

The Influence of Dietary Intervention on Patients with Hypertension

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ABSTRACT

Background With billions of cases worldwide, hypertension is a chronic illness that greatly raises the risk of cardiovascular illnesses. Dietary interventions are considered an important non-pharmacological approach for managing hypertension. **Objective** The purpose of this study is to evaluate the efficacy of dietary interventions in the prevention and management of hypertension, including a comparative evaluation of various dietary patterns for blood pressure reduction and their application across diverse populations. **Methods** An extensive literature review and analysis of existing research data were conducted to evaluate the influence of dietary changes on the quality of life and cardiovascular health in hypertensive patients. The effectiveness of dietary therapies high in potassium, calcium, and magnesium, such as the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet, and a modified form of Chinese diet, is especially investigated in this study. **Results** The results show that dietary patterns, especially those high in potassium, calcium, and magnesium, have a significant impact on lowering blood pressure and improving cardiovascular health. Both the DASH diet and the Mediterranean diet demonstrated strong efficacy in controlling hypertension, with the adapted traditional Chinese diet also showing promising results. The study further suggests that personalized dietary interventions can offer enhanced benefits for hypertension management across diverse populations. **Conclusion** The findings underscore the significance of dietary changes in controlling hypertension and enhancing cardiovascular health. This study offers insight for public health policymakers in the creation of evidence-based strategies for the prevention and management of hypertension and provides a theoretical basis for future research on customized dietary interventions.

KEYWORDS

Hypertension; Dietary intervention; DASH diet; Mediterranean diet; Traditional Chinese diet; Cardiovascular health; Life quality

1 Introduction

Hypertension, one of the world's most frequent chronic noncommunicable diseases, is a major risk factor for a variety of illnesses such as stroke, renal disease, and cardiovascular disease. Two-thirds of the 1.28 billion persons between the ages of 30 and 79 who suffer from hypertension live in low- and middle-income nations^[1]. A sizable portion of people go undiagnosed or untreated despite its high incidence. The prevalence of hypertension is on the rise, which presents a serious public health concern as the world's population ages^[2], especially the fast growing number of individuals over 80^[3].

Pharmacological treatment remains a cornerstone of hypertension management. However, most antihypertensive medications come with a range of side effects, such as dizziness, fatigue, and gastrointestinal issues, which may impact patients' quality of life and adherence to treatment. For example, beta-blockers^[4], which reduce the force and speed of your heart rate, can cause side effects like asthma symptoms, cold hands and feet, depression, erection problems, and insomnia^[5]. As a result, there is an increasing interest in dietary interventions as an alternative, non-pharmacological approach.

2 Dominant dietary pattern

Recently, the impact of dietary patterns on hypertension management has become the focus of international research. Among the many dietary patterns, the DASH diet and the Mediterranean diet have been shown to have significant effects on controlling hypertension.

2.1 DASH diet

The "Dietary Approaches to Stop Hypertension" (DASH) diet is a balanced, adaptable eating plan that aims to establish a lifetime heart-healthy eating habit^[6]. The DASH diet consists of 7–8 portions of whole grains per day, 4–5 portions each of fruits and vegetables per day, 2–3 portions of low-fat dairy per day, no more than 2 portions of lean protein per day with an emphasis on plant-based sources, nuts 4–5 times a week, and reduced salt intake^[7]. This diet has a strong emphasis on consuming fewer sodium-containing foods and more fruits, vegetables, and whole grains that are high in potassium, calcium, and magnesium. Foods high in saturated fat, including fatty meats, full-fat dairy products, and tropical oils, as well as sweets and beverages with added sugar, are also prohibited. For those with high blood pressure, the DASH diet is very helpful in managing and lowering the risk of health problems associated with hypertension. Studies funded by the NHLBI have shown that the DASH diet can effectively lower blood pressure. The DASH diet offers a clinically

meaningful reduction in DBP and SBP of approximately 5–8 mmHg and 3–4 mmHg, respectively. According to studies, a 2 mmHg drop in SBP and DBP is linked to a 7% decrease in coronary artery disease mortality and a 10% decrease in stroke mortality^{[8][9]}.

