Can Prevention of Hypertension Work?

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Over the years, many controlled clinical trials have demonstrated the efficacy of pharmacological treatment of hypertension. However, such treatment has its shortcomings. First, it usually requires a life-long commitment to therapy because, while this approach can control hypertension and reduce its consequences, it does not cure the condition. Next, the cost of pharmacological interventions can be very high and, thus, prohibitive for poorer individuals and nations. In addition, many patients experience problems with compliance and adherence, which almost certainly contribute to the low level of hypertension control that is so widely observed. Finally, the pharmacological approach requires a strong commitment by public health officials to detection and treatment of hypertension if there is to be any hope of limiting this condition's impact. All of these negative considerations are compounded by the fact that the prevalence of hypertension is increasing worldwide.

For all these reasons, non-pharmacological interventions should be implemented to prevent or delay the occurrence of hypertension.

Key words: Prevention, hypertesion

In the following, examples of practical and relatively easy interventions are provided. Others have been described and evaluated elsewhere[1].

1. Weight Control

The efficacy of weight loss has been studied by many investigators. One of the most interesting research programs has been the Trials of Hypertension Prevention. Its first study, TOHP I2, involved 2,182 men and women at 10 study sites. The participants were followed for 18 months, during which time 308 were in a weight-reduction program and 327 were in a sodium-reduction program. By the end of the study period, the weight-reduction group had experienced an average weight loss of 3.4 kg and the sodium-reduction group had lowered its average sodium urinary excretion by 44 mmol/24 hr. Table 1 shows the systolic and diastolic blood pressure reductions that were observed.

In 2001, the results from TOHP II3 were reported. Its goal was to evaluate the effect of weight loss in overweight persons whose systolic and diastolic blood pressures were below 140 mmHg and 89 mmHg, respectively. The study recruited nearly 1,200 participants, half of whom served as non-intervention controls. The intervention consisted of self-directed behavioral changes, especially increased physical activity and reduced caloric intake. Average weight losses were 4.4 kg at 6 months, 2.0 kg at 18 months, and 0.2 kg at 36 months, and Figure 1, panel a, shows the associated average changes in systolic and diastolic blood pressures. Overall weight losses varied greatly among participant in the intervention; panel b shows the blood pressure changes for each quintile of weight change. The study concluded that "some degree of weight loss, even if not sustained beyond 6 months, confers benefits."

Figure 1, panel a

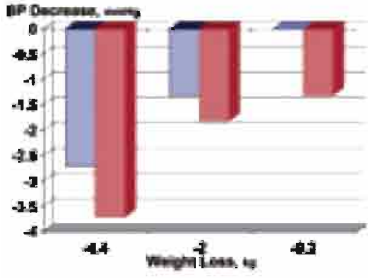
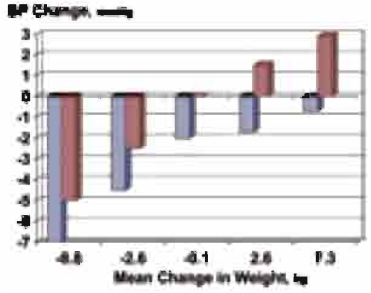
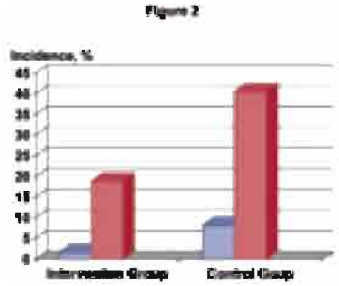


Figure 1, panel b

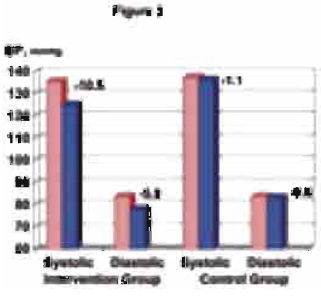


Another study4, derivative from TOHP I but limited to the cohort enrolled in only one of its sites, recently reported some long-term follow-up data. This cohort included 53 participants in the weight-reduction group and 42 non-intervention controls. At baseline, the mean blood pressure was 121.8/84.1 mmHg in the weight-reduction group and 123.0/84.5 mmHg in the control group. Hypertension was determined to exist at follow-up assessment if a physician had made such a diagnosis and initiated pharmacological treatment or if the systolic blood pressure was >160 mmHg or the diastolic blood pressure was >90 mmHg. As shown in Figure 2, among the weight-reduction group, 1.7% had developed hypertension at 18 months and 8.2% at 7 years; the comparable figures for the control group were 18.9% and 40.5%.



