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REVIEW ARTICLE OPEN ACCESS

ANALYSIS OF FOUR NON-DRUG MEASURES IN THE TREATMENT OF ARTERIAL HYPERTENSION: A LITERATURE REVIEW

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ABSTRACT

Systemic arterial hypertension (SAH) can be conceptualized as a chronic degenerative disease of multifactorial nature, in most cases asymptomatic, that fundamentally compromises the balance of the vasodilator and vasoconstrictor systems that maintain the vasomotor tone, leading to a reduction in the lumen of the vessels and damage to the organs they irrigate. In practice, SAH is characterized by an increase in blood pressure levels above what is recommended for a given age group. The objective was to analyze four non-drug measures in the treatment of systemic arterial hypertension which are: dietary control, alcohol control, tobacco control, and physical exercise. This study was based on a bibliographic review in databases and considered systematic review, case report, clinical trial, and included publications in Portuguese and English. SAH is a highly prevalent disease with a high negative social impact. Early identification of hypertensive patients and effective treatment are of great clinical importance. Identification of possibly reversible causes is a fundamental part in the clinical management of these patients. It was concluded that nutritional therapy and lifestyle changes associated with pharmacological therapy can promote benefits in the reduction of systemic blood pressure. Thus, it is of utmost importance to stimulate and make the population aware of the need for adherence to pharmacological antihypertensive treatment along with non-drug therapy, thus contributing to the reduction of morbidity, mortality and health care costs.

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INTRODUCTION

Systemic arterial hypertension (SAH) is defined, by the Brazilian Hypertension Guidelines of 2020, as a multifactorial condition, which depends on genetic/epigenetic, environmental, and social factors, determined by persistent elevation of Blood Pressure (BP), ie, Systolic BP greater than or equal to 140 mmHg and/or diastolic BP greater than or equal to 90 mmHg, measured with the correct technique, on at least two different occasions, in the absence of antihypertensive medication, in which the benefits of treatment (non-drug and/or drug) outweigh the risks. It is advisable, when possible, to validate such measurements by assessing BP outside the office by means of ambulatory blood pressure monitoring (ABPM), residential blood pressure monitoring (RBPM), or self-measured blood pressure (SMBP). Risk factors for arterial hypertension include genetics, age(≥ 60 years), gender, ethnicity, overweight and obesity (BMI > 30 kg/m2), sodium intake, it is recommended that sodium intake be limited to approximately 2 g/day (equivalent to about 5 g salt per day) and potassium, sedentary lifestyle, alcoholism (intake of six or more doses of alcohol per day, equivalent to 30 g alcohol per day = 1 bottle of beer (5% alcohol, 600 mL) = 2 glasses of wine (12% alcohol, 250 mL); = 1 shot (42% alcohol, 60 mL) of spirits (whiskey, vodka, brandy), smoking, socioeconomic factors, obstructive sleep apnea (OSA), and others. In this work, we will address four non-drug measures in the treatment of SAH which are: dietary control, alcohol control, tobacco control, and physical exercise.

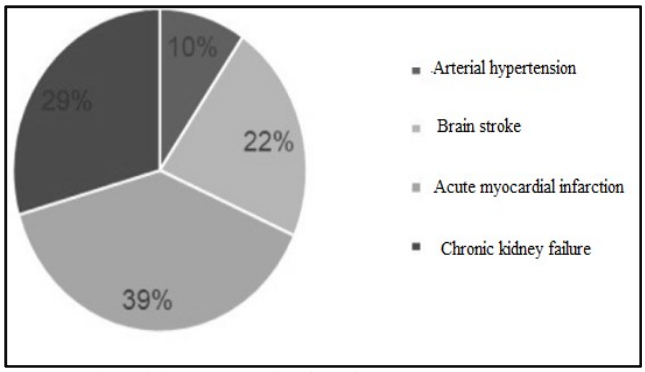
Epidemiology: In Brazil, considering the BP measurements and use of antihypertensive medication, the percentage of adults with BP greater than or equal to 140 by 90 mmHg reached 32.3% (95% CI 31.7- 33.0). The prevalence of AH was found to be higher among men and, as expected, increased with age by all criteria, reaching 71.7% for individuals over 70 years of age. Cardiovascular diseases (CVD) are the leading causes of death, hospitalizations, and outpatient care worldwide, including in developing countries such as Brazil.

Chart 1. Classification of blood pressure according to the measurement in the doctor's office from the age of 18 years.

Classification	SBP (mmHg)		DBP (mmHg)
Optimal BP	< 120	and	<80
Normal BP	120-129	and/or	80-84
Pre-hypertension	130-139	and/or	85-89
AH stage 1	140-159	and/or	90-99
AH stage 2	160-179	and/or	100-109
AH stage 3	≥180	and/or	≥110

Note: BP: blood pressure; AH: arterial hypertension; SBP: systolic blood pressure; DBP: diastolic blood pressure;

In 2017, complete and revised data from Datasus showed the occurrence of 1,312,663 deaths in total, with a percentage of 27.3% for cardiovascular diseases. Arterial hypertension (AH) was associated in 45% of these cardiac deaths: coronary artery disease (CAD) and heart failure (HF) and 51.0% of deaths from cerebrovascular disease (CVD) and a very small percentage of deaths directly related to AH (13.0%). It is noteworthy that AH kills more due to its target organ damage.



Source: Adapted from Datasus/MS/SVS/CGIAE (2017).