2.2 Mediterranean diet

The Mediterranean diet, inspired by the traditional eating habits of people in Crete, Greece, and Southern Italy, is popular for its association with low rates of heart disease, chronic illness, and obesity. This diet emphasizes whole grains, healthy fats (such as those found in fish, olive oil, and nuts), plenty of vegetables and fruits, frequent fish, and limited consumption of non-fish meats^[10]. A meta-analysis reported that adherence to the MedDiet was linked to a decrease of approximately 1.4 mmHg in systolic BP and 1.5 mmHg in diastolic BP. Another study found that higher adherence to the MedDiet reduced the odds of hypertension by 36%, and up to 60% when considering weight status. Additionally, the PREDIMED study observed significant reductions in diastolic BP among participants following the MedDiet^[11].

2.3 Modified Chinese diet

Traditional Chinese diets, which are often high in salt, have a significant impact on the emergence and progression of hypertension. A high-salt diet is one of the primary causes of China's high prevalence of hypertension, according to a Shanghai-focused study. Reducing daily salt intake by 5 grams has been shown to significantly lower systolic blood pressure (4–6 mmHg) in patients with mild to moderate hypertension^[12]. Furthermore, it has been discovered that some plant-based foods that are frequently included in Chinese diets, like green tea and soy products, help to regulate blood pressure. The genistein in soybean isoflavone has a significant protective effect on the cardiovascular system^[13], while green tea polyphenols can regulate the expression of NADPH oxidase subunit, a key enzyme produced by reactive oxygen species (ROS) in endothelial cells, and contribute to the prevention and treatment of cardiovascular diseases and the regulation of vascular endothelial cell function^[14]. Domestic research has also made significant strides in dietary interventions for hypertension. Studies have demonstrated that controlling sodium intake to less than 2000 mg per day can significantly reduce blood pressure in hypertensive patients. Cutting back on pickled foods, salty sauces, and high-sodium seasonings has been shown to lower blood pressure in areas like Northern China where people have historically consumed a lot of salt, especially in those with mild to moderate hypertension. Additionally, research on traditional Chinese medicine has revealed that flavonoids (e. g., quercetin and naringin), saponins (e. g., ginsenosides and glycyrrhizin), and polyphenolic substances found in Chinese herbs help lower blood pressure through mechanisms like antioxidant effects, inhibition of vasoconstriction, and improvement of endothelial function. For example, *Eucommia ulmoides* extract has shown significant blood pressure-lowering effects and excellent kidney protection in animal studies, while *Cassia* seeds, rich in active components like rhein and flavonoids, lower blood pressure by reducing serum lipids and alleviating atherosclerosis^[15]. These findings underscore the potential of dietary and herbal interventions in managing hypertension in China.

3 Mechanistic Insight into Dietary Interventions and Control of Blood Pressure

Beyond observational results, knowledge of the mechanisms by which dietary interventions influence blood pressure is important for translating nutritional recommendations into clinical practice. Each of the three diets employs a distinct profile of nutrients that act through overlapping sets of physiological systems to control blood pressure.

The DASH diet lowers blood pressure through increased intake of potassium, calcium, and magnesium and reduced sodium intake. Potassium enhances natriuresis (excretion of sodium in the urine), balances electrolytes, and decreases vascular resistance. Calcium plays a crucial role in the contraction of vascular smooth muscle, and magnesium preserves endothelial function and vasodilation. In modulating these pathways, the DASH diet can decrease both systolic and diastolic pressures and is best suited for patients with stage 2 or stage 1 hypertension.

