

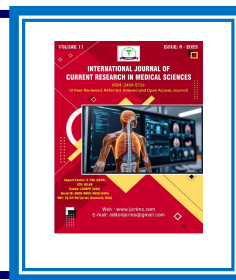


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Life style management in hypertension

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Abstract

Over 1.5 billion individuals worldwide suffer with hypertension, which is defined as chronically increased systolic blood pressure (SBP) >140 mmHg and/or diastolic blood pressure (DBP) at least 90 mmHg (International Society of Hypertension recommendations). Increased risk of cardiovascular disease (CVD) events, such as heart failure, stroke, and coronary heart disease, as well as mortality, is linked to hypertension. The International Society of Hypertension College of Experts organized an international panel of experts that developed lifestyle management guidelines as the primary method of preventing and treating adult-onset hypertension. Additionally, we advise sticking to lifestyle modifications even in cases when prescription drugs for blood pressure reduction are issued. Advice to begin these measures early in life is summarized in specific recommendations based on literature evidence. These recommendations include maintaining a healthy body weight, increasing levels of various physical activities, eating and drinking healthily, avoiding and quitting smoking and alcohol use, managing stress and sleep levels, and more.

Keywords: Hypertension, Healthy body weight, Quitting alcohol and smoking, Reduce salt intake

Introduction

A continuously elevated pressure in the blood arteries is called hypertension, also referred to as high or rising blood pressure. Over 1.5 billion individuals worldwide suffer with hypertension, which is defined as chronically increased systolic blood pressure (SBP) >140 mmHg and/or diastolic blood pressure (DBP) at least 90 mmHg (International Society of Hypertension recommendations). An higher risk of cardiovascular disease (CVD) events is linked to hypertension.^[1]

Types of Hypertension

1. **Primary (Essential) Hypertension:** Presently accounting for 90–95% of cases, primary hypertension is the most prevalent kind. Without a clear-cut cause, it evolves gradually over time. Rather, genetic, environmental, and behavioral variables usually combine to cause primary hypertension. A sedentary lifestyle, stress, age, high salt intake, heavy alcohol consumption, and heredity are all potential contributing factors.
2. **Secondary Hypertension:** Defined as increased blood pressure resulting from a known underlying cause, secondary hypertension makes for 5–10% of instances of hypertension. Secondary hypertension differs from primary hypertension in that it generally appears more quickly and with more severe symptoms.
3. **Resistant Hypertension:** When blood pressure remains high even after taking three or more antihypertensive drugs, including a diuretic, at

recommended dosages, the condition is known as resistant hypertension. It affects a portion of hypertensive people and presents difficult treatment issues.

4. **White Coat Hypertension:** Although blood pressure is normal outside of these contexts, white coat hypertension is defined as increased blood pressure readings in clinical settings (such as a hospital or doctor's office) as a result of stress or worry.
5. **Masked Hypertension:** This condition contrasts with white coat hypertension in that it occurs when blood pressure readings are normal in a clinical environment but excessive in other contexts (e.g., during ambulatory monitoring or at home). If left untreated, it frequently goes unreported during regular clinical visits and might raise the risk of cardiovascular problems.^[2,3]

Stages of Hypertension

According to new guidelines from the American College of Cardiology (ACC), the phases and classification of hypertension are as follows

Normal is defined as SBP < 120 and DBP < 80 mm Hg;

Elevated is defined as SBP 120 to 129 and DBP less than 80 mm Hg;

Stage 1 hypertension is defined as SBP 130 to 139 or DBP 80 to 89 mm Hg;

Stage 2 hypertension is defined as SBP greater than or equal to 140 mm Hg or DBP greater than or equal to 90 mm Hg.^[4]

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Figure 1 : Stages of Hypertension

Epidemiology

Research indicates that India's incidence of hypertension has been rising over time, especially in metropolitan regions and among specific demographic groups. The National Family Health Survey (NFHS) 2019–2020 estimates that 29% of Indian people between the ages of 15 and 49 suffer from hypertension. However, depending on the area and demographics, this number could change. The incidence of hypertension is estimated by the Indian Council of Medical Research (ICMR) to be between 25 and 30 percent in urban regions and 10 to 15 percent in rural areas.^[5]

Etiology

1. Genetic Factors:

- Family history is a risk factor for developing hypertension, and genetic predisposition plays a major role in the illness.

