

## HYPERTENSION

### WHEN TO SUSPECT / RECOGNISE

#### CASE DEFINITION

**A case of Hypertension :** Hypertension in adults (>18 yrs) is defined as systolic blood pressure (SBP) of 140 mm of Hg or greater and/ or diastolic blood pressure (DBP) of 90 mm of Hg or greater, based on the average of two or more properly measured, seated BP readings on each of two or more visits.

**Primary hypertension:** When etiology is unknown, as in 90 to 95% of patients.

**Secondary hypertension:** Hypertension with an identifiable cause, secondary to which hypertension appears. Correction of primary cause is likely to improve hypertension.

**Isolated systolic hypertension:** A systolic pressure > 160, with Diastolic pressure <90 mm of Hg, most common in elderly patients, due to reduced vascular compliance.

**TABLE 1. Classification of Blood Pressure for Adults**

BP Classification	SBP mm Hg		DBP mm Hg
Normal	<120	and	<80
High Normal	120-139	or	80-89
Stage 1 hypertension	140-159	or	90-99
Stage 2 hypertension	>160	or	>100

#### Pointers to secondary hypertension

1. Onset of hypertension before 30 years of age, or after age of 55 years.
2. Abdominal bruit.
3. Accelerated hypertension.
4. Resistant hypertension.
5. Decreased pressure in the lower extremities, delayed or absent femoral arterial pulses or asymmetry of upper limb pulses.
6. Paroxysms of hypertension accompanied by headache, palpitations, pallor, and perspiration.
7. Flash pulmonary edema.
8. Abnormal urinalysis.

### EPIDEMIOLOGY OF THE CONDITION IN OUR COUNTRY

**Prevalence:** According to a recent review on “the global burden of Hypertension,” estimated prevalence in India, in 2000 was about 21%. (Indian Guidelines for management of Hypertension 2006)

### DIFFERENTIAL DIAGNOSIS

Following are the conditions where hypertension has an identifiable cause, unlike in primary hypertension.

**TABLE 2. Identifiable Causes of Hypertension**

Cause	Features
Chronic kidney disease	Elevated creatinine, abnormal urinalysis, renal ultrasonography.
Coarctation of the aorta	Decreased pressure in the lower extremities or delayed or absent femoral arterial pulses.

Cause	Features
Cushing syndrome and other glucocorticoid excess states	Truncal obesity, glucose intolerance, and purple striae
Pheochromocytoma	Labile hypertension, paroxysms of hypertension accompanied by headache, palpitations, pallor, and perspiration.
Primary aldosteronism and other mineralocorticoid excess states	Unprovoked hypokalemia
Renovascular hypertension	(1) Onset of hypertension before 30 years, or after 55 years of age (2) Abdominal bruit (3) Accelerated hypertension (4) Resistant hypertension (5) Flash pulmonary edema (6) Renal failure of uncertain etiology (7) Acute renal failure precipitated by therapy with an angiotensin-converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB)
Sleep apnea	Obesity, snoring, day time somnolence, resistant hypertension
Thyroid	Goiter, features of dysthyroidism
Parathyroid disease	Hypercalcemia

## DIAGNOSTIC CRITERIA, INVESTIGATIONS, TREATMENT & REFERRAL CRITERIA

### LEVEL 1: AT SOLO PHYSICIAN CLINIC

**Clinical Diagnosis:** An average of two or more properly measured, seated, BP readings on each of two or more visits, classifying as per table 1. A thorough general and systemic examination should be carried out to look for target organ involvement and to rule out secondary causes of hypertension.

**Investigations:** The diagnosis is mainly clinical. However complete haemogram, routine and microscopic examination of urine, blood urea, serum creatinine, fasting blood sugar, fasting lipid profile, ECG and chest X ray may be done outside or from level 3 care, as outlined below.

**Treatment:** Treatment comprises of lifestyle modification and pharmacological therapy with antihypertensive drugs. Patients with stage 1 hypertension without any other risk factors or target organ damage can be managed by instituting life-style modifications and reviewed after 3 months to decide whether they require antihypertensive therapy.

