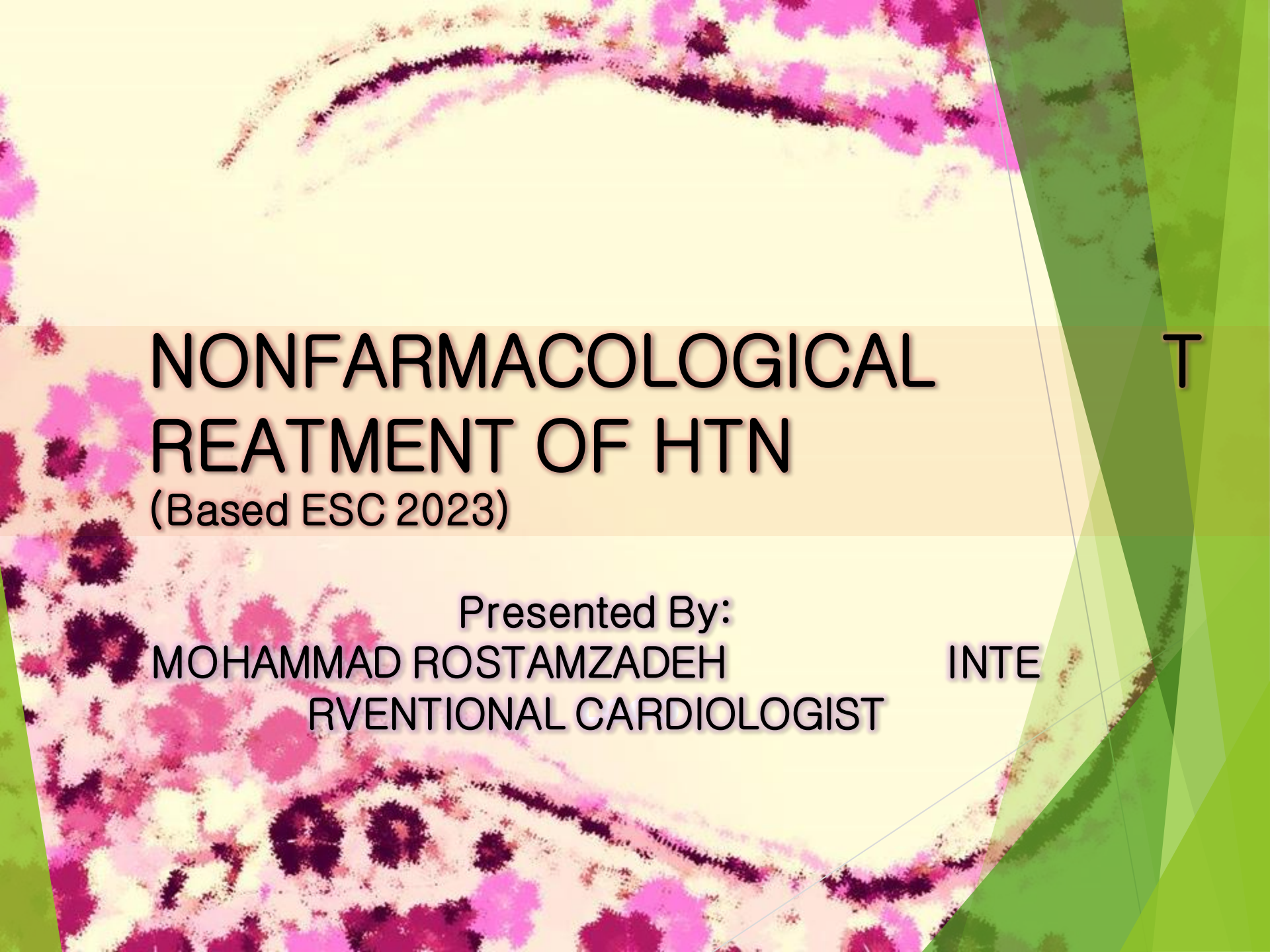


***IN THE NAME OF GOD***





# NONFARMACOLOGICAL REATMENT OF HTN

(Based ESC 2023)

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- clinical studies show that the BP-lowering effects of targeted lifestyle modifications can be **equivalent to drug monotherapy**
- 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
  - **contribute to BP reduction**, allowing reduction of number and doses of antihypertensive agents
- **major drawback** is the **low level of adherence over time** —**which** requires special action to be overcome

- heart-healthy lifestyle  
reduce the elevated BP values and  
lower the associated increase of CV risk
- healthy lifestyle measures can augment  
the BP-lowering effect of  
pharmacological interventions and  
reduce the number of drugs



- all lifestyle interventions seem to have heart-healthy benefits that may go beyond the benefits associated with their effect on BP.
- The most important and well-established effective lifestyle interventions

losing weight, the DASH diet, salt reduction, augmentation of potassium intake, engaging in regular physical activity and structured exercise and a moderation of alcohol consumption

In addition, smoking cessation and other nonpharmacological interventions (e.g. dietary components like polyphenols, coffee and tea, or stress-reducing therapies) have been reported to lower BP, but the extent and/or quality of the supporting clinical trial experience is less robust and persuasive.

