

## **DRUG USED IN TREATMENT OF HYPERTENSION**

**1. Debjit bhowmik\*, Chiranjib, Dipu kakoty 2.Margret Chandira, 3.K.P.Sampath Kumar**

**1. Rajiv Gandhi college of Pharmacy, Nautanwa, Uttar Pradesh**

**2. Vinayaka missions college of Pharmacy, Salem**

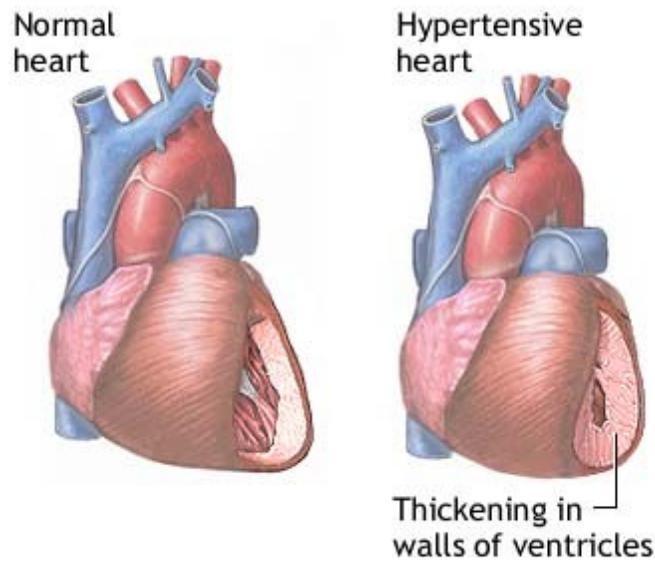
**3.Coimbatore Medical college ,Coimbatore**

### **ABSTRACT**

Antihypertensive drugs are medicines that help lower blood pressure in people whose blood pressure is too high. Blood pressure is a measurement of the force with which blood moves through the body's system of blood vessels. Although everyone's blood pressure goes up and down in the course of a typical day, some people have blood pressure that stays high all the time. This condition is known as hypertension. Hypertension is not the same as nervous tension. People who have high blood pressure are not necessarily tense, high-strung, or nervous. They may not even be aware of their condition. Being aware of high blood pressure and doing something to control it are extremely important, however. Untreated, high blood pressure can lead to diseases of the heart and arteries, kidney damage, or stroke, and can shorten life expectancy. Treatments for high blood pressure depend on the type of hypertension. Most cases of high blood pressure are called essential or primary hypertension, meaning that the high blood pressure is not caused by some other medical condition. For most people with primary hypertension, it is difficult to figure out the exact cause of the problem. However, such hypertension usually can be controlled by some combination of antihypertensive drugs and changes in daily habits (such as diet, exercise, and weight control). Controlling primary hypertension is however a lifelong commitment. Although people may be able to reduce the amount of medicine they take as their blood pressure improves, they usually must continue taking it for the rest of their lives. In people with secondary hypertension, the high blood pressure may be due to medical problems such as kidney disease, narrowing of certain arteries, or tumors of the adrenal glands. Correcting these problems often cures the high blood pressure, and no further treatment is needed.

## INTRODUCTION

Antihypertensives are a class of drugs that are used in medicine and pharmacology to treat hypertension (high blood pressure). There are many classes of antihypertensive, which—by varying means—act by lowering blood pressure. Evidence suggests that reduction of the blood pressure by 5-6 mm Hg can decrease the risk of stroke by 40%, of coronary heart disease by 15-20%, and reduces the likelihood of dementia, heart failure, and mortality from cardiovascular disease. The fundamental goal of the treatment should be the prevention of the important "endpoints" of hypertension such as heart attack, stroke and heart failure. Several classes of medications are effective in reducing blood pressure. However, these classes differ in side effect profiles, ability to prevent endpoints, and cost. The choice of more expensive agents, where cheaper ones would be equally effective, may have negative impacts on national healthcare budgets. The term "hypertension" means an abnormally raised arterial blood pressure. There are many conditions which elevate arterial blood pressure including primary renal disease, pheochromocytoma, hyperthyroidism, hyperaldosteronism, and coarction of aorta, leading to secondary hypertension. In about 80 to 85% of patients of hypertension, no significant cause is evident such condition is called primary hypertension. The recommended dosage depends on the type, strength, and form of antihypertensive drug. Check with the physician who prescribed the drug or the pharmacist who filled the prescription for the correct dosage. Always take antihypertensive drugs exactly as directed. Never take larger or more frequent doses, and do not miss any doses. Some antihypertensive drugs may take several weeks to noticeably lower blood pressure. Once it begins to work and symptoms improve, continuing to take the medicine is just as important. Stopping some hypertensive drugs suddenly may cause serious problems. Check with the physician who prescribed the medicine to find out if it is necessary to gradually taper down before stopping the medicine completely.