2. Environmental Factors:

- Excessive salt intake has been linked to fluid retention and increased blood volume, making it a known risk factor for hypertension. Environmental stressors such as noise pollution, air pollution, and others can also cause hypertension by oxidatively stressing the body and stimulating the sympathetic nervous system.

3.

4. Physiological Factors:

- Age: As people age, their arterial stiffness and vascular resistance tend to vary, which results in a rise in blood pressure.
- Sex: Women are more susceptible to hypertension after menopause, while males are more likely to have it earlier in life.
- Race/Ethnicity: People of African American and South Asian descent are among the racial and ethnic groups with a greater prevalence of hypertension.

5. Lifestyle Factors:

- Life style factors includes diet, obesity, alcohol and tobacco use are strongly associated with hypertension

6. Psychosocial Factors:

- Hypertension has been related to chronic stress, anxiety, depression, and social isolation. Over time, high blood pressure results from stress because it raises cortisol levels and stimulates the sympathetic nervous system.

7. Chronic Conditions:

- Hypertension is more common in those with certain long-term illnesses, including diabetes, chronic renal disease, and sleep apnea. Elevated blood pressure can be caused by several diseases, which can also impact hormone levels, fluid balance, and blood vessel function.^[6,7,8]

Pathogenesis

The complicated pathophysiology of hypertension, or high blood pressure, includes a number of variables that affect the ailment's onset and course. Usually, a combination of lifestyle choices, environmental variables, and genetic susceptibility results in hypertension. A substantial influence is played by genetic variables; some people are born with genes that make them more likely to develop hypertension. Blood pressure regulation by hormones, salt homeostasis, and blood vessel function may be impacted by these genes. Hypertension is also influenced by lifestyle and environmental variables. Blood pressure can be elevated by a high salt diet, obesity, stress, physical inactivity, and heavy alcohol use. Elevated blood pressure can result from these causes because they can cause endothelial dysfunction, changes in hormonal pathways, and increased activity of the sympathetic nervous system.

Renal processes are essential for controlling blood pressure. Volume expansion and hypertension can result from problems in renal function, which is regulated by the kidneys and controls the body's

salt and water balance. Two prominent processes that underlie hypertension are poor renal blood flow control and dysregulation of the renin-angiotensin-aldosterone system (RAAS).

Blood pressure control is also influenced by endocrine and neurological mechanisms. The sympathetic nerve system and hormone systems, including vasopressin and the RAAS, can become activated, increasing peripheral vascular resistance and fluid retention, which can result in hypertension. The vasculature experiences structural and functional alterations as a result of chronic hypertension, including endothelial dysfunction, vascular remodeling, and an increase in arterial stiffness. Vascular damage and the advancement of hypertension are further facilitated by inflammation and oxidative stress.

In general, a complex interaction of genetic, environmental, physiological, and behavioral variables contributes to the etiology of hypertension. Gaining an understanding of these processes is essential to creating focused therapies that successfully prevent and control hypertension and lower the risk of cardiovascular problems.^[9,10]

