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Review

The Silent Killer: A Comprehensive Guide to Hypertension

Padmavathi. M, Abinesh. E, Thrisha.S, Ponmadasamy.M*, Dr. Vigneshwaran.L.V.

Department of Pharmacognosy, RKP College of Pharmacy, Krishnagiri, Tamil nadu, India.

*Author for Correspondence: Ponmadasamy M
Email: ponmadasamymmc@gmail.com

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Abstract

A major global health concern, hypertension, also known as high blood pressure, is thought to be responsible for 7.1 million deaths per year. This study offers a thorough analysis of hypertension, outlining its types, causes, symptoms, prevalence and complications. The study examines the various factors that contribute to high blood pressure, such as genetics, lifestyle choices and comorbid conditions and distinguishes between primary and secondary hypertension. The study highlights the value of dietary and lifestyle adjustments in prevention and treatment, in addition to pharmaceutical interventions like calcium channel blockers, ACE inhibitors and diuretics. By highlighting its function as a prelude to serious cardiovascular events, this study calls for proactive approaches to blood pressure monitoring and management.

Keywords: Hypertension, Cardiovascular disease, Global health, Therapy.

1. INTRODUCTION

Blood is pumped by the heart via the blood vessels, where it is forced up against the vessel walls. The pressure that results from this is known as blood pressure. The body needs this pressure in order to circulate blood throughout itself. to ensure that each body part receives the oxygen it requires [1]. A linear relationship between blood pressure (BP) and the risk of cardiovascular events has been shown by meta-analyses. An estimated 7.1 million deaths annually are attributed to suboptimal blood pressure control, which is also the most prevalent attributable risk for death globally, accounting for 49% of ischemic heart disease and 62% of cerebrovascular disease [2]. Due to its great prevalence, hypertension is considered a major global public health concern. It is known to raise the risk of a number of illnesses, including blindness, kidney failure, heart attacks and strokes.[3]

2. DEFINITION

Hypertension, commonly referred to as high blood pressure, can develop over time as blood flows through your arteries at higher-than-normal pressures. Due to restricted arteries brought on by cholesterol buildup,

the heart and blood vessels must work harder, which raises blood pressure. Hypertension is referred to be the silent killer as most people do not show any symptoms. Having your blood pressure checked frequently is therefore essential.[4]

3. PREVALENCE

Different geographical areas and national economic brackets have different rates of hypertension. Hypertension is most common in the WHO African Region (27%), while its prevalence is lowest in the WHO Region of the Americas (18%). Between 1975 and 2015, the number of adults with hypertension rose from 594 million to 1.13 billion, with the majority of this growth occurring in low- and middle-income nations. The primary cause of this increase is the rise in risk factors for hypertension in those populations.[5].

The percentage of adults with hypertension was 26·4% (95% CI 26·0–26·8%) in 2000 (26·6% of men [26·0–27·2%] and 26·1% of women [25·5–26·6%]) and by 2025, 29·2% (28·8–29·7%) were expected to have it (29·0% of men [28·6–29·4%] and 29·5% of women [29·1–29·9%]). 972 million (957–987 million) adults worldwide were expected to have hypertension in 2000; 333 million (329–336 million) lived in economically developed nations, whereas 639 million (625–654 million) lived in economically underdeveloped nations. It was estimated that there will be 1·56 billion adults with hypertension in 2025, an increase of roughly 60% (1·54–1·58 billion. [6]

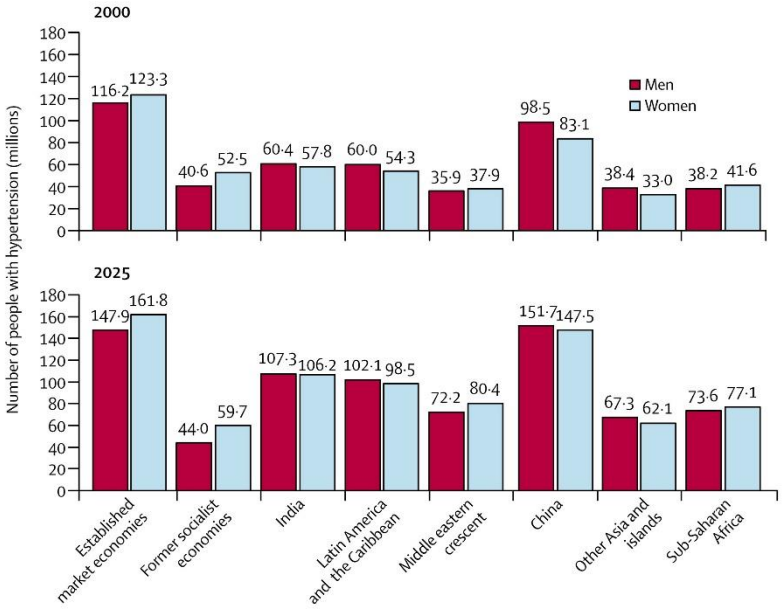

Fig 1: Prevalence Of Hypertension In World [6]