- Main problem : low persistence of the prescribed measures
- This is in part the result of the difficulty of permanently adhering to lifestyles that may interfere with working or home habits and needs.  
Some lifestyle measures also have a cost,
- After prescribing physicians should establish a FU program allows to check whether there is adherence to the prescribed measures and whether the therapeutic goal is achieved.

# Weight reduction

- Being overweight or obese has been **directly associated** with hypertension , weight-loss interventions are well-established strategies to lower BP.
- **low-caloric diet** : reductions of 6.5mmHg for SBP and 4.6mmHg for DBP
- In patients with hypertension, **low-caloric diet** was **ranked first** among all lifestyle interventions in lowering SBP and DBP

- meta-analysis of RCTs :
- for each kilogram of body weight loss, both SBP and DBP were reduced by approximately 1mmHg. Additionally, attenuation of pressogenic factors such as sympathetic activation and a 15% lower all-cause mortality irrespective of age [369].
- Modest weight loss, a key recommendation and should ideally be achieved through a combination of a low caloric diet and exercise

This often challenging, although feasible, over prolonged periods of FU

- A rather frequent phenomenon is weight cycling (sequential losses and regains of body weight), which adversely affect BP, CV risk and the metabolic profile.



- who do not meet their weight loss goals with nonpharmacological interventions, pharmacotherapy could be considered, although evidence on the effectiveness of weight-loss medicines on BP is scant, based on a small number of studies, and these drugs are often associated with unwanted side effects
- The GLP-1 receptor agonists reduce body weight and concomitantly lower BP by a few mmHg, a favourable therapeutic effect in patients with diabetes and obesity

- Alternatively, **bariatric surgery** is an effective longer lasting strategy for **morbidly obese** patients to manage BP and CV risk factors and might be considered in case of failure of all of the above measures, particularly in patients with **severe obesity**.
- predictors of greater weight loss success: **greater initial weight loss** and **higher adherence to lifestyle advice**
- The type of weight loss programme should always be **individually tailored**, taking into account setting of **realistic goals**, **tailor-made dietary and exercise regimes** and **frequent FU to motivate** and address challenges in behavior change

## Restriction of sodium intake

- There is **strong evidence** for an association between **high sodium consumption** and increased BP
- the relation between **sodium-restricted diets** and **improved BP control** has been widely recognized by randomized trials and confirmed by meta-analyses.

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- Greater BP reductions have been observed in hypertensive patients and other patient categories (nonwhite people, older populations, patients with diabetes, metabolic syndrome or CKD)
- restriction of sodium intake : lower BP in patients with resistant hypertension and to reduce the number of drugs.

- A recent network meta-analysis **restricting sodium intake to <100 mmol (5.8 g salt per day)** resulting an average of approximately **5/2mmHg SBP/DBP** reduction in patients with hypertension.
- meta-analysis of RCTs examining sodium intake reduction to **as low as 800 mg/day** showed a **linear decrease in BP**
- reduction in dietary sodium intake from about 3.6 g/day to about 2.7 g/day has been found to be associated with an **approximately 18–26% reduction in CV disease**



unlimited sodium restriction is still a matter of debate, observational studies showing that **below a sodium intake of approximately 3.5 g/day** further BP reduction is associated with an **increased mortality** in both hypertensive patients and the general population **no side effects** have been reported by epidemiological studies in very low-salt diet populations a lack of proper long-term randomized trials on the effects of various degrees of sodium restriction on outcomes represents the most important limitation for this medical area. In the studies in which the relationship between dietary sodium and CV outcomes exhibited a **J-shaped curve**, sodium intake was assessed by sodium excretion in **spot urine**, and this has been criticized as a measure **unable to reflect the more accurate 24 hr amount of urinary sodium excretion**,

- Larger, longer and more precisely controlled intervention studies are needed.
- Sodium is mainly consumed as salt, which in the diet comes from processed foods or is added to the food during cooking or at the table.
- For people with a long-established habit of high salt intake, it might be difficult to attain and maintain long-term voluntary salt control, and alternative approaches might be needed.

