

# A Summarized and Complete Review on Hypertension: Focusing the Audience of Diploma Pharmacy for Basic Understanding

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## Abstract:

Hypertension (HTN) commonly known as high blood pressure has become one of the most detrimental and life-threatening condition for public health. High blood pressure does not merely affect the heart muscles, but it is also a root cause of multiple dysfunctions of other systems. Untreated blood pressure can cause cardiac problems, ischemic conditions, stroke, renal difficulties, and optic nerve damage. One of the most problematic cause is “silent killer” which means high blood pressure demolishes and worsens the health of the affected person without showing any symptoms till the blood pressure reaches too high. HTN is a life-threatening problem that can be controlled and managed by medicinal or herbal products. This review contains the background, etiology, pathophysiology, and current treatments for high blood pressure. This review aims to deliver basic knowledge or understanding of HTN and management by using drug products with their mechanism of action.

**Keywords:** HTN, Etiology, Pathophysiology, Pharmacological treatment, Mechanism of action

## 1.1 Introduction

HTN comprises two words; hyper means high and tension implies stress. This term clarifies the pressure or stress exerted via the excess blood volume on cardiac walls or other vessels. In other words, HTN decodes abnormal blood pressure when the systolic blood pressure (SBP) reaches 130 mmHg and diastolic blood pressure (DBP) attains more than 80 mmHg. The SBP is defined as when the heart contracts and pumps the blood volume at the upper and lower portions of the body. At this time the pressure experienced by the heart muscles should not be more than 120 mmHg. On the other hand, normal DBP counts 80 mmHg at the time of relaxation of the heart wall or vasodilation. World Health Organization (WHO) explained the SBS and DBS as;

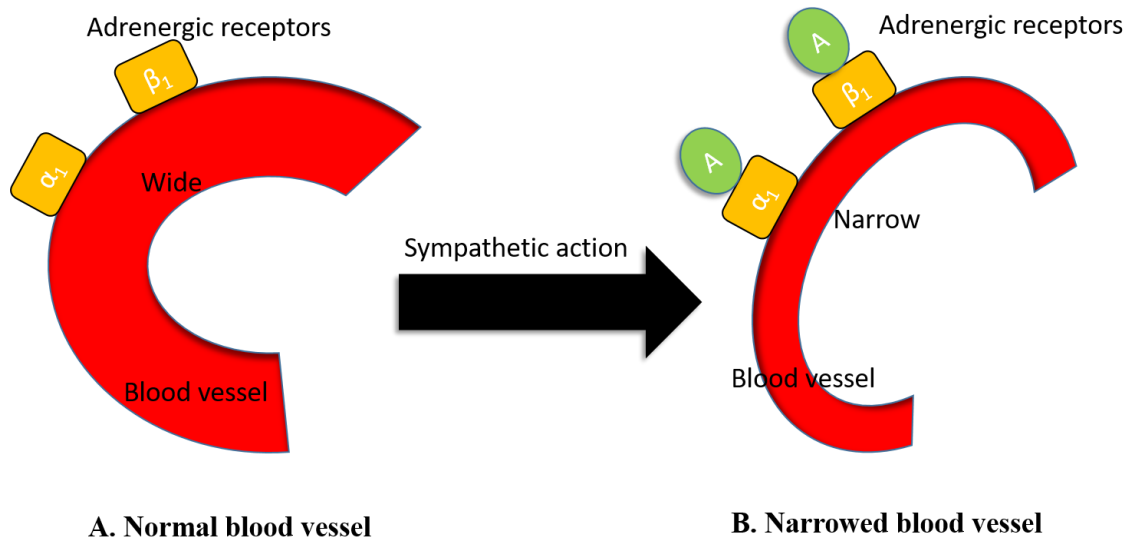
*SBP: pressure feels at the time of heart beats for pumping.*

*DBP: pressure exerted at the time of resting of heart between beats.*

Sr. No.	Range on stage	SBP	DBP
1.	Normal	<120	<80
2.	High blood pressure	120-129	<80
3.	Stage I	130-139	80-89

4.	Stage II	>140	>90
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**Table: 1 Normal and abnormal blood pressure range**



**Fig. 1 Constriction of blood vessels due to the attachment of adrenaline (A) activates the sympathetic nervous system and helps to create blood pressure.**

### 1.2 Types

**Primary HTN:** It occurs due to an unhealthy lifestyle or is not associated with any other disease or disorder.

**Secondary HTN:** It is associated with other diseases or disorders means affected patients who already suffer from another medical condition.