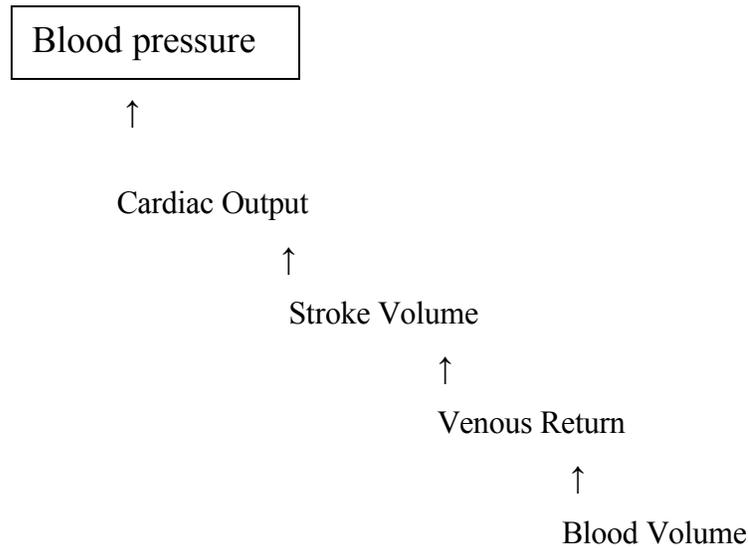
**Fig No. 1: Comparison of normal & hypertensive heart**

If the values of systolic/diastolic BP on repeated determinations exceed 140/90 mm Hg, then that person is suffering from hypertension.

## Adult Blood Pressure Classification

Category	SBP:mmHg	DBP:mmHg
Normal	<120	<80
Pre Htn	120-139	80-89
<b>Hypertension:</b>		
Stage I	140-159	90-99
Stage II	≥ 160	≥ 100
Defer Rx	≥180	≥110

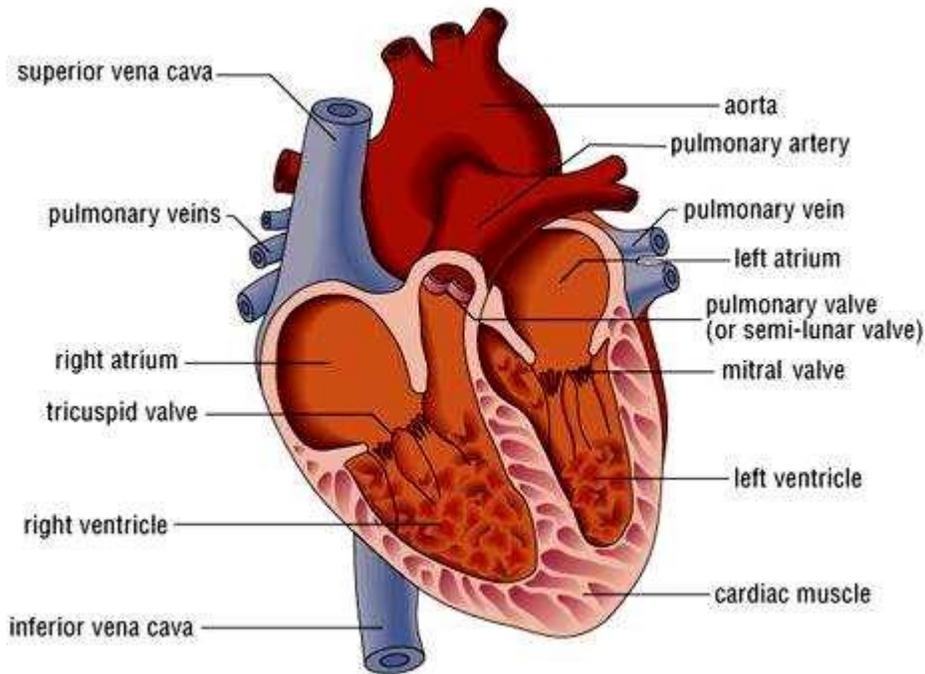
## Regulation of Blood Pressure



**Fig No. 2: Scheme for physiological maintenance of Blood Pressure**

The four factors namely total peripheral resistance(TPR), heart rate, myocardial contractility and venous return are directly under the control of sympathetic nervous system which is defective in hypertensive patients. In hypertensive patients, the Renin: Angiotensin: Aldosterone System is also faulty.

