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Editorial

Salt never calls itself sweet

'Jamaican saying'

According to The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7), one billion individuals in the world have hypertension^{1,2}. About 65 million Americans have high blood pressure, and 59 million more have pre-hypertension, *i.e.* over 40 per cent of the US population is at risk. Studies in the urban Indian population suggest that up to 35 per cent of the patients have high blood pressure³⁻⁷ and it has been suggested that 47.4 per cent of adults have pre-hypertension⁸. This high burden of hypertension, particularly in urban India, unless treated will contribute to the increasing prevalence of coronary heart disease, heart failure, kidney failure and strokes. For every 20 mm Hg increase in the systolic blood pressure (SBP) the risk of both heart disease death (Fig. 1) and stroke death (Fig. 2) doubles. On the other hand, even a 2 mmHg decrease in SBP reduces overall mortality by 3 per cent and a 5 mmHg decrease in SBP reduces stroke mortality by 14 per cent, coronary heart disease mortality by 9 per cent and total mortality by 7 per cent (Fig. 3). An analysis based on the Framingham Heart Study, reported that a 2 mmHg reduction in the population average of diastolic blood pressure (DBP) for white US residents (35 to 64 yr) would result in a 17 per cent decrease in the prevalence of hypertension, a 14 per cent reduction in the risk of stroke and a 6 per cent reduction in the risk of coronary heart disease. The most cost-effective method of reducing blood pressure is by lifestyle changes, including reduction of salt intake.

Salt has direct detrimental effects on target organs beyond its capability of elevating blood pressure⁹⁻¹¹. In fact, salt intake induces left ventricular hypertrophy even before the blood pressure increases. Similarly, salt intake

results in proteinuria before there is any elevation of blood pressure. Reduction of salt intake has been shown to be beneficial - in the Trials of Hypertension Prevention (TOHP) studies I and II, involving 2,382 individuals with pre-hypertension; the risk of a cardiovascular event was 25-35 per cent lower in participants who adhered to sodium-restriction when compared to the control group¹². In TOHP I, individuals with DBP levels of 80 to 89 mm Hg and SBP levels <160 mm Hg were randomly assigned to 18-month interventions to lose weight or to reduce dietary sodium or to respective control groups. The incidence of hypertension, after 7 yr, was 18.9 per cent in the weight loss group and 40.5 per cent in its control group and 22.4 per cent in the sodium reduction group and 32.9 per cent in its control group¹³. The Dietary Approach to Stop Hypertension (DASH) study investigators found that although the DASH eating plan caused significant reductions in blood pressure across all age groups independent of salt intake, the greatest effect on blood pressure was achieved by a combination of low salt intake and the DASH diet in the recent DASH-Sodium study¹⁴, whereas an increase in fruits and vegetables alone had no significant effect on blood pressure in individuals without hypertension in the original DASH study¹⁵. The totality of evidence for reducing salt is stronger than any other dietary constituents (*e.g.*, fruits and vegetables), but unlike reducing solely dietary salt, it requires major changes in eating habits. JNC7 recommends that dietary sodium be reduced to 100 mmol/day (2400 mg sodium), or less.

Reducing salt intake in individuals with hypertension and receiving antihypertensive drugs provide additional benefits in terms of blood pressure control with diuretics, angiotensin-converting enzyme (ACE) inhibitors, and beta-blockers but not calcium-