### 1.3 Signs and Symptoms

**Sign:** when the normal condition is observed by the other one. eg; redness, inflammation, skin rashes, hair fall and changes in physical appearance.

**Symptoms:** Experience by affected person or patient. eg; pain, body aches.

- Silent killer (No symptoms)
- Symptoms show at the time when blood pressure reaches an extreme level
- Headache
- Dizziness
- Irregular heartbeat
- Chest pain
- Blur vision
- Anxiety

### 1.4 Causes/Etiology/Risk factors

- Genetics (Family history of HTN)
- Age

- Obesity
- Intake of high sodium diet
- Lack of physical activity
- Unhealthy diet
- Mental stress
- Diabetes
- Hyperlipidemia
- Excess use of alcohol
- Smoking
- Tobacco

### 1.5 Pathophysiology

Healthy or normal blood pressure is usually created by the activation of the adrenergic or sympathetic nervous system following a fight mechanism and shows an increase in blood pressure. Another one releases the renin hormone from the kidney and starts increasing the level of blood pressure by retaining water and sodium contents.

#### Mechanism I

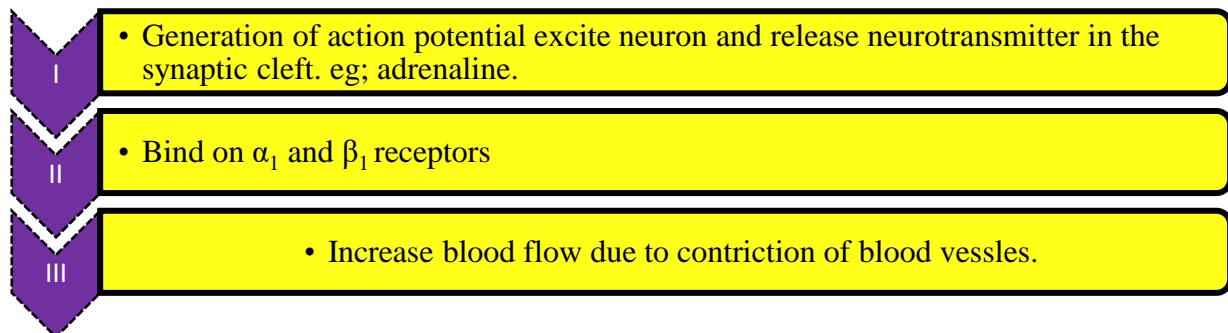


Fig. 2 Sympathetic mechanism of blood pressure

#### Activation of the adrenergic system

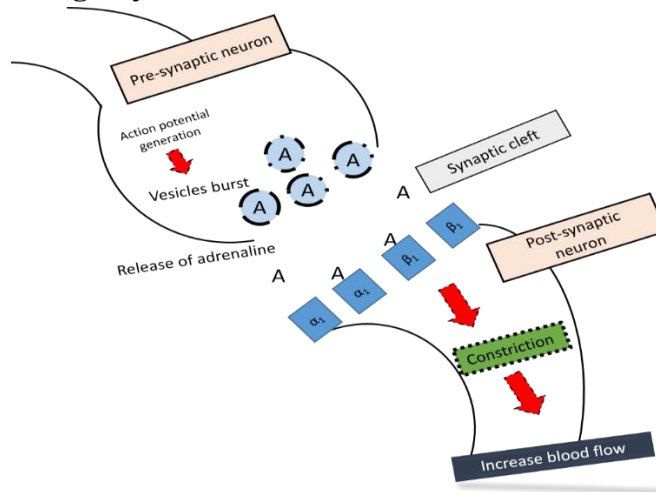
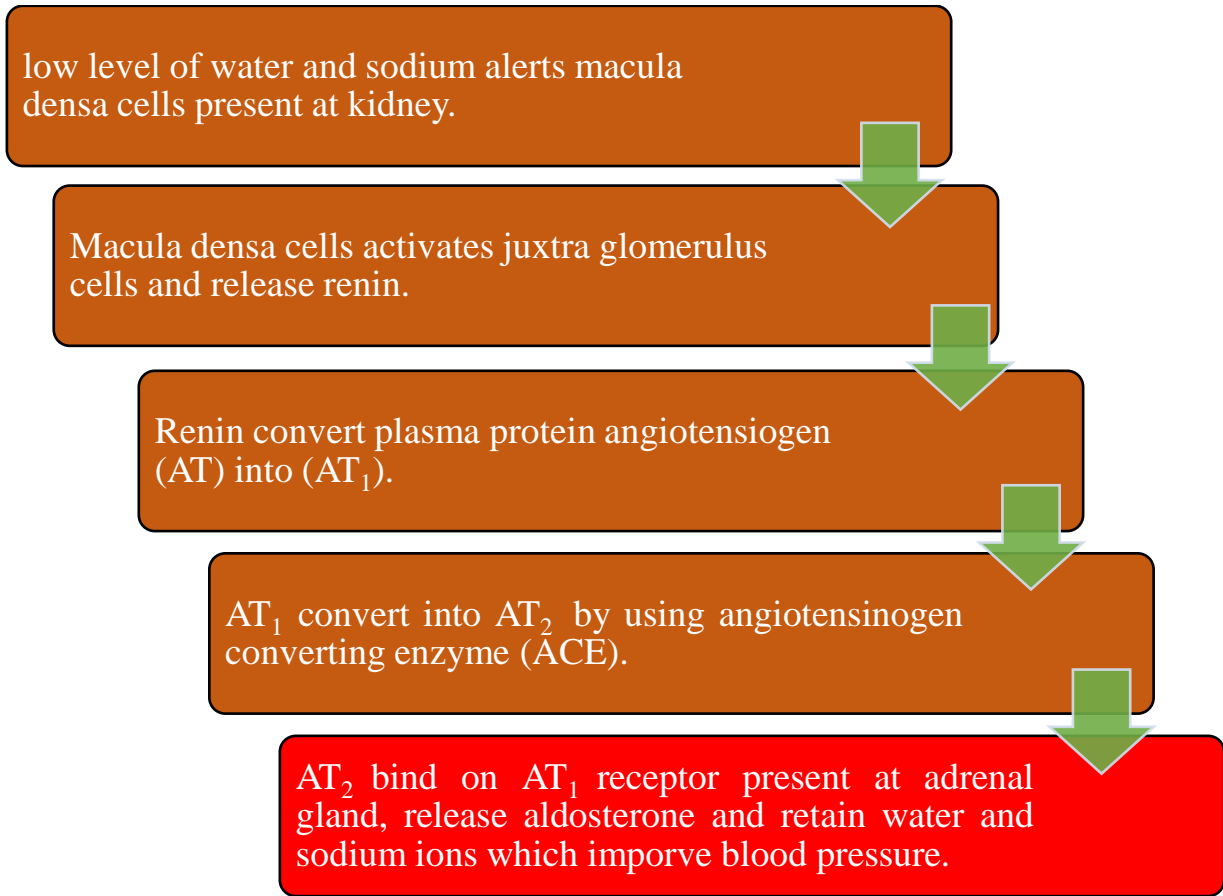


