

Review Article

Lifestyle modification in the management of hypertension – a review

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ABSTRACT

Hypertension remains the leading global modifiable risk factor for all-cause mortality and cardiovascular disease, with an increasing burden in low- and middle-income countries, particularly in sub-Saharan Africa. Non-pharmacological interventions such as weight reduction, structured physical activity, dietary modification, reduced alcohol consumption, smoking cessation, and stress reduction are fundamental in the prevention and management of hypertension and may additionally reduce cardiovascular risk. The Dietary Approaches to Stop Hypertension (DASH) eating plan, combined with sodium restriction, is among the most effective strategies for blood pressure (BP) reduction. Such approaches are a scalable and cost-effective strategy that should be integrated into standard hypertension care and public health policies. This review summarises available evidence and recommendations for lifestyle modifications in the management of hypertension.

INTRODUCTION

Hypertension is the leading global modifiable risk factor for all-cause mortality; however, achieving sustained blood pressure control remains inconsistent.(1) Sub-Saharan Africa, alongside South Asia and Central and Eastern Europe, carries a disproportionate burden of the global hypertension cases.(1) While the prevalence of hypertension has shown a modest decrease in high-income countries, exposure to lifestyle and dietary risk factors has resulted in an increase in prevalence in low- and middle-income countries.(1)

South Africa reflects this global shift with particular urgency. National and population-based studies report hypertension prevalence rates of 30% to 48%, underscoring the scale of the disease burden.(2–4) More recent data from the 2025 May Measurement Month initiative reported a hypertension prevalence of 29.7% among South African adults, with fewer than half receiving antihypertensive medication and only just over half of treated individuals achieving adequate blood pressure control.(5) These findings highlight a persistent and clinically significant treatment gap.

While the efficacy of drug therapies is well-evidenced in the literature, sole reliance on pharmacotherapy is an

incomplete solution to address hypertension and its complications. Non-pharmacological interventions in the form of lifestyle modification are a foundational, evidence-based intervention for both the prevention and treatment of hypertension.(6) They remain key as an adjunct therapy in improving BP control and reducing pill burden in people with hypertension requiring prescription of antihypertensive agents, as the sole therapy in patients with increased BP not yet meeting the threshold for drug initiation, and as a preventative measure in individuals at risk of developing hypertension.(6) As a result, guidelines for the management of hypertension routinely call for lifestyle modification as an essential first step in treatment.(7,8) Importantly, these interventions are low-cost, scalable, and particularly relevant in resource-constrained settings where health systems face rising demand.

Despite this, lifestyle interventions remain underemphasised in routine hypertension care. In South Africa, where hypertension is common, frequently undiagnosed, and often poorly controlled, strengthening lifestyle-based prevention and management is not optional — it is essential. This review therefore examines the evidence for lifestyle modification in hypertension, with an emphasis on

practical, clinically relevant interventions that can reduce blood pressure, improve cardiovascular risk, and support more effective control of hypertension.

RECOMMENDED LIFESTYLE MODIFICATIONS IN THE TREATMENT OF HYPERTENSION

Lifestyle modification is a cornerstone of treatment in all patients living with hypertension and may be considered as (the) sole treatment in low-risk patients with mildly elevated BP, provided close follow-up confirms achievement of target BP.(7–9) Recommended lifestyle modification include:

- Weight loss of at least 5% in overweight or obese patients, preferably targeting a body mass index (BMI) of 18.5 – 24.9 kg/m².
- Increased physical activity through a structured exercise programme that includes at least 150–300 min of moderate or 75–150 min of vigorous aerobic activity per week, and dynamic resistance training at least 2–3 times per week.
- Reduced alcohol consumption to at most 1 drink per day for women and 2 drinks per day for men, ideally aiming for complete abstinence.
- Stopping or avoiding starting smoking.
- Stress reduction through relaxation techniques and adequate sleep.
- Dietary modification, comprising –
 - A heart-healthy eating pattern, such as the DASH eating plan, or adopting a Mediterranean diet, or one featuring plant-based rather than animal-based protein.
 - Avoidance of saturated fats.
 - A reduction in dietary sodium intake to at most 2.3g/day and ideally to less than 1.5g/day.
 - Dietary potassium supplementation as a salt substitute, except in the setting of chronic kidney disease or where potassium-sparing drugs have been prescribed for the management of hypertension.

