Non-pharmacological treatment of hypertension in women
Francesco Vittorio Costa

This paper reviews literature data about non-pharmacological treatment of hypertension in women. A reduction in salt intake, an increase in physical activity and body weight reduction have been clearly demonstrated to be effective in reducing blood pressure values in women. Other lifestyle changes have been investigated in past years, but the results are still debated.

A 4–8% body weight reduction causes an average 3 mmHg blood pressure decrease. However, many women tend to regain the weight (weight cycling), and in this case an increase of blood pressure can be observed. Older women are less responsive to low-calorie diets. Sodium restriction is effective in a dose-dependent way. The main problem is that good compliance is difficult to obtain. Salt substitutes may be helpful. Regular physical activity can reduce blood pressure by at least 5/3 mmHg, while walking for less than 2 h per week can reduce the risk of stroke by 50%. Data on coffee drinking are less conclusive even if there is evidence that the effect on blood pressure is greater at increasing levels of blood pressure. The reduction of alcohol intake, an increase in fibers and an increase in unsaturated fatty acids are well known tools to improve blood pressure control. Within unsaturated fatty acids, olive oil seems to be particularly helpful since it is able to produce significant blood pressure reductions, which are greater than those observed with sunflower oil.

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Introduction

Many studies have underlined the relationship existing between factors such as physical activity, body weight, diet composition, coffee drinking, dietary fat, and high blood pressure. Similarly, there is a large body of experimental evidence showing that lifestyle changes can favorably affect blood pressure and reduce cardiovascular risk.

However, even if physicians are well aware that a correct lifestyle can be very helpful in controlling blood pressure, non-pharmacological measures, for several hard to fight reasons, are frequently not taken into account as a feasible and realistic tool to reduce blood pressure. Many physicians simply tell to their patients to lose weight, to reduce salt, or to stop smoking, without explaining how and without giving the patient a detailed plan that could allow him/her to reach the target. This is rarely sufficient for a correct non-pharmacological treatment.

Furthermore, antihypertensive drugs reduce rather than eliminate risk, and can cause adverse reactions, adverse events and unwanted biochemical changes. Since the final goal of treatment is not that of normalizing blood pressure, but that of reducing as much as possible the global cardiovascular risk of our patients, lifestyle changes can play a pivotal role in this strategy.

A recent report on 84,129 women participating in the Nurses Health Study [1] has shown that the incidence of major coronary events during a 14-year follow-up was inversely related to the presence of low-risk factors (low-risk subjects were women not smoking, with a normal body mass index, performing regular physical activity, drinking less than one-half of an alcoholic beverage per day, and eating a high-fiber, low-unsaturated fat, low-sugar diet). The relative risk for coronary events was 0.43 in women with low values of three risk factors, 0.34 in those with low values of four risk factors and 0.17 in those with low values of five risk factors. Thus, for risk prevention, multiple lifestyle changes should be the winning strategy.

In the present review, we focus on a few aspects of lifestyle changes for controlling hypertension, favoring those studies focused on women or in which data regarding females are available.

Lifestyle changes for reducing blood pressure and cardiovascular risk

The list of non-pharmacological measures able, or supposed to be able, to reduce blood pressure is quite long, but we will focus on a few that have sufficient experimental evidence (Table 1).
Table 1 Lifestyle changes to reduce blood pressure

<table>
<thead>
<tr>
<th>Strong evidence, highly effective</th>
<th>Weight reduction</th>
<th>Reduction in salt intake</th>
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<tr>
<td></td>
<td>Increase in olive oil consumption</td>
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**Weight reduction**

The prevalence of hypertension (systolic blood pressure > 140 mmHg and/or diastolic blood pressure > 90 mmHg) increases with body mass index (BMI).

In a cohort of about 1000 women followed for more than 20 years in Brisighella, a small town of our region, we found an increasing prevalence of hypertension with increasing BMI, the prevalence being particularly high after menopause. In fact, in obese women the prevalence is higher than 41%, while in women with normal BMI it is less than 25% (Fig. 1).

On the contrary, the effects on blood pressure of body weight reduction have been assessed by several studies. A meta-analysis of 11 studies showed that a 1-kg reduction in body weight causes a reduction of 1.6 mmHg in systolic blood pressure and of 1.3 mmHg in diastolic blood pressure [2].

