

Missing ingredients for a lifestyle recipe to treat hypertension

James A. Blumenthal, Andrew Sherwood

Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC, USA

Correspondence to: James A. Blumenthal, PhD. Department of Psychiatry and Behavioral Sciences, Box 3119, Duke University Medical Center, Durham, NC 27710, USA. Email: blume003@mc.duke.edu.

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Two decades ago, the DASH-Sodium study examined the impact of the Dietary Approaches to Stop Hypertension (DASH) diet and three different levels of sodium consumption on clinic blood pressure (BP) in a sample of 421 overweight or obese adults >21 years old with high normal BP and hypertension (1). Participants were randomized either to a control diet, typical of what is consumed by many Americans, or to the DASH diet, which is high in low fat dairy products and emphasizes fruits and vegetables, whole grains and nuts, fish and poultry, and smaller amounts of red meat and sweets compared to the typical American diet. DASH-Sodium was a 3-month 'feeding' study in which participants were provided all meals and snacks, and consumed their assigned diets at each of the three sodium levels, provided in random order, for 30 days. Results showed that the DASH diet was associated with significant reductions in systolic blood pressure (SBP) and diastolic blood pressure (DBP); furthermore, sodium restriction resulted in an additional, albeit modest, BP reduction, with lower levels of sodium producing the lowest pressures in both DASH and control diet groups. The effects of reduced sodium appeared to be greater among hypertensive participants compared to those without hypertension, in blacks on the control diet compared to participants of other races and ethnicities, and in women on the DASH diet compared to their male counterparts. The DASH-Sodium study helped to establish the DASH eating plan as the JNC 7 recommended diet for lowering BP in hypertensive individuals (2).

Juraschek and colleagues (3) recently re-examined the

DASH-Sodium trial by partitioning participants into 4 groups based upon their baseline clinic SBPs: <130, 130–139, 140–149, and >150 mmHg. Reducing sodium resulted in significant SBP reductions across the respective baseline BP strata for participants on both diets, and was greatest among those individuals who consumed the low-sodium DASH diet. The authors concluded that the findings "*reaffirm the importance of lifestyle interventions among adults with uncontrolled SBP (p7).*"

As important as the DASH eating plan is, along with reduced sodium, to improve BP control, there are several missing ingredients for an effective recipe for the optimal lifestyle management of high BP. Because the DASH-Sodium study was a feeding study, in which all meals were provided to participants, the practical significance of the DASH diet remained uncertain. Consequently, the subsequent PREMIER trial (4) was conducted to evaluate the DASH diet in free living adults with high BP. Results revealed that participants who were randomized to either the DASH diet or to the 'established' diet of fruits and vegetables had lower BPs compared to controls. Importantly, the PREMIER study proved that the DASH diet could be successfully implemented in free-living persons with unmedicated hypertension, but because there was no BP difference between the DASH diet and the 'established' diet, and because weight loss was greater among DASH diet participants, the merits of the DASH diet in reducing BP, independent of other lifestyle changes, could not be determined.

The ENCORE study was designed to address this issue

and provided further evidence for value of the DASH diet, independent of weight loss and exercise, in reducing BP in unmedicated hypertensive adults (5). The ENCORE trial was a 4-month randomized clinical trial (RCT) in which 144 men and women with high BP were randomly assigned to one of three conditions: the DASH diet alone; the DASH diet combined with a behavioral weight loss intervention consisting of aerobic exercise, caloric restriction, and behavior modification to promote weight loss; or to a control condition in which participants were asked to maintain their usual diets and physical activity levels and weight loss was discouraged. Results showed that the DASH diet produced significant reductions in BP compared to the control group that consumed the typical American diet. Participants randomized to either the DASH diet alone (without aerobic exercise or weight loss), or to the DASH diet and weight loss intervention, exhibited greater reductions in BP and greater improvements in biomarkers of cardiovascular disease (CVD) risk compared to patients consuming their usual, non-DASH diets. When compared to usual diet controls, the combined DASH and weight loss condition produced a 16/10 mmHg net benefit in clinic BP and the DASH only condition resulted in an 11/7 mmHg net benefit. These findings confirmed the value of the DASH diet in reducing BP and provided evidence for the “added value” associated with exercise and weight loss when combined with the DASH diet among unmedicated adults with high BP. Furthermore, the results of the ENCORE study demonstrated improvements in other important CVD biomarkers associated with a more comprehensive lifestyle intervention of weight loss and exercise in the context of the DASH diet, including improved vascular endothelial function, reduced arterial stiffness, improved baroreflex sensitivity, glucose metabolism and insulin resistance, and reduced cardiac left ventricular mass (5,6). The DASH eating plan, together with reduced sodium, regular exercise and caloric restriction to promote weight loss, therefore has the potential to not only lower BP, but also to improve CVD biomarkers, and to reverse target organ damage related to hypertension.

