Public Health Issues and Intervention Programs in Hypertension

Some Public Policy Concerns in Managing Hypertension

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SUMMARY In analyzing policy concerns related to hypertension management, recommendations must be based on sound science. Where uncertainties remain about the causes and management of hypertension, decisions and recommendations should be appropriate to the known science and foster resolution of uncertainty. Obesity control and sodium restriction can be useful in the management of hypertension but may require appropriate policy decisions for their effective implementation on a wide scale. Constructive debate can serve to focus societal attention on clear needs and provide direction for recommendations to meet those needs.


KEY WORDS • sodium • obesity • sodium labeling • rice-fruit diet • epidemiology • potassium

TO sharpen the focus of the debates surrounding hypertension and its management as a public health concern, one can draw on a suggestion1 and pose two fundamental queries: 1) Have the scientific uncertainties related to hypertension and current hypertension management techniques been resolved?; and, if not 2) Are the public policy judgments about hypertension and its management as public health issues appropriate for our society? The first question is a scientific one; the second is a public policy one. In viewing the public health issues that relate to hypertension and its management, it may be useful to review the debate in the light of these two questions.

Causes of Hypertension

The current classification of hypertension into essential and secondary is not very satisfactory because it leaves by far the largest category of hypertensive people (as much as 95%) essentially unclassified by cause of their hypertension. This classification does indicate, however, the extent to which research is still needed to determine the underlying cause or causes of essential hypertension. Clearly, then, many uncertainties remain, and appropriate public policy would call for continuing support of research efforts to achieve their resolution.

Hypertension is a burden of ill health that increases the risk for several diseases including coronary heart disease, congestive heart failure, cerebrovascular accidents, and renal insufficiency. Whether chronic excessive intake of sodium causes essential hypertension, however, has yet to be determined. Current scientific evidence would lead us to the conclusion that, although 95% of several million people all have the same phenotype (essential hypertension), the genotypes that affect the expression of that phenotype are quite varied. Hence, appropriate public health policy recommendations and decisions should incorporate both scientific uncertainty about cause and effect and the reasonable likelihood of multiple causes.

The scientific and public policy aspects of such problems can be approached, for example, as in a statement from the Council on Scientific Affairs:2

'‘Weight control and sodium restriction are often indicated in the management of hypertension and in some instances obviate drug therapy. An increase in weight during adulthood correlates positively with an increase in blood pressure. Individuals with a family history of hypertension should avoid excess weight gain and also restrict their sodium intake.

'‘Whether the amount of salt in the diet bears a direct relationship to the development of hypertension is not known. Prudence suggests moderation in salt intake is desirable for the entire population. For the healthy population, total dietary

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Epidemiology and Public Issues

Examination of the epidemiologic evidence shows that hypertension and increases in blood pressure are associated with aging in developed societies, where sodium consumption is high, but are usually absent among people of primitive cultures where, reportedly, the average consumption of sodium is low. These cultural and epidemiologic studies, however, do not include studies of confounding influences and, thus, provide only limited insight into the relationship of dietary sodium to hypertension. From the food and nutrition science standpoint, the dietary links so frequently cited are perhaps the weakest links. It is worthwhile, here, to cite two recently published studies3-4 that serve as examples of some of these concerns.

In Page et al.’s study,2 determinations of the blood pressure of Iranian nomads showed significant increases in blood pressure with age and suggested that the blood pressure trends are related to habitual dietary electrolyte intake. Both dietary and urinary samples were chemically analyzed. Timed overnight urine samples were analyzed clinically for sodium, potassium, and creatinine. Food samples from several different study sites were obtained. Proximate analyses and sodium, potassium, and calcium determinations of these food samples were performed by a laboratory with experience in the specified methods for food product analysis. The population was reported to be at a low level of acculturation and undergoing cultural change at only a very slow pace. These cultural observations would tend to support the concept that the reported dietary practices were of long duration and that the chemical analyses of foods, as reported, represented both long-term and current intake patterns.