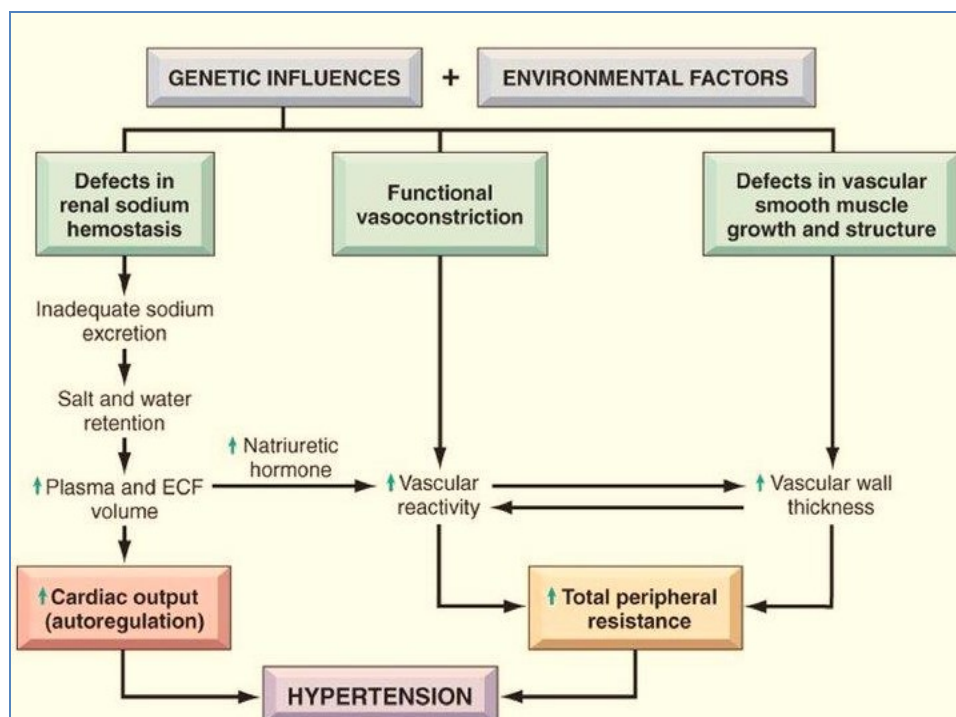


Figure 2 : Pathogenesis of Hypertension

Blood Pressure Measurement:

A sphygmomanometer, which consists of an inflated cuff and a pressure gauge, is commonly used to measure blood pressure. Blood pressure readings are expressed as two values, expressed in millimeters of mercury (mmHg): the greater number is the diastolic pressure and the lower number is the systolic pressure. After the person has rested for at least five minutes, measurements are obtained while they are comfortably sitting, with their arm supported at heart level.^[11]

Treatment

If lifestyle changes are insufficient to meet blood pressure objectives or if the patient has additional cardiovascular risk factors, pharmacological therapy may be required. The following are the primary categories of antihypertensive drugs:

- Diuretics, including potassium-sparing, thiazide, and loop diuretics.
- Inhibitors of the Angiotensin-Converting Enzyme (ACE): Prevent the conversion of Type I hypertension to Type II hypertension.
- ARBs, or angiotensin II receptor blockers, prevent angiotensin II from acting on its receptors.
- Calcium Channel Blockers (CCBs): Prevent calcium from entering smooth muscle cells in the vascular system.
- Beta-Blockers: Prevent adrenaline's effects on beta-adrenergic receptors.

- Alpha-Blockers: They cause vasodilation by inhibiting alpha-adrenergic receptors.
- Direct Renin Inhibitors: These agents lower the synthesis of angiotensin I by inhibiting the renin enzyme.
- Central Alpha Agonists: Reduce sympathetic outflow by acting on the central nervous system.
- Peripheral Adrenergic Inhibitors: These inhibitors lower sympathetic activity by acting on peripheral adrenergic receptors.
- Vasodilators: Cause vasodilation by directly relaxing vascular smooth muscle.

Combination Therapy:

In patients with resistant hypertension or several cardiovascular risk factors, combination treatment including two or more antihypertensive drugs from different classes may be required to manage blood pressure. To streamline therapy and enhance adherence, fixed-dose combination medicines comprising two or more antihypertensive medications are offered.

Individualized Treatment:

To enhance blood pressure management and minimize side effects, medication adjustments and regular monitoring of blood pressure and treatment response are crucial. The patient's age, comorbidities, cardiovascular risk profile, medication tolerance, and possible drug interactions should all be taken into account when designing a personalized treatment plan.^[12 to 15]

