

# Rational approaches to the treatment of hypertension: diet

Soner Duman<sup>1</sup>

<sup>1</sup>Department of Internal Medicine, Ege University Medical School, Bornova, İzmir, Turkey

**Hypertension affects one in three adults in Turkey and the United States. Only half are treated for this condition and only 10–20% is controlled. Dietary modifications such as salt restriction, moderation of alcohol drinking, and a diet rich in fruits, vegetables, and legumes and low in snacks, sweets, meat, and saturated fat are helpful in the treatment of hypertension. Consumption of dark chocolate is also associated with a drop in systolic blood pressure. Individual dietary factors that may reduce blood pressure include increased intakes of potassium, calcium, fish oil, fiber, and milk-based and vegetable-based protein.**

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Hypertension affects one in three adults in Turkey and the United States and is often called the ‘silent killer’ because it can go undetected for years until a fatal heart attack or stroke occurs. Hypertension is an under-treated disease due to the asymptomatic nature of this condition, and among the 50% of patients who do receive treatment only 10–20% achieve blood pressure goals.<sup>1,2</sup> Other consequences of untreated hypertension include kidney and heart failure, stroke, and peripheral vascular disease. It is important that blood pressure levels be carefully examined and checked regularly.

Hypertension can be treated through lifestyle changes and medications. While medications to treat hypertension are available, research has shown that lifestyle modifications that incorporate physical activity, tobacco avoidance, and limitation of alcohol consumption along with dietary changes can help treat and often delay or prevent hypertension. Current data strongly support the idea that multiple dietary factors affect blood pressure. Proposed dietary modifications to lower blood pressure include reduced salt intake, increased potassium intake, and moderation of alcohol consumption.<sup>1</sup> Over the past decade, an important dietary recommendation by expert groups such as the American Heart Association and the National Cancer Institute for prevention or management of hypertension has been adoption of the DASH (Dietary Approaches to Stop Hypertension) dietary pattern.

## THE DASH DIET

The DASH diet focuses on ingestion of twice the average daily amount of fruits, vegetables, low-fat dairy products, and complex carbohydrates. This diet is lower in fat (especially saturated fat), cholesterol, and sodium, but contains higher amounts of potassium, magnesium, and calcium. A diet rich in potassium, magnesium, and calcium is believed to be at least partially responsible for its beneficial effects on blood pressure. An earlier published study showed that adoption of the DASH diet with sodium restriction in patients with stage I hypertension provided comparable reductions in blood pressure to that of any anti-hypertensive medication.<sup>3,4</sup>

DASH diet provides an effective strategy to lower blood pressure. Blood pressure reduction occurred rapidly after the introduction of the DASH diet and was seen widely across different demographic groups.<sup>3</sup> DASH diet may also help one adjust daily caloric intake and may have a greater effect in reducing blood pressure than following a low-fat diet alone.

**Correspondence:** Soner Duman, Department of Internal Medicine, Ege University Medical School, Bornova, İzmir 35100, Turkey.  
E-mail: sonerduman@hotmail.com or soner.duman@ege.edu.tr

Along with drug therapy, weight reduction should be a primary objective of DASH diet therapy. Weight reduction may also reduce the number of antihypertensive drugs required to control blood pressure. Reduction in daily caloric intake can also significantly lower both systolic and diastolic blood pressure levels.<sup>5-7</sup>

#### VEGETARIAN DIETS

Vegetarian diets have been associated with average reduction of systolic blood pressure by approximately 5 mm Hg.<sup>5,6,8</sup> In developed countries, it has been reported that people who consume vegetarian diets have lower blood pressures than non-vegetarians. One explanation for this may be the non-dietary lifestyle characteristics associated with patients adherent to vegetarian diets, including high levels of physical activity leading to reduced body weight, along with well-known dietary risk factors (e.g. increased potassium intake, low-to-moderate alcohol consumption, high fiber intake, decreased meat ingestion).<sup>1,6</sup>

#### ALCOHOL INTAKE

A meta-analysis of 15 randomized controlled trials showed that decreased alcohol consumption was associated with reduction of systolic and diastolic blood pressures by 3.3 and 2 mm Hg, respectively, which was similar in non-hypertensive and hypertensive persons.<sup>9</sup> Available evidence indicates that moderation of alcohol use among those who regularly drink is an effective strategy to lower blood pressure, with recommended daily alcohol intake limited to 2 drinks or less for men and 1 drink or less for women.<sup>1</sup>

#### DIETARY INTAKE OF SODIUM

Dietary salt intake has impact on blood pressure levels in the general population and should be limited to reduce the risk of hypertension.<sup>1,5</sup> More recently, in a population-based epidemiological study from Turkey, Erdem *et al.*<sup>10</sup> showed that the Turkish population consumes a large amount of salt (18 g/day) and this is positively correlated with blood pressure levels.