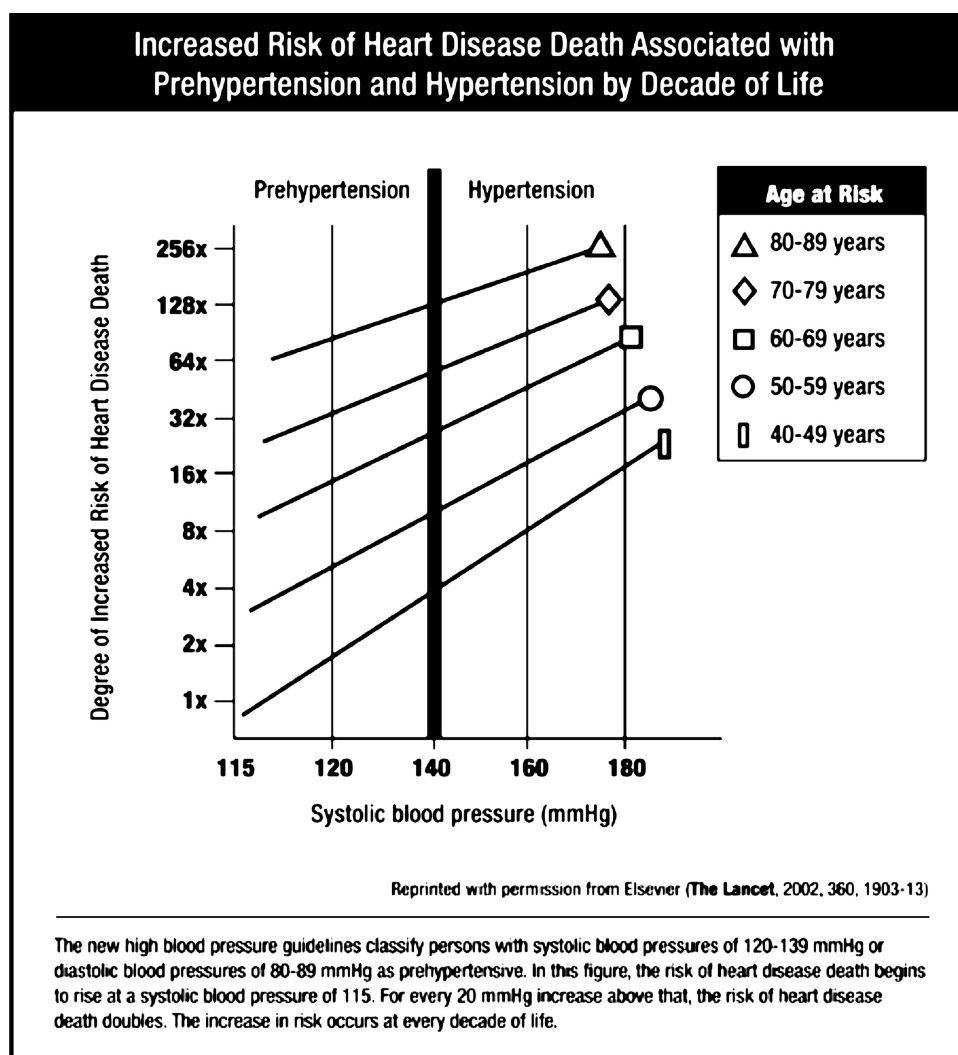


Fig. 1. For every 20 mm Hg increase in systolic blood pressure above 115 mm Hg the risk of heart disease mortality doubles.

channel blockers. An additional 3 mm Hg decrease in DBP with reduced salt intake in patients on diuretic and beta-blocker therapy has been conclusively reported¹⁶. A low-salt diet provided an additional 4 mm Hg/2 mm Hg decrease in systolic and diastolic blood pressure, respectively, with beta blocker and diuretic therapy¹⁷. The patients who had hypertension and were on diuretic therapy also benefited from salt reduction¹⁸. The blood pressure -lowering benefits of salt reduction have also been shown in hypertensives treated with ACE inhibitors. Two separate studies have demonstrated that moderate salt reduction resulted in additional decreases in blood pressure in patients receiving captopril^{19,20}. In a separate study, when a low-salt diet was used with captopril treatment there was an additional reduction of 4 mm Hg/3 mm Hg in systolic and diastolic blood

pressure, respectively²¹. The beneficial effect of dietary salt reduction on reducing blood pressure is not seen in individuals with hypertension who take calcium-channel blockers. Inexplicably, the greatest reduction in blood pressure with calcium-channel blockers was seen in patients on a high-salt diet rather than a low-salt diet^{22,23}.

According to the Nutrition Committee of the American Heart Association, normal daily salt intake is 1.6 to 3 teaspoons of sodium chloride (NaCl)²⁴. This is equivalent to 7.6-10 g of NaCl, or 131-175 mmol (3.1-6.0 g) of sodium. According to these guidelines many Americans consume high-salt diets; the current U.S. mean level of daily salt (NaCl) consumption is almost 9 g. Sodium intakes around the world are well in excess of physiological requirements (*i.e.*, 10-20 mmol/day)