In Shekelle et al.‘s study,4 a dietary history over 20 years old was used to draw the conclusion that the lipid composition of the diet affects the level of serum cholesterol and the long-term risk of death from coronary heart disease (CHD) in middle-aged American men. The reported risk of death was adjusted for age, body-mass index, systolic blood pressure, cigarette smoking, serum cholesterol, monthly alcohol intake, and ethnic variables. No citation was made in this report of the dietary data adjustments for qualitative and quantitative changes in dietary fat that were likely to have occurred in the intervening 20 years since the recording of the dietary history. Food composition tables from 1950–1958 were used to determine the total daily calorie intake as well as total consumption of saturated and unsaturated fatty acids. The omission of more current qualitative and quantitative information on dietary fats may be significant, particularly in the context that food manufacturing practices and therefore dietary changes may change rapidly in Western societies, particularly in countries such as the United States.

Clearly, the fundamental scientific uncertainty underlying any study that correlates dietary patterns and the public health must answer the fundamental food and nutrition question: What is being ingested? The recently published study of Iranian nomads may set a somewhat better perspective on the resolution of some food and nutrition uncertainties than does the comparative example. Unfortunately, many studies that postulate cause-effect associations in essential hypertension in humans are all too often replete with scientific uncertainties.

Currently, both experimental and clinical observations support the thesis that, in humans, heredity plays a major role in the sensitivity of blood pressure to sodium, possibly through defects in the handling of sodium by the kidneys and/or the cellular movement of sodium, potassium, or other mineral ions between the bloodstream and the body’s cells. Other mechanisms, discussed during this symposium, are likely to be at work. Until these scientific uncertainties are resolved, the public health decisions that are made must be appropriate to the scientific uncertainties that surround the issue. The public’s health is ill served if we allow the public to believe that we have answers to questions when we really only have scientific hypotheses.

Medical Management of Hypertension

Although the evidence linking high sodium intake and hypertension is circumstantial and complicated by many variables, it is accepted practice in the medical management of hypertension to prescribe antihypertensive medications, weight reduction when indicated, and/or control of sodium intake. Dietary changes can help to control the blood pressure of some hypertensive patients and enhance the effects of the drug therapy chosen for treatment.5-8 Additionally, control of both dietary sodium intake and weight is encouraged for persons with a family history of hypertension.

Antihypertensive Medications

The goal of any treatment for hypertension is the reduction of blood pressure. Pharmacologic treatment with use of diuretics and other antihypertensive agents has been demonstrated to be an effective method for reaching this goal. Moreover, effective reduction of blood pressure decreases the frequency of most complications of hypertension and increases life expectancy. Hence, an important public health concern continues to be the identification of both the hypertensive and those at risk of developing hypertension. Clearly, an appropriate set of public policy recommendations would continue to include a high priority for research that would resolve scientific uncertainty and result in
the ability to predict those with genetic sensitivities predisposing to hypertension.

For patients with complicated or severe hypertension, primary therapy usually requires pharmacologic agents, and the physician's armamentarium includes a variety of effective antihypertensive agents to assist in reducing or normalizing blood pressure. The choice of appropriate drugs depends on several considerations, including the severity of the disease and the individual patient's response. Because of differences in individual responsiveness, treatment regimens must be individualized. Effective doses may vary considerably from patient to patient. Various drugs or combinations may be used to help assure optimal effect.

The use of antihypertensive medications, however, by millions of individuals within the population does raise some public health questions and, perhaps, need for policy considerations. Scientific questions remain unresolved in our currently available approaches to weighing alternative risks and alternative benefits in the medical management of hypertension. Where policy recommendations would establish a goal of a management determination jointly undertaken between physician and informed patient, appropriate policy considerations would include establishing effective educational mechanisms to foster that goal. Establishing and continuing cooperative efforts between the public and private sectors would seem an appropriate public policy, particularly in an era when the costs of duplicate efforts are deemed to be unsupportable.

There may be concerns, as well, related to the use of antihypertensive medications by millions of Americans. Although the drug approval processes in this country may be considered among the most thorough in the world, scientific uncertainties remain about the chronic life-time use of these medications. Perhaps appropriate public health decisions in such instances should involve alternative risk factors: the risk of using medications and the risk of not using medications.

As one commentator has recently stated:

"Hypertension plays a major role in the evolution of cardiovascular disease, and there is now substantial controlled trial evidence of the efficacy of controlling even mild degrees of hypertension. More widespread detection, awareness, better treatment, and control of hypertension have likely been major elements in the reduction of cardiovascular mortality."

"Evidence that hypertension control is an important contributor to the decline is especially strong because hypertension is one of the major risk factors for stroke, cardiac failure, and coronary diseases; hypertension-related deaths have shown the steepest decline; and declines in stroke incidence are seen in women who have shown the greatest improvement in hypertension awareness and treatment."