Figure 1. Percentage of deaths from arterial hypertension, acute myocardial infarction, brain stroke, and chronic kidney failure (Brasil, 2000)

In the year 2017, data from the Global Burden of Disease (GBD) indicated that cardiovascular diseases accounted for 28.8 % of all deaths among chronic non-communicable diseases (NCDs). The Global Burden of Disease study revealed that in 2017, there were nearly 18 million deaths from cardiovascular disease causes (31.8 percent of all deaths), accounting for 20.6 percent of total years of life lost (YLL) and 14.7 percent of total DALYs (years of healthy life lost). Also, according to the Global Burden of Disease, it was observed that elevated systolic blood pressure (SBP) was the leading risk factor, accounting for 10.4 million deaths and 218 million DALYs. It was also responsible for about 40.0% of deaths in those with diabetes mellitus (DM), 14.0% of maternal-fetal mortality in pregnancy, and 14.7% of total years loss of healthy life to chronic kidney disease (CKD) (Barroso *et al*., 2020).

Diagnosis: A person who has had his blood pressure checked once and had a blood pressure level above 140/90 mmHg cannot be said to have arterial hypertension. So the diagnosis of arterial hypertension can be made in the doctor's office, or through ABPM or RBPM. In the office, you need to measure the pressure in both arms and in different positions, for example measuring in both arms with the patient sitting down, and also measuring in both arms with the patient standing up, and repeat the measurement in the next visit, noting which arm has the higher pressure. This should be done when the blood pressure is persistently high. Before the measurement in the doctor's office, the patient must be certified and instructed not to exercise, not to drink coffee, not to drink alcohol, because they can bias the result. In the case of patients who have high BP and are asymptomatic, or are symptomatic but are normotensive when measured, one must pay attention to occasional situations such as: white coat arterial hypertension, which is when the patient has high blood pressure inside the doctor's office, either because he or she got nervous in front of the doctor, becoming hypertensive inside the office but does not present arterial hypertension outside the office, or the case of masked arterial hypertension where the patient is hypertensive but is normotensive in the office. Having illustrated these two examples, these patients are indicated for a more elaborate measurement, which are the ABPM or RBPM. RBPM is a measurement modality performed with a specific protocol, consisting of taking three measurements in the morning, before breakfast and before taking medication, and three in the evening, before dinner, for five days. Another option is to take two measurements in each of these two sessions, for seven days. BP values ≥ 135/85 mmHg are considered abnormal. ABPM is the method that allows the indirect and intermittent recording of BP for 24 hours or more, while the patient performs his or her usual activities during waking and sleeping periods. One of its most specific features is the possibility of identifying circadian changes in BP, especially in relation to measurements during sleep, which have considerable prognostic implications. 24-hour BP averages ≥ 130/80 mmHg, wakefulness ≥ 135/85 mmHg, and sleep ≥ 120/70 mmHg are currently considered abnormal.

Drug Treatment: The five main classes of antihypertensive drugs most commonly used are: diuretics (DIU), calcium channel blockers (CCB), angiotensin-converting enzyme inhibitors (ACEI), angiotensin II receptor blockers (ARB), and beta-blockers (BB). Initial treatment can be initiated with monotherapy or a combination of drugs. Monotherapy is an indicated strategy for patients with stage 1 arterial hypertension with low cardiovascular (CV) risk or with blood pressure 130-139/85-89 mmHg high CV risk. For monotherapy, all the drugs mentioned above are preferred, with the exception of beta-blockers, which can be used in specific situations, such as post-acute myocardial infarction (AMI) and angina pectoris, but are often used in combination with other drugs. For most hypertensive drugs, combination therapy is preferable, regardless of the stage of AH and the associated CV risk. The indicated two-drug combination is either: ACEI or ARB + CCB or DIU. For three drugs, it would be either: ACEI or ARB + CCB + DIU. If the target blood pressure is not reached, a fourth drug can be associated, and a potassium sparing diuretic, Spironolactone, is indicated. If the goal is not reached, beta-blockers, central sympatholytic, alpha-blockers, or vasodilators may be associated. It is worth noting that beta-blockers must be indicated in the specific conditions already mentioned and the association between ACEI and CCB is contraindicated. Elevated BP is present in most patients with chronic kidney disease (CKD), which increases the risk of CV disease, CKD, and death. The Systolic Blood Pressure Intervention Trial (SPRINT) concluded that systolic BP < 120 mmHg decreased the risk of CV disease and mortality in non-diabetic adults with high CV risk, many of whom had CKD. However, it was not able to slow the progression of CKD.

The absolute risk reduction may be greater among those with albuminuria, because of the strong association between albuminuria and CV and kidney disease, but the effects of intensive BP reduction on CVD risk appear to be similar by albuminuria level. Current evidence indicates a goal of BP < 130/80 mmHg in patients with CKD, regardless of the presence of DM. In patients with end-stage CKD, the benefits of intensive BP control are uncertain, as studies are of short duration, and hemodynamic effects may lead to further reduction in glomerular filtration rate (GFR). Regardless of the goal to be achieved, BP reduction in the CKD patient always requires attention to the correct measurement of BP and monitoring of adverse events, especially electrolyte abnormalities and reduced GFR. In hypertensive and diabetic mellitus (DM) patients, the prevention of morbidity and mortality is obtained with the control of blood glucose, the normalization of BP and the reduction of other CV risk factors. And keeping BP under control in the diabetic individual is essential for renal protection, which reduces albuminuria, and is important for decreasing the risk of stroke and left ventricular hypertrophy (LVH). Evidence from randomized clinical trials, meta-analyses, and observational studies in hypertensive diabetics indicates that a reduction in SBP to 130-139 mmHg, with values near 130 mmHg,

effectively protects against CV and renal complications. The DBP can be reduced to 70-79 mmHg without compromising the protection and safety of the individual. On the other hand, there are no conclusive data that lowering SBP to < 130 mmHg leads to greater CV and renal protection. SBP values < 120 mmHg should be avoided. Therefore, the recommended goal in diabetics is < 130/80 mmHg. Achieving a lower SBP target implies a need for more antihypertensive drugs, which raises the risk of serious adverse effects. In addition, lower blood pressure levels may be better tolerated and result in greater benefit in the medium and long term. In general, BP control is more difficult in diabetic individuals than in non-diabetic ones (Barroso *et al*., 2021).