A salt substitute with low-sodium content and an acceptable salty flavor would be an ideal alternative.

- In a random-effects model, participants consuming **salt substitute** showed **significant SBP and DBP reductions** (4.8 and 1.5 mmHg, respectively) compared with participants consuming normal salt

Of the five studies with mortality outcome data, salt substitute also **significantly reduced all-cause mortality**

Daily diet modification by this nonpharmacological management may, thus, **improve BP control**.

## Recommendations:1

- In adults with hypertension consuming a high sodium diet (most Europeans), salt substitutes replacing part of the NaCl with KCl is recommended to reduce BP and the risk for CVD.
- Dietary salt (NaCl) restriction is recommended for adults with elevated BP to reduce BP. Salt (NaCl) restriction to **< 5 g (~2g sodium)** per day is recommended.

## Augmentation of dietary potassium intake

- **Dietary potassium is associated with BP and hypertension ,**
  - **a U-shape relation** adequate intake of potassium is desirable to achieve a lower BP level but that an **excessive potassium intake should be avoided**
- Potassium supplementations (especially with intakes of **75–125** mmol per day) have been effective in lowering BP , especially in adults with **hypertension** , consuming an **excess of sodium** and **Black** people.







# DASH DIET



*for beginners*



**Lower Blood Pressure,  
Reduce Cholesterol and  
Manage Diabetes Naturally**



**NATHALIE SEATON**

The large recent randomized controlled Salt Substitution and Stroke Study (SSaSS) trial reported that **increasing potassium intake** as a sodium substitute, i.e. replacing **25% sodium chloride with potassium chloride** in salt, reduces the **risk of stroke**, disease and death in patients with increased **CV risk**

A recent meta-analysis :  
goal of potassium intake recently set : 90 mmol per day (3500 mg/day).

In most trials, potassium supplementation was achieved by administration of potassium chloride pills, but the BP response pattern was similar when dietary modifications were used .

Because potassium-rich diets tend to be heart-healthy, they are preferred over the use of pills for potassium supplementation.

Good sources of dietary potassium :

fruits and vegetables, as well as low-fat dairy products, selected fish and meats, nuts and soy products.

Four to five servings of fruits and vegetables will usually provide 1500 to >3000 mg of potassium.

This can be achieved by a diet, such as the DASH diet , that is high in potassium content.

Increase levels of daily physical activity and regular exercise

- The **acute pressor effect of dynamic and isometric** exercise does **not contraindicate** regular exercise on a **chronic basis**.
- Large epidemiological studies, which allowed for age and other confounding factors, have yielded consistent evidence of an **inverse relation between the incidence of hypertension and habitual levels of physical activity**,
- recommended **minimum** physical activity level of **150 min per week**), the risk of developing hypertension was found to **fall by 6%**



exercise



- Type of exercise: BP-lowering effect of structured exercise has been repeatedly demonstrated in RCTs especially when focused on **dynamic aerobic exercise** but also, though to a **lesser extent, following dynamic resistance training and static isometric exercise.**
- The BP reductions have been documented irrespective of age , sex or ethnicity

The average SBP reductions with aerobic exercise are approximately 2–4 and 5–8mmHg in adult patients with normotension and hypertension, respectively .

- Regarding the exercise intensity: moderate intensity aerobic exercise (40–60% heart rate reserve) is recommended to prevent and treat hypertension ,
- Although many hypertensive patients present with diverse comorbidities, are older or limited in the level of physical activity they can undertake. In this context, it is of note that a Cochrane meta-analysis including 73 trials found moderate-certainty evidence that walking already results in meaningful BP reductions.
- In patients with hypertension, a daily bout of exercise is preferred, to minimize the problem of postexercise hypotension

- Finally, a physically active lifestyle and regular exercise have positive effects on many other adverse health outcomes and CV risk factors at all ages and sexes, and across all BP categories.
- BP reductions and cardiometabolic benefits have also been reported with low intensity physical activity (6min hourly) in highly sedentary people

## RECOMMENDATION:1

Daily physical activity and structured exercise is recommended for adults with elevated BP to reduce BP and improve cardiovascular risk profile.

It is recommended to strive for at least 150–300 minutes of aerobic exercise a week of moderate intensity, or 75–150 minutes a week of aerobic exercise of vigorous intensity or an equivalent combination.

Sedentary time should also be reduced and supplemented with dynamic resistance exercise (2–3 times per week).



## Moderation of alcohol intake

Large-scale observational studies report a strong positive **linear association between alcohol consumption and BP** .