Such comments would clearly support the appropriateness of societal decisions fostering public health measures to control hypertension.

**Sodium Restriction**

Sodium-restricted dietary recommendations can range from mild (no salt added) through moderate (2000 to 3000 mg of total sodium) to strict (1000 mg or less total sodium) per day. On a practical basis, restriction to about 2000 mg per day is commonly recommended.

In the 1940s, Kempner reported a controlled energy rice-fruit dietary regimen extremely restricted in sodium content, reporting that this regimen could reverse the malignant phase of hypertension. The high potassium content and weight reduction effects on patients responding to this regimen have not been extensively reported, and now, because of the lapse of time, such reports may be difficult to compile. A review of several studies establishes the inconsistent nature of some available reports. However, relationships between weight loss and blood pressure reduction can be illustrated.

Murphy reported the rice-fruit diet as containing about 150 mg of sodium and 3000 mg of potassium. Kempner reported the urine sodium content of patients as 10 and 16 mg, and the potassium sodium content of urine as 3000 and 3400 mg of potassium after 2 months and 36 days respectively on the rice-fruit diet. This report helps establish that conformity to the Kempner rice-fruit diet can effect a striking shift in the individual's urinary ratio of sodium and potassium.

Thus, several variables (weight reduction, sodium restriction, sodium/potassium ratio) may be affecting reductions in blood pressure reported when the Kempner regimen is employed in the management of hypertension (table 1). Public policies derived, in part, from reliance on such reports, then, should be considered most appropriate when many variables, not just one, become factors in the policy equation.

Studies show that both moderate dietary sodium restriction and diuretics can result in a reduction in blood pressure. The additive effect of an oral diuretic and a low sodium diet in causing still greater reductions in blood pressure has also been demonstrated. Other studies have shown the effectiveness of low sodium diets either with or without antihypertensive agents. Moderate dietary sodium restriction, moreover, has been shown to minimize potassium loss in patients receiving an oral diuretic.

Regardless of the scientific uncertainties that remain relative to its mechanism of action, restriction of dietary intake of sodium can be of benefit in the management of hypertension. Currently, however, it is difficult for patients to conform to moderate dietary restrictions (of about 2000 mg) in total sodium intake. Significantly, less than 30% of the current average total daily sodium intake of about 1700 mg/1000 kcal is reported to be derived from the discretionary use of sodium during home cooking and at the table. No reliable estimates are currently available for per capita consumption of sodium ingested through foods eaten in restaurants or other food service settings. The sodium content of over-the-counter (OTC) drugs and some
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<td>Initial</td>
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**Kempner’s study, 1948 (ref 10)**

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**Kempner’s study, 1944 (ref 14)**

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**Dustan et al's study, 1974 (ref 15)**

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The mean arterial blood pressure calculated as in Dustan et al. (ref 15).
water supplies also may need to be considered, particularly when unusual dietary therapy is instituted for individuals on extremely restricted sodium intakes, to 500 mg or less. Dietary planning is made even more difficult in the absence of readily available information about the sodium content of foods, OTC drugs, and community water supplies. A cost-effective system of sodium labeling would be beneficial to both patients and their physicians and thus be of considerable assistance when dietary intervention is a part of the management of hypertension.

In this instance, some of the scientific uncertainty appears to be on the way to resolution. Appropriate public policy recommendations, however, must consider the cost of implementing sodium labeling for food and beverage products, the technologic feasibility of such labeling, and the time constraints involved. Further public policy recommendations must involve the establishment of effective educational mechanisms to assure that such labeling efforts are both useful and used. Recommendations that involve suggestions for cooperative, cost-effective efforts between the public and private sectors might also be deemed appropriate.

Obesity and Hypertension

Control of obesity is another approach to the treatment of hypertension. Data from the Framingham Study20 show that adiposity makes a significant contribution to the development of hypertension in men and women beyond 30 years of age. Other studies21, 22 confirm this observation. Moreover, there has been a consistent thread in the literature for more than 50 years associating weight loss with reduction in blood pressure. Clearly, as a public health measure, weight control may be even more difficult to achieve than control of the sodium intake in the diets of those for whom such measures have been recommended. Weight control has been cited recently23 as an attractive therapeutic approach, and some recent studies24, 25 confirm the effectiveness of blood pressure reductions when weight loss is sustained.

