# National Guideline on Hypertension


2nd Edition

Non Communicable Disease Control Program (NCDC)
Directorate General of Health Services
Ministry of Health & Family Welfare

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# National Guideline on Hypertension


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**Honorable Health Minister**
Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh

# Message

It brings me great joy to learn that the Non-communicable Disease Control (NCDC) Program under the Directorate General of Health Services (DGHS) is publishing the second edition of "National Guidelines for Management of Hypertension in Bangladesh"in collaboration with National Heart Foundation Hospital and Research Institute and Japan International Cooperation Agency (JICA).I extend my heartfelt appreciation to the dedicated experts who have invested their efforts in bringing this guideline to fruition. Their commitment is truly commendable, and I am sincerely grateful for their valuable contributions.

Hypertension is a chronic condition that spans a lifetime. Left uncontrolled, it can escalate into life-threatening emergencies and tragically even death. Long-term hypertension can result in severe health complications over time. Yet, research has revealed that the potential complications are highly preventable through early detection and effective control. This guideline holds the potential to steer our physicians towards the right treatment regimen for their patients' optimal management.

The true value of a guideline emerges when it finds its way into clinical practice. With that in mind, I would like to encourage all clinicians to follow this guideline, in their settings to ensure the optimal management of hypertension.

I wish the "National Hypertension Guidelines' a grand success.
Joi Bangla. Joi Bangabandhu May Bangladesh Live Forever.

Zahid Maleque, MP

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**Founder & President**
National Heart Foundation of Bangladesh

# Message

Hypertension, a prevalent cardiovascular disorder affecting people worldwide, continues to be inadequately addressed in many countries, including Bangladesh. Despite the existence of guidelines from international organizations, there is an urgent need for a country-specific approach that considers the unique characteristics of the Bangladeshi population. Such tailored guidelines would be of immense value to physicians and healthcare providers, enabling them to effectively manage hypertension. This national guideline for hypertension management in Bangladesh have been meticulously developed by the Non-Communicable Disease Control program under the Directorate General of Health Services, in collaboration with National Heart Foundation Hospital and Research Institute and Japan International Cooperation Agency, who provided necessary technical assistance.

I would like to express my congratulations and appreciation to all those who are involved in developing this guideline, as they contributed significantly to enhance the capacity of the country's healthcare system.

National Professor Brig. (Rtd.) Abdul Malik

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**Secretary**
Health Service Division
Ministry of Health & Family Welfare
Government of the People's Republic of Bangladesh

# Message

Hypertension is the most prevalent cardiovascular condition, presenting a challenge due to its asymptomatic nature, complicating detection and treatment. To effectively manage hypertension, tailored guidelines that consider the unique context of the Bangladeshi population are important for healthcare professionals.

I extend my gratitude to National Heart Foundation Hospital and Research Institute and Japan International Cooperation Agency (JICA) for their technical support in crafting these national guidelines. I firmly believe that this collaborative effort will empower physicians and contribute significantly to our journey toward achieving universal health coverage.

I eagerly anticipate the successful implementation of these guidelines, envisaging ahealthier future for all.

Dr. Md. Anwar Hossain Howlader

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**Director General**
Directorate General of Health Services
Government of the People's Republic of Bangladesh

# Message

In Bangladesh, hypertension is a significant risk factor for non-communicable diseases. A large number ofpeople suffer from hypertension. Ibelievethis national hypertension guideline will provide vital assistance to physicians in effective management of hypertension.

I would like to express my deepest appreciation to the diligent members of the Working Group on Hypertension guideline for their unwavering dedication in creating the latest edition of the Hypertension Guidelines for Bangladesh.

I look forward to the imminent success of this guideline.

Prof. Dr. ABM Khurshid Alam

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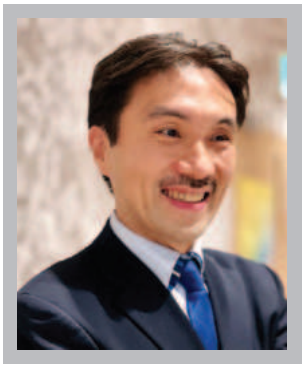

Chief Representative
JICA Bangladesh Office

# Message

It is my great pleasure that the National Hypertension Guidelineis launched by the Government of Bangladesh (GOB).JICA recognizes that Non-Communicable Diseases (NCDs), including Hypertension , are a growing public health concern in Bangladesh, affecting a significant portion of the population and leading to high morbidity and mortality. Nevertheless, thanks to initiatives by the GOB to improve people's access to NCDs services, remarkable progress has been made over the past few years in instituting measures against NCDs, particularly diabetes and hypertension.