#### Goals of Therapy

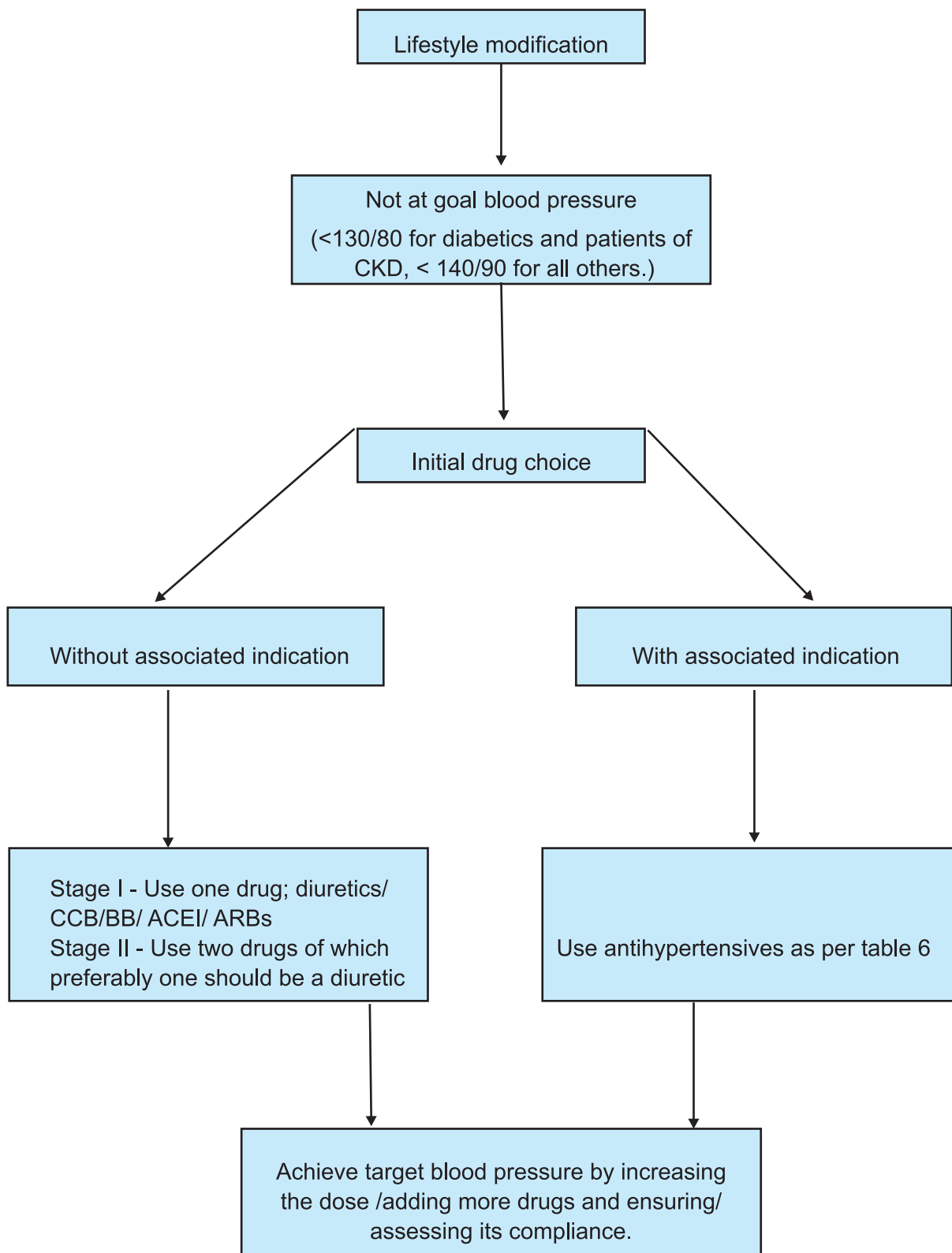
- To reduce SBP and DBP to < 140 and <90 mm of Hg
- In hypertensive patients with diabetes or renal disease, the BP goal is < 130/80 mm Hg

#### Lifestyle Modifications

- Adoption of healthy lifestyles by all patients is an indispensable part of the management of all patients with hypertension and alone is sufficient for individuals with high normal blood pressure.
- Weight loss -As little as 10 lbs (4.5 kg) reduces BP, although the ideal is to maintain normal body weight.
- Dietary Approach - Diet rich in fruits and vegetables, and low in fat, dairy products, cholesterol, saturated and total fat. Dietary sodium should be less than 100 mmol per day (2.4 g of sodium).
- Regular physical activity-brisk walking at least 30 minutes per day, most days of the week.