4. CAUSES

As people age, their blood pressure increases. A complicated interplay between genes and environmental factors leads to hypertension.[7] Both primary and secondary hypertension are possible. Primary (essential) hypertension accounts for the majority of instances. This indicates that your hypertension has no particular cause and is most likely caused by a combination of factors such as age, nutrition, lifestyle and genetics. About 5–10% of those with high blood pressure go on to develop secondary hypertension. There is a specific cause for it, such hypothyroidism. If the underlying illness is properly treated, secondary hypertension can frequently be reversed.The cause of secondary hypertension can be identified. Renal disease is the most common secondary cause of hypertension. Endocrine disorders such [7]

- hypercortisolism
- hyperthyroidism
- Acromegaly,
- Conn's syndrome
- Hyperaldosteronism
- Hyperparathyroidism

and pheochromocytoma can also result in hypertension. Obesity, sleep apnea, pregnancy, aortic coarctation, excessive alcohol usage, some prescription medications, herbal treatments, and illicit drugs are additional causes of secondary hypertension.

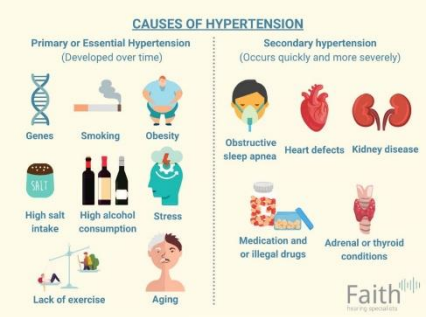

Fig 2: Causes of Hypertension [8]

5. SYMPTOMS [9]

Even when blood pressure readings reach dangerously high levels, the majority of patients with hypertension show no symptoms. These symptoms and indicators usually do not appear until hypertension has progressed to an advanced or even life-threatening degree.

- Dull headaches
- Light headedness
- More than normal nosebleeds.
- Tinnitus
- Blurring of vision
- Palpitations
- Dizziness

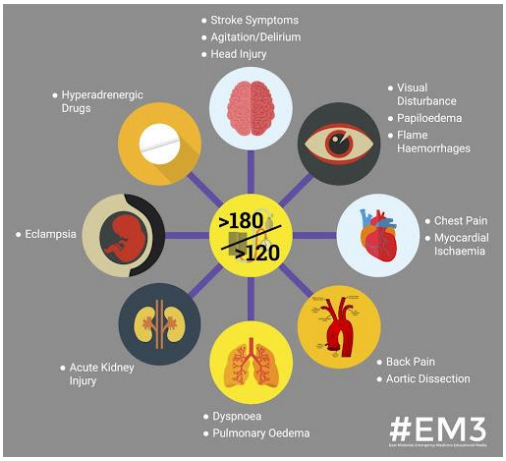

Fig 3: Symptoms Of Hypertension [10]

6.COMORBID CONDITIONS [11]

- Ischeamic Heart disease
- Chronic kidney disease
- Stroke
- Heart failure
- Chronic Obstructive Pulmonary Disease

7. TYPES [12]

Primary hypertension and Secondary hypertension are the two principal forms of hypertension.

7.1 PRIMARY HYPERTENSION

The most prevalent kind of hypertension is primary hypertension. Another name for it is essential hypertension. This kind of hypertension has no discernible cause. According to the American Heart Association, primary hypertension is caused by a confluence of lifestyle, age and hereditary factors. Lifestyle choices like smoking, binge drinking, and not exercising can all have an impact. A person may be able to lower their blood pressure and lower their risk of consequences from hypertension by making dietary and lifestyle changes.