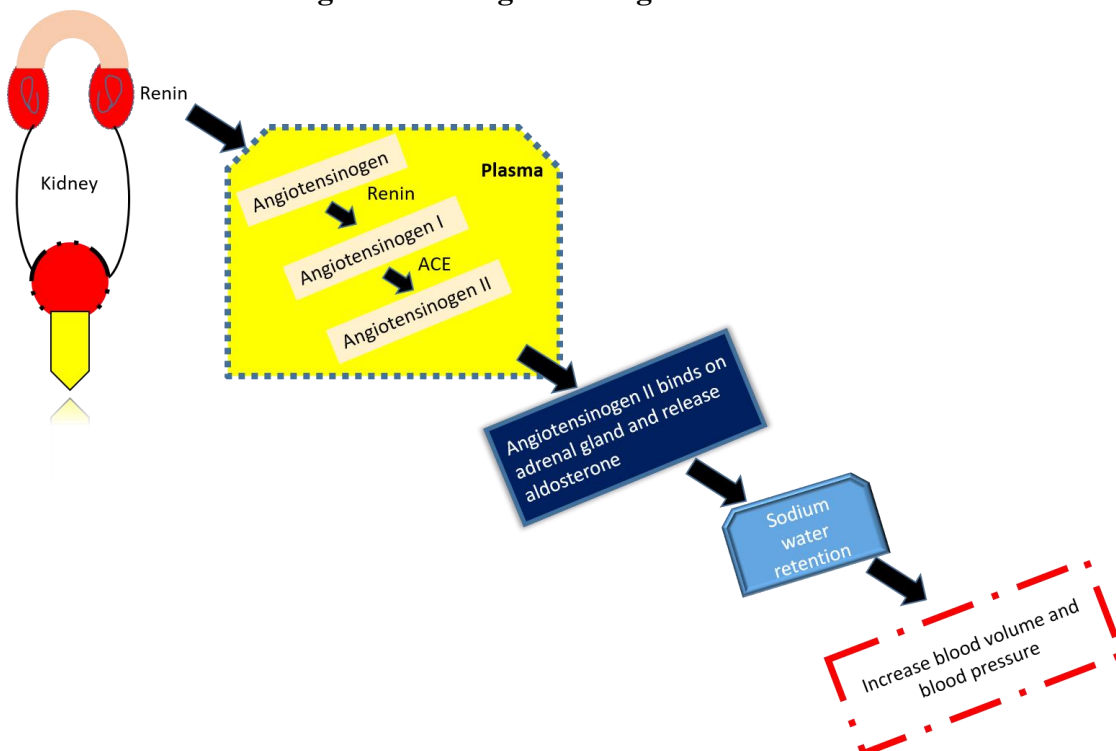
Fig. 3 Adrenaline works as an agonist and shows biological response as constriction in the blood vessels, increasing the blood flow during physical activity or workload.

**Mechanism II**

**Renin angiotensinogen system:**



**Fig. 4 Renin angiotensinogen mechanism**



**Fig. 5 Release of renin initiates regaining the optimum level of blood pressure.**

**1.6 Prevention**

- Healthy diet
- Avoid excess sodium content
- Healthy sleep
- Away from stress
- Meditation
- Physical exercise
- Healthy weight
- Avoid smoking and alcohol
- Health check-up

**1.7 Complication**

- Risk of heart disease eg, heart attack and myocardial infarction
- Brain stroke
- Kidney disease
- Optic damage
- Angina pectoris
- Sexual difficulties in both male and female

**1.8 Diagnosis test**

- Sphygmomanometer
- Blood test
- Eye test
- Echocardiogram

**1.9 Medication**

**Pharmacological treatment:** When high blood pressure is treated or controlled by the pharmaceutical drug product.

**Table 2. Category I: Diuretics**

Drug	Brand name	Mechanism
<b>Thiazide</b>		
Hydrochlorothiazide		Decrease reabsorption of sodium
Chlorthalidone		
Indapamide		
<b>High ceiling</b>		
Furosemide		Decrease reabsorption of sodium
<b>Potassium Sparing</b>		
Spironolactone		Diminished the action of aldosterone
Eplerenone		
Amiloride		

