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Non-Pharmacological Approach as Prevention and Initial Management of Hypertension

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Abstract

Hypertension (aka High blood pressure (BP)) is a worrisome problem in India and is on the rise in urban and rural populations. With increasing economic growth rate, India is not only facing the epidemic of CAD but also of obesity, diabetes mellitus, and hypertension. Cardiovascular diseases caused 2.3 million deaths in India in the year 1990; this is projected to double by the year 2020. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India. The Chennai Urban Rural Epidemiological Study (CURES) shows that hypertension was present in 1/5th of urban south Indian population and majority of the hypertensive subjects still remain undetected and the control of hypertension is also inadequate. The scenario is similar throughout India. This calls for urgent prevention and control measures for hypertension. However, lifestyle modification is mostly neglected in the management of hypertension. In the present article we will discuss some of the non-pharmacological measures in the prevention of hypertension. Lifestyle changes should be the initial approach to hypertension management and include dietary interventions (reducing salt, increasing potassium, alcohol avoidance, and multifactorial diet control), weight reduction, tobacco cessation, physical exercise, and stress management.

Keywords: Hypertension, Management, Physical Exercise.

Introduction

Hypertension has become a major cause of morbidity and mortality worldwide and it is now ranked third as a cause of disability-adjusted life years[1]. High blood pressure (BP) is a major public health problem in India and elsewhere[2,5]. Furthermore, the risk for CVD starts even at upper limits of normal levels of blood pressure[6]. In a meta-analysis of 61 studies involving more than a million patients Strategies for initial management of hypertension Rajeev Gupta & Soneil Guptha, Department of Medicine, Fortis-Escorts Hospital, Jaipur, India & Regional Headquaters, MSD Technology Singapore Pte Ltd, Singapore Received May 1, 2009 High blood pressure (BP) is a major public health problem in India and its prevalence is rapidly increasing among urban and rural populations. It is therefore important to reach a normal BP, that would be below 130/80 mmHg in the young and middle-aged. In diabetics and CKD subjects BP should be below 130/80 mmHg; in patients with stroke it should be below 130/85 mmHg; and below 140/90 mmHg in elderly patients as mentioned in the Indian Hypertension Guidelines II. It is a major cardiovascular risk factor and contributes significantly to cardiovascular mortality[7,8]. There would be a decrease in cardiovascular risk by reducing systolic and diastolic BP, this can be achieved by non-pharmacological (lifestyle measures) as well as pharmacological means. The initial approach should be to achieve a lifestyle change.

Lifestyle changes should be the initial approach to hypertension management and include dietary interventions (reducing salt, increasing potassium, alcohol avoidance, and multifactorial diet control), weight reduction, tobacco cessation, physical exercise, and stress management. Though the prevalence of hypertension has remained stable or has decreased in developed countries during the past decade, it has dramatically increased in developing countries like India. A greater understanding of the risk factors that account for the increase in hypertension could potentially contribute to its future prevention by addressing its root causes. Public health efforts to reduce the prevalence of hypertension have rightly focused on non-pharmacological approaches (lifestyle modification) that lower blood pressure. The WHO report states that a 2% reduction in diastolic blood pressure could prevent 3,00,000 deaths from CVD by 2020[9]. Prospective Studies Collaboration has reported that reducing BP can substantially decrease cardiovascular risk and cardiovascular as well as all-cause mortality[10]. Pooling of epidemiological studies shows that hypertension is present in 25% urban and 10% rural subjects in India. At an underestimate, there are 31.5 million hypertensives in the rural and 34 million in the urban population[11].This risk reduction is steeper in younger subjects than in the