This study also found that the average weight change at 18 months was -2.4 kg in the intervention group, compared with +1.1 kg in the control group. After 7 years, the average weight change was +4.9 kg in the intervention group compared with +4.5 kg in the control group. Thus, it appears that the weight reduction program, which lasted only 18 months and did not ultimately result in sustained weight loss, nevertheless had a long-term effect in preventing the development of hypertension.

A 2002 study5 compared the effect of a 9-week weight-reduction intervention on 24-hour mean ambulatory blood pressure in hypertensive patients who were overweight. This research differed from the previous studies in which the participants were normotensive at baseline; the intervention, however, was comparable. Study patients had a mean weight of 92 kg at baseline, and while on antihypertensive medication, their systolic blood pressures ranged from 130 to 170 mmHg, and their diastolic blood pressures, from 80 to 100 mmHg. The results, shown in Figure 3, demonstrate that weight reduction in overweight hypertensive patients leads to a significant decrease in systolic and diastolic blood pressure.

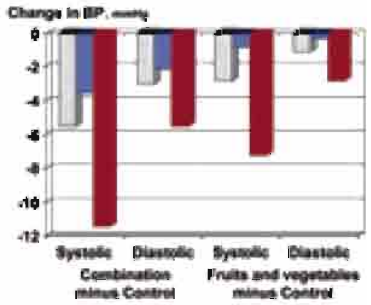


2. Dietary interventions

Several studies have reported the effects of modified diets on blood pressure levels, as well as on body weight. The clinical trial Dietary Approaches to Stop Hypertension (DASH) produced some very convincing data on the effects of different dietary patterns on blood pressure in normotensive and hypertensive persons6. DASH enrolled 459 people with systolic blood pressure less than 160 mmHg and diastolic blood pressure between 80 and 95 mmHg; some hypertensive patients were enrolled if they met these blood pressure criteria after medication withdrawal. The participants were assigned in equal numbers to one of three dietary patterns: (1) the typical American diet, which served as the control; (2) the #1 diet enriched with fruits and vegetables; and (3) the "DASH diet", which consisted of the #2 diet with added low-fat dairy products and an overall reduction in total fat, saturated fat, and cholesterol. All three dietary patterns were continued for 8 weeks. The outcomes experienced by participants who were fed the tested diets (i.e., #2 or the DASH diet) are shown in Figure 4 as the difference between the average blood pressure of these participants and that of the participants who were fed the control diet. The data reveal significant decreases in blood pressure for both normotensive and hypertensive participants who followed either of the tested dietary patterns. The DASH diet was more effective than the #2 diet, and the greatest benefits occurred in people with hypertension.

Tabla 1

	Blood Pressure Change, mmHg	
	Systolic	Diastolic
Weight Loss	-2.9	-2.3
Sodium Reduction	-1.7	-0.9



A subsequent study7 enrolled 412 adults to evaluate the effect of reducing sodium intake in conjunction with the DASH diet. Usual American and Western European diets include about 3 to 3.5 g of sodium per day; in this study the sodium intake was reduced to about 2.4 g or 1.5 g per day in subgroups of the test population, while the participants also followed either a typical American diet (the control) or the DASH diet. The blood pressures reported in Table 2 were measured after a 30-day period on each diet and sodium level. These data confirm the marked

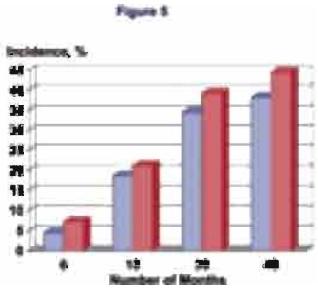
effectiveness of the DASH diet irrespective of sodium intake. They also reveal an added benefit of sodium reduction that is significant, albeit smaller than that of the DASH diet.

Table 2

Na Intake, g/day	3-3.5	2.4	1.5
Systolic BP, mmHg			
Control Diet	132.9	130.5	126.3
DASH Diet	127.0	125.5	124.1
Diastolic BP, mmHg			
Control Diet	83.3	82.5	80.0
DASH Diet	80.4	80.0	79.0

The efficacy of sodium-intake reduction in decreasing blood pressure has been demonstrated in several randomized controlled trials; one of them8 concluded that "reduced sodium intake … constitute[s] a feasible, effective and safe nonpharmacological therapy of hypertension in older persons". In addition to decreasing systolic and diastolic blood pressures, sodium reduction has been found to prevent the development of hypertension. The abovementioned study derivative of TOHP I4 showed a durable benefit for sodium reduction, just as it did for weight loss: 7 years after the initiation of an 18-month sodium-reduction program, the prevalence of hypertension was 22.4% in the intervention group compared with 32.9% in the control group.