7.2 SECONDARY HYPERTENSION

High blood pressure that has a known etiology or underlying ailment is referred to as secondary hypertension [12]. One kind of hypertension that may have a reversible underlying cause is secondary hypertension. It barely accounts for 5% to 10% of cases of hypertension. 3–5 Secondary hypertension is more common in younger people and varies by age, with a frequency of nearly 30% in those with hypertension aged 18 to 40.[13] The following are a few potential underlying causes of secondary hypertension:
Renal artery stenosis, a narrowing of the arteries delivering blood to the kidneys, is one of the disorders of the adrenal glands:

- Hypercortisolism
- Paraganglioma
- Apnea that obstructs sleep
- Thyroid conditions
- Birth abnormalities of the heart, like aortic coarctation.

8. PATHOPHYSIOLOGY [14]

Younger individuals frequently have higher cardiac outputs, but elderly patients are primarily affected by higher systemic vascular resistance and greater vasculature stiffness. Increased a-adrenoceptor activation or increased production of peptides like endothelins or angiotensin can both result in raised vascular tone. Vasoconstriction is the result of the last pathway, which is an increase in cytosolic calcium in vascular smooth muscle. Vascular remodelling is the name for the increase in vascular smooth muscle mass brought on by a number of growth hormones, such as endothelins and angiotensin. The strain placed on the left ventricle is increased by both an increase in vascular stiffness and an increase in systemic vascular resistance; this results in left ventricular hypertrophy and diastolic dysfunction. The aorta and elastic arteries stiffen with age, raising pulse pressure. Early diastole gives way to late systole for reflected waves. As a result, left ventricular afterload rises, which fuels left ventricular hypertrophy. Age-related increases in pulse pressure are a reliable indicator of coronary heart disease.

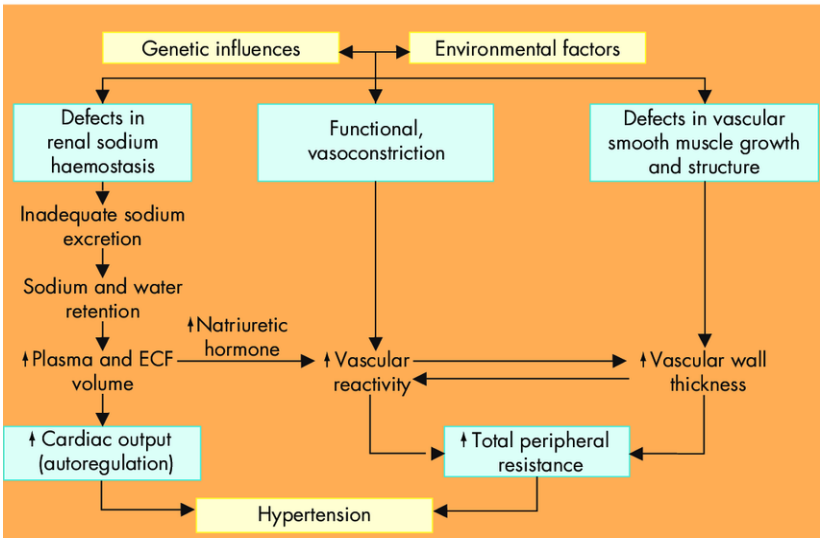

Fig 4: Pathophysiology Of Hypertension [15]

9. RISK FACTORS [16]

- Life style factors
  - Smoking
  - Alcohol intake
  - Dietary salt intake
  - Obesity

- ❖ Others
  - Lipid accumulation
  - Comorbid conditions like diabetes
  - Heart hypertrophy

10.COMPLICATIONS [17]

The cardiac consequences of hypertension are left ventricular hypertrophy and coronary artery disease.

10.1 LEFT VENTRICULAR DYSTROPHY

The concentric cause of left ventricular hypertrophy is pressure overload. Although the wall thickness and muscle mass have increased, the ventricular capacity has not. Diastolic function is hampered by left ventricular hypertrophy, which also delays filling and slows ventricular relaxation. Unrelated to cardiovascular disease, left ventricular hypertrophy is a risk factor for unexpected death.

10.2 CORONARY ARTERY DISEASE

Chronic arterial hypertension accelerates and is linked to coronary artery disease, which can result in myocardial infarction and myocardial ischaemia. In fact, patients with untreated or inadequately managed hypertension are far more likely to experience myocardial ischaemia than those with normotension. Major complications of hypertension include strokes, which can be caused by cerebral hemorrhage, thrombosis, or thrombo-embolism. Initially manifested as micro-albuminemia, renal illness might develop gradually and become noticeable in later years.