The Mediterranean diet is antihypertensive due to its high monounsaturated fat content (mainly from olive oil), omega-3 fatty acid content (from fish), and polyphenol content (from fruits, vegetables, and wine). The nutrients reduce oxidative stress and inflammation, improve lipid profile, increase nitric oxide bioavailability in endothelial cells, leading to improved arterial elasticity and peripheral resistance reduction.

In the case of the classical Chinese diet, the most important mechanism of intervention is the reduction of salt. High dietary sodium intake is associated with impaired renal sodium handling, stimulation of the sympathetic nervous system, and vascular remodeling. Reducing sodium intake can reverse these changes and can reduce blood pressure significantly. In addition, foods like isoflavones in soy and catechins in tea possess antioxidant and anti-inflammatory activities that are likely to provide cardiovascular protection. Herbal ingredients like quercetin and saponins in traditional Chinese medicine

have additionally been found to suppress the renin-angiotensin-aldosterone system (RAAS) and attenuate endothelial dysfunction.

4 Limitations

Although remarkable progress has been made in improving hypertension through dietary interventions, there are still some limitations. The DASH diet, in particular, is based on Western dietary patterns, with limited research on its applicability to non-Western populations, especially Asians. Similarly, the Mediterranean diet relies on specific food ingredients and cooking methods, which may be difficult to fully adopt in some regions, further limiting its widespread implementation. Therefore, validation of these results in China and other Asian countries is still not reliable and valid enough and requires further confirmation. Second, although the main components such as potassium and sodium have been identified as playing an important role in controlling blood pressure, the mechanisms of interaction between the various components and the effects of long-term use of these components on stability are still unknown. In particular, local specialty foods (such as bean products and tea polyphenols) lack in-depth and systematic studies on the specific mechanisms of regulating the stability of the blood circulation system. In addition, although the DASH diet and the Mediterranean diet have been validated internationally, the long-term effects of these dietary patterns and their suitability in Asian populations require further research to determine their effects in patients with hypertension in different regions.

5 Future Directions and Practical Implications

While much progress has been made in the discovery of healthy eating patterns for hypertension, more culturally specific and individualized nutritional strategies must be developed. Maintenance of these diets over long periods in several populations, particularly in Asian populations with distinct dietary practices, must be examined. The integration of diet into public health policies can be effective. For instance, community education interventions, occupational nutrition programs, and mobile health programs can raise awareness and maximize compliance. Clinically, the integration of dietitians into hypertension treatment teams can maximize individualized counseling and surveillance. In addition, future studies should address gaps in current literature, such as the combined effect of diet and lifestyle elements (e.g., exercise, sleep, stress reduction) and the role of food processing in modulating nutrient bioavailability. With rising prevalence of hypertension, especially in low-resource settings, culturally adapted and cost-efficient food strategies are critical. As research is expanded, guidelines are enhanced, and policy implementation is encouraged, food-based interventions can be life-changing and be the bedrock, non-pharmacological interventions for the control of hypertension globally.

6 Conclusion

Existing studies indicate that the DASH diet, Mediterranean diet, domestic diet all have a positive impact on the management of hypertension. Each dietary pattern helps control blood pressure and improve cardiovascular health in different ways. By consuming fewer sodium-containing meals and more foods high in potassium, calcium, and dietary fiber, the DASH diet effectively lowers blood pressure. It has been demonstrated to dramatically lower blood pressure at both the diastolic and systolic levels. Consuming healthy fats like fish and olive oil raises blood lipid levels, which in turn lowers blood pressure. This is the main way that the Mediterranean diet affects blood pressure. Long-term cardiovascular health maintenance is especially aided by this diet. Domestic diet, by reducing salt intake and increasing plant-based foods such as beans, tea, and whole grains, has been found to effectively regulate blood pressure. This diet is especially suitable for populations in East Asia, where high salt intake is common, and it helps reduce the risk of hypertension associated with high-salt diets. Overall, each of these diets offers a viable approach to managing blood pressure and improving heart health.

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