Anti-hypertensive drugs	Medications
Alpha adrenoceptor antagonists	Doxazosin, Prazosin, Terazosin
Beta-adrenoceptor antagonists or β -blockers/ beta-adrenergic blocking agents (BABAs)	Acebutolol, Atenolol, Bisoprolol, Metoprolol, Nadolol, Nebivolol, Propranolol
Calcium channel blockers (CCBs)	Amlodipine, Diltiazem, Felodipine, Isradipine, Nicardipine, Nifedipine, Nisoldipine, Verapamil
Angiotensin II receptor blockers (ARBs)	Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, Valsartan
Antiarrhythmics	Amiodarone, Flecainide, Propafenone
Angiotensin converting enzyme inhibitors (ACE-I)	Benazepril, Captopril, Enalapril, Fosinopril, Lisinopril, Moexipril, Perindopril, Quinapril, Ramipril, Trandolapril
Diuretics	Thiazide diuretics- Chlorothiazide, Chlorthalidone, Hydrochlorothiazide, Indapamide, Metolazone. Potassium-sparing diuretics – Amiloride, Eplerenone, Spironolactone, Triamterene Loop diuretics – Bumetanide, Ethacrynic acid, Furosemide, Torsemide

Figure 3 : Antihypertensive drugs

Lifestyle management of hypertension

The term "lifestyle changes" describes alterations or revisions made to a person's regular activities, habits, and behaviors with the intention of enhancing their well-being and health. Usually, these adjustments entail embracing better routines and habits in a number of areas of life, such as nutrition, exercise, stress reduction, sleeping patterns, and drug usage. In order to prevent, manage, or treat a variety of health concerns, such as high blood pressure, obesity, diabetes, heart disease, and mental health disorders, lifestyle modifications are frequently advised as a main or supplemental strategy. The focus is on long-term, sustainable changes that improve general health and lower the likelihood of chronic illnesses and their repercussions.

Regardless of pharmacological therapy, lifestyle modification is recommended for all patients with hypertension since it may minimize or even eliminate the requirement for antihypertensive medications. Apart from the direct objective of reducing blood pressure, the suggested lifestyle modifications offer several health advantages, such as improved results for prevalent chronic illnesses.

Additionally, individual lifestyle variables were linked to cardiovascular morbidity and death, according to observational and clinical investigations. According to new research, modifying one's lifestyle can lower blood pressure and the risk of cardiovascular disease worldwide.

Furthermore, the more current recommendations for the treatment of arterial hypertension advise starting lifestyle modifications in all hypertensive patients, including those who need medication therapy, whenever it is acceptable. In hypertension patients, failure to adopt a healthy lifestyle might impede the therapeutic effects of medication and the achievement of goal values.^[16,17]

Dietary Modifications (DASH Diet)

Many food items have been shown to have the ability to affect blood pressure. It seemed

plausible that some dietary modifications were the actual factors influencing the decrease in blood pressure. The Dietary Approaches to Stop Hypertension (DASH) diet, which emphasizes eating a diet high in fruits and vegetables, low-fat dairy products, whole-grain foods, lean meats, fish, poultry, nuts, and low in salt and sugar, has been shown to have several health advantages. Nine servings or more of fruits and vegetables, two servings or more of dairy products, and a reduction in fat intake for hypertension individuals were all recommended in the DASH diet. Blood pressure decreased with this eating plan. Seven research examined how the DASH diet affected blood pressure in this systematic review.

In a research by Dickenson et al. (2006), diet led to a drop in mean systolic blood pressure of 6 mmHg and a diastolic blood pressure of 4.8 mmHg after 8 weeks of treatments. The DASH diet was also examined by Svetkey et al. (2004) on 810 participants. The results showed a mean drop in blood pressure of 4.3 mmHg for systolic and 2.6 mmHg for diastolic. Furthermore, a 6-month intensive lifestyle intervention was used by Lien et al. (2007) to analyze the effects of the DASH diet as an intervention in blood pressure control. Results showed that there is a mean change in blood pressure of 3.18 mmHg in the diastolic blood pressure and 8.4 mmHg in the systolic blood pressure.^[18,19]

Quit Smoking

It is widely acknowledged that the effects of certain chemicals, namely nicotine and carbon monoxide, in cigarettes pose a serious risk to the heart and blood vessels. Exposure to cigarette smoke reduces the ability of macrovascular beds, including microvascular beds, to vasodilate depending on the endothelium. An essential part of the endothelium's vasodilatory function is played by nitric oxide (NO). It has been demonstrated that exposure to smoke reduces the amount of NO available via changing the endothelium NO synthase enzyme's expression and activity.