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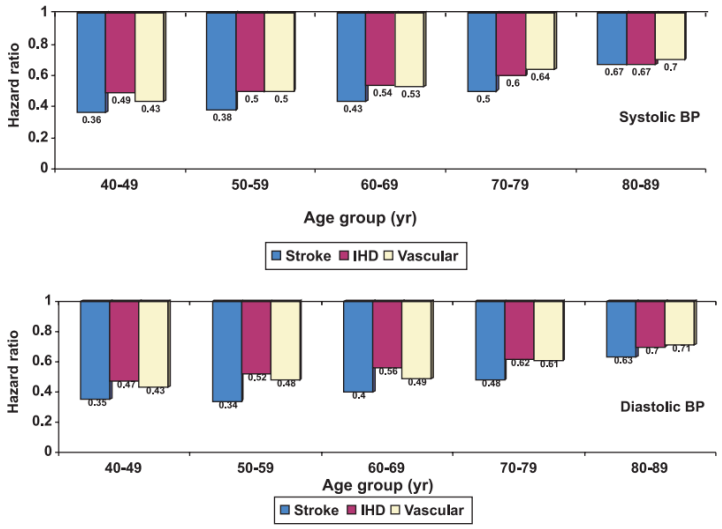
older subjects (**Fig. I**) and is more when baseline blood pressure levels are high. A number of pharmaceutical agents, well evidenced by large randomized clinical trials, are available for initial treatment of high BP. Comprehensive hypertension management focuses on reducing overall cardiovascular risk by lifestyle measures, BP lowering and lipid management and should be the preferred initial treatment approach.

Figure I. Prospective Studies Collaboration analysis on influence of high blood pressure on cardiovascular mortality. Reduction of usual systolic BP (upper panel) and diastolic BP (lower panel) is associated with a lower hazard ratios (hazard ratio)



At ages 40-69 yr, each difference of 20 mm Hg systolic BP or 10 mm Hg diastolic BP was associated with more than a twofold difference in the stroke death rate, and with two-fold differences in the death rates from coronary heart disease and other vascular causes. All of these proportional differences in vascular mortality were about half as extreme at ages 80-89 yr as at ages 40- 49 yr, but the annual absolute differences in risk were greater in old age. There is, therefore, a need to lower BP in all groups of patients. This can be achieved by non-pharmacological (lifestyle measures) as well as pharmacological means [12]. Lifestyle changes include dietary interventions, weight control, tobacco cessation, exercise, and stress management. A number of pharmaceutical agents, well evidenced by large randomized clinical trials, are available for initial treatment of high BP. Comprehensive hypertension management focuses on reducing overall cardiovascular risk and should be the preferred approach for initial management of hypertension. This article focuses on initial management strategies in hypertension using mainly non-pharmacological approaches.

Lifestyle management for Hypertension

Most of physicians in India who are treating hypertension, especially in community hospitals do not have time to advice patients on importance of lifestyle modification; though non-pharmacological management is available they rely on pharmacological drugs. Moreover, due to great seasonal variation of temperature in India, marginal alteration of doses of drugs is needed from time-to-time, and due to poor infrastructure these goals cannot be achieved. Table I highlights the lifestyle interventions and their effect on blood pressure[13]. Non-pharmacological therapy (or lifestyle management) has an important role in both non-hypertensive and hypertensive individuals. In non-hypertensive individuals, including those with pre-hypertension, lifestyle modifications have the potential to prevent hypertension and more importantly to reduce BP and lower the risk of BP-related clinical complications. In hypertensive individuals, lifestyle modifications can serve as initial treatment before the start of drug therapy and as an adjunct to drug therapy in persons already on medication. In hypertensive individuals with medication-controlled BP these therapies can facilitate drug step-down in individuals who can sustain lifestyle changes. Treatment is successful when multiple factors in the patient's life are addressed, since essential hypertension is considered as a result of interactions between genes and environment[14]. The environmental effects are powerful and explain most of the BP differences between individuals and populations and their control in management of high BP is crucial[14]. Important lifestyle or environmental factors are dietary excess of sodium and fat, dietary deficiency of potassium and fibre, alcohol intake, physical inactivity, and psychosocial stress[15]. Obesity, especially, truncal obesity are powerful proximate determinants of high BP, also in Indians[16], and lifestyle influences on their genesis are well known. Major lifestyle factors influencing hypertension management and amenable to control are shown in Table