Non-drug treatment: High blood pressure (BP), smoking, obesity, unhealthy diet, and insufficient physical activity are established cardiovascular risk factors (CVRFs) and targets for interventions to control Arterial Hypertension (AH). In recent years, some unconventional therapeutic modalities have been investigated, involving adoption of slow breathing, music therapy, and spirituality. In non-drug treatment (NDT), the evidence supporting the recommended behaviors on smoking, dietary pattern, sodium, potassium, dairy products, chocolate and cocoa products, vitamin D, supplements and substitutes, weight loss, alcohol consumption, physical activity and exercise, slow breathing, stress control, spirituality, and religiosity are discussed.

Diet: The consumption of a diet rich in sodium has been one of the indicators responsible for the increase in systemic blood pressure. Some studies corroborate and identify that excessive consumption of sodium; alcoholic beverages, cigarettes, excess body weight, and a sedentary lifestyle are associated with increased blood pressure levels. These four variables have been emphasized as important factors in the control of systemic arterial hypertension (SAH). The dietary models most commonly found in the literature survey suggested for the control of SAH are the DASH diet (Dietary Approaches to Stop Hypertension), magnesium diet, Mediterranean diet and Low-sodium diet (Verrengia & Sousa. 2012). However, it is worth noting the importance of nutritional therapy, of its positive assistance in controlling blood pressure levels, through changes in eating habits and adherence to specific diets targeted for this disease. It has been observed that these dietary models have been effective in the non-pharmacological treatment and control of systemic arterial hypertension.

DASH Diet: The goal of the DASH diet was to use nutrients with possible hypotensive effect, coming from foods commonly consumed by the population and not from food supplements. The intention was to recommend food that had the benefits of the vegetarian diet, but associated with animal products for the non-vegetarian population, making it attractive to most people and consequently favoring a greater adherence of the population (Sacks *et al*., 1995).This model advocates restricting the consumption of red and processed meats, sodium and sugary drinks. This dietary pattern rich in potassium, calcium, magnesium, and dietary fiber was initially studied to aid in the non-pharmacological treatment and prevention of arterial hypertension, but the literature points out that this dietary model is a dietary pattern for all adults. Hypertensive patients who associated the DASH diet with lifestyle changes had reduced morbidity and mortality from cardiovascular disease. Therefore, poor diet is also a risk factor that influences the elevation of blood pressure levels. The DASH diet is currently one of the most widely studied and known methods for preventing the increase in blood pressure; it reduces the development of arterial hypertension by 14%. The study of this model proposes that a diet of 2. 100kcal diet has 2 servings/day of lean meats; 2 to 3 servings/day of oils and fats; 4 to 5 servings/day of fruits and vegetables; 2 to 3 servings/day of skimmed milk and dairy products; 4 to 5 servings/day of legumes and nuts; 6g of salt/day (3000 mg of sodium); up to 5 servings/week of sugars; 7 to 8 servings/day of whole grains, and the components present in the foods responsible for lowering blood pressure are: calcium, potassium, fiber, magnesium. The amounts of micronutrients found in the diet may result in improved vascular and endothelial function, preventing the development of elevated blood pressure levels(American Heart Association Nutrition Committee *et al*., 2006; Beyer *et al*., 2006).

Low-Sodium Diet: The etiology of increased BP is multifactorial, but excessive salt intake is frequent and important. It causes an increase in blood pressure levels and cardiovascular complications. Thus, salt restriction is an important tool for the prevention and control of arterial hypertension and CVD. Excessive salt consumption has been identified as an important risk factor for cardiovascular disease (CVD). Sodium restriction has a favorable influence on blood pressure (BP) control, and is thus a potentially powerful tool for the prevention and control of systemic arterial hypertension (SAH). Several studies have stated that reducing the consumption of sodium-rich foods causes a significant decrease in blood pressure in hypertensive patients. The recommended average intake is 5 g salt/day/person, or < 2 g sodium/day/person. However, the average daily salt intake of Brazilians is above recommended, reaching up to 12 g/day. High sodium excretion is related to a higher risk of death from CVD. On the other hand, higher potassium excretion implies a reduced risk of heart attack. Studies show that mortality from CVD decreased significantly in individuals who consumed salt with lower sodium and higher potassium levels(Arantes *et al*., 2020; Barros *et al*., 2014).

Magnesium Diet: Magnesium, in particular, has been the subject of many studies, and there is a significant correlation between serum magnesium levels and the incidence of cardiovascular disease. Furthermore, hypertensive patients usually have reduced intracellular magnesium content, while sodium and calcium contents are often increased compared to normotensive patients (Hatzistavri *et al*, 2009). It is known that this mineral has antiarrhythmic effects, acts in vascular tone because changes in extracellular magnesium content are able to modify the formation and release of nitric oxide, resulting in changes in arterial smooth muscle tone and contractility by affecting calcium concentrations, and also participates in glucose metabolism and insulin homeostasis. Therefore, it has been suggested that magnesium deficiency or alterations in its metabolism are related to the pathophysiology of arterial hypertension, arrhythmias, preeclampsia, insulin resistance, and diabetes(Barbagallo *et al*., 2003).