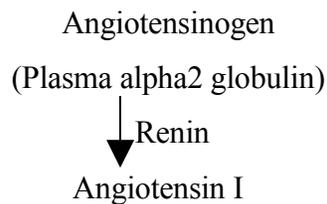
At a less complex level essential hypertension could be the result of an interaction between renin, angiotensin, aldosterone and the sympathetic autonomous nervous system.

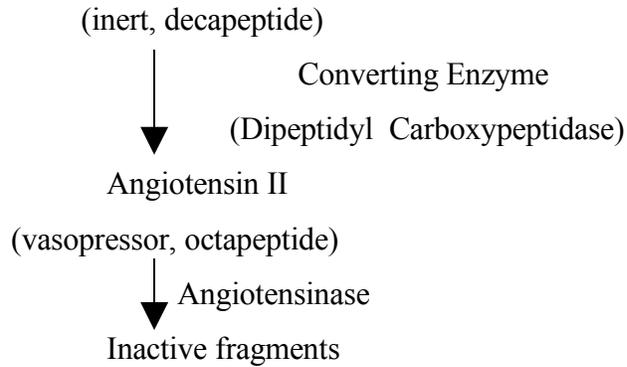


**Fig No. 3: DIAGRAM OF HEART SHOWING OF ALL PARTS**

### **The Renin: Angiotensin: Aldosterone System**

Renal ischaemia leads to hypertension led to the discovery of a kidney enzyme **renin**, which is derived from the granules of the juxtaglomerular apparatus. On renal ischaemia renin is released which acts on substrate in the blood, called **angiotensinogen**, an alpha 2-globulin which is converted into **angiotensin I**, a decapeptide. This is converted into **angiotensin II or angiotensin**, an octapeptide, by the converting enzymes located in the lungs. Angiotensin stimulates the adrenal cortex to release **aldosterone**. Converting enzymes are responsible for the breakdown of bradykinin. Angiotensin is rapidly destroyed in man by the angiotensinases to give inactive peptide fragments. A part of angiotensin I and angitensinII is converted to angiotensin III. Angiotensin III is less potent than angiotensin II.





**Fig No. 4: The Renin: Angiotensin : Aldosterone System**

Many different types of drugs are used, alone or in combination with other drugs, to treat high blood pressure. The major categories are:

- 1) **Angiotensin-converting enzyme (ACE) inhibitors**, such as benazepril (Lotensin), captopril (Capoten), enalapril (Vasotec), lisinopril (Prinivil, Zestril), quinapril (Accupril), and ramipril (Altace). ACE inhibitors work by preventing a chemical in the blood, angiotensin I, from being converted into a substance that increases salt and water retention in the body. These drugs also make blood vessels relax, which further reduces blood pressure.
- 2) **Angiotensin II receptor antagonists**, such as losartan (Cozaar) and losartan with hydrochlorothiazide (Hyzaar). These drugs act at a later step in the same process that ACE inhibitors affect. Like ACE inhibitors, they lower blood pressure by relaxing blood vessels.
- 3) **Beta blockers**, such as atenolol (Tenormin), metoprolol (Lopressor), nadolol (Corgard), propranolol (Inderal), and timolol (Blocadren). Beta blockers affect the body's response to certain nerve impulses. This, in turn, decreases the force and rate of the heart's contractions, which lowers blood pressure.
- 4) **Blood vessel dilators (vasodilators)**, such as hydralazine (Apresoline) and minoxidil (Loniten). These drugs lower blood pressure by relaxing muscles in the blood vessel walls.
- 5) **Calcium channel blockers**, such as amlodipine (Norvasc), diltiazem (Cardizem), isradipine (DynaCirc), nifedipine (Adalat, Procardia), and verapamil (Calan).