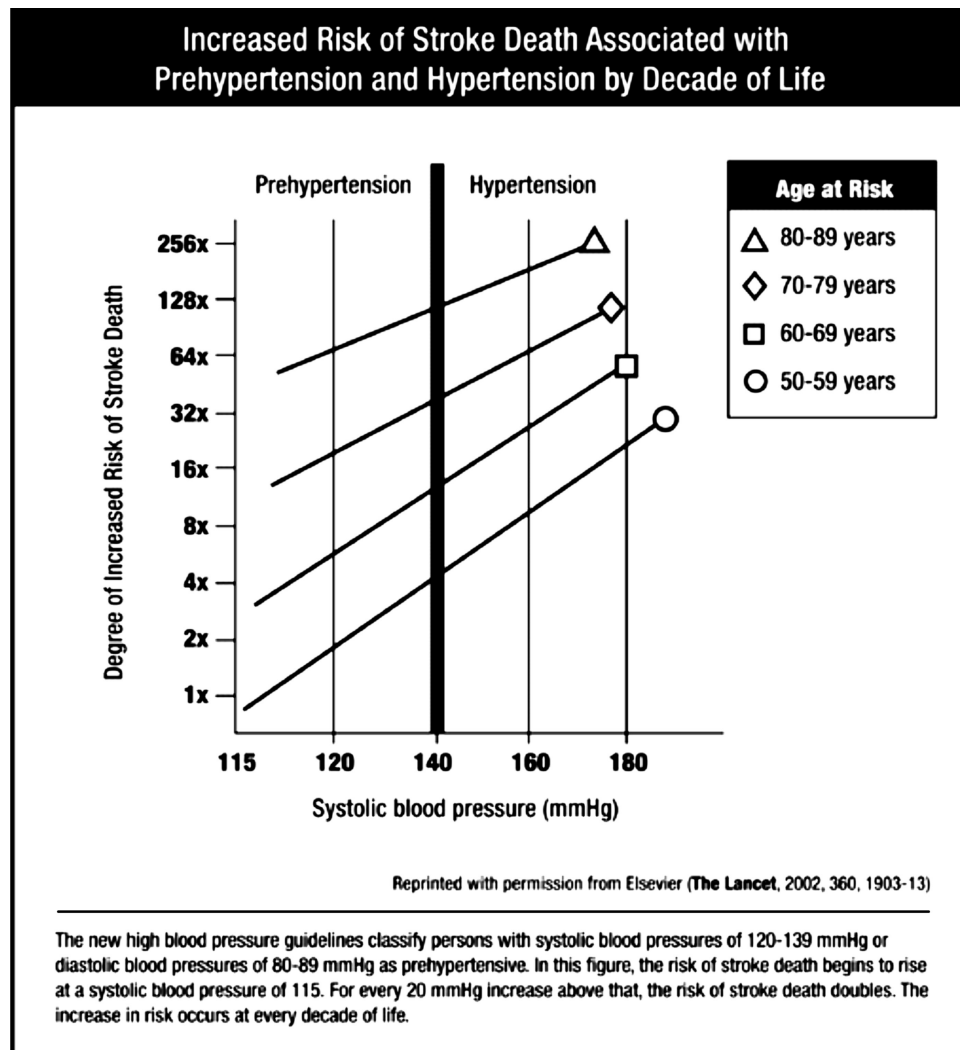
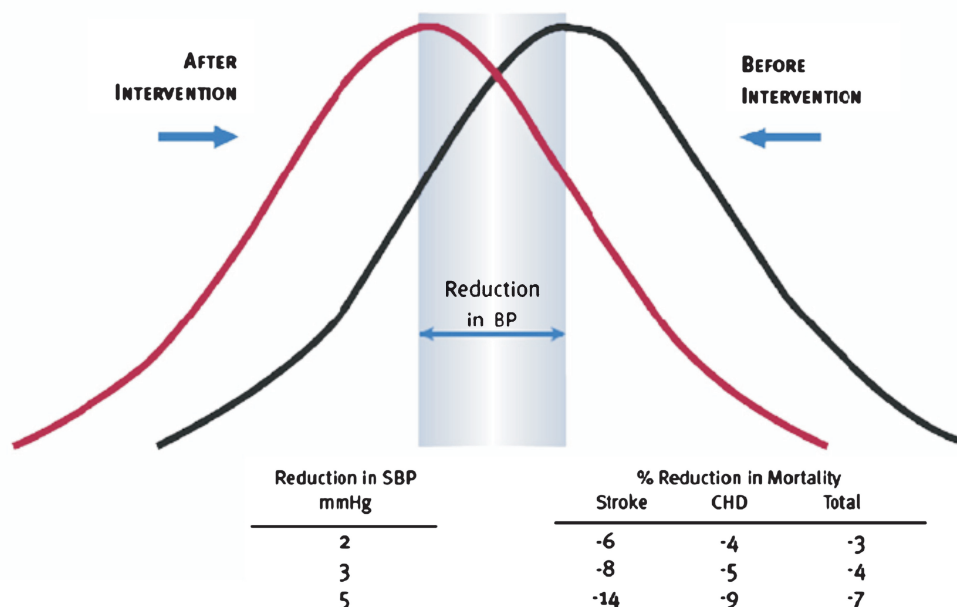


Fig. 2. For every 20 mm Hg increase in systolic blood pressure above 115 mm Hg the risk of stroke mortality doubles.