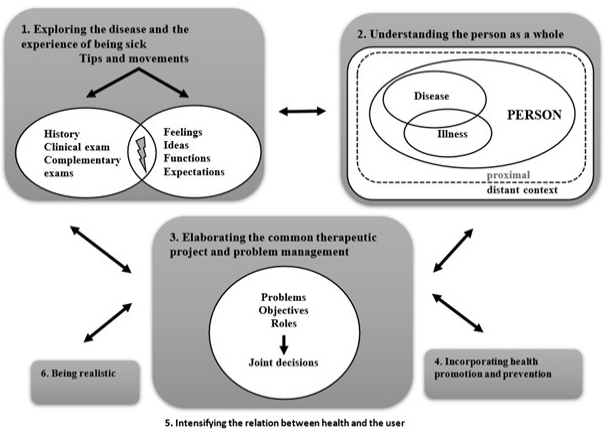
Mediterranean Diet: The Mediterranean diet is characterized by high consumption of vegetables, fresh fruits, nuts, oilseeds, legumes, cereals, the use of olive oil as the main source of fat, moderate intake of fish, eggs and dairy products, reduced consumption of red meat and regular and moderate intake of alcoholic beverage, especially red wine, during meals (Bach-Faig *et al*., 2011).

Smoking: Tobacco has more than 4,720 chemical products, nicotine being responsible for addiction, increased heart rate (HR), blood pressure (BP) and dual product (DP), changes associated with increased cardiac work in the smoker. A study by Hollmann and Hettinger evidenced that smoking a single cigarette increases the HR up to 10/20 beats/min and this increase may regress after 15/45 minutes. Smoking one to five cigarettes/day resulted in a 38% increase in relative risk for AMI, while with over forty cigarettes/day; the risk is multiplied by 9.16. Therefore, it is recommended to stop smoking completely in order to have a good treatment of arterial hypertension (Brasil, 2015). Smoking can be divided into active smoking, where after swallowing; both men and women will present an acute increase in blood pressure and heart rate, probably mediated by nicotine that acts as an adrenergic agonist, promoting the local and systemic release of catecholamine (dopamine, norepinephrine, and vasopressin). Passive smoking is the inhalation of tobacco smoke (cigarettes, cigars, cigarillos, pipes, shisha, and other smoke producers) by nonsmokers living with smokers, also described as exposure to Environmental Tobacco Pollution (ETP) (WHO). The smoke expelled contains, on average, three times more nicotine, three times more carbon monoxide, and up to 50 times more carcinogenic substances than the smoke inhaled by the smoker after passing through the cigarette filter, and can increase by up to 30% the cardiovascular risk of the individual, besides being related to several respiratory diseases. There are those who can be classified as

occasional smokers. They do not consume large quantities; they smoke only sporadically thinking that this habit is less harmful. There is no safe margin for cigarette smoking. Occasional smoking does not protect people from diseases resulting from this addiction. According to the U.S. National Cancer Institute (NCI) smoking one cigarette or less per day increases the chances of dying from lung cancer by 9 times and of suffering a premature death by 64%. The risks for these people are very similar to those who smoke more. Cigarette-related illnesses are numerous: among the most dangerous are cancers of the throat, lung, breast, pulmonary emphysema, and cardiovascular disease(American Cancer Association, 2020). Smoking is the leading cause of preventable death in the world, according to the World Health Organization(Brasil, 2015; Souza, 2015). Active and passive exposure to cigarette smoke are associated with a decrease in the vasodilator function - nitric oxide (NO), which is the main responsible for this function in the endothelium, leading to atherosclerotic manifestations in the vessels. Some studies have also shown that smoking cessation quickly reverses this endothelial dysfunction, placing the treatment of smoking as an essential measure to improve vascular homeostasis, because NO has not only vasomotor function, but also regulates platelet activation, inflammation, leukocyte adhesion and thrombosis (Sousa, 2015). The strategies used for smoking cessation are divided into psychosocial interventions and drug treatment, as the focus of this article is the non-drug treatment, we will talk about this.

Motivational interview: Motivational interviewing (MI) aims to work on and increase the patient's motivation to change his or her behavior and lifestyle habits. This interview is nothing more than a dialog between the patient and the health professional who, through defined strategies, tries to bring the patient's focus to his or her treatment. The strategies are defined in 4 principles: (1) resist the reflex to fix things; (2) understand and explore the motivations of the user; (3) listen with empathy and (4) empower the user by stimulating hope and optimism (Rollnick *et al*., 2009). MI is a viable alternative in non-drug treatment, as it appears to have a positive influence on behavior change and motivation for the patient. During follow-up, the health professional should avoid generating confrontations and arguments, labeling, and blaming the user (Figlie & Guimarães, 2014).

Person-centered clinical method: The person-centered clinical method, different from motivational interviewing, proposes a new model for the doctor-user relationship. This approach is broader and concerns the communicative processes in accompanying people and not directed only to motivation. The theory that stands out most among those developed is identified with six interrelated components: (1) explore illness and illness; (2) understand the person as a whole; (3) negotiate common ground; (4) incorporate prevention and promotion; (5) enhance the doctor-patient relationship; (6) be realistic (Brasil, 2015). These components are exemplified in the following image:



Source: Brasil (2015).

The person-centered clinical method helps in understanding that no smoker is the same as another. Feelings and ideas, features and expectations vary radically from person to person, just as the reasons for smoking are different for each individual.