The American Heart Association guidelines suggest that restriction of sodium intake to 1.5 g per day is helpful in reducing blood pressure and is not associated with any adverse effects.<sup>11</sup> Lowering sodium consumption also reduces the risk of stroke and fatal coronary heart disease in adults.<sup>12</sup> Results of the original DASH study indicate that limitation of sodium intake to 1,500 mg/day lowers and maintains blood pressure.<sup>3,6</sup>

In order to reduce salt intake, consumers should select foods low in salt and limit the amount of salt added to food. It is necessary to examine food labels for sodium content in processed foods. However, because >75% of consumed salt comes from prepared foods/restaurant meals, any significant strategy to reduce salt intake must include efforts by food manufacturers and restaurants to progressively reduce the salt contents of prepared foods by 50%.<sup>1</sup>

#### DIETARY INTAKE OF POTASSIUM

A large body of published evidence including animal studies, observational reports, and clinical trials has shown that high daily potassium intake is associated with reduced blood pressure, especially when combined with dietary sodium restriction. Two meta-analyses of such trials have reported a significant negative association between potassium intake and blood pressure in normal and hypertensive persons.<sup>1,5</sup>

The recommended potassium intake for adults is 4.7 g/day. Potassium-rich foods such as leafy green vegetables, potatoes, carrots, and fruit are preferred to potassium supplement pills because they provide additional nutritional benefits.<sup>5</sup>

#### DIETARY INTAKE OF CALCIUM AND MAGNESIUM

Data from a wide range of studies suggest that calcium intake might affect blood pressure. Observational studies point to a negative association between blood pressure and dietary calcium intake. There is some evidence suggesting that the level of calcium intake may affect the blood pressure response to salt. In three small trials, calcium supplementation attenuated the effect of a high sodium intake on blood pressure measurements.<sup>1,5</sup> Similarly, in observational studies, an inverse relationship between dietary intake of magnesium and blood pressure was noted.

Therefore, increased intake of calcium and magnesium may have blood pressure-lowering benefits, especially if achieved through the DASH dietary pattern, but there is presently no convincing evidence to recommend calcium and magnesium supplementation beyond current estimates of average daily consumption.

#### FISH AND FISH OIL

Consumption of fish on a weekly basis may have favorable effects on blood pressure. Several small clinical trials and meta-analyses have reported that high-dose (3 g/day) omega-3 polyunsaturated fatty acid supplements can lower blood pressure in hypertensive patients.<sup>1,5</sup> However, given this high dose requirement along with the side-effect profile, fish oil supplements cannot currently be recommended to lower blood pressure.

#### FIBER

A meta-analysis of 40 randomized controlled trials reported that an increase in fiber intake by 14 g per day was associated with net systolic and diastolic blood pressure reductions of 1.6 and 2.0 mm Hg, respectively.<sup>1,6</sup> However, present data are inadequate to recommend an increased fiber intake to lower blood pressure.

#### DIETARY FAT

Several observational studies and a few clinical trials have evaluated the impact of saturated fat on blood pressure.<sup>13</sup> The effect of fat on blood pressure might be positive or negative, depending on the type of fats consumed. For example, dietary intake of omega-6 polyunsaturated fat has

little effect on blood pressure. Similarly, five cross-sectional and two prospective studies did not find an association between monounsaturated fat intake and the incidence of hypertension<sup>1,5,13</sup> Current recommendations include decreasing intake of saturated fat as well as overall intake of dietary fat.

### PROTEIN INTAKE

Data from observational studies have previously showed a statistically significant inverse relationship between protein intake and blood pressure, and similar results were found in two recent major observational studies, the International Study on Macronutrients and Blood Pressure (INTERMAP) and the Chicago Western Electric Study.<sup>14,15</sup> According to these studies, protein from plant sources was associated with lower blood pressure, whereas protein from animal sources had no effect. The Omni Heart study also showed that partial substitution of daily dietary carbohydrate intake with protein consumption (about half from plant sources) reduced blood pressure.<sup>16</sup> However, it is not clear whether these findings reflect the benefits derived from reduced carbohydrate or increased protein intake.

### FLAVONOIDS

Fruits and vegetables are rich in polyphenols (e.g., flavonoids). Significant sources of these compounds include tea and cocoa products. A meta-analysis of 20 studies showed that flavanol-rich cocoa products significantly reduced both systolic and diastolic pressure compared with placebo.<sup>17</sup> Daily intake of 46–106 g of dark or mild chocolate, which provides 213–500 mg of cocoa polyphenol, modestly reduced systolic blood pressure by 4.7 mm Hg and diastolic by 2.8 mm Hg in normotensive and hypertensive people.<sup>18</sup>

### VITAMIN C

The data from laboratory and epidemiological studies suggest that increased vitamin C intake is associated with lower blood pressure. In a systematic review, an inverse association between plasma vitamin C and blood pressure was found.<sup>19</sup> In another study, 500 mg/day of vitamin C treatment had no effect on blood pressure over the course of 5 years.<sup>20</sup> It remains uncertain whether an increased intake of vitamin C reduces blood pressure.

### FOLATE

Several studies have shown an inverse relationship between folate intake and blood pressure levels or degree of hypertension. In a meta-analysis, a daily intake of greater than 5 mg per day of supplemental folic acid significantly reduced systolic by 2.0 mm Hg, but did not affect diastolic blood pressure, as compared with placebo.<sup>21</sup>

In conclusion, evidence-based data strongly support that multiple dietary factors affect blood pressure levels. Dietary modifications which are associated with effective reductions in blood pressure are reduced salt intake, increased potassium

intake, moderation of alcohol consumption, and adoption of or compliance with an overall healthy dietary pattern, such as the DASH diet. The evidence for the effect of other vitamins and nutrients on blood pressure control is currently too limited and inconclusive to suggest changes in the currently recommended daily allowances.

### DISCLOSURE

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