Data from epidemiological studies on alcohol consumption largely **rely on self-reported alcohol intake of participating people** as defined by drinks per day.

**Sex differences** in the metabolism of alcohol recommended upper limits for daily pure alcohol intake with **higher limits for men than for women**.

- This contrasts with the fact that the global attributable impact of alcohol intake to mortality is **more than four-fold higher in men than in women** , thus **putting in question** the recommendation of higher values in men.
- Previous observational data suggested a decrease in CVD, particularly CAD, with **light drinking compared with abstainers** .

However, this potential cardioprotective effect of low-to-moderate alcohol intake on CAD seems largely because of a **healthier life style in these individuals**, and the **effect is attenuated after full adjustment for the confounding factors**

Indeed, recent epidemiological and genetic Mendelian randomization studies indicated a continuous nonlinear **positive relationship between alcohol intake and BP**. The risk for hypertension increases in **both** men and women, if daily alcohol intake is at least **one to two** drinks (at least 10–20 g alcohol) per day

alcohol reduction **close to abstinence** was associated with a 3.3/2.0mmHg SBP/DBP reduction . The benefit seems to be consistent across trials but confined to people **consuming 3 drinks/day (equivalent to about 42g alcohol intake/day according to the definition in this report)**.

A dose-dependent effect was observed particularly in heavy drinkers, 6 drinks/day at baseline and reduce their alcohol intake by about 50% experiencing an SBP/DBP reduction of approximately 5.5/4.0mmHg

Additionally, both trial data and observational literature support the hypertensiogenic effect of binge drinking

In this regard, it is important to mention that together with hypertension, excessive alcohol intake is the most important risk factor for intracranial hemorrhage .

Consequently, excessive (binge) drinking should be avoided

- Unfortunately, recommendations among different guidelines vary regarding the upper limits and the definition of drinks and the recommendations of sex-specific upper limits for alcohol intake appear questionable.
- Nevertheless, moderation of alcohol intake and implementation of alcohol-free days during the week in people who consume drinks that contain alcohol are generally recommended to improve BP control and overall health.

## RECOMMENDATION:1

Adult men and women with elevated BP or hypertension who currently consume alcohol ( $\geq 3$  drinks/day) should be advised that reduction of alcohol intake close to **abstinence** will lower their BP.<sup>1</sup>

Alcohol should not be recommended for CVD prevention, as previous studies linking moderate consumption to lower CV risk are likely confounded.

### III B

It is recommended to avoid excessive (binge) drinking to reduce BP, and the risks particularly for haemorrhagic stroke and premature death.

### III

## Smoking cessation

- Tobacco smoking is the **single largest preventable cause of death** and is known to significantly increase the risk of CVD
- Compared with nonsmokers, smokers more frequently present with **Masked HTN**, documented by normal office and higher daytime ambulatory BP values .
- because smoking a cigarette is accompanied by a **sympathetic nervous system activation** and a prolonged BP increase (about 30min) ], the ups and downs of BP also increase daytime **BP variability**
- In addition, smoking may **impair the BP-lowering effect of some antihypertensive drugs, i.e. BBs**

- Attention should also be given to **passive exposure** to smoking, which has been associated with the risk of CVD and a 24 h BP elevation
- **Brief advice from a physician** may already be advantageous when time is limited
- **combining behavioral support with pharmacotherapy** increases the chance of success compared with brief advice alone



In recent decades, **water pipe smoking** rapidly growing alternative to traditional tobacco smoking within the global tobacco epidemic. Similarly, the few available studies showed **no clear difference** in the CV disease incidence between water pipe smoking and traditional tobacco smokers

**Likewise, e-cigarettes** [439] originally marketed as potential aids in smoking cessation, have attracted a lot of consumers, including both smokers and nonsmokers. Recent meta-analyses now highlight that these 'so-called safer' alternatives acutely **increase BP**, **heart rate** and may also be associated with **increased risk of CV disease**

Health professionals should, therefore, **be cautious in recommending the use of e-cigarettes** to their patients and the general public.