11.PREVENTION [17]

11.1 LIFE STYLE MODIFICATIONS

Good lifestyle can prevent the onset of high BP, which reduce the cardiovascular events. Lifestyle modification is the first line of antihypertensive treatment**.**

11.2 SALT REDUCTION

The consumption of salt is linked to elevated blood pressure. Consume less salt at the table and when food is being prepared. Reduce your intake of items heavy in salt, such as soy sauce, fast food and processed meals like salty breads and cereals.

11.3 HEALTHY DIET

Consuming a diet rich in whole grains, fruits, vegetables, polyunsaturated fats and dairy products, as well as increasing consumption of vegetables high in nitrates such as beetroot and leafy vegetables is known to lower blood pressure. Other healthy foods and nutrients include foods like avocados, nuts, seeds, legumes, and tofu that are high in potassium, calcium and magnesium. lowers consumption of foods heavy in sugar, saturated fat and trans fats, such those included in the DASH diet.

11.4 HEALTHY DRINKS

Moderate consumption of black tea, green tea, and coffee. Pomegranate juice, beetroot juice, chocolate and karkadé (hibiscus) tea are additional drinks that may be helpful.

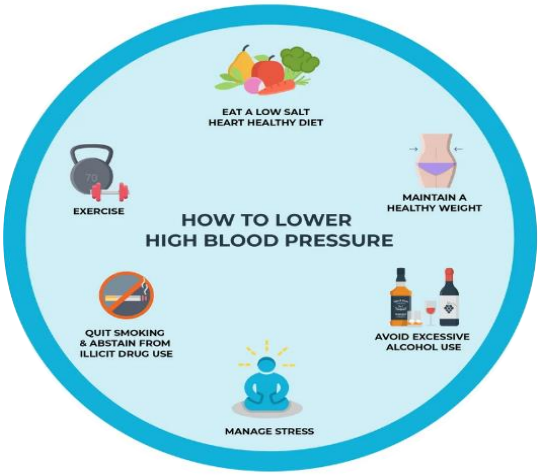

Fig 5: Prevention Of Hypertension [18]

12.TREATMENT [17]

The classes of drugs most commonly used include the thiazide diuretics, beta blockers, ACE inhibitors, angiotensin II receptors antagonists, calcium channel blockers, alpha-adrenoceptor blockers, combined alpha and beta-blockers, direct vasodilators and Imidazoline I-1 receptor agonists and alpha 2-adrenoceptor agonists are two examples of centrally acting medications. The first step in treating hypertension is changing one's lifestyle, which includes increasing activity, reducing alcohol use, helping obese people lose weight, and moderately limiting sodium intake. When the aforementioned treatments have failed or when hypertension is initially identified at a dangerous stage (Stage 3), medication therapy becomes required.

12.1 DRUG THERAPY [17]

12.1.1 DIURETICS

The risk of stroke, coronary heart disease, congestive heart failure and overall mortality is decreased by low-dose diuretic therapy. Although thiazides are the most often used medication, loop diuretics can also be used effectively, and taking them with a potassium-sparing diuretic lowers the risk of hypokalaemia and hypomagnesaemia. Diuretics enhance other antihypertensive medications, even at low dosages. The risk of sudden death is decreased by using potassium-sparing diuretics. Spironolactones lower morbidity and death overtime in individuals suffering from heart failure, a common side effect of chronic hypertension.

1. Thiazide:

- ❖ **Chlorthalidone**: Dose- 12.5–25 mg/day, once daily
- ✓ Preferred due to prolonged half-life and proven cardiovascular disease (CVD) risk reduction.
- ✓ Monitor for hyponatremia, hypokalaemia, uric acid and calcium levels.
- ✓ Unless on uric acid-lowering medication, use with care in individuals who have experienced acute gout in the past.
  - **Hydrochlorothiazide**: Dose- 25–50 mg/day, once daily
  - **Indapamide**: Dose- 1.25–2.5 mg/day, once daily
  - **Metolazone**: Dose- 2.5–5 mg/day, once daily

12.1.2 ACE INHIBITORS

The usage of ACE inhibitors as first-line treatment is growing. Aside from bilateral renal artery stenoses, they have comparatively little adverse effects and contraindications. ACE medications can treat unilateral renovascular hypertension, however they also carry the risk of ischemic atrophy. As a result, surgical renal artery reconstruction or angioplasty are better options than long-term, exclusively medicinal treatment. Because they delay the course of renal damage, ACE inhibitors are the first-choice medication for individuals with diabetes who also have hypertension.[17]