with mean sodium intakes >100 mmol/day, and for many (particularly the Asian countries) mean intakes are >200 mmol/day. Exceptions to these estimates include data from Cameroon, Ghana, Samoa, Spain, Taiwan, Tanzania, Uganda and Venezuela, where methodologies were less than optimal and samples were not representative of the national intake. Sodium intakes are commonly >100 mmol/day in children over 5 yr old, and increases with age. In the US and European countries, sodium intake is dominated by salt added to manufactured foods (approximately 75% of intake). Cereals and baked goods were the single largest contributor to dietary sodium intake in UK and US adults. In China and Japan, salt added at home (in cooking and at the table) and soy sauce are the largest sources of sodium²⁵. An urban India investigation reported a mean dietary salt intake of 8.5 g/day and that in the highest quintile of salt intake had

significantly higher prevalence of hypertension than did those in the lowest quintile (48.4 vs 16.6%, $P < 0.0001$)²⁶. The governments of Finland, UK and Japan have mandated reductions in salt content of food. Over the past three decades, the Finns lowered the amount of salt in their diet by about 30 per cent and as a result, Finland has seen a 10 mm drop in blood pressure nationwide, and a 75 per cent reduction in cardiovascular disease in individuals under the age of 65 yr, plus a six-year increase in overall life expectancy.

The UK government compelled food manufacturers into lowering the salt content in about 85 categories of processed foods and as a result there is considerable success in reducing the sodium intake from levels of 4 g/day²⁷. Currently the US has introduced mandatory labeling of sodium content of foods but has not



BP, blood pressure; CHD, coronary heart disease; SBP, systolic blood pressure

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Fig. 3. A 2-mmHg decrease in SBP reduces overall mortality by 3 per cent and a 5-mmHg decrease in SBP reduces stroke mortality by 14 per cent, coronary heart disease mortality by 9 per cent and total mortality by 7 per cent.

legislated salt content. In the US the salt intake is as high as 20 g per day with an average of 10 to 12 g per day. One study showed that modest reductions in salt intake from this current level to the recommended level of 5 to 6 g per day lowers SBP significantly in isolated systolic hypertension and combined hypertension²⁸. A decrease of 10 mm Hg in SBP with salt reduction in isolated systolic hypertension observed in this study may cut stroke rates by about a third, ischaemic heart disease by a quarter, and heart failure by just over a quarter in individuals aged 60-80 yr in whom isolated systolic hypertension is the predominate form of hypertension with have the highest risk of cardiovascular disease. These studies demonstrate that there is considerable opportunity to reduce the average salt intake and according to the American Medical Association reducing salt intake by half would save 150,000 lives annually in the United States alone, which is five times greater than the number of people die of motor vehicle accidents annually²⁹. The success in these European countries suggests that although salt makes food tasty, it is not impossible to reduce average salt intake.

From a public health and clinical perspective, one of the most attainable road maps to reduce salt intake is to target salt hidden in processed foods, such as fast

foods, TV dinners, and restaurant meals, that contributes to about 80 per cent of the excess salt consumed². If small reductions (10-20%) were pursued, these would be detected by human taste receptors and should require minimal adaptation of food technology processes. Such a reduction staggered every 1 to 2 yr, can potentially reduced the intake of salt by approximately 6 g/day³⁰.

Strategies must also be developed at the individual level to educate patients about successful implementation of a salt-restricted diet. Such strategies might include innovative approaches to counselling, development of better teaching aids and development of alternative diets. Patient should be educated that decreasing salt intake can reduce systolic blood pressure level by 1 to 4 mm Hg. Restricting sodium to less than 2400 mg per day is often the first lifestyle change. The average Western diet contains 3800 mg of sodium per day and the US diet is 10 to 12 g a day³¹, and patients are often unaware of the high sodium content of many foods³². Four simple questions³³ can give an approximation on high salt intake in an individual: (i) Do you use prepared foods, such as frozen dinners, packaged or canned goods, or processed meats or cheeses? (ii) Do you eat salty snack foods, such as potato chips, salted nuts, cheese snacks, or pretzels? (iii) Do you eat in restaurants? and (iv) Do you salt your food at the table? Patients should be educated to avoid

processed foods, lunchmeats, soups, Chinese food, and canned processed food.

An effective road map requires a system-wide approach to achieve long-lasting reductions in blood pressure². These strategies would require buy-in from local governments and their leaders, employers, insurers, managed care organizations, community groups, media outlets, and schools to facilitate necessary changes. School systems should incorporate a curriculum on health issues and get rid of unhealthy high salt meals on their lunch menus and vending machines with processed foods on their premises. The community at large should make available areas and programmes to increase physical activity. Realistically, new federal or local legislation and policies, not dissimilar to the transfat ban in New York, may be required to achieve these necessary goals. The health care system should be updated to provide incentives to physicians and other care providers to institute preventive medicine efforts including effective dietary and lifestyle counselling. Only then would these physicians and other health care providers reorganize their clinical practice to provide preventive care.

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