Cognitive-Behavioral Approach: The approach with this method combines cognitive interventions with behavioral skills training through the detection of relapse risk situations and development of coping strategies. Chemical dependency, in general, results from a complex interaction between cognition, behaviors, emotions, family and social relationships, cultural influences, and biological and physiological processes. To effectively change a behavior, one must initially identify the dysfunctional thoughts and beliefs associated with this act. The approach seeks, from its two main pillars, to produce modifications in the user's thinking and belief system, in order to promote lasting emotional and behavioral changes. The approaches for smoking cessation are classified as minimal (professional-user contact of less than three minutes for each meeting), basic (professional-user contact of between three and ten minutes for each meeting), or intensive (professional-user contact of more than ten minutes for each meeting)(Brasil, 2015; Silva & Serra, 2004; Ismael, 2007).

Organization of smoking cessation groups: The organization of smoking cessation groups proposed by the Consensus on Smoking Management and Treatment (2001) is of four structured sessions of 90 minutes each, on a weekly basis. This proposed group structure also requires that each professional and team adapts the method to their reality and the needs of their community: sometimes it will be necessary to increase the number of sessions or condense them to guarantee more access. It is essential that the professional and the team evaluate the results found with the intervention model adopted (Brasil, 2015; Clinical Practice Guideline Treating Tobacco Use and Dependence, 2008).

Drinking: Behind only smoking and obesity, excessive alcohol consumption is the third leading cause of premature death in the United States. Studies prove that consuming more than two alcoholic drinks a day increases the risk of arterial hypertension. Beyond the first 1 or 2 drinks per day, each additional alcoholic drink will increase BP by approximately 1.5 mm Hg. Within 2 to 4 weeks of abstinence or substantial reduction in intake, alcohol-induced arterial hypertension usually disappears. In systematic reviews of intervention studies, which evaluated the effects of alcohol on blood pressure using office measurement compared with home measurement, they reported that there was a biphasic response immediately after alcohol exposure, manifested by vasodilation, followed by a later response in which there was elevation of blood pressure levels. Thus it is considered a biphasic effect, vasodilation due to an inhibition of sympathetic activity and a vasoconstriction response mediated by the detection of this vasodilation by baroreceptors, which induces an activation of the sympathetic system that in turn activates the renin-angiotensin-aldosterone system. So the response in late-onset hypertensive drugs is stronger as well. In a research comparing hypertensive and normotensive individuals, there was no alteration in heart rate, neither in normotensive nor hypertensive individuals. Another study evidenced that individuals who drank alcohol without food had a higher risk of developing arterial hypertension when compared to individuals who consumed alcohol and food in a single meal. Regarding the consumption of alcoholic beverages, excessive alcohol consumption is strongly associated with increased risk of arterial hypertension. According to Franz, heavier alcohol consumption> 20 g/dl is associated with the risk of developing arterial hypertension in women and men. Studies suggest that reducing alcohol consumption should be recommended as an important modifiable lifestyle component for the prevention and treatment of arterial hypertension. Furthermore, studies have shown that only 30 g of alcohol per day should be ingested.

Activity and Physical Exercise: According to the American College of Sports Medicine (ACSM) (2006), Physical Activity (PA) is any contraction of skeletal muscles that determines a caloric demand above that of the basal metabolic demand. The concept of Physical Exercise (PE), according to the same reference, is defined as PA

structured and organized with the clear objective of improving physical fitness and health (American College of Sports Medicine, 2006). It is estimated that sedentary lifestyle is one of the top ten risk factors for global mortality, causing millions of deaths annually. PA and PE are efficient antagonists to sedentary behavior and effective against some cardiovascular risk factors, including Systemic Arterial Hypertension (SAH). Both PA and PE are effective in decreasing the incidence of SAH. However, PE shows a significant decrease in both systolic and diastolic blood pressure values in hypertensive people. The benefits can be obtained through PE relative to its modalities, such as aerobic exercise (AE), dynamic resistance training (DRT), and isometric resistance training (ISRT) (Pescatello *et al*., 2004; American College of Sports Medicine, 2006; Barroso *et al*., 2021).

OBJECTIVE

Analyze four non-drug measures in the treatment of arterial hypertension.

METHODS

This is a literature review on the analysis of four non-drug measures in the treatment of systemic arterial hypertension. The search was conducted in databases such as Pubmed, Scielo , The Lancet journal , in the period from March to May of the year 2021, using the following keywords - key words: "alcohols," "alcohol drinking," and "blood pressure," "binge drinking," "diet," "DASH," "nutritional therapy," "Mediterranean diet," "sodium," "eating behavior," "smoking," "passive smoking," "nicotine," "smoking cessation," "physical activity," "resistance training," "isometric training," "aerobic exercise".

Inclusion Criteria: This review considered studies such as systematic reviews, case reports, clinical trials, and publications in Portuguese and English.

Exclusion Criteria: Articles with objectives other than the four non-drug measures in the treatment of arterial hypertension were excluded from the study.