- Alcohol intake - (preferably avoided)
  - Men - not more than 1 oz (30 mL) of ethanol, the equivalent of two drinks per day
  - Women - not more than 0.5 oz of ethanol (one drink) per day in women and lighter weight persons.
- Patients should be strongly counseled to quit smoking

**Treatment Algorithm:**



**TABLE 3. Oral Antihypertensive Drugs**

Class	Drug	Usual Dose Range, mg/d	Usual Daily Frequency
Thiazide diuretics	Hydrochlorothiazide	12.5-50	1
	Indapamide	1.25-2.5	1
Beta blockers (BBs)	Atenolol	25-100	1
	Metoprolol	50-100	1-2
	Propranolol	40-160	2
Angiotensin II antagonists (ACE inhibitors)	Ramipril	2.5-20	1
	Envas	2.5-20	2
	Perindopril	4-8	1
Angiotensin receptor blockers	Losartan	25-100	1-2
	Valsartan	80-320	1-2
Calcium channel blockers (CCBs) - Non-dihydropyridines	Diltiazem extended release	180-420	1
CCBs -Dihydropyridines	Nifedipine (long-acting)	30-60	1
	Amlodipine	2.5-10	1
Central $\alpha$ 2 agonists and other centrally acting drugs	Clonidine	0.1-0.8	2
	Methyldopa	250-3000	2
Alpha blockers	Prazosin	2.5-10	1

**Referral criteria:**

All patients detected to have hypertension for the first time.

Those with target organ damage, for further evaluation

Those with features suggestive of secondary hypertension, requiring further evaluation

**LEVEL 2: AT 6-10 BEDDED PRIMARY HEALTH CENTRE**

**Clinical diagnosis:** Same as level 1 (including for a fresh case, reporting directly).

**Investigations:**

- Same as Level 1 (including for a fresh case, reporting directly).

**Treatment**

- Same as Level 1

**Referral criteria**

Same as level 1

Patients requiring those investigations that are available only at the next level of health care.

Refractory hypertension- suboptimal control of blood pressure in spite of appropriate therapy i.e. 3 antihypertensive drugs in maximal doses (one of these drugs should be a diuretic)

**LEVEL 3: AT 30-100 BEDDED COMMUNITY HEALTH CENTRE**

**Clinical Diagnosis:** Same as level 1 (including for a fresh case, reporting directly). Evaluate for cardiovascular risk factors as per table 4. Look for target organ damage.

**TABLE 4. Cardiovascular Risk Factors**

Age (older than 55 yrs for men, 65 yrs for women)
Diabetes mellitus
Elevated LDL (or total) cholesterol or low HDL cholesterol
Estimated GFR < 60 ml/min
Family history of premature cardiovascular disease (men aged <55 or women aged <65)
Microalbuminuria
Obesity (body mass index $\geq 30$ kg/m <sup>2</sup> )
Physical inactivity
Tobacco usage, particularly cigarettes

**Investigations:**

Same as Level 2, including for a fresh case reporting directly. Evaluate the target organ damage as per table 5. Evaluate judiciously for identifiable causes of hypertension (secondary hypertension) as per table 2. Routine laboratory tests for all patients

- 12-lead ECG
- Hematocrit
- Urinalysis
- Blood glucose
- Serum electrolytes
- Serum creatinine (calculate GFR from the modified Cockcroft and Gault equation)
- Serum Calcium
- Lipid profile (after 9- to 12-hour fast)
- Urinary albumin excretion or albumin / creatinine ratio (ACR) for those with diabetes or kidney disease.

More extensive testing for identifiable causes is indicated in the following conditions

- BP control is not achieved
- Clinical and routine laboratory evaluation strongly suggests an identifiable secondary cause

**Table 5. Target organ damage**

Organ	Features	Evaluation History	Examination	Investigation
Heart	Heart failure	Exertional breathlessness, PND, orthopnea, edema	Pedal edema, JVP, diffuse apical impulse, S3, S4, chest examination for pulmonary edema.	X-ray chest, ECG, Echocardiography
	Coronary artery disease	History of angina, prior myocardial infarction, prior coronary revascularization		In addition to above, TMT and Coronary angiography if indicated.
	Left ventricular hypertrophy		Forceful sustained apical impulse	ECG, Echocardiography.