Isoptin, Verelan). Drugs in this group slow the movement of calcium into the cells of blood vessels. This relaxes the blood vessels and lowers blood pressure.

- 6) **Diuretics**, such as chlorthalidone (Hygroton), furosemide (Lasix), hydrochlorothiazide (Esidrix, HydroDIURIL), and metolazone (Zaroxolyn). These drugs control blood pressure by eliminating excess salt and water from the body.
- 7) **Nerve blockers**, such as alpha methyldopa (Aldomet), clonidine (Catapres), guanabenz (Wytensin), guanadrel (Hylorel), guanethidine (Ismelin), prazosin (Minipress), rauwolfia derivatives (Reserpine), and terazosin (Hytrin). These drugs control nerve impulses along certain nerve pathways. This allows blood vessels to relax and lowers blood pressure.

### **Blood pressure vaccine**

Blood pressure vaccinations are being trialed and may become a treatment option for high blood pressure in the future. “Vaccination against high blood pressure: a new strategy” showed patients experienced a drop in systolic and diastolic blood pressure after taking the vaccine. Effective blood pressure vaccines would assist those people who forget to take their medication. It would also help those who stop taking their medication due to side effects or falsely believing they don't need them anymore once their blood pressure is lowered.

### **Antihypertensive Drugs and side effects**

<b>Brand Name (Generic Name)</b>	<b>Possible Common Side Effects Include:</b>
Accupril (quinapril hydrochloride)	Headache, dizziness
Aldatazide	Diarrhea, fever, headache, decreased coordination
Aldactone (spironolactone)	Cramps, drowsiness, stomach disorders
Aldomet (methyldopa)	Fluid retention, headache, weak feeling
Altace (ramipril)	Headache, cough
Calan, Calan SR (verapamil hydrochloride)	Constipation, fatigue, decreased blood pressure
Capoten (captopril)	Decreased sense of taste, decreased blood pressure ticking, rash
Cardene (nicardipine Hydrochloride)	Dizziness, headache, indigestion and nausea, increased heartbeat

<b>Brand Name (Generic Name)</b>	<b>Possible Common Side Effects Include:</b>
Cardizem (diltiazem hydrochloride)	Dizziness, fluid retention, headache, nausea, skin rash
Cardura (doxazosin mesylate)	Dizziness, fatigue, drowsiness, headache
Catapres	Dry mouth, drowsiness, dizziness, constipation
Corgard (nadolol)	Behaviorial changes, dizziness, decreased heartbeat, tiredness
Corzide	Dizziness, decreased heartbeat, fatigue, cold hands and feet
Diuril (chlorothiazide)	Cramps, constipation or diarrhea, dizziness, fever, increased glucose level in urine
Dyazide	Blurred vision, muscle and abdominal pain, fatigue
DynaCirc (isradipine)	Chest pain, fluid retention, headache, fatigue
HydroDIURIL (hydrochlorothiazide)	Upset stomach, headache, cramps, loss of appetite
Hygroton (chlorthalidone)	Anemia, constipation or diarrhea, cramps, itching
Hytrin (terazosin hydrochloride)	Dizziness, labored breathing, nausea, swelling
Inderal (propranolol hydrochloride)	Constipation or diarrhea, tingling sensation, nausea and vomiting
Inderide	Blurred vision, cramps, fatigue, loss of appetite
Lasix (furosemide)	Back and muscle pain, indigestion, nausea
Lopressor (metoprolol tartrate)	Diarrhea, itching/rash, tiredness
Lotensin (benazepril hydrochloride)	Nausea, dizziness, fatigue, headache
Alozol (indapamide)	Anxiety, headache, loss of energy, muscle cramps
Maxzide	Cramps, labored breathing, drowsiness, irritated stomach
Minipress (prazosin hydrochloride)	Headache, nausea, weakness, dizziness
Moduretic	Diarrhea, fatigue, itching, loss of appetite
Monopril (fosinopril sodium)	Nausea and vomiting, headache, cough
Normodyne (labetalol hydrochloride)	Fatigue, nausea, stuffy nose