RESULTS AND DISCUSSION

Diet: According to a brief review of the history of diets associated with hypertensive patients, a total of 12 articles were selected regarding the types of diets. We highlight the eight main studies addressed in the articles, among them, five referring to the DASH diet, and the other three respective diets, low-sodium, magnesium, and Mediterranean. In the years 1993 to 2020. A clinical trial evaluating American adults showed that consumption of the DASH diet resulted in increased intake of nutrients that may contribute to the reduction of blood pressure levels, such as potassium (K), magnesium (Mg), calcium (Ca), and dietary fiber. For this reason, DASH has been recommended for BP lowering in international and national guidelines. As a result, the researchers found that the Fruits and Vegetables diet reduced systolic blood pressure (SBP) by 2.8 mmHg ($p < 0.001$) and diastolic blood pressure (DBP) by 1.1 mmHg ($p < 0.07$), while the DASH diet reduced SBP by 5.5 mmHg and DBP by 3.0 mmHg ($p < 0.001$), both relative to the control group. Considering only the subjects with mild AH (n = 133), the DASH diet was able to reduce SBP by 11.4 mmHg and DBP by 5.5 mmHg ($p < 0.001$), relative to controls. The study concluded that the DASH diet can be a strategy to reduce and treat SAH. Another study ratifying the importance of BP reduction was the PREMIER study, used to test the antihypertensive effect of two lifestyle interventions in 810 individuals without or with mild arterial hypertension, multicenter, controlled, in which three groups were randomized: the first received standard or guideline-established guidance (weight loss, reduced salt and alcohol intake, and increased physical activity (n=268); the second group received standard guidance coupled with the DASH diet (n=269), in a less strict and controlled manner than in the original DASH diet study; and the third group (control) received only nutritional counseling, in a single meeting, at the beginning of the study (n=273). After six months of follow-up, in all groups blood pressure progressively decreased, being 6.6 mmHg in systolic and 3.8 mmHg in diastolic in the control group; 10.5 mmHg and 5.5 mmHg in systolic and diastolic, respectively, in the group receiving standard counseling, and 11.1 mmHg and 6.4 mmHg in systolic and diastolic, respectively, in the group receiving standard counseling plus DASH diet. Considering only the hypertensive individuals, the reduction was even greater (7.8; 12.5; and 14.2 mmHg in the systolic pressure of the control, standard, and standard plus DASH diet groups, respectively). The authors also found a 12% reduction in the prevalence of SAH in the group of hypertensive individuals who received standard plus DASH diet counseling, which corresponded to a 53% reduction in the risk of cardiovascular events, when compared to the group that only received counselingSvetkey *et al*. (2003).In addition to the aforementioned studies, it is worth noting that, associated with the effects of minerals and fiber, the higher intake of polyunsaturated fatty acids recommended by the DASH di*et al*so contributes to the average reduction in blood pressure; two meta-analyses confirm these findings. In the study by Appel *et al*. (1997) 11 randomized clinical trials involving 728 normotensive subjects were analyzed; the results indicated that dietary supplementation with a relatively high dose of omega-3 (more than 3 g/day) can lead to a significant reduction in blood pressure, while in the study by Morris, *et al*. the analysis involved 31 placebo-controlled studies with 1,356 subjects, and also found a positive effect of omega-3 intake.

This hypotensive effect was greatest in hypertensive patients and those with a clinical picture of atherosclerotic disease or hypercholesterolemia. Appel *et al*. (1993). According to Wong*et al*. (2016) in a randomized clinical trial (n=556) where dietary approaches for reducing systemic blood pressure were evaluated it was observed in patients with grade 1 arterial hypertension and age between 40 and 70 years, in the group using the DASH diet as in the control group there was significant improvement in cardiovascular risk in 10 years. However, both groups showed no significant difference in cardiovascular risk at 6 months, according to the result presented by Wong *et al*. (2016) it is worth further study the benefits of the DASH diet in the long term. The studies found on the low-sodium diet show that the decrease in sodium intake causes a significant reduction in blood pressure in hypertensive patients. Intersalt was one of the first studies to assess sodium intake from 24-hour urine samples and demonstrated a positive association between high sodium intake and increased BP. High sodium excretion relates to a higher risk of death from CVD (Barros *et al*., 2014). On the other hand, higher potassium excretion implies a reduced risk of myocardial infarction. Studies have detected a significant decrease in CVD mortality in individuals who consumed salt with lower sodium and higher potassium content (Barros *et al*., 2014). Another study that confirms the efficacy of sodium reduction was a simple-blind randomized controlled study conducted by the Hypertension League of the Medical School of the Federal University of Goiás, which evaluated 35 patients (65.7% women), 19 allocated in GI and 16 in CG, where the mean age was 55.5 ± 7.4 years(Barros *et al*., 2014). The IG showed a significant reduction in both systolic pressure (SBP) and diastolic pressure (DBP) in the casual and MRPA measurements ($p < 0.05$) and also decreased sodium excretion ($p = 0.016$). CG showed significant reduction only in the casual measurement of SBP ($p = 0.032$).

This study sought to reduce the daily dietary sodium intake of the CG patients to an intake lower than the 5 g of salt (2 g of sodium) proposed by the World Health Organization, considering that the 3 g provided corresponded to an intake of 1.2 g of sodium from common salt(Barros *et al*., 2014). On the other hand, light salt (with approximately 67% less sodium than regular salt) promoted an average intake of 390 mg of sodium per day. This sodium restriction was able to promote control of BP and sodium excretion observed in GI, suggesting that, at least in the short term, the use of light salt proved to be an efficient strategy for the treatment of SAH (Barros *et*

al., 2014). Furthermore, an interesting Dutch study simulated two different strategies for reducing salt intake, targeting up to 6 grams of salt per day, based on national population data. One strategy was to replace foods with more salt by similar foods with less salt already on the market, while the other was to change the salt content of processed foods as much as possible. It was observed that the reduction in salt intake, with either of these strategies, would be about 30%, with a drop in systolic blood pressure of 1.6 mmHg and a potential reduction in the incidence of acute myocardial infarction of 4.8% (Lima, 2020). The studies found on the Magnesium Diet showed beneficial effects on blood pressure, but information regarding the intake of this micronutrient is still scarce. A cross-sectional, analytical research with a quantitative approach was carried out by means of data survey. This study included patients over 18 years of age, who had started drug treatment for arterial hypertension at least one year before. The profile of the patients in this study showed that the hypertensive patients were prevalently female, with a prevalent age range of 60 to 74 years old, who had completed elementary school, who take medication every day, presenting systolic blood pressure between 120 and 130 mmHg.