## Other dietary interventions

The **most well established** dietary interventions for the reduction in BP are the **DASH diet** and the **Mediterranean diet** ,

DASH eating plan offering the **best demonstration of BP-lowering effectiveness**

The DASH diet promotes the consumption of **whole grains , fruits, vegetables and low-fat dairy products.**

It provides a means to enhance intake of **potassium, calcium, magnesium and fiber .**

# ST DIETS

## At-A-Glance



**Mediterranean**



**DASH**



**Flexitarian**

	<p>Seafood, veggies, fruits, beans, seeds, whole grains</p> <p>Healthy fats: olive oil, nuts, avocados</p> <p>Olive oil is a staple.</p>	<p>Fruits, veggies, whole grains, lean protein, low-fat dairy</p> <p>Food must have 5% or less daily value of sodium per serving</p>	<p>Non-meat proteins: beans, peas, eggs</p> <p>Fruits and veggies</p> <p>Whole grains</p> <p>Dairy</p>
	<p>Processed foods (including meats), saturated fats, foods with added sugar</p> <p>White bread, pasta, potatoes</p>	<p>Fatty meats, full-fat dairy, sweets, excess sodium</p> <p>Saturated fats</p>	<p>Focus on decreasing (not prohibiting) meat consumption</p>
n	<p>Dairy, poultry and eggs, red meat "very rarely"</p>	<p>Sodium – no more than 2,300 mg (one teaspoon) a day, and eventually, just 1,500 mg a day</p>	<p>Meat products</p>
	<p>Benefits heart health</p>	<p>Reduces high blood pressure</p>	<p>One of the best diets for diabetes</p> <p>Flexitarians tend to weigh less than full-fledged meat eaters*</p>
	<p>Weight gain is possible if you don't watch your portions</p>	<p>Food may taste bland - try seasoning with herbs and spices instead of salt</p>	<p>Challenging for meat lovers</p>

- High-quality evidence confirms that the DASH diet results in a **significant reduction in SBP and DBP** diet is associated with a lower risk of **all-cause and , cause-specific mortality** .
- Other diets including **vegetarian, Paleolithic, low-carbohydrate, low glycemic index, high-protein and low-fat diets** have also been shown to reduce BP, though **results are inconsistent and the quality of evidence low** .

Coffee has been reported to have a modest short-lasting pressor effect but recent data appear to indicate that its moderate regular consumption not adversely affect BP and the CV system [451], including the absence of an effect of acute coffee consumption on premature atrial contractions (PAC)

Results from four observational and one quasi-experimental studies have shown that, depending on individual's CYP1A2 genetic profile, a high caffeine intake may actually protect nonsmokers but not smokers from hypertension

# Improve stress management

Stress and anxiety are associated with an increased risk of hypertension and CV events

Patients with mental distress may develop a **sudden increase in BP**, which may normalize when the distress is relieved. Growing evidence also links the **exposure to intensely traumatic life events** with an increased risk of hypertension.

Recent meta-analyses report promising results for the ability of mind-body stress reducing interventions to not only reduce stress and mood swings but also SBP and DBP, although the **quality of the evidence is low**.

**Meditation** [460,461] and **breathing control** through e.g. yoga are considered to be among the **better** stress-reduction interventions for lowering BP [367], though their effect sizes are **smaller** compared with the main lifestyle interventions.

Recommendation:

Reduced stress via controlled breathing exercises, mindfulness-based exercise and meditation may be considered.

**II C**

# Exposure to noise and air pollution

- two major risk factors that exert a **negative impact on CV health, particularly in urbanized** settings.

Both factors are environmental stressors that have been Identified as **risk factors for increases in BP** incident hypertension and also **HMOD**, including **vascular stiffness** .

- Air pollution is a complex mixture of gaseous and particulate matter components, noise exposure is largely due to traffic noise.
- leading eventually to **vascular inflammation and endothelial dysfunction** that mediate the BP increasing effects



- reducing traffic noise and air pollution  
improving BP control and CV health.
- can reduce exposure to air pollution by modifying the location, timing and type of outdoor activities and may also try to reduce indoor exposure to noise and air pollution.

Thank  
you!



## Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension

	Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Calorie reduction & physical activity	Best goal is ideal body weight. Expect about 1 mm Hg for every 1-kg reduction in weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH diet	Diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced saturated and total fat.	-11 mm Hg	-3 mm Hg
Dietary sodium	Reduced intake	Optimal goal <1500 mg/d, but at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
Dietary potassium	Enhanced intake through diet	3500–5000 mg/d, preferably by diet rich in potassium.	-4/5 mm Hg	-2 mm Hg
Physical activity	Aerobic	● 90–150 min/wk (65%–75% heart rate reserve)	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	● 90–150 min/wk (50%–80% 1 rep maximum) ● 6 exercises, 3 sets/exercise, 10 repetitions/set	-4 mm Hg	-2 mm Hg
	Isometric resistance	● 4 × 2 min (hand grip), 1 min between exercises, 30%–40% max. voluntary contraction, 3 sessions/wk (8–10 wk)	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol to: ● Men: ≤2 drinks daily ● Women: ≤1 drink daily	-4 mm Hg	-3 mm Hg