Organ	Features	Evaluation History	Examination	Investigation
Brain	Stroke or transient ischemic attack	History of sudden onset, transient / persistent neurological deficit	Neurological examination	
	Dementia		MMSE, Neurological examination	NCCT/ MRI brain
Chronic kidney disease		Uremic complaints, urine out-put, dyspnea	Pallor, edema, peripheral neuropathy, sensorium and orientation, asterexis, uremic odour and clinically assess requirement for dialysis	Urine analysis, BUN, creatinine, haemoglobin, electrolytes, $\text{Ca}^{2+}$ , $\text{PO}_4^{4-}$ , ECG, X-Ray chest, sonography for kidney
Peripheral arterial disease		H/o claudication	Assess peripheral pulses, look for arterial bruits	Doppler studies
Retinopathy				Fundoscopy

**Treatment:** Same as Level 2. Additionally, look for compelling indications to modify the medications.

**TABLE 6. Preferred indications for Individual drug classes**

Compelling Indication	Recommended Drugs					
	Diuretic	BB	ACEI	ARB	CCB	Aldosterone Antagonists
Heart failure	•	•	•	•		•
Post-myocardial infarction		•	•			•
High coronary disease risk	•	•	•		•	
Diabetes	•	•	•	•	•	
Chronic kidney disease			•	•		
Recurrent stroke prevention	•		•			

Important contraindications, for e.g. raised serum creatinine-more than 3 mg% while prescribing ACE inhibitors or while prescribing  $\beta$  blockers in patients with heart failure having NYHA class III symptoms, should be kept in mind.

### Evaluation of refractory hypertension

Evaluation of remediable causes in refractory hypertension-

1. Excess salt intake
2. Inadequate diuretic therapy
3. Non-adherence
4. Inadequate doses and inappropriate combination
5. Other medication use such as non steroidal anti inflammatory drugs, cocaine, amphetamine, sympathomimetics, corticosteroids, cyclosporine etc.

6. Associated conditions like obesity, excess alcohol use, obstructive sleep apnea.
7. Identifiable causes of hypertension

**Referral criteria:**

Refractory Hypertension

Definitive management of secondary hypertension

Definitive management of complications of hypertension

**LEVEL 4: AT 100 OR MORE BEDDED DISTRICT HOSPITAL**

**Clinical Diagnosis:** Same as level 3. Usually a patient requiring the referral to level 4 would have either complications of hypertension not manageable at level 3 or a secondary hypertension manageable only at level 4.

**Investigations:** Same as level 3. Other investigations, including hormonal, imaging (CT/MRI), renal, coronary and other angiographies if indicated, and not available at level 3, including those mentioned in table 5 and 7.

**Treatment:** Hormonal therapy, surgery and non-surgical interventional management etc can be offered at this level of care in secondary hypertension and complications of hypertension.

**TABLE 7. Common management offered for various identifiable causes of hypertension**

Diagnosis	Diagnostic Test	Management
Coarctation of the aorta	CT angiography	Surgical correction
Cushing syndrome and other glucocorticoid excess states including chronic steroid therapy	History/dexamethasone suppression test, serum cortisol	Resection of tumour, tapering of corticosteroids if possible
Pheochromocytoma	24-hour urinary metanephrine and normetanephrine	Surgical resection
Primary aldosteronism and other mineralocorticoid excess states	24-hour urinary aldosterone level or specific measurements of other mineralocorticoids	Surgical resection
Renovascular hypertension	Doppler flow study, magnetic resonance angiography	Stenting / surgical revascularisation
Sleep apnea	Sleep study with O <sub>2</sub> saturation	Continuous positive airway pressure
Thyroid/parathyroid disease	TSH, serum PTH	Anti thyroid drugs, radio iodine, surgical resection, replacement in case of hypothyroidism

**SUGGESTED READING**

1. Roccella E, Kaplan N. Interpretation and evaluation of clinical guidelines. In: Izzo JL Jr, Black HR (eds). Hypertension Primer: The Essentials of High Blood Pressure: Basic Science, Population Science, and Clinical Management. Philadelphia, PA: Lippincott Williams & Wilkins; 2003.
2. Haynes WG, Lopez JAG, Mark AL. Treatment of hypertension combined with cardiovascular disease. In: Smith TW (ed): Cardiovascular Therapeutics: A Companion to Braunwald's Heart Disease. Philadelphia, PA: WB Saunders; 1996.
3. Clinical guidelines for the management of hypertension, Cairo, World Health Organization Regional Office for the Eastern Mediterranean, 2005 (EMRO Technical Publications Series No. 29).
4. Chobanian AV, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. Hypertension, 2003, 42:1206-1252.
5. Williams B, et al. Guidelines for management of hypertension: Report of the fourth working party of the British Hypertension Society, 2004-BHS IV. Journal of Human Hypertension, 2004, 18:139-185.