the recommended daily range of potassium intake that their kidneys can process, it is important to consult healthcare professionals before considering the DASH diet or not proceed with the DASH diet.

4. Adapting the DASH diet for individuals with chronic liver disease (CLD)

Normally, the liver performs several vital functions in the body, including detoxification, metabolism, nutrient storage, bile production, and the synthesis of proteins necessary for blood clotting and immune function. A patient with Chronic Liver Disease (CLD), however, may experience difficulties in performing those liver functions [9]. While there are various causes of liver damage, CLD patients usually experience the same course of progression. Typically, a CLD patient will gradually experience the following four stages: Inflammation, Fibrosis, Cirrhosis, and liver failure. During inflammation and fibrosis, the liver is still able to perform its essential functions adequately, despite the presence of liver damage [10]. Cirrhosis and liver failure, however, are called decompensated a chronic liver disease because the liver can no longer compensate for the damage and its functions become significantly impaired [11]. To minimize the strain on livers, individuals with decompensated CLD need to adhere to specific dietary restrictions in their daily eating patterns. In the early stage of CLD, the DASH diet can serve as a beneficial framework because its emphasis on whole foods, fruits, vegetables, whole grains, lean proteins, and low-fat dairy products will provide sufficient nutrients and limit sodium intake for CLD patients. However, specific modifications need to be made for individuals with advanced CLD to adopt the DASH diet.

In the DASH diet, a large amount of vegetables and fruits is consumed to help maintain proper hydration levels, which in turn supports optimal nutrient absorption. In addition to the hydration obtained from consuming water-rich fruits and vegetables, an additional intake of 1150 ml to 2700 ml of water is recommended to meet the daily fluid requirements for a healthy individual [12]. However, individuals with advanced CLD experience a significant decrease in the amount of solute-free water excreted per day, which requires a restricted fluid intake.

When water is not properly excreted, it can accumulate in the body and lead to a dilution of the concentration of sodium in the bloodstream. This condition is called dilutional hyponatremia that will cause various symptoms such as nausea, headache, confusion, seizures, and, in severe cases, even coma or death [13]. To avoid dilutional hyponatremia, the intake of water for advanced CLD patients is limited to only 1.5 liters of fluid per day before fluid accumulation arises [13]. Dilutional hyponatremia can be caused by excessive water intake or insufficient sodium intake.

In addition to recommending appropriate water intake, the DASH diet also emphasizes the importance of limited sodium intake while increasing potassium intake to drop blood pressure [3]. This recommendation aligns with the dietary guidelines for individuals with advanced Chronic Liver Disease (CLD) who are advised to lower their sodium intake [9]. According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), patients with cirrhosis should limit their daily sodium intake to 2300 mg [14], which is consistent with the sodium intake recommended in the DASH diet [2]. Given that impaired kidney function is a common complication for patients with advanced Chronic Liver Disease (CLD), it is crucial to exercise caution and limit potassium intake. Further details regarding the recommended daily potassium intake for individuals with advanced CKD will be provided in the preceding discussion. Again, it is recommended to consult a health profession before adjusting the DASH diet.

5. Conclusion

In conclusion, the DASH diet offers a valuable framework for individuals with Chronic Kidney Disease (CKD) and Chronic Liver Disease (CLD) who are seeking to manage their condition through dietary modifications. While the DASH diet promotes a balanced approach to nutrition, adjustments are necessary to accommodate the unique needs of individuals with CKD and advanced CLD. CKD patients must carefully manage their potassium intake based on their specific stage of the disease, as the kidneys may struggle to process excess potassium. Advanced CLD patients should adhere to restricted fluid

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intake guidelines to prevent fluid accumulation and dilutional hyponatremia. It is important for individuals with CKD or advanced CLD to consult healthcare professionals for personalized dietary recommendations tailored to their specific conditions. By making appropriate adaptations, the DASH diet can be a valuable tool in supporting the overall health and well-being of individuals with CKD and CLD. While this essay provides an overview of the general considerations and adjustments needed, there is a need for more comprehensive studies and evidence-based guidelines specific to these patient populations. Additionally, future research should be more quantitative and focus on conducting clinical studies and trials to assess the effectiveness and safety of implementing the DASH diet in individuals with CKD and CLD.

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