Lifestyle interventions to prevent and treat hypertension

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University of North Carolina
Lifestyle interventions to prevent and treat hypertension

• Objectives
  – To review evidence supporting the use of lifestyle interventions to treat high blood pressure
  – To describe strategies to help your patients successfully adopt lifestyle changes
Distribution of SBP in the U.S.
Impact of high normal BP on CVD risk
Framingham Heart Study

Hypertension 42:1206,2003
Lifestyle interventions to prevent and treat hypertension

• What works?
  – DASH (or similar) dietary pattern
  – Dietary sodium reduction
  – Physical activity
  – Weight reduction
  – Moderation of alcohol consumption
Lifestyle interventions to prevent and treat hypertension

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DASH

D – Dietary
A – Approaches to
S – Stop
H – Hypertension
DASH Fact Sheet

The DASH Eating Plan

Research has found that diet affects the development of high blood pressure, or hypertension (the medical term). Recently, two studies showed that following a particular eating plan—called the DASH eating plan—and reducing the amount of sodium consumed lowers blood pressure.

While each step alone lowers blood pressure, the combination of the eating plan and a reduced sodium intake gives the biggest benefit and may help prevent the development of high blood pressure.

This fact sheet, based on the DASH research findings, tells about high blood pressure, and how to follow the DASH eating plan and reduce the amount of sodium you consume. It offers tips on how to start and stay on the eating plan, as well as a week of menus and sample recipes. The menus and recipes are given for two levels of daily sodium consumption—2,400 milligrams (the upper limit of current recommendations by the Federal Government’s National High Blood Pressure Education Program, or NHBPEP) and the amount used to figure food labels’ Nutrition Facts Daily Value (1,500 milligrams).

Those with high blood pressure may especially benefit from following the eating plan and reducing their sodium intake. But the combination is a heart-healthy recipe that all adults can follow.

NATIONAL INSTITUTES OF HEALTH
NATIONAL HEART, LUNG, AND BLOOD INSTITUTE
DASH

• Objective – To assess effects of dietary patterns on BP
• Design – Randomized controlled trial
• Participants – 459 subjects with SBP < 160 mmHg and DBP 80-95 mmHg
• Intervention – Control diet, high fruits and vegetables diet, DASH diet
• Outcome – BP
The DASH eating plan lowers BP

- DASH diet reduced BP by 5.5/3.0 mmHg
- Results were more pronounced in hypertensive patients (11.4/5.5 mmHg)
- Diet high in fruits and vegetables reduced BP by 2.8/1.1 mmHg

NEJM 336:1117,1997
Lifestyle interventions to prevent and treat hypertension

Patients with high blood pressure should be advised to:

- Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, nontropical vegetable oils and nuts; and limits intake of sweets, sugar-sweetened beverages and red meats.
Lifestyle interventions to prevent and treat hypertension

• What works?
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DASH – Na⁺

- **Objective** – To study the effects of Na⁺ and the DASH diet on BP
- **Design**: Randomized controlled trial with crossover to different Na⁺ conditions
- **Participants** – 412 subjects with SBP 120-159 or DBP 80-95 mmHg
- **Interventions** – Control or DASH diet at 3 Na⁺ levels:
  - 150 mmol per day (typical US)
  - 100 mmol per day (upper limit US guideline)
  - 50 mmol per day
- **Endpoint** – BP
Reducing dietary sodium consumption lowers BP

- BP on the DASH diet was lower at all levels of Na⁺
- Reducing Na⁺ lowered BP on both the DASH and control diets
- Results were more pronounced in hypertensive patients and African Americans

NEJM 344:3, 2001
Lifestyle interventions to prevent and treat hypertension

Patients with high blood pressure should be advised to:

• Lower dietary sodium intake
  • Consume no more than 2,400 mg of sodium/day;
  • Further reduction of sodium intake to 1,500 mg/day is desirable;
  • Reduce intake by at least 1,000 mg/day, since that will lower BP even if the desired daily sodium intake is not achieved
Lifestyle interventions to prevent and treat hypertension

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HYPE II

- Objective – To determine the effects of exercise vs exercise plus weight loss on BP
- Design – Randomized controlled trial
- Participants – 133 untreated sedentary, overweight (BMI 25-37 kg/m\(^2\)) subjects with BP 130-180/85-110 mmHg
- Interventions – Exercise only, exercise plus weight loss (weight mgmt), or waiting list control
- Outcomes – BP
Aerobic physical activity lowers BP

- Exercise reduced BP by 4/4 mmHg
- Weight management reduced BP by 7/5 mmHg
- No BP change in control group

Lifestyle interventions to prevent and treat hypertension

Patients with high blood pressure should be advised to:

• Engage in aerobic physical activity -- 3 to 4 sessions a week, lasting on average 40 minutes per session, and involving moderate-to-vigorous intensity physical activity -- to lower BP
Lifestyle interventions to prevent and treat hypertension

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ENCORE
Objectives

• To examine the effects of 1) the DASH diet, and 2) the DASH diet plus exercise and weight loss on blood pressure in overweight patients with high blood pressure

• To examine the effects of lifestyle modifications on cardiovascular, metabolic, and neurocognitive manifestations of high blood pressure
ENCORE
Study population

• Overweight but otherwise generally healthy adults with above-optimal blood pressure

• Inclusion criteria
  – Age > 35 years
  – BMI 25-40 kg/m2
  – Sedentary (not engaged in regular exercise)
  – BP 130-159/85-99 mmHg