I. Lifestyle measures, are a crucial step in hypertension management.

Table I. Dietary and lifestyle changes that modify blood pressure

	Level of evidence	Recommendations
Dietary sodium intake	++	<100 mmol (2.3 g) of sodium per day
Dietary potassium intake	++	>120 mmol (4.7 g) of potassium per day
Omega-3 polyunsaturated fat	++	Increase omega-3 fat intake from natural sources
Overall healthy dietary patterns	++	An overall healthy diet: DASH diet (USA), Mediterranean diet (Europe), Ornish Diet (USA), Indian vegetarian diet (India)
Dietary calcium, magnesium	+/-	Increase dietary calcium and magnesium intake through natural sources
Saturated fat, omega-6 unsaturated fat, monounsaturated fat	+/- to +	Low saturated fat diet for reducing the cardiovascular risk
Protein, total protein, animal protein, vegetable protein	+/- to +	Increase vegetable protein in place of carbohydrates
Carbohydrate	+	Amount and type of carbohydrate uncertain
Fibre	+	High fibre diet
Cholesterol	+/-	Low cholesterol diet to reduce cardiovascular risk
Exercise	+	At least 30 min of moderate activity most days of the week
Alcohol intake	++	Moderation of alcohol intake to ≤2 drinks/day in men and ≤1 drink/day in women in those who take alcohol
Stress management	+/-	Yoga, meditation, progressive relaxation techniques

+/- indicates limited or equivocal evidence; + suggestive evidence, typically from observational studies and some clinical trials; ++ persuasive evidence, typically from randomized clinical trials. DASH dietary approaches to stop hypertension.

Source: [15, 26, 60, 61, 62]

Dietary Approaches to Stop Hypertension (DASH) study [17] showed that a diet low in sodium and high in fruits, vegetables, and calcium is helpful in treating hypertension. Exercise is critically important, especially in children and young adults with hypertension who often have heightened sympathetic nervous system activity. Patients with hypertension often feel stressed, and the stress aggravates their BP. A more recent trial[18] has documented that individuals can simultaneously make multiple lifestyle changes but a vexing issue is the extent to which individuals can sustain lifestyle changes over the long term. However, it is important to individually evaluate various factors (listed in Table I) for their importance in initial management of hypertension.

Diet

Dietary modifications are mainstay for prevention and initial treatment of hypertension[19]. In hypertensive patients, in addition to a well-balanced diet, the dietary sodium intake should be limited to 65 to 100 mmol/day. Other recommendations are: following a diet low in saturated fat and cholesterol, and one that emphasizes fruits, vegetables and low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources[19] Alcohol intake should be moderated.

Reduced salt intake

Dietary salt intake has a linear association with blood pressure. Epidemiological[20], clinical[21], experimental[22], and randomised controlled trials[23] suggest that health intervention, including government policies and action to regulate reduction in the salt content of processed foods, are cost-effective ways to limit cardiovascular disease. This could avert over 21 million disability-adjusted life-years per year world wide[24]. The Dietary Approach to Stop Hypertension (DASH) sodium feeding study showed that an even lower intake of sodium (approximately 60 mmol/day) further reduces blood pressure in both normotensives and hypertensives[25]. In an observational studies, reduced salt intake is associated with a reduced risk of atherosclerotic cardiovascular events and congestive heart failure[26]. The Indian Council of Medical Research (ICMR) recommends 1.5 g/d (65 mmol/d) sodium as an adequate intake level, primarily to ensure nutrient adequacy[27]. To reduce salt intake, people should choose foods low in salt and limit the amount of salt added to food. However, because >75 per cent of consumed salt in India comes from home cooked foods, any meaningful strategy to reduce salt intake must involve public education to change consumption[28].