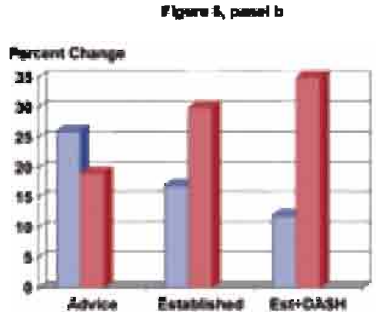
In an earlier study9, part of TOHP II, 594 subjects were enrolled in a sodium intake reduction group (1800mmg/day) and compared to 596 subjects in a control group (usual sodium intake). All subjects were followed for 36 months, and about 19% of them for 48 months. The incidence of hypertension, defined by its diagnosis and initiation of a pharmacological treatment, in both the sodium reduction group and in the usual care group is shown in Figure 5; for every duration of the intervention, the incidence was lower in the sodium intake reduction group than in the control group.



3. Comprehensive lifestyle modification

Other interventions beside losing weight and adopting specific dietary patterns have been proven effective in decreasing blood pressure10; included are increasing physical activity and limiting alcohol consumption. It has been shown that all together, these interventions are effective in persons with high-normal blood pressure (defined as a range, e.g. 130-139/80-89 mmHg in the absence of taking hypertension medications). (It should be noted that later in the JNC VII11 this blood pressure level was renamed "prehypertension").

In 1997, the PREMIER clinical trial12 reported on three groups of approximately 270 subjects each: (1) the Advice-Only group was given one-time advice about how specific lifestyle modifications could improve their blood pressure status; (2) the Established group was given specific goals for weight, sodium intake, and other lifestyle and received 18 face-to-face counseling sessions over a 6-month period on how to reach the goals. (3) the Established+DASH group was given the same goals and counseling and was also asked to follow the DASH diet. The data presented in Figure 6 were collected at the end of 6 months. Panel a shows the reductions in blood pressure from the average baseline values of 135 mmHg systolic and 85 mmHg diastolic. Panel b shows the prevalence of hypertension in each of the three groups (hypertension is defined as either diagnosed and/or subjects taking hypertensive medication). Also included in Panel b is the percentage of participants in each group who after six months lowered their blood pressure to the optimal level defined as 120/80 mm Hg. All the indicators reported—systolic and diastolic blood pressure, prevalence of hypertension, and lowering of blood pressure to the optimal level—show a very significant improvement with the counseling intervention that became even larger with the addition of the DASH diet.



In 2006 another clinical trial, patterned after PREMIER, reported new and confirming data13. For practical purposes, the study used interventions similar to those of PREMIER and similar eligibility criteria (120-159 mmHg systolic and 80-89 mmHg diastolic blood pressure). The major difference was that the study period was scheduled to last 18 months instead of only 6 months. Admittedly, adherence of the subjects to the lifestyle modifications diminished as time went on. Nonetheless, this research demonstrated that lifestyle modifications have favorable effects on blood pressure levels of people with prehypertension and stage 1 hypertension, and that the modifications can be achieved and maintained to a degree that is beneficial.

Comments

Does prevention of hypertension work? The totality of the evidence strongly indicates that the answer is yes.

Lifestyle modification in subjects who have optimal blood pressure (< 120/80 mm Hg) or prehypertension (120–139 mmHg systolic or 80–89 mmHg diastolic) are markedly beneficial. Because of their capacity to lower blood pressure levels without reliance on pharmacological treatment, these lifestyle modifications achieve "primary prevention" which has biologic, economic, and societal advantages.

However, it is also evident from the data that patients with stage 1 or stage 2 hypertension can benefit from lifestyle modifications in addition to their pharmacological treatment. This shows the value of "secondary prevention", which has the capacity to lower further the level of blood pressure or even to limit future increases.

Furthermore, it has been shown that weight loss, which is one of the most critical non-pharmacological interventions for the care of hypertensive patients, may enable such persons to use significantly fewer medications to control their condition14. It has also been demonstrated that patients with well-controlled hypertension may successfully discontinue their medications if they adhere to lifestyle changes such as weight loss and sodium intake reduction15. That lifestyle modifications can reduce reliance on pharmacological treatment of hypertension is one more reason for strongly advocating their use. Among all of them, weight reduction and the adoption of eating patterns such as the DASH diet16 appear to be most effective.

Admittedly, implementing lifestyle modifications at the individual or national levels is not easy. Nonetheless, the medical and public health communities should rise to the challenge of widening the application of these interventions.

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