In this instance, then, some of the scientific uncertainties appear to be resolved. Appropriate policy recommendations, for example, could focus on a goal of obesity control, perhaps through identification of those hypertensives who could best be helped by weight reduction programs and public support for programs dealing with the treatment of obesity. A variety of ancillary aspects could also be reviewed, for example, regulatory constraints, if any, on the food producer’s manufacture of more and better low calorie food products. Clearly, the resolution of scientific uncertainties can trigger a more focused program of public health policies.

Sodium in the Food Supply

Persons for whom sodium restriction is prescribed or advisable will need useful information to monitor and control their total daily intake of sodium. Many groups support the goal of providing a cost-effective labeling system informing consumers of the sodium content of products.

Providing information about current levels of sodium in various products, however, is only one aspect of the public health discussion. Should it become desirable to reduce sodium intake in general, beyond the mere avoidance of table salt and the use of labeling to foster careful food selection patterns, some technological uses of sodium-containing substances would surely have to be altered. Since the sodium ion may possess properties not present in suggested alternatives (for example, potassium or ammonium bearing substances), the safety of foods and technological processes of production could be affected by premature formulation changes. Clearly, many of the food science concerns about sodium reduction in processed foods remain currently unresolved.

Sodium in Food Processing

Although discretionary sodium (sodium added by consumers in cooking or at the table, usually as sodium chloride) is a significant contributor to the total exposure to dietary sodium, processed foods can make a significant contribution as well.26 In many food products, particularly those preserved by canning and freezing, sodium chloride is present as a flavoring agent. In some foods, however, sodium chloride and other sodium-containing components have important technological properties other than flavoring.

Sodium salts are important ingredients in all chemically leavened baked goods, e.g., biscuits and donuts. In yeast-raised breads, salt is added not only for flavoring but also for controlling the rate of fermentation of yeast-leavened products and strengthening gluten, the “structural” protein of bread. Alternative processing, when available, would likely increase the price of bread and other cereal and grain-based bakery products.

In fermented foods, whether in vegetable (e.g., sauerkraut), dairy (e.g., natural cheeses), or meat (e.g., dry and semi-dry sausage) products, salt acts as a selective agent, preventing the growth of undesirable bacteria. Both flavor and microbiological safety may be dependent on the level of salt that is present in the product.

Processed meats contain wide-ranging sodium levels and no average figure is readily available. Each of the estimated 200 kinds of processed meats sold in the United States has characteristics based on its ingredient combination (including salt) and method of preparation. In processed meats, salt provides flavor, antibacterial effects on pathogenic and spoilage microorganisms, and helps establish texture characteristics. There is valid concern over microbiological safety of these products in relation to the salt and other ingredients used for product preservation. Public health measures to effectively control the trichinosis problem so frequently seen in the past with pork products reportedly are, in part, a function of the USDA requirements for salt levels in some of these products.27
To establish arbitrary levels of sodium per serving for food products may be impossible and could create microbiological hazards, since absolute levels of salt required for preservation or technological needs will vary with products. A public policy recommendation that would establish upper limits or permissible ranges for sodium in commercially produced foods presupposes that these foods are quite similar and that, therefore, limits can readily be set; such is not the case. Moreover, to set limits even within small categories of foods does not address a primary public health goal: patient compliance with the physician’s dietary prescription for sodium restriction, using cost-effective labeling of available food products.

Cost effective sodium labeling, on the other hand, could be an effective communications tool between food producer, patient, and physician and thus foster selection of appropriate food choices from within the varied food groups. Additional public policy recommendations could also be made that would assist in resolving food science uncertainties and foster appropriate public policy goals. Where questions exist about food safety concerns, research support to assist in resolution of the uncertainties would be an appropriate public policy recommendation. Regulatory and industrial resolution of technological, time, or other constraints could assist in fostering more widespread implementation of cost-effective food labeling efforts. Where food Standards of Identity would need to be changed, appropriate policy recommendations could include decisions to expedite such changes and thus permit substitution of non-sodium containing for sodium containing ingredients.

In providing focus for debates about public health issues and public health policy recommendations, it is important to get to the heart of the matter. All too often public debate about the public’s health distresses from the fundamental query: “Is the science solid?” Where the answer is “no,” appropriate recommendations should be designed to generate a clearer understanding of the scientific certainties needed for policy decisions.

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