

# Prevention of hypertension

## Treatment strategies Lifestyle changes

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Appropriate lifestyle changes are the cornerstone for the prevention of hypertension. They are also important for its treatment, although they should never delay the initiation of drug therapy in patients at a high level of risk. Clinical studies show that the BP-lowering effects of targeted lifestyle modifications can be equivalent to drug monotherapy,<sup>337</sup> although the major drawback is the low level of adherence over time—which requires special action to be overcome. Appropriate lifestyle changes may safely and effectively delay or prevent hypertension in non-hypertensive subjects, delay or prevent medical therapy in grade I hypertensive patients and contribute to BP reduction in hypertensive individuals already on medical therapy, allowing reduction of the number and doses of antihypertensive agents.<sup>338</sup> Beside the BP-lowering effect, lifestyle changes contribute to the control of other CV risk factors and clinical conditions.<sup>50</sup> The recommended lifestyle measures that have been shown to be capable of reducing BP are: (i) salt restriction, (ii) moderation of alcohol consumption, (iii) high consumption of vegetables

and fruits and low-fat and other types of diet, (iv) weight reduction and maintenance and (v) regular physical exercise. 339 In addition, insistence on cessation of smoking is mandatory in order to improve CV risk, and because cigarette smoking has an acute pressor effect that may raise daytime ambulatory BP. 340 – 342

### **Salt restriction**

There is evidence for a causal relationship between salt intake and BP and excessive salt consumption may contribute to resistant hypertension. Mechanisms linking salt intake and BP elevation include an increase in extracellular volume—but also in peripheral vascular resistance, due in part to sympathetic activation.<sup>343</sup> The usual salt intake is between 9 and 12 g/day in many countries and it has been shown that reduction to about 5 g/day has a modest (1–2 mmHg) SBP-lowering effect in normotensive individuals and a somewhat more pronounced effect (4–5 mmHg) in hypertensive individuals. 339,<sup>344</sup>,<sup>345</sup> A daily intake of 5–6 g of salt is thus recommended for the general population. The effect of sodium restriction is greater in black people, older people and in individuals with diabetes, metabolic syndrome or CKD, and salt restriction may reduce the number and doses of antihypertensive drugs.<sup>345</sup>,<sup>346</sup> The effect of reduced dietary salt on CVD events remains unclear,<sup>347</sup> – 350 although the

long-term follow-up of the Trials of Hypertension Prevention (TOHP) trial showed a reduced salt intake to be associated with lower risk of CV events.<sup>351</sup> Overall there is no evidence that reducing sodium from high- to moderate intakes causes harm.<sup>352</sup> At the individual level, effective salt reduction is by no means easy to achieve. Advice should be given to avoid added salt and high-salt food. A reduction in population-wide salt intake remains a public health priority but requires a combined effort by the food industry, governments and the public in general, since 80% of salt consumption involves 'hidden salt'. It has been calculated that salt reduction in the manufacturing processes of bread, processed meat and cheese, margarine and cereals will result in an increase in quality-adjusted life-years.<sup>353</sup>

### **Moderation of alcohol consumption**

The relationship between alcohol consumption, BP levels and the prevalence of hypertension is linear. Regular alcohol use raises BP in treated hypertensive subjects.<sup>354</sup> While moderate consumption may do no harm, the move from moderate to excessive drinking is associated both with raised BP and with an increased risk of stroke. The Prevention And Treatment of Hypertension Study (PATHS) investigated the effects of alcohol reduction on BP. The intervention group had a 1.2/0.7 mmHg greater reduction in BP than the control group at the end of

the 6-month period.<sup>355</sup> No studies have been designed to assess the impact of alcohol reduction on CV endpoints. Hypertensive men who drink alcohol should be advised to limit their consumption to no more than 20–30 g, and hypertensive women to no more than 10–20 g, of ethanol per day. Total alcohol consumption should not exceed 140 g per week for men and 80 g per week for women.