Another meta-analysis of six randomized, controlled studies including 361 overweight hypertensives, treated only with a caloric-restricted diet versus a regular diet (excluding other lifestyle changes able to produce weight reduction in comparison with baseline values), showed that a weight loss in the range of 4-8% was associated with a decrease in blood pressure in the range of 3 mmHg for both systolic and diastolic blood pressure [3]. Three trials involving 363 patients assessing a weight-reducing diet versus antihypertensive drug treatment showed that drugs were more effective than diet alone but that patients treated with both drugs and diet needed less intensive drug therapy. A weight-loss program prescribed for 18 months is also able to reduce the incidence of hypertension during a 7-year follow-up [4]. In a group of middle-aged people (both males and females), the incidence of hypertension in people losing weight was 18.9% while in those not on a diet it was 40.5% (a reduction in incidence of 46.6%). This study showed also that a dietary sodium reduction was less effective in reducing the incidence of hypertension, from 32.9 to 22.4% (a reduction of 32%).

However, not all overweight women have similar blood pressure response to a low-calorie diet. In fact, they can be classified as caloric sensitive and caloric insensitive [5]. Caloric-sensitive women are younger than caloric-insensitive women (51 versus 61 years old) and the amount of weight lost can explain part of the difference in blood pressure reduction. Thus, a body weight reduction is harder to obtain in older women.

As for other lifestyle changes, compliance in the long-term is the main problem to solve. Most women who lose weight will subsequently regain it or even gain more. Many women

![Fig. 1](image-url)
have a history of repeated cycles of weight loss and regain. This phenomenon is known as ‘weight cycling’ and it has been shown that weight fluctuations could increase blood pressure in obese women [6]. The reason for this unwanted phenomenon seems to be a redistribution of fat from the gynoid to the android type. This phenomenon has not been found in a group of 4353 men enrolled in the Multiple Risk Factor Intervention Trial [7]. It should be remembered that abdominal obesity is more common in women than in men, reaching an average of 55.4% in Hispanic women (versus 21.4% in Hispanic men), and that it is associated with a twofold to threefold increased risk of hypertension [8].

Another point that should be remembered when prescribing a low-sodium diet in postmenopausal women is that weight loss can be accompanied by a decrease of bone mineral density [9]. Thus, calcium supplements, along with caloric restriction, should always be prescribed to these women.

**Reduction in salt intake**

As already stated, a restriction in dietary sodium intake can reduce the incidence of hypertension even if its efficacy seems to be less than that of weight loss [4].

Many randomized trials have been conducted in already hypertensive subjects in the past 30 years, and it has been observed that there is a dose-response correlation between the entity of dietary sodium intake reduction and blood pressure decrease.

A few years ago, it was shown that a low level of sodium intake was related to increased myocardial infarction in men [10], but an opposite trend was observed in women. More recently [11], a study in 875 older hypertensives, both men and women, showed that a reduction in salt intake by about 50 mmol/day was feasible and able to significantly reduce the event rate 30 months after stopping antihypertensive drugs (relative hazard ratio, 0.69).

The real problem with a low-salt diet is the great difficulty in obtaining good compliance. It has been shown that only 20% of hypertensives to whom a low-salt diet was prescribed was highly compliant, attaining the target urinary sodium excretion (< 75 mmol/daily) [12]. Since a reduction in salt intake is not easy to obtain, low-sodium salt substitutes can be helpful. A long-term controlled study in which a low-sodium, high-potassium, high-magnesium salt was used as a salt substitute showed that both systolic and diastolic blood pressure were significantly reduced by about 4 mmHg.

**Physical activity**

Observational studies have shown that people having a regular physical activity have blood pressure levels about 5 mmHg lower than inactive subjects. Beside the favorable effects of a regular physical activity, the parameters of an exercise program that would maximize blood pressure reduction are still a matter of debate, and the blood pressure decrease that will be obtained depends on many variables (frequency, intensity, duration and type of the exercise). A meta-analysis of 29 randomized, controlled trials of aerobic exercise training programs of 4 weeks or more including both men and women [13] has shown that exercise training reduced systolic blood pressure by 4.7 mmHg and diastolic blood pressure by 3.1 mmHg. It has also been observed that increasing exercise above 70% VO2 max or increasing the frequency to more than three sessions per week, does not have any additional effect on blood pressure reduction. Another meta-analysis including 10 studies specifically devoted to women has found a decrease of 2.3 mmHg for systolic and 1.2 mmHg for diastolic blood pressure [14].