Recent changes in the clinical practice guidelines for the prevention and management of hypertension further underscore the importance of controlling BP, by redefining stage 1 hypertension as a SBP of 130–139 or a DBP of 80–89 mmHg (7). While there have been some objections to the new classification criteria, which significantly lower the threshold for diagnosing and treating hypertension, Greenland (8) recently noted that rather than take issue

with the new BP guidelines, physicians should focus on the promotion of healthy behaviors and better risk factor management. Promotion of healthy eating patterns and regular exercise should be considered central to this effort, rather than simply relying on medications to achieve optimal BP control.

It also should be emphasized that the DASH-Sodium study, as well as the PREMIER and ENCORE studies, included only unmedicated patients. Relatively few studies have evaluated the value of lifestyle modification in patients already taking antihypertensive medications; however, the available evidence obtained primarily from studies of patients on one or two antihypertensive agents is encouraging. Studies have shown that regular exercise, without weight loss, may lower BP (9) and that the addition of the DASH diet for patients on medications such as angiotensin receptor blockers (ARBs) is associated with greater reductions in ambulatory SBPs compared to patients taking ARBs but consuming their usual diets (10). Similar findings have emerged from such RCTs as the TONE study (11), the ADAPT trial (12), and DEW-IT study (13).

Resistant hypertension represents an additional condition for which lifestyle modification may be of benefit. Resistant hypertension is defined as BP that remains above goal (e.g., SBP >130 mmHg and/or DBP >80 mmHg), despite adherence to a regimen of 3 or more optimally-dosed antihypertensive medications of different classes, one of which is a diuretic; or the need for 4 or more antihypertensive agents to achieve goal (14), and with the new BP guidelines may now include individuals with SBP >120 mmHg on 3 or more antihypertensive agents. Hayward and Krumholz argued convincingly that treatment decisions should be made on the basis of patients’ overall CVD risk, with the objective of lowering this risk as much as possible (15). Effective lifestyle interventions may afford the opportunity for not only reducing BP, but also for reducing multiple risk factors, resulting in significant reductions of overall CVD risk in patients with resistant hypertension. The TRIUMPH study (16) is one example of an ongoing RCT of 120 patients with resistant hypertension in which the central premise is that unhealthy lifestyles, including poor food choices and sedentary living, play an important role in the development and persistence of resistant hypertension and that modifying these unhealthy behaviors will arrest and potentially reverse the disease process. It remains an empirical question as to whether these patients can successfully modify their diets, lose

weight, and exercise regularly, and whether such lifestyle changes will produce clinically significant BP reductions.

The DASH-Sodium study (1) was instrumental in demonstrating the importance of the nutritional content of a healthy diet that could help lower BP in patients with hypertension. In addition to reduced sodium, other important dietary considerations for lowering BP include the avoidance of excessive alcohol consumption (17). Building upon this nutritional foundation, further guidelines have emphasized how more comprehensive lifestyle modifications may further lower BP and reduce other CVD risk factors (6,18). Because patients with hypertension are typically sedentary and often overweight or obese, such as those participants enrolled in the DASH-Sodium trial, lifestyle changes that include exercise and weight loss, in addition to optimal nutrition, appear especially effective at lowering BP. However, the successful adoption of more comprehensive lifestyle changes can be challenging; although some patients will heed the advice and guidance for lifestyle changes from their health care providers, many others will fail. For those patients with hypertension who are at high risk for CVD events, and have been unable to adopt physicians' advice, a structured treatment program helping patients to make these lifestyle changes may be required (19,20). Such intervention programs could be delivered in the existing medical management infrastructure provided by certified cardiac rehabilitation programs, to which physician referrals could be made. Prevention strategies to promote healthy habits early in life and to help individuals modify unhealthy habits and maintain more healthy lifestyles throughout the lifespan also remains a challenge. Nonetheless, at a population-based level, small steps towards successful promotion of healthy eating habits, routine physical exercise, and attainment of normal weight, are likely to pay huge dividends in terms of hypertension prevention, as well as broader health benefits including reduced risk of myocardial infarction, stroke, and kidney disease, and lowered health care costs.

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Footnote

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