Table II. Sodium content of food per 100 gms

< 25 mg (low)		25 – 50 mg (moderate)	50 – 100 mg (moderately high)	> 100 mg (high)
Amla	Horse gram	Raisins	Cauliflower	Amaranth
Bitter gourd	Ragi	Broad beans	Fenugreek	Bacon
Bottle gourd	Vermicelli	Carrots	Lettuce	Egg
Brinjal	Semolina	Raddish white	Field beans	Lobster
Cabbage	Wheat	Black gram dal	Beetroot	
Lady finger	Maida	Green gram dal	Water melon	
Colocasia	Milk	Red gram dal	Bengal gram dal	
Cucumber	Grapes	Lentil whole	Red gram tender	
French beans	Sweetlime	Bengal gram whole	Liver	
Peas	Papaya	Banana	Prawns	
Onion	Orange	Pineapple	Beef	
Potato	Sapota	Apple	Chicken	
Tomato (ripe)		Mutton		
Yam				

Source: Srilaksmi B. Diet in Diseases of Cardiovascular system In: Srilaksmi B editor Dietetics. Revised. 5th ed. New Delhi: New Age International (P) Ltd; 2005; p.189-213.

Dash diet

Multiple dietary factors are involved in hypertension and it is reasonable that a comprehensive dietary management would be the best approach to manage hypertension and to reduce overall cardiovascular risk. DASH and related dietary patterns Dietary Approaches to Stop Hypertension (DASH) was a program by the National Institutes of Health, USA[29,30,31]. This series of three large controlled trials tested the effects of dietary patterns on BP. The first trial was a randomized feeding study that compared 3 dietary patterns[29]. Of the 3 diets studied, the most effective diet, now called the DASH diet, emphasized fruits, vegetables, and low-fat dairy products; included whole grains, poultry, fish and nuts; and was low in fats, red meat, sweets, and sugar-containing beverages. Accordingly, it was rich in potassium, magnesium, calcium, and fibre and was low in total fat, saturated fat, and cholesterol; it also was slightly high in protein. It is likely that several aspects of the diet, rather than just one nutrient or food, reduced BP Overall, the DASH diet cohort, reduced systolic BP by 5.5 mmHg and diastolic BP by 3 mmHg[32]. A second diet, which emphasized just fruits and vegetables also significantly reduced BP but to about half of the effect of the DASH diet [30].

The Indian vegetarian diet

Vegetarian diets have been associated with low BP. In industrialized countries individuals who consume a vegetarian diet have markedly lower BP than do non vegetarians[33].Vegetarians also experience a lower age-related rise in BP. Some of the lowest BP observed in developed countries are documented in strict vegetarians. Several aspects of a vegetarian lifestyle might lower BP, including non dietary factors (e.g., physical activity), established dietary risk factors (e.g., low weight, high potassium, and low-to-moderate alcohol intake), and other aspects of vegetarian diets (e.g., high fibre, no meat). Limited trial evidence, indicates that non-dietary factors and established dietary risk factors are not fully responsible for the BP lowering effects of vegetarian diets and that some other aspects of vegetarian diets lower BP. In India, diets in many rural and urban populations are predominantly vegetarian[34,35]. BP levels are also lower in these subjects15. Large studies that have evaluated comprehensive dietary patterns with BP levels are not available from India. Chhajer et al[36] have modified the Ornish diet[37] into low-fat Indian vegetarian diet and reported significant reductions in multiple cardiovascular risk factors including BP[38]. Importance of comprehensive dietary change in prevention and management of high BP among Indians has been highlighted[39]. Larger controlled interventional studies are needed to confirm superiority of a particular type of Indian vegetarian diet over other similar diets as in India many “healthy” diets are prevalent[34].

Smoking and tobacco intake

Smoking as a hypertension risk factor is not well defined. In western countries epidemiological studies have reported that smokers tend to have lower BP than non-smokers[45]. This is partly accounted for by the fact that smokers tend to be less obese, effect of white coat hypertension is less pronounced in these subjects and usually BP is recorded after abstaining. Ambulatory BP measurements, however, show that the BP of smokers tends to be greater than non-smokers. The effect of smoking on hypertension in less obese subjects of developing countries has not been well studied [46].