### **Other dietary changes**

Hypertensive patients should be advised to eat vegetables, low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources, reduced in saturated fat and cholesterol. Fresh fruits are also recommended—although with caution in overweight patients because their sometimes high carbohydrate content may promote weight gain.<sup>339,356</sup> The Mediterranean type of diet, especially, has attracted interest in recent years. A number of studies and meta-analyses have reported on the CV protective effect of the Mediterranean diet.<sup>357,358</sup> Patients with hypertension should be advised to eat fish at least twice a week and 300–400 g/day of fruit and vegetables. Soy milk appeared to lower BP when compared with skimmed cows' milk.<sup>359</sup> Diet adjustment should be accompanied by other lifestyle changes. In patients with elevated BP, compared with the Dietary Approaches to Stop Hypertension (DASH) diet alone, the

combination of the DASH diet with exercise and weight loss resulted in greater reductions in BP and LVM.<sup>360</sup> With regard to coffee consumption, a recent systematic review found that most of the available studies (10 RCTs and 5 cohort studies) were of insufficient quality to allow a firm recommendation to be given for or against coffee consumption as related to hypertension.<sup>361</sup>

### **Weight reduction**

Hypertension is closely correlated with excess body weight,<sup>362</sup> and weight reduction is followed by a decrease in BP. In a meta-analysis, the mean SBP and DBP reductions associated with an average weight loss of 5.1 kg were 4.4 and 3.6 mmHg, respectively.<sup>363</sup> Weight reduction is recommended in overweight and obese hypertensive patients for control of risk factors, but weight stabilisation may be a reasonable target for many of them. In patients with established CVD manifestations, observational data indicate a worse prognosis following weight loss. This seems to be true also in the elderly. Maintenance of a healthy body weight (BMI of about 25 kg/m<sup>2</sup>) and waist circumference (102 cm for men and 88 cm for women) is recommended for non-hypertensive individuals to prevent hypertension and for hypertensive patients to reduce BP. It is noteworthy, however, that the optimal BMI is unclear, based on two large meta-analyses of prospective

observational population-based outcome studies. The Prospective Studies Collaboration concluded that mortality was lowest at a BMI of about 22.5–25 kg/m<sup>2</sup>,<sup>364</sup> whereas a more recent meta-analysis concluded that mortality was lowest in overweight subjects.<sup>365</sup> Weight loss can also improve the efficacy of antihypertensive medications and the CV risk profile. Weight loss should employ a multidisciplinary approach that includes dietary advice and regular exercise. Weight-loss programmes are not so successful and influences on BP may be overestimated. Furthermore, short-term results are often not maintained in the long term. In a systematic review of diabetic patients,<sup>366</sup> the mean weight loss after 1–5 years was 1.7 kg. In ‘pre-diabetic’ patients, combined dietary and physical activity interventions gave a 2.8 kg extra weight reduction after 1 year and a further 2.6 kg reduction after 2 years: while not impressive, this is sufficient to have a protective effect against the incidence of diabetes.<sup>367</sup> In established type 2 diabetes mellitus (DM), intentional weight loss—according to the Action for Health in Diabetes (AHEAD) study—did not reduce CV events, so that a general control of risk factors is probably more important than weight loss per se. Weight loss can also be promoted by anti-obesity drugs, such as orlistat and, to a greater degree, by bariatric surgery, which appears to decrease CV risk in severely obese patients.