Adopting a healthier lifestyle among hypertensives is associated with a 4–5 mmHg reduction in systolic BP and a 30–33% lower risk of cardiovascular events.(10) Cardiovascular benefits may go beyond their effect on BP; long-standing hypertension together with dysregulation of environmental, genetic, behavioural, hormonal and immunological factors can lead to hypertension-mediated organ damage (HMOD).(8) Adequate BP control can alleviate subclinical complications due to its microcirculatory effects on low-resistance organs.(8) Meta-analysis ranks the most effective lifestyle interventions for BP lowering as the DASH eating plan, followed by aerobic exercise, isometric resistance training, low-sodium / increased-potassium dietary interventions, and comprehensive lifestyle modifications.(11) Evidence for individual lifestyle modification on recommendations is outlined below.(8)

WEIGHT LOSS

Weight gain increases the risk of primary hypertension by 65–75%; a 1.7kg/m² increase in BMI or a 4.5cm increase in waist circumference is associated with a 1 mmHg increase in systolic BP.(12) Mechanisms underlying obesity-related hypertension are complex. Accumulation of ectopic renal fat compresses the intrarenal vasculature, altering glomerular filtration and increasing sodium reabsorption.(12) These vascular effects, along with ectopic renal fat-produced adipokines, such as leptin, IL-1 β , and TNF α , result in renin-angiotensin-aldosterone system (RAAS) and sympathetic nervous system activation, in turn increasing sodium retention.(12) Increased leptin levels are also associated with carotid body dysfunction and increased chemoreflex-mediated BP elevation, and enhanced adrenal production of aldosterone.(12)

Weight reduction through a low-calorie diet, in conjunction with an exercise regimen, has been reported to lower systolic BP by 6.5 mmHg and diastolic BP by 4.6 mmHg.(11) Meta-analysis of randomised controlled trials (RCTs) to determine BP effects on weight reduction suggests that a weight loss of 1kg improves BP by 1mmHg.(13) Weight loss additionally reduces all-cause mortality by 15%.(14) Maintenance of weight loss through behavioural changes is often challenging, and patients may experience weight cycling with adverse effects on BP control, cardiovascular risk, and metabolic profile.(15) For such patients, pharmacotherapy with the glucagon-like peptide-1 receptor agonist (GLP-1RA) class may be considered.(8) Bariatric surgery has previously shown efficacy in improving BP in patients failing to achieve weight loss through other means, although carrying an increased risk of short-term adverse events attendant upon such an invasive intervention.(16)

INCREASED PHYSICAL ACTIVITY

The direct mechanisms by which physical activity improves BP control are poorly elucidated and may vary among patients; however, a reduction in total peripheral resistance (TPR) appears to be the most significant physiological contributor.(17) These changes may be mediated by improvements in autonomic system vasomotor dysregulation, structural changes in resistance vessel walls, and/or endothelium-mediated local vessel vasodilation.(18)

Structured, regular aerobic exercise has been repeatedly shown to lower BP in randomised controlled trial to be abbreviated to RCT, with improvements of 5–8mmHg documented in hypertensives.(19) Both dynamic and isometric resistance training have shown benefit in controlling BP, albeit less effectively than aerobic exercise, and may be useful in patients unable to tolerate the latter.(20–22) Exercise appears to have a dose-response effect on BP, with a 2 mmHg reduction in systolic BP for each additional 30 minutes of aerobic exercise per day, and the largest BP reduction observed among those achieving 150 minutes of exercise per week.(23) Meaningful BP

reductions have nevertheless been observed for walking and for low-intensity resistance activities in highly sedentary patients, demonstrating the benefit of some degree of exercise at levels below guideline recommendations.(24) Exercise-mediated cardiometabolic parameter improvements additionally exert positive effects on cardiovascular risk, regardless of BP category, for all ages and sexes.(24)

REDUCED ALCOHOL CONSUMPTION

Several studies confirm a causal relationship between alcohol intake and hypertension, although precise mechanisms remain unclear.(25) Possible factors include autonomic and baroreceptor dysfunction, renin-angiotensin system aberration, and altered vascular smooth muscle calcium flux promoting vasoconstriction.(25) Altered arachidonic acid pathway metabolism through the altered function of alcohol dehydrogenase has been suggested by some as a possible route to vasoconstriction and hypertension.(25)

The risk of hypertension is increased in individuals consuming more than one alcoholic drink per day.(26) Meta-analysis of primary trials investigating the effect of alcohol consumption on BP, has shown that reducing intake towards abstinence consistently improves BP in hypertensives consuming more than three alcoholic drinks per day by up to 3mmHg.(27) Individuals who consume less than three drinks per day do not appear to benefit from reduced alcohol intake.(27) Since both hypertension and excessive alcohol intake increase the risk of intracranial haemorrhage (ICH), patients deemed at high risk for ICH should receive special counselling on the importance of alcohol moderation.(8)

SMOKING CESSATION OR AVOIDANCE

Exposure to nicotine absorbed via inhalation of tobacco smoke results in increased sympathetic nervous system (SNS) activity through activation of peripheral postganglionic adrenergic receptors and chemoreceptors of the carotid bodies and aortic arch. Sympathetic nervous system discharge increases heart rate and cardiac output and causes vasoconstriction; the initial neurohormonal effects following nicotine exposure are augmented and sustained by subsequent adrenal catecholamine release. In addition, nicotine and free radicals present in tobacco smoke damage the endothelium, leading to altered prostacyclin and nitric oxide production and eventual endothelial proliferation and intimal hyperplasia, as well as provoking vascular inflammation. These effects find clinical expression in increased hypertension and cardiovascular risk in tobacco smokers.(28)