- **Captopril**: Dose- 12.5–150 mg/day, 2–3 times daily
- **Enalapril**: Dose- 5–40 mg/day, 1-2 daily
- **Lisinopril**: Dose- 10–40 mg/day, once daily
- **Ramipril**: Dose- 2.5–20 mg/day, 1-2 daily

- ✓ Do not combine with ARBs.
- ✓ Increased risk of hyperkalaemia, especially in chronic kidney disease (CKD) and those on potassium supplements, potassium-sparing drugs.
- ✓ Risk of acute renal failure in severe bilateral renal artery stenosis.
- ✓ Contraindication in pregnancy and patients with a history of angioedema due to ACE inhibitors.[17]

12.1.3 ANGIOTENSIN RECEPTOR BLOCKERS (ARB's)

Angiotensin AT1-receptor antagonists are useful antihypertensive medications because angiotensin II activates AT1-receptors that result in vasoconstriction. Compared to ACE inhibitors, losartan, valsartan and candesartan are less coughing-causing and effective.[17]

- **Losartan**: Dose- 50–100 mg/day, once or twice daily

- ✓ Avoid combining with ACE inhibitors.
- ✓ Risk of hyperkalaemia in CKD or potassium supplementation.
- ✓ Contraindicated in pregnancy.

❖ Other drugs are:

- ➢ **Valsartan**: Dose - 80–320 mg/day.
- ➢ **Olmesartan**: Dose- 20–40 mg/day.
- ➢ **Telmisartan**: Dose- 20-40 mg/day.

12.1.4 CALCIUM CHANNEL BLOCKERS

Elderly people who do not tolerate b-blockers, such as those with asthma, peripheral vascular disease, or Raynaud's phenomenon, may benefit from calcium channel blockers as a monotherapy. Verapamil and diltiazem shouldn't be used in heart failure. Although nifedipine can be administered sublingually to treat severe hypertension, caution is advised because to the possibility of severe hypotension. Calcium channel blockers are frequently linked to ACE inhibitors, diuretics and/or b-blockers.[17]

- **Dihydropyridines**:
  - **Amlodipine**: 2.5–10 mg/day, once daily
  - ✓ Associated with dose-dependent pedal oedema.
  - **Nifedipine**: 30–90 mg/day, once daily
  - Other drugs are also used.
- **Non-dihydropyridines**:
  - **Diltiazem ER**: 120–360 mg/day, once daily
  - ✓ Avoid use with beta-blockers due to risk of bradycardia and heart block.
  - ✓ Steer clear of heart failure when the ejection fraction is low[17]

12.2 SECONDARY AGENTS [17]

1. Loop Diuretics

- **Furosemide**: Dose- 20–80 mg/day.
  - ✓ Preferred in symptomatic heart failure or moderate-to-severe CKD (GFR < 30mL/min).

2. Potassium-Sparing Diuretics

- **Spironolactone**: Dose- 25–100 mg/day.
- ✓ Common add-on therapy in resistant hypertension.
- ✓ Avoid in renal dysfunction

3. Beta-Blockers

- **Cardioselective**:
  - **Metoprolol**: Dose- 50–200 mg/day
  - ✓ Preferred in heart failure with reduced ejection fraction.
  - **Atenolol:** 25–100 mg/day.
- **Non-cardioselective**:
  - Propranolol IR: 80–160 mg/day.
  - ✓ Combined Alpha and Beta-Blockers:
  - Carvedilol: 12.5–50 mg/day.

4. Central Alpha-2 Agonists

- **Clonidine**: 0.1–0.8 mg/day.
- ✓ Reserved for last-line therapy due to significant CNS side effects.

5. Direct Vasodilators

- Hydralazine: 100–200 mg/day.
- ✓ It is combined with diuretic and beta-blocker to prevent reflex tachycardia and fluid retention.

13.CONCLUSION

Due to its high mortality rates, hypertension is a global concern. The cause of primary hypertension is unknown, but it may be influenced by genetics, age and lifestyle. The prevalence of hypertension has increased, particularly in low- and middle-income countries. Because blood pressure has no symptoms, regular monitoring is essential. The necessity of lifestyle changes is highlighted by complications such as coronary artery disease. Drug therapy and lifestyle modifications are available as forms of treatment.

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