The authors reported that lower blood pressure levels were associated with the consumption of Brazil nuts, cashew nuts, silver banana, peanuts and oats, which shows that the consumption of food rich in magnesium is beneficial for the reduction of systolic blood pressure levels, 3 mg/day to 161.9 mg/day, a value lower than the magnesium recommendations by the Dietary Reference Intakes, from 310 to 320 mg per day for women and 410 to 420 mg per day for men, which makes reflect that if the recommended daily intake of magnesium associated with lifestyle changes and pharmacological therapy can be found good results, but the magnesium diet needs to be further studied there are few articles reporting its benefits. As for the Mediterranean diet, several studies on its theme have shown its relation to several health benefits, such as: reduction of blood pressure, total cholesterol and LDL-c concentrations, prevalence of type 2 diabetes mellitus, and cardiovascular diseases. The prospective population-based study with 274 participants, aimed to evaluate the association of the Mediterranean diet with blood pressure values. All patients were followed up in an outpatient clinic at an interval of 3 to 4 months. BP was measured at each clinical visit. At the end of the study, it was verified that the predominant male population consumed larger quantities of the recommended foods than the female population, and consequently had lower blood pressure levels ($p<0.01$), thus proving the positive long-term effects of adhering to the Mediterranean diet in relation to blood pressure control. Being rich in whole foods, vegetable oils, white meats, and moderate alcohol consumption (wine), epidemiological and intervention studies have reported the protective effects of the Mediterranean diet against inflammatory processes and metabolic complications that result in cardiovascular diseases. Therefore, based on the literature surveyed, it was observed how the DASH diet can significantly reduce systemic blood pressure, which justifies the results found in studies conducted by the authors, Appel *et al*. (1993), Appel *et al*. (1997), Svetkey *et al*. (2003), Wong *et al*. (2016), corroborating what has been recommended in national and international hypertension guidelines.

Smoking: Cigarette smoking causes acute and chronic increase in BP, the chronic by loss of elasticity of the arteries and the acute by increasing Heart Rate (HR) and Blood Pressure (BP) due to increased cardiac work in the smoker, studies show that smoking only 1 cigarette the HR has a significant increase of 10 to 20 beats per minute, so there is no beneficial or safe amount for cigarette use, studies point to better prognoses with permanent cessation of consumption (Pureza *et al*., 2007). Smoking cessation will bring benefits at any time or age; even people older than 65 who quit the habit showed a lower mortality rate than those who kept the habit after five years of follow-up. Smokers with coronary heart disease who stopped the habit have beneficial effects translated into 40% fewer deaths from cardiac causes after an infarction and lower rates of restenosis after angioplasty (Souza, 2015) (Brasil, 2015). Evidence proves that both hypertensive and dyslipidemia patients, even when taking medication, when smokers have a worse cardiovascular prognosis, generating important information in cardiovascular risk stratification and providing clinicians with a better understanding and approach in the treatment of smoking. The approach to the patient for smoking cessation must be done in the correct way to prevent the occurrence of the withdrawal syndrome, which refers to the appearance of physiological signs and symptoms from the suppression of the effect of the drug, consequent to the reduction of stimuli in the CNS, and that usually disappear quickly after the consumption of the drug. Besides the fact that the abstinence can increase blood pressure, the main symptoms of nicotine abstinence are described in the table below:

These symptoms lead the individual to increasingly use the drug in larger quantities and intensities, which generates a loss of control over consumption, defining a compulsion, as well as impacting the treatment of arterial hypertension (Brasil, 2015; Carvalho, 2000; Ismael, 2007; Rosemberg, 2002).

Drinking: Related to alcoholism, alcohol consumption impacts Arterial hypertension. According to the Brazilian Hypertension Guideline of 2020, alcohol intake should be limited to 30 g of alcohol per day, which corresponds to 1 bottle of beer (5% alcohol, 600 mL) or 2 glasses of wine (12% alcohol, 250 mL) or 1 shot (42% alcohol, 60 mL) of distilled spirits (whiskey, vodka, brandy). In addition, an article published in The Lancet entitled "effects of alcohol on blood pressure" reports that the blood pressure lowering effect mediated by reducing alcohol consumption is dose-dependent, as people who drink two drinks or less per day did not experience a significant reduction in blood pressure when they reduced their alcohol consumption to near abstinence, suggesting that this amount of alcohol intake does not increase blood pressure. However, the more people drink beyond this level; the delayed response overrides the acute response leading to an increase in pressure. Still another important point about alcoholism is the distinction of alcohol consumption related to gender. According to the article "Alcohol Consumption and the Risk of Hypertension in Men and Women: A Systematic Review and Meta-Analysis", moderate alcohol consumption was associated with lower incidence of cardiovascular disease only in women. In men, light to moderate alcohol consumption continued to be associated with a higher risk of arterial hypertension. However, heavy drinking is strongly associated with increased risk of arterial hypertension, regardless of gender.