JICA has been providing support in the health sector through financial and technical cooperation with the GOB. Currently, the prevention of NCDs is one of our prioritiesas seen inJICA's implementation of the "Project for Strengthening Health Care Systems for Organizing Communities (known as SHASTO)"until 2022. The project worked closely with the Non Communicable Disease Control Program(NCDC) and the Directorate General of Health Services (DGHS) to develop and implement the NCDC Program activities, including promoting the NCDs management model to prevent hypertension and diabetes. We are happy to celebrate the lauchning of this guideline as a output of SHASTO project. JICA is delighted to continue the collaboration with NCDC and DGHS for launching anew project on strengthening healthcare systems for preventing NCDs this year.

This national Hypertension guideline aims to provide evidence-based guidance for the prevention, diagnosis, and management of Hypertension in Bangladesh, which is tailored to local needs, practices, and resource availability. It covers various aspects of Hypertension care.

The guideline, which was developed through the efforts of experts on Hypertension care in Bangladesh,fully reflects the accumulated expertise in such care. We believe this will help healthcare professionals responsible for those with Hypertension ensure essential, high-quality healthcare services that improve the health outcomes and quality of life of patients while reducing the burden the disease places on those patients and on the healthcare system.

We remain committed to working with the Government of Bangladesh and our other partners to reduce the impact of NCDs on the country

T. Ichiguchi

Ichiguchi Tomohide

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**Line Director**
Non-communicable Disease Control Program
Directorate General of Health Services

# Preface

I am thrilled to witness the remarkable milestone achieved in Bangladesh with the development of a comprehensive national guideline tailored for physicians to effectively manage hypertension. This commendable achievement has been made possible through the collaborative efforts of the NCD Unit within the Directorate General of Health Services and the invaluable technical assistance provided by the National Heart Foundation Hospital and Japan International Cooperation Agency (JICA). As the epidemiological landscape undergoes continuous changes, the prevention and management of hypertension have become increasingly crucial in safeguarding public health. These meticulously crafted guidelines hold great promise in equipping physicians and healthcare providers throughout Bangladesh with the necessary tools and knowledge to address hypertension comprehensively. I am confident that the implementation of these guidelines will bring about significant improvements in hypertension management, leading to enhanced healthcare outcomes for individuals across the country.

I express my heartiest thanks to all the members of the working committee for their brilliant contribution to publishing this guideline. Thanks to National Heart Foundation Hospital and Research Institute and JICA for their technical support.

Prof. Dr. Md. Robed Amin
Editor-in-Chief

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# Abbreviations

| | |
|---|---|
| ABPM | Ambulatory Blood Pressure Monitoring |
| ACEi | Angiotensin Converting Enzyme Inhibitors |
| AF | Atrial Fibrillation |
| ASH | American Society of Hypertension |
| ARBs | AngiotensinReceptorBlockers |
| BBs | Beta-blockers |
| BP | Blood Pressure |
| BMI | Body Mass Index |
| CBC | Complete Blood Count |
| CCB | Calcium Channel Blocker |
| CHF | Congestive Heart Failure |
| CHW | Community Health Workers |
| CKD | Chronic Kidney Disease |
| CMP | Comprehensive Metabolic Panel |
| CPP | Cerebral Perfusion Pressure |
| CTA | Computed Tomography Angiography |
| CV | Cardiovascular |
| CVD | Cardiovascular disease |
| DBP | Diastolic Blood Pressure |
| DGHS | Directorate General of Health Service |
| DM | Diabetes Mellitus |
| DMSA | Dimercapto Succinic Acid |
| ECG | Electrocardiogram |
| ERSD | End Stage Renal Disease |
| ESH | European Society of Hypertension |
| eGFR | Estimated Glomerular Filtration Rate |
| GFR | Glomerular Filtration Rate |
| HBPM | Home Blood Pressure Monitoring |
| HCW | Health Care Worker |
| HDL | High-density Lipoproteins |
| HTN | Hypertension |
| ICH | Intracerebral Hemorrhagic |

| | |
|---|---|
| ICU | Intensive Care Unit |
| ISH | International Society of Hypertension |
| KDOQI | Kidney Disease Outcomes Quality Initiative. |
| LDL | Low-density Lipoproteins |
| LEAD | Lower Extremity Artery Disease |
| LFT | Liver Function Tests |
| LVH | Left Ventricular Hypertrophy |
| MAP | Mean Arterial Pressure |
| MI | Myocardial Infarction |
| MRA | Magnetic Resonance Angiography |
| NCD | Non communicable Diseases |
| NICE | National Institute for Health and Clinical Excellence |
| OSAS | Obstructive Sleep Apnea Syndrome |
| PWV | Pulse Wave velocity |
| RAS | Renin Angiotensin System |
| RAAS | Renin Angiotensin Aldosterone System |
| RCT | Randomized Control Trial |
| SACMO | Sub Assistant Community Medical Officer |
| SAH | Subarachnoid Hemorrhage |
| SBPM | Self Blood Pressure Monitoring |
| SBP | Systolic Blood Pressure |
| SPC | Single-pillcombination |
| TFT | Thyroid Function Test |
| TIA | Transient Ischemic Attack |
| TOD | Target Organ Damage |
| TTE | Transthoracic Echocardiography |
| UHC | Upazila Health Complex |
| USG | Ultrasonogram |
| WHO | World Health Organization |

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# Executive Summary

# Executive Summary

## Background

Hypertension is a chronic long-term condition where blood pressure is increased. In adults, blood pressure is considered to be normal under a systolic value of 140 mmHg and under a diastolic value of 90 mmHg.