Data suggest that use of so-called “e-cigarettes” is associated with similar adverse effects on blood pressure and cardiovascular risk, although BP elevation is reportedly quantitatively lower with exposure to nicotine through these devices compared to traditional smoking techniques.(29) Adverse effects of tobacco smoke on hypertension

have been shown in passive smokers, mandating a holistic approach to avoidance.(30)

STRESS REDUCTION

In addition to traditional cardiovascular risk behaviours such as smoking and alcohol use, psychosocial factors may also influence BP control. An association between psychosocial distress and hypertension has long been posited, and growing observational data support chronic psychosocial stress as a risk factor for hypertension.(31) While relaxation techniques have been shown to improve BP control in some studies,(32) evidence for these interventions is limited, with effect size smaller than that reported for other lifestyle interventions.(11) In general, evidence for transcendental meditation in lowering BP is stronger than that for breathing techniques or for yoga practices.(11)

DIETARY MODIFICATION

Salt-sensitive hypertension (SSH) accounts for about half of all cases of hypertension. Black Africans, diabetics, obese and older patients, and those living with chronic kidney disease (CKD) have a higher prevalence of SSH.(33) Salt sensitivity is believed to reflect either defective renal regulation of intravascular volume (the “renal dysfunction theory”) or disordered regulation of vascular tone (the “vasodysfunction theory”).(34) The renal dysfunction theory posits that SSH arises from a failure of pressure natriuresis to compensate for salt loading; inherited or acquired Rac1-mediated upregulation of distal nephron sodium channel expression, reduced nephron endowment, acquired chronic kidney disease, and tubular interstitial inflammation may account for this defective natriuresis.(34) In contrast, the vasodysfunction theory suggests that SSH occurs due to defective vasodilatation in response to sodium loading, possibly due to deficient production of nitric oxide by the endothelium, abnormalities in guanylate cyclase signalling in the vascular smooth muscle, and disordered functioning of the SNS, RAAS, and endothelin-1 paracrine systems.(34)

Dietary salt restriction is a major intervention to address salt sensitivity. Reducing sodium intake to 1.5–2.3g per day has been shown to lower systolic BP by 6–8 mmHg.(35) Salt is consumed in excess in most countries; the global salt intake averages more than 10g per day.(36) Dietary salt is recognised as a global health risk; in 2013, all WHO member states committed to achieving a 30% reduction in salt intake by 2025, although as of 2023, no member state was on track to meet this goal.(36)

Substitution with potassium salts provides a means to reduce sodium intake. In addition, potassium supplementation appears to inhibit the thiazide-sensitive sodium-chloride cotransporter in the distal convoluted tubule by activating the potassium-secreting renal outer medullary K⁺ (ROMK) channel in the collecting duct, potentially correcting the defective pressure natriuresis in SSH.(34) Potassium supplementation also appears to reduce

inhibition of nitric oxide synthesis in SSH, correcting vasodysfunction.(34) Prescription of potassium supplementation or recommendation of a potassium-rich diet targeting a daily intake of 3.5 – 5g has demonstrated a mean systolic BP reduction of 6mmHg in hypertensive patients. (7) Care should, however, be taken in recommending such approaches in patients living with CKD, because of the risk of precipitating life-threatening hyperkalaemia.(37)

Sodium restriction and potassium supplementation are cornerstones of the Dietary Approaches to Stop Hypertension (DASH) diet, along with a reduction in dietary saturated fat. The DASH diet is a heart-healthy diet emphasising the consumption of fruits, vegetables, whole grains, lean proteins, and low-fat dairy products. Adoption of the DASH diet has been reported to reduce systolic BP by 5– 8 mmHg in hypertensives.(7) The diet is particularly effective in patients of Black African ethnicity.(38) The DASH-Sodium Trial has additionally shown benefit for the diet in reducing high-sensitivity cardiac troponin I and C-reactive protein, markers of subclinical cardiac injury.(39) A practical approach to implementing the DASH diet in the individual patient should consider early referral to a dietitian to individualise caloric requirements, weight goals, and planning of sustainable and affordable meals.(40)

CONCLUSIONS

Given the high burden of uncontrolled hypertension in South Africa and other low- and middle-income countries, integrating structured lifestyle interventions into routine primary care represents an important opportunity to improve cardiovascular outcomes cost-effectively. Non-pharmacological interventions are scalable strategies that can be readily integrated into standard care. Sustainable implementation will require multidisciplinary support, patient education, culturally appropriate dietary guidance, and alignment with public health policy

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