<b>Brand Name (Generic Name)</b>	<b>Possible Common Side Effects Include:</b>
Plendil (felodipine)	Pain in back, chest, muscles, joints, and abdomen, itching, dry mouth, respiratory problems
Procardia, Procardia X (nifedipine)	Swelling, constipation, decreased blood pressure, nausea, fatigue
Sectral (acebutolol hydrochloride)	Constipation or diarrhea, gas, chest and joint pain
Ser-Ap-Es	Blurred vision, cramps, muscle pain, dizziness
Tenex (guanfacine hydrochloride)	Headache, constipation, dry mouth, weakness
Tenoretic	Decreased heartbeat, fatigue, nausea
Tenormin (atenolol)	Nausea, fatigue, dizziness
Veseretic	Diarrhea, muscle cramps, rash
Vasotec (enalapril maleate)	Chest pain, blurred vision, constipation or diarrhea, hives, nausea
Visken (pindolol)	Muscle cramps, labored breathing, nausea, fluid retention
Wytensin (guanabenz acetate)	Headache, drowsiness, dizziness
Zaroxolyn (metolazone)	Constipation or diarrhea, chest pain, spasms, nausea
Zestoretic (lisinopril hydrochlorothiazide)	Fatigue, headache, dizziness
Zestril (lisinopril)	Labored breathing, abdominal and chest pain, nausea, decreased blood pressure

Sodium nitroprusside (Nitropress) and diazoxide (Hyperstat) are used for rapid treatment of hypertensive emergencies. They are given by vein, often during surgery, to reduce blood pressure that suddenly becomes elevated.

Many classes of antihypertensive drugs have been used before surgery to maintain a low blood pressure during the procedure. There does not appear to be a significant difference between drugs when they are used for blood pressure reduction during surgery.

## **Precautions**

The warnings and precautions given below apply to the use of antihypertensive drugs over a long period of time. These adverse effects are generally not a problem when the drugs are given as a single dose prior to surgery.

Because of the large number of classes and individual drugs in this group, patients should ask their physicians about specific drugs.

Peripheral vasodilators may cause dizziness and orthostatic hypotension—a rapid lowering of blood pressure when the patient stands up in the morning. Patients taking these drugs must be instructed to rise from bed slowly. Pregnancy risk factors for this group are generally category C, meaning they may result in adverse effects on the fetus. Hydralazine has been shown to cause cleft palate in animal studies, but there is no human data available. Breastfeeding is not recommended.

ACE inhibitors are generally well tolerated, but may rarely cause dangerous reactions including laryngospasm and angioedema. Persistent cough is a common side effect. ACE inhibitors should not be used in pregnancy. When used in pregnancy during the second and third trimesters, ACE inhibitors can cause injury to and even death in the developing fetus. When pregnancy is detected, discontinue the ACE inhibitor as soon as possible. Breastfeeding is not recommended.

ACE II inhibitors are generally well tolerated and do not cause cough. Pregnancy risk factor is category C during the first trimester and category D (known to cause adverse effects in the fetus) during the second and third trimesters. Drugs that act directly on the renin-angiotensin system can cause fetal and neonatal morbidity and death when administered to pregnant women. Several dozen cases have been reported in patients who were taking ACE inhibitors. When pregnancy is detected, discontinue ACE inhibitors as soon as possible. Breast-feeding is not recommended.

Thiazide diuretics commonly cause potassium depletion. Patients should have potassium supplementation either through diet, or potassium supplements. Pregnancy risk factor is category B (chlorothiazide, chlorthalidone, hydrochlorothiazide, indapamide, metolazone)

or category C (bendroflumethiazide, benzthiazide, hydroflumethiazide, methyclothiazide, trichlormethiazide). Routine use during normal pregnancy is inappropriate. Thiazides are found in breast milk. Breastfeeding is not recommended.

Beta blockers may cause a large number of adverse reactions including dangerous heart rate abnormalities. Pregnancy risk factor is category B (acebutolol, pindolol, sotalol) or category C (atenolol, labetalol, esmolol, metoprolol, nadolol, timolol, propranolol, penbutolol, carteolol, bisoprolol). Breastfeeding is not recommended.

## **CONCLUSION**

Antihypertensive drugs will not cure high blood pressure, but will help control the condition. To avoid the serious health problems that high blood pressure can cause, patients may have to take medicine for the rest of their lives. Furthermore, medicine alone may not be enough. People with high blood pressure also may need to avoid certain foods and keep their weight under control. The health care professional who is treating the condition can offer advice on what measures may be necessary.

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