Cigarette smoke therefore affects vascular resistances in two ways: it increases catecholamine-dependent vasoconstriction and impairs endothelium-dependent vasodilatation. Furthermore, the research suggests that smoking increases platelet aggregation and adhesiveness, which alters blood rheology and increases the risk of thrombosis

Studies found that smokers had higher blood pressure and developed hypertension compared to non-smokers, indicating that smoking has a negative effect on pressure values that are correlated with daily cigarette use and long-term exposure. There has been recent reporting of a considerable improvement in diastolic and systolic blood pressure in those who cut back or quit smoking.

However, according to other research, smoking status has no direct bearing on the onset of hypertension or blood pressure readings. While observational analyses could not demonstrate a causal relationship between smoking and blood pressure, they did show that current smoking is linked with lower blood pressure and a reduced prevalence of hypertension.^[20,21]

Limit Dietary salt

The connection between dietary salt and elevated blood pressure levels is widely recognized. The food supply is heavily laden with salt (sodium chloride), with an average male eating 10.4g of salt day. This quantity far above the current recommended daily intake of 2300 mg of sodium. It should be mentioned that the majority of the salt in our diet—roughly 80%—comes from the regular consumption of restaurant and processed meals. Blood pressure would drop as a result of consuming less salt. In hypertensive individuals, limiting salt consumption for brief periods of time lowered blood pressure. The lower the salt consumption, the less the drop in blood pressure in those with high blood pressure, according to randomised trials evaluating the effect of salt reduction on blood pressure. Eight weeks of sodium restriction led to a 4.7 mmHg drop in systolic blood pressure and a 2.5 mmHg drop in diastolic blood pressure in the Dickenson et al.

(2006) research [35]. Dickey and Janick (2001) reported that a reduced sodium diet caused a mean change in blood pressure of 3.7 mmHg for the systolic and 2.0 mmHg for the diastolic.^[22,23]

Quit Alcohol

A new meta-analysis has cast doubt on the evidence supporting the benefits of modest drinking for the cardiovascular system. Evidence is mounting, however, that alcohol use at any amount raises blood pressure, regardless of the dispute. While binge drinking seems to raise the risk of hypertension, moderate drinking can raise blood pressure. There is a linear correlation between the prevalence of hypertension and alcohol intake, according to epidemiological statistics. In people with hypertension, cutting back on alcohol can reduce systolic blood pressure by an average of 3.8 mmHg. Patients with hypertension are advised by the Heart Foundation to restrict their alcohol consumption to no more than two standard drinks for men and one standard drink for women each day.^[24,25]

Physical Activity

Exercise training has been shown to have a number of positive hemodynamic and metabolic benefits, lowering the risk of cardiometabolic diseases worldwide. In response to psychophysical stress, it lessens sympathetic reactions and influences the hypothalamic-pituitary-adrenal axis, resulting in a decrease in cortisol levels, a decrease in cardiovascular reactivity, and a faster rate of cardiovascular recovery.

Additionally, exercise causes the artery wall to adjust systemically, which may lower peripheral resistance. Exercise training increases pro-angiogenic factors, which in turn increases the number of capillaries for muscle fiber. A growing body of research indicates that exercise can also improve vascular function by balancing the vasoconstrictor and vasodilator systems, lowering arterial stiffness.

It can be challenging to determine how physical activity affects blood pressure, though, as there are a number of confounding variables that might cause findings to be inconsistent, including age, the intensity and duration of exercise, the muscles used, and comorbidities.

Many studies found that exercise significantly lowers blood pressure, but the results are hard to compare because different methodologies were used to obtain the data, which varied depending on the sample's characteristics (i.e., whether the subjects were hypertensive or normotensive), training status, use of antihypertensive medication, frequency of exercise, time of day, and type of measurement.^[26,27]

Weight Management

Blood pressure and body weight and/or abdominal obesity are directly correlated. Studies on weight loss demonstrate that blood pressure is inversely correlated with weight loss and that mild weight loss can result in clinically significant drops in blood pressure in both hypertensive and non-hypertensive individuals.