**Table 3. Category II: Renin-angiotensin blockers and inhibitors**

Drug	Brand name	Mechanism
<b>ACE inhibitors</b>		
Captopril	CAPOTRIL, ACETEN	Inhibit ACE and block conversion of AT <sub>1</sub> to AT <sub>2</sub>
Enalapril	ENAPRIL, ENVAS	
Lisinopril	LINVAS, LISTRIL	
Perindopril	COVERSYL	
Ramipril	CARDACE, RAMIRIL	
Fosinopril	FOSINACE	
Quinapril	ACCUPRIL-H Quinapril+hydrochlorothiazide	
Trandolapril	ZETPRIL	
<b>AT<sub>1</sub> receptor blockers</b>		
Losartan	LOSAR	Block AT <sub>1</sub> receptor (Act as Antagonist)
Candesartan	CANDESAR	
Valsartan	DIOVAN	
Telmisartan	TELMA	
Irbesartan	IROVEL	
Olmesartan	OLMAT	
<b>Direct renin inhibitor</b>		
Aliskiren	RASILEZ	Inhibit renin function

**Table 4. Category III: Adrenergic receptor blockers**

Drug	Brand name	Mechanism
<b>Selective β<sub>1</sub> -blockers</b>		
Propranolol	Besprol	Block β <sub>1</sub> receptor and causes vasodilation.
Atenolol	Anten-50mg	
Metoprolol	Asoprol	
Bisoprolol	Biselect	
Esmolol	ESOCARD	
<b>Selective α<sub>1</sub> -blockers</b>		
Prazosin	Minipress	Block α <sub>1</sub> receptor and causes vasodilation.
Terazosin	Hytrin-2	
Doxazocin	Doxacard	
Phentolamine	FENTANOR	
Phenoxybenzamine	FENOXENE	
Alfuzosin	Alfusin	
<b>α+β blockers</b>		
Labetalol	Labetamac	Block both receptors and cause vasodilation.
Carvedilol	Carvedil	
<b>Central sympatholytics</b>		
Clonidine	CATAPRES	

Methyldopa	EMDOPA	Works as $\alpha_2$ agonist gives sympatholytic effect on the brain.
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**Table 5. Category IV: Calcium channel blockers**

Drug	Brand name	Mechanism
<b>Phenyl-alkylamine</b>		
Verapamil	CALAPTIN	Inhibit calcium channels
<b>Benzothiazepine</b>		
Diltiazem	DILZEM	Inhibit calcium channels
<b>Dihydropyridines</b>		
Nifedipine	CALCIGARD	Inhibit calcium channels
Felodipine	FELOGARD	
Amlodipine	AMLOPRES	
Nitrendipine	NITREPIN	
Lacidipine	LACIVAS	
Lercanidipine	LERKA	
Benidipine	CARITEC	

**Table 6. Category V: Vasodilators**

Drug	Brand name	Mechanism
<b>Arteriolar dilators</b>		
Hydralazine	NEPRESOL	Act as vasodilators
Minoxidil	Minoxihart 5	
Diazoxide	Edumin	
<b>Arteriolar+venodilator</b>		
Nitroprusside sodium	SONIDE	Act as vasodilators

### 1.10 Non-pharmacological treatment (Treat by medical consultation)

- Regular check-up
- Changes in lifestyle
- Healthy diet
- Weight loss
- Physical Exercise

### 1.11 Side effects of some drugs

**Table 7. Common side effects of drugs**

Sr. no.	Class	Drug	Side effects
1.	Diuretic	Furosemide	Headache, dry mouth, dizziness
2.	ACE inhibitor	Captopril	Cough, low blood pressure
3.	AT <sub>1</sub> receptor blockers	Losartan	Dizziness, nausea

4.	Selective $\beta_1$ -blockers	Propranolol	Dizziness, cold hands
5.	Calcium channel blockers	Verapamil	Constipation
6.	Arteriolar dilators	Minoxidil	Hair growth

### 1.12 Conclusion

As researchers, drug discovery requires meticulous knowledge of a target disease and disorder. This review combined and exhibited the quickest and easiest ways to understand the development and management of HTN. The preparation of this review focuses student's attention on a basic understanding of HTN.

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