Physical exercise: The systematic practice of physical exercise will be the focus of the present discussion. However, physical activity has been shown to be an important independent variable in reducing the incidence of cardiovascular death associated with decreased sedentary time and reduced incidence of SAH, which is a major modifiable cardiovascular risk variable. This exposes the importance of an active lifestyle through PA (Barroso *et al*., 2021; Ekelund *et al*., 2016). When we talk about the systematic practice of PA and its benefits in the reduction of pressure indexes in hypertensive patients, it is necessary to understand the physiological adaptations that support the use of such therapeutic resource. Modest levels of evidence list vascular, neural and humoral structural factors as responsible for the reduction of blood pressure values as chronic adaptations to PE. Evidence also points to the possibility of alterations in genetic factors associated with pressure reduction with PE, through the expression of variants of the gene responsible for the synthesis of nitric oxide, a potent vasodilator (Pescatello *et al*., 2004). PE based on its methodological definition as a structured and organized PA with the clear objective of improving physical fitness, having among its cyclic modalities the EA, DRT and ISRT; as well as other acyclical modalities such as dance and yoga, if the purpose is to improve physical conditioning and health(Conceição *et al*., 2016; Cramer *et al*., 2016). Aerobic exercise (AE) of cyclical nature, such as walking, running, swimming, or cycling are among the main prescriptions of PE protocols for the reduction of blood pressure values in hypertensive individuals. With recommendations of at least 150 min/week of moderate intensity effort or 75 min/week of vigorous intensity, with the possibility of distributing the workouts with a weekly frequency of 3 to 5 times a week, and increasing this total

volume of work over time, which is directly related proportionally to the magnitude of the reduction in blood pressure values. Significant reductions associated with AE are in the magnitude of -12.3 and -6.1 mmHg of systolic blood pressure (SBP) and diastolic blood pressure (DBP) respectively as measured in a physician's office and -8.8 mmHg of SBP and -4.9 mmHg of DBP as measured through ABPM (Barroso *et al*., 2021; Pescatello *et al*., 2004; Cao *et al*., 2019). The dynamic resistance training (DRT) seems to present a significant decrease in blood pressure values in patients with SAH, as demonstrated in a study that analyzed the DRT performed 3 times a week for a period of 14 weeks with moderate intensity in a sample of hypertensive patients, showing a reduction of -5.7 of SBP and -5.2 of DBP in Caucasian subjects, and in non-Caucasian subjects the reduction equals the findings in AE practitioners, -14.3 mmHg and -10.3 mmHg of SBP and DBP respectively. (MacDonald *et al*., 2016). The isometric resistance training (ISRT) in the management of patients with SAH was analyzed in a study that implemented an 8-week isometric contraction training in non-dominant hand using a handgrip device. The training was performed 3 times a week with one group performing 30% force relative to a maximal voluntary contraction performed with 4 sets of 2 minutes of contraction each, with a rest interval of 3 minutes between sets. Significant reductions of -7 mmHg of SBP were reported. Which corroborates with -6.5 mmHg and -5.5 mmHg reductions of SBP and DBP respectively in guideline for management of patients with SAH (Carlson *et al*., 2016; Barroso *et al*., 2021). Acyclic PE modalities, such as the example of dance, seem to show significant reduction in SBP and DBP values comparable to the findings found in studies with AE. However, due to the heterogeneity of the types of dances and their respective metabolic demands, the beneficial results of this modality may vary greatly in impact on SAH. However, it seems that in general, acyclic PE seems to be a good alternative for those patients who have difficulty adhering to AE and DRT (Conceição *et al*., 2016; Cramer *et al*., 2016). re.al 2020.

CONCLUSION

It can be concluded that nutritional therapy, associated with lifestyle changes and associated with pharmacological therapy, is capable of promoting benefits in the reduction of systemic blood pressure. The DASH, low-sodium, magnesium diet, and Mediterranean diet were the most cited in the literature; however, among them, it is noteworthy that the DASH and Mediterranean diets had a greater prominence according to the researched articles, proving greater benefits in reducing BP and decreasing cardiovascular risk. Smoking, as mentioned earlier, is the main preventable risk factor for cardiovascular disease and the leading cause of preventable death today. Tobacco use favors atherosclerosis through its thrombogenic effect and through sympathetic neural stimulation promoted by nicotine. The risk of cardiovascular disease increases with the number of cigarettes smoked per day, the total number of years of smoking, and the early age at which smoking began. Smoking cessation can rapidly decrease the risk of coronary heart disease and seems to be the single measure with the greatest impact on reducing cardiovascular risk in hypertensive individuals, and is an important component of the strategy and control of arterial hypertension. As for alcoholism, the consumption of alcohol in a light or moderate manner (refers to the amount) may present a cardio protective effect, however, if this even light or moderate consumption is done every day, it contributes to an increase in blood pressure. Although it is well established that aerobic exercise (running, walking, swimming, and cycling) is the first line of conduct in the use of physical exercise in reducing blood pressure values, this type of PE is still shown as an activity of low adherence by patients, mainly due to the recommended time spent necessary for the therapeutic practice of these modalities in arterial hypertension. Thus, the DRT and especially the ISRT seem to be viable alternatives for a better adherence to PE, with results sometimes similar to those found in the EA modalities. The DRT seems to be very promising even for those patients with mobility problems or with social-environmental difficulties to practice PE with more complex logistics. However, this type of approach needs more studies to prove the robustness of the data already presented by the state of the art. Therefore, it is necessary to stimulate and raise awareness among the population to adhere to pharmacological antihypertensive treatment associated with non-drug therapy, thus contributing to a reduction in morbidity, mortality, and health care costs. Once that, the adherence to treatment proposals and consequently the control of hypertensive patients is still a challenge for all health professionals. Therefore, it is essential that there is a commitment on the part of the multi-professional health team and the government to meet the real needs of hypertensive individuals, so that there are changes in the current panorama of arterial hypertension in the Brazilian population.

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