Since being fat increases the risk of hypertension, those who are obese should try to lower their BMI to less than 25 kg/m², while those who are not obese should keep their BMI at this level. In instance, visceral obesity is closely associated with metabolic syndrome and causes problems in glucose and lipid metabolism in addition to hypertension. The Framingham Study found that even in individuals with comparable BMIs, blood pressure rises in proportion to visceral fat.

It is well-established that losing 4–5 kg of weight has a considerable hypotensive effect on blood pressure. Losing weight also corrects abnormalities in metabolic indicators. Furthermore, it has been documented that reducing body weight mitigates the exacerbation of inflammatory responses and anomalies in vascular endothelial function, which are seen in circumstances such as metabolic syndrome. Patients with obesity and hypertension should initially prioritize weight control, but they should also implement a long-term, stress-free weight-loss strategy after this.^[28,29]

Dietary potassium

According to certain clinical research, raising the daily intake of potassium in food by about 2100 mg (54 mmol) will lower systolic blood pressure in hypertensive people by 4–8 mmHg and in normotensive people by 2 mmHg. Whole foods high in potassium, such as yoghurt, bananas, avocados, kiwi fruit, potatoes (with skin), almonds, and spinach, are more helpful at lowering blood pressure than potassium pills, which may be harmful.⁴ People with reduced renal function may develop hyperkalaemia by consuming high amounts of potassium. It should only be advised for people whose renal function is known to be normal.^[30,31]

Getting Adequate Sleep

Sleep apnea and other sleep disorders, as well as poor sleep quality, can raise blood pressure. Aim for seven to nine hours of good sleep every night. Establish a regular sleep schedule, make a calming nighttime ritual, and create a cozy sleeping environment to practice excellent sleep hygiene.^[32]

Monitoring Blood Pressure

Use a home blood pressure monitor that has been advised by a healthcare professional to regularly check your blood pressure at home. Record blood pressure values and submit them to medical professionals during follow-up appointments.^[33]

Seeking Social Support:

Creating social networks of support can aid in stress management and enhance general wellbeing. Join support groups, spend time with loved ones, and, if necessary, seek professional counseling.

Educating Yourself:

Acquire knowledge about hypertension, its contributing causes, and lifestyle choices that can help control the illness. Gaining information can help you follow treatment advice and lifestyle modifications more closely.^[34,35]

To sum up, changing one's lifestyle is crucial to controlling hypertension and lowering the risk of cardiovascular problems. People can effectively manage their hypertension and enhance their overall health and well-being by adopting a heart-healthy diet, getting regular exercise, keeping a healthy weight, reducing alcohol and sodium

intake, stopping smoking, managing stress, getting enough sleep, checking their blood pressure, finding social support, and learning about the disease. Close collaboration with healthcare providers is necessary to create a customized strategy that takes into account each patient's requirements and preferences.



Figure 4 : Life Styles Management of Hypertension

Conclusion

Numerous cardiovascular illnesses have been linked to hypertension as a key risk factor. Based on current studies, it is evident that lifestyle choices might have an impact on blood pressure levels. After that, altering a patient's lifestyle can help hypertension individuals by lowering their overall cardiovascular risk and death from all causes. Scientific evidence indicates that the most effective lifestyle modifications for the prevention and treatment of hypertension include cutting back on alcohol and salt intake, quitting smoking, engaging in regular aerobic physical activity, correcting overweight through the adoption of a balanced, norm-caloric diet rich in fresh fruits and vegetables and low in saturated fats.

Conversely, in patients on antihypertensive medications, the absence of these lifestyle modifications may make it impossible to reach the pressure target. For these reasons, we think that before starting pharmaceutical treatment, lifestyle modifications should be made. Doctors shouldn't recommend medications unless they have fully informed their patients about the health benefits of leading a desirable lifestyle and have offered

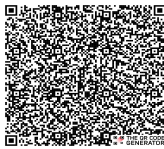
them psychological and motivational assistance. Public health authorities should support and promote the adoption of a healthy lifestyle model in the general public as well as in hypertensive persons through proper information campaigns.

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