Many other epidemiological studies from India have reported significant association of smoking and hypertension[46]. Multiple patho-physiological mechanisms explaining smoking with high BP have been postulated[45]. Smoking is one of the more important cardiovascular risk factor in India[47] and smoking cessation and tobacco control must be an important

initial strategy to reduce hypertension as well as overall cardiovascular risk.

Physical activity

Increase in aerobic physical activity such as brisk walking, jogging, swimming, or bicycling has been shown to lower blood pressure. This reduction is independent of weight loss[40]. A meta-analysis of 54 randomised control trials show a net reduction of 3.8 mmHg in systolic and 2.6 mmHg diastolic blood pressure in individuals performing aerobic exercises. Compared to controls[40]. physical activity reduces systemic vascular resistance due to decreased sympathetic and nervous system activity. This is evidenced by lower plasma norepinephrine level in exercising individuals as compared to sedentary ones [41]. There is also decrease in renin activity, insulin-resistance and endothelial dysfunction[42,43]. Importantly, this reduction appears to be independent of intensity, frequency and type of exercise. It is recommended that a person should exercise for at least 30 min in a day, if not all, 5 days of the week[44].

Weight reduction

Overweight (body mass index > 25 kg/m2) has been seen in epidemiologic studies to be an important risk factor for higher blood pressure and there seems to be a linear relationship between body weight and blood pressure[53]. Clinical trials have shown that weight loss – especially when combined with dietary sodium restriction – lowers blood pressure in hypertensive's and also in normotensives[54,55]. The hypertension prevention trial showed that 4% reduction in body weight over 3-years was associated with a 2.4 mmHg reduction in systolic and a 1.8 mmHg reduction in diastolic blood pressure22. In a landmark study, He et al showed that the effects of even short-term weight loss persist for long [56]. A meta-analysis by Staessen et also showed that mean systolic and diastolic blood pressure reductions were 1.6/1.1 mmHg per kg of weight loss[53]. The exact mechanism by which weight reduction lowers blood pressure is not known but there are certain possible reasons. Aneja et al have shown a putative role of leptin via activation of sympathetic nervous system and direct effect of kidney in the causation of hypertension and obesity per semay have a structural effect on the kidneys that may perpetuate hypertension[57]. Insulin-resistance and associated endothelial dysfunction may also contribute[58]. Since sustained weight reduction is difficult to achieve, prevention of weight gain should be emphasised

Yoga and Stress Management

The old Indian traditional therapy of yoga has again rejuvenated the interest of the physician in the management of hypertension. If we believed in the principle of 'old is gold' yogais most effective and widely believed to reduce blood pressure[48]. Yogic practices have been reported to reduce BP and multiple cardiovascular risk factors in many studies from India[49]. It was found in one study that yoga reduced systolic and diastolic blood pressure 10.7 mmHg and 6.4 mmHg respectively over a period of three months[50]. In a study, twenty hypertensive patients were treated by relaxation exercises and followed-up monthly for twelve months. It was noted that at the end of the training period in study groups average systolic blood pressure reduction was 20.4 ± 11.4 mmHg while diastolic blood pressure was reduced by14.2 ± 7.5 mmHg [51]. In a study by Sahay et al, there is a useful role of yoga (pranayama and shavasana) in the control of diabetes mellitus, and there is beneficial effect on the co-morbid conditions like hypertension and dyslipidaemia[52].

Conclusion

Regarding optimal management of Indian hypertensive population according to CUPS – Chennai Urban Population Study, prevalence of hypertension in men (22.8%) and in women (19.7%)[59] is still a dream by pharmacological measurement, because rule of halves for hypertension states that half the people with high blood pressure are not known, half of those known are not treated, and half of those treated are not controlled. Thus, by this rule one out of eight patient is optimally treated by pharmacological measurement. If lifestyle modifications are adopted as a primary prevention strategy in Indian population, then many of the uncontrolled hypertension patients can be optimally managed.

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