In women, moderate physical activity can also have highly favorable effects on cardiovascular risk. A recent report [15] showed that, in a group of more than 70,000 women aged 40–65 years, free of cardiovascular events at the beginning of the study; increasing physical activity was inversely related with the frequency of stroke. The relative risk was reduced by about 50% for women with high levels of physical activity but a reduction of about 25% can be obtained with only 1.7 h of walking each week. Also, walking pace is important, the reduction of risk being maximal for those women walking at a brisk pace (> 2.9 m.p.h.).

In postmenopausal women, after 12 weeks of regular aerobic exercise, systolic blood pressure was reduced by 10–12 mmHg and diastolic blood pressure by 5–7 mmHg (sitting and standing). This significant effect on blood pressure was observed in absence of body weight, dietary intake and maximal aerobic capacity changes [16].

Along with its effects on blood pressure and risk of stroke, short-term aerobic exercise training is able to greatly increase insulin sensitivity in women [17].

**Other lifestyle changes**

**Coffee drinking**

For coffee drinking, data from the literature are rather conflicting and the effects of caffeine seem to depend on many variables like the daily dose, pre-existing blood pressure values and coffee drinking habits.

Elevations of blood pressure have been found 45–60 min after caffeine ingestion and response to caffeine was greater at increasing risk of hypertension. The ingestion of 250 mg caffeine in fact caused an increase of about 6/5 (systolic/diastolic) mmHg in normal subjects, of 8/7 mmHg in high-normal subjects and of 10/8.5 mmHg in hypertensive subjects [18]. A meta-analysis of 11 trials [19], showed that chronic coffee drinkers (5 cups/day on the average) have blood pressure values slightly higher than...
non-drinkers (2.4 mmHg systolic, 1.2 mmHg diastolic). However, definitive data of the effect of stopping coffee drinking on blood pressure levels are still lacking.

**Unsaturated fats**

The effects on blood pressure of changing from saturated to unsaturated fats have not been fully elucidated even if epidemiological data show that blood pressure increases along with the increase in total fat and saturated–unsaturated fat ratio.

There is also epidemiological evidence that the Mediterranean diet, rich in olive oil, is associated with lower serum lipids levels and lower blood pressure values. The effects on blood pressure of a olive oil enriched diet have been evaluated by a few studies but it has been shown that, in both normocholesterolemic and hypercholesterolemic hypertensives, olive oil causes a blood pressure reduction greater than that observed with sunflower oil supplements [20]. Another cross-over, randomized, 6-month study [21] confirmed this hypothesis, since extra-virgin olive oil, but not sunflower oil, significantly reduced systolic and diastolic blood pressure (about 7 and 6 mmHg, respectively) in already treated hypertensives. The reasons for the superiority of olive oil in reducing blood pressure are not easy to investigate, since in olive oil there is a mix of many chemical substances.

Olive oil is rich in monounsaturated fatty acids (MUFA), while other vegetal oils like sunflower oil are rich in polyunsaturated fatty acids (PUFA); thus it is possible that a diet rich in MUFA is more effective than one rich in PUFA in controlling high blood pressure. Olive oil is rich in oleic acid while sunflower oil is rich in linoleic acid, and this difference could be relevant. Possible, already demonstrated, mechanisms include an increase in tissue insulin sensitivity and a reduction of the vasoconstrictor thromboxane-2, but these effects are not peculiar to olive oil and can also be observed with PUFA. Thus, other mechanisms should be involved. While in sunflower oil antioxidant polyphenols are totally absent, extra-virgin olive oil is quite rich in these substances and thus olive oil could act through enhanced nitric oxide levels stimulated by polyphenols.

**Conclusions**

Lifestyle changes such as increase in physical activity, reduction of body weight and sodium intake, moderate coffee consumption and supplementation in olive oil can be very helpful in preventing hypertension, reducing blood pressure values and decreasing cardiovascular risk. However, poor compliance is very frequent and still represents the main obstacle to this kind of effective and money-saving therapeutic approach.

A recent study in which compliance of women to many lifestyle changes was evaluated [22] underlined that a good compliance (80%) was obtained only in the case of substitution of sugar with edulcorants, while all the other changes (reduction of total fats, of NaCl, increase in fibers, etc.) were associated with compliance levels usually below 10%.

The problem of compliance is quite complex and needs a strict cooperation between doctors and patients. The first who must become aware of this are physicians, who frequently find it much easier to prescribe a pill than to instruct the patient about how to successfully change their lifestyle.

**References**