• Exclusion criteria
  – Treatment with antihypertensive medication
  – Secondary hypertension
  – Cardiac disease, diabetes, or chronic kidney disease
ENCORE Study design

Screening → Baseline Assessments → DASH Diet → DASH Diet + Behavioral Weight Loss → Usual care → Post Intervention Assessments → 12-Month Assessments

16 weeks
ENCORE
Outcome measures

• Primary outcome measure
  – Resting blood pressure
• Secondary outcome measures
  – Ambulatory blood pressure
  – Cardiovascular manifestations of high blood pressure
  – Metabolic abnormalities
  – Neurocognitive function
# Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>DASH + WM N=49</th>
<th>DASH Alone N = 46</th>
<th>Usual Care N = 49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>52.3 (10)</td>
<td>51.8 (10)</td>
<td>52.0 (10)</td>
</tr>
<tr>
<td>Gender: Female (%)</td>
<td>69</td>
<td>63</td>
<td>69</td>
</tr>
<tr>
<td>Ethnicity: Caucasian (%)</td>
<td>69</td>
<td>50</td>
<td>59</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>33.5 (4.4)</td>
<td>32.8 (3.4)</td>
<td>33.0 (3.9)</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>139 (8)</td>
<td>138 (9)</td>
<td>138 (10)</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>86 (7)</td>
<td>86 (6)</td>
<td>86 (6)</td>
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</tbody>
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Values are mean (SD) unless otherwise specified
Weight

Adjusted means after treatment

Treatment v Usual Care: p < .001
DASH + WM v DASH Alone: p < .001
Aerobic Capacity

Adjusted means after treatment

Peak VO₂

Treadmill Time

mL/kg/minute

Minutes

Treatment v Usual Care: p < .001
DASH + WM v DASH Alone: p < .001
Weight loss lowers BP

Adjusted means after treatment

Systolic

Diastolic

Treatment v Usual Care: p < .001
DASH + WM v DASH Alone: p = .023

Treatment v Usual Care: p < .001
DASH + WM v DASH Alone: p = .048
Vascular stiffness and endothelial function

Adjusted Means After Treatment

Pulse Wave Velocity

Flow-Mediated Dilation

Treatment v Usual Care: p = .002
DASH + WM v DASH Alone: p = .033

Treatment v Usual Care: p < .059
DASH + WM v DASH Alone: p = .989
Left ventricular mass index

Adjusted Means After Treatment

Treatment v Usual Care: p = .202
DASH + WM v DASH Alone: p = .016
Serum lipids
Adjusted Means After Treatment

Total cholesterol

Triglycerides

DASH + WM v DASH Alone: p = .008
DASH + WM v Usual Care: p < .001
DASH Alone v Usual Care: p = .364

DASH + WM v DASH Alone: p < .001
DASH + WM v Usual Care: p < .001
DASH Alone v Usual Care: p = .900
Insulin sensitivity

Adjusted Means After Treatment

$\text{ISI}_{0,120}$

QUICKI

DASH + WM v DASH Alone: $p = .031$
DASH + WM v Usual Care: $p = .026$
DASH Alone v Usual Care: $p = .981$

DASH + WM v DASH Alone: $p < .001$
DASH + WM v Usual Care: $p < .001$
DASH Alone v Usual Care: $p = .850$
Neurocognitive function

Adjusted Means After Treatment

Executive Function

Psychomotor Speed

DASH + WM v Usual Care: p = .014
DASH Alone v Usual Care: p = .226

DASH + WM v Usual Care: p = .023
DASH Alone v Usual Care: p = .036
## Follow-up Examination
### Dietary Intake and Exercise Behaviors

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<tr>
<td>Total calories (kcal)</td>
<td>1806</td>
<td>1772</td>
<td>1873</td>
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<td>Sodium (mg/day)</td>
<td>2374</td>
<td>2031</td>
<td>2803*</td>
</tr>
<tr>
<td>Potassium (mg/day)</td>
<td>3069</td>
<td>3217</td>
<td>2702*</td>
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<td>9 (22%)</td>
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## Follow-up Examination

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Conclusions

• In our study of overweight patients with high blood pressure,
  – The DASH diet resulted in significant BP lowering
  – Exercise and weight loss in addition to the DASH diet resulted in an incremental decrease in BP and had other benefits
  – Significant changes in dietary habits, weight, and BP persisted for 36 weeks following completion of the lifestyle intervention programs, although there was some attenuation of the benefits
Lifestyle interventions to prevent and treat hypertension

Overweight or obese patients with high blood pressure should be advised to:

• Achieve a weight loss of 5%-10% over 6 months by reducing calorie intake as part of a comprehensive lifestyle intervention.

• On site, high-intensity interventions provided by a trained interventionist are recommended.

• Electronically delivered programs that include personalized feedback may also be effective.
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Moderation of alcohol consumption lowers BP

Hypertension 38:1112,2001
Lifestyle interventions to prevent and treat hypertension

Patients with high blood pressure should be advised to:

• Limit consumption to no more than 2 alcoholic drinks per day in most men and to no more than 1 drink per day in women
Promoting lifestyle interventions

• Focus efforts on individuals who are willing to make changes
• Set SMART (Specific, Measurable, Attainable, Realistic, Time-related) goals
• Use contracts for agreed-upon goals
• Engage nurses, nutritionists, and other educators
Promoting lifestyle interventions

• Encourage self-monitoring
• Encourage gradual changes
• Focus on one lifestyle change at a time
• Discourage unproven therapies
• Use positive messages and feedback