368 Details are available in a recent document by the ESH and the European Association for the Study of Obesity.<sup>368</sup>

### **Regular physical exercise**

Epidemiological studies suggest that regular aerobic physical activity may be beneficial for both prevention and treatment of hypertension and to lower CV risk and mortality. A meta-analysis of randomized controlled trials has shown that aerobic endurance training reduces resting SBP and DBP by 3.0/2.4 mmHg overall and even by 6.9/4.9 mmHg in hypertensive participants.<sup>369</sup> Even regular physical activity of lower intensity and duration has been shown to be associated with about a 20% decrease in mortality in cohort studies,<sup>370,371</sup> and this is also the case for measured physical fitness.<sup>372</sup> Hypertensive patients should be advised to participate in at least 30 min of moderate-intensity dynamic aerobic exercise (walking, jogging, cycling or swimming) on 5–7 days per week.<sup>373</sup> Aerobic interval training has also been shown to reduce BP.<sup>374</sup> The impact on BP values of other forms of exercise, such as isometric resistance training (muscular force development without movement) and dynamic resistance exercise (force development associated with movement) has been reviewed recently.<sup>375,376</sup> Dynamic resistance training was followed by significant BP reduction, as well as improvements in other metabolic parameters, and

performance of resistance exercises on 2–3 days per week can be advised. Isometric exercises are not recommended, since data from only a few studies are available.

### **Smoking cessation**

Smoking is a major risk factor for atherosclerotic CVD. Although the rate of smoking is declining in most European countries (in which a legalized smoking ban is effective) it is still common in many regions and age groups, partly due to education-related inequalities in cessation of smoking.<sup>377</sup> There is evidence also on the ill-health effects of passive smoking.<sup>378</sup> Smoking causes an acute increase in BP and heart rate, persisting for more than 15 minutes after smoking one cigarette,<sup>340</sup> as a consequence of stimulation of the sympathetic nervous system at the central level and at the nerve endings.<sup>379</sup> A parallel change in plasma catecholamines and BP, plus an impairment of the baroreflex, have been described that are related to smoking.<sup>379 – 381</sup> Studies using ABPM have shown that both normotensive and untreated hypertensive smokers present higher daily BP values than non-smokers.<sup>341,342,382</sup> No chronic effect of smoking has been reported for office BP, <sup>383</sup> which is not lowered by giving up smoking. Beside the impact on BP values, smoking is a powerful CV risk factor and quitting smoking is probably the single most effective lifestyle measure for the prevention of



CVDs including stroke, myocardial infarction and peripheral vascular disease.<sup>384 – 386</sup> Therefore tobacco use status should be established at each patient visit and hypertensive smokers should be counselled regarding giving up smoking. Even in motivated patients, programmes to stop smoking are successful (at 1 year) in only 20–30%.

<sup>387</sup>Where necessary, smoking cessation medications, such as nicotine replacement therapy, bupropion, or varenicline, should be considered. A meta-analysis of 36 trials comparing long-term cessation rates using bupropion vs. control yielded a relative success rate of 1.69 (1.53–1.85),<sup>388</sup> whereas evidence of any additional effect of adding bupropion to nicotine replacement therapy was inadequate.<sup>389</sup> The partial nicotine-receptor agonist varenicline has shown a modest benefit over nicotine replacement therapy and bupropion,<sup>388</sup> but the U.S. Food & Drug Administration (FDA) has recently issued a warning regarding the safety profile of varenicline (<http://www.fda.gov/Drugs/DrugSafety/ucm330367.htm>). Although these drugs have been shown to be effective in clinical trials, they are underused due to adverse effects, contra-indications, low acceptance, high cost and lack of reimbursement in many countries. Relapse prevention is a cornerstone in fighting nicotine addiction but the field is inadequately studied and existing evidence is disappointing.<sup>388</sup> There is insufficient

evidence to support the use of any specific behavioural intervention; some positive results can be expected from interventions focussing on identifying and resolving temptation situations, as well as from strategies steering patients towards changes in behaviours, such as motivational interviews. Extended treatment with varenicline may prevent relapse but studies of extended treatment with nicotine replacement are not available.<sup>390</sup> 5.1.7

### **Summary of recommendations**

Adoption of lifestyle changes The following lifestyle change measures are recommended in all patients with hypertension to reduce BP and/or the number of CV risk factors