A person is considered to have high blood pressure if the systolic value is equal to or above 140 mmHg, the diastolic value is equal to or above 90 mmHg, or if both are higher than these readings.It is a complex condition with many causes including lifestyle factors, such as physical inactivity, a salt-rich diet with high processed and fatty foods, and alcohol and tobacco use.

Hypertension is known as "silent killer" because people with high blood pressure may not feel symptoms. The only way to know is to routinely check blood pressure.Pharmacologic and nonpharmacologic interventions together requires for effective hypertension treatment and management and prevent target organ damage.

## Diagnosis of HTN

Most people with hypertension do not feel any symptoms.Individuals with extremely high blood pressure may experience headaches, blurred vision, chest pain, and other related symptoms.Regular monitoring of blood pressure is crucial for early detection. Left untreated, hypertension can lead to the development of serious health conditions such as kidney disease, heart disease, and stroke.

Diagnosis of HTN is usually based on the average of two or more readings taken on separate occasions.Hypertension is defined as 140/90 mmHg or higher. Severe hypertension is 160/100 mmHg and higher and may require immediate or emergency treatment.

## Management of HTN

Controlling hypertension is associated with a reduction in mortality and adverse cardiovascular outcomes, and both non-pharmacological and pharmacological interventions are essential to treatment.HTN is a global epidemic and hence many guidelines and pharmacologic options are available to prevent the morbidity and mortality associated with HTN. The national guideline of HTN in Bangladesh is updated and second version is also aim to prevent these similar aim.

Although lifestyle modifications are frequently neglected, they should be started early and continued indefinitely. For some individuals, the management of blood pressure necessitates the use of multiple antihypertensive agents.

The pharmacological management should be started with any one of either Calcium channel blocker(CCB), ACEI or ARB or Thiazide diuretics. The primary health care of Bangladesh is settled with first line CCB (Amlodipine) followed by second line ARB (Losartan potassium) and third line Thiazide diuretics( Hydrochlorothiazide) with defined protocol.

Combining therapies prove effective, especially for those in stage 2HTN. Regardless of the chosen medication, the foremost objective in HTN treatment is achieving the target blood pressure. Effective communication among physicians, healthcare providers, and patients plays a pivotal role in the successful management of HTN.

## Hypertensive crisis

Hypertensive crisis is a severe clinical condition in which a sudden increase in arterial blood pressure can lead to acute vascular damage of vital organs.A thorough assessment must be performed to differentiate between urgency and emergency.Timely detection, evaluation and adequate treatment are crucial to preventing permanent damage to vital organs.

## Secondary hypertension and Resistant hypertension

Resistant hypertension may have no symptoms for a longer period, but then can cause heart attack, stroke, and vision and kidney damage.Pseudoresistant hypertension is important to diagnose and treat.Assessment and treatment of resistant hypertension includes addressing any identifiable conditions or causes and adjusting medications in a personalized way.

## Hypertension in patients with diabetes mellitus

ACEIs are the preferred choice for cardiovascular and renal protection in diabetic patients as they have no adverse effects on lipid and carbohydrate metabolism. If ACEIs are not tolerated, ARBs can be considered, offering similar efficacy and better tolerance.

Diuretics can be used alone or with ACEIs/ARBs at the lowest effective dose to minimize adverse metabolic effects.

CCBs have minimal metabolic impact, and non-dihydropyridine CCBs may be preferable for reducing proteinuria in diabetic nephropathy.

Beta-blockers are an option when other medications are unsuitable, but caution is advised, especially in type 1 diabetes. Peripheral alpha blockers don't affect carbohydrate or lipid metabolism but may worsen orthostatic hypotension in autonomic neuropathy.

## Hypertension in coronary artery diseases

Individuals who have both hypertension and HFrEF should be treated with medications.Beta-blockers and MRAs are effective in improving clinical outcome in patients with HFrEF compared to diuretics. Antihypertensive treatment is frequently required for patients with HFpEF. Same BP threshold and target for drug treatment recommended for HFrEF should be applied in HFpEF.

## Hypertension management in stroke

Stroke is a medical emergencyof cerebrovascular disease.Although many strokes are treatable, some can lead to disability or death. Therefore, immediate treatment for stroke may help prevent life-threatening consequences. Blood pressure below 185/105 is needed if patient undergo thrombolysis in ischemicstroke and a blood pressure above 220/110, then immediate reduction is important (10-20% reduction in the first hour, reaching 160/100 mmHg in 6 hours, reduce to target in 2-3 days).

## Hypertension in children and adolescents

A well-taken history provides clues about the cause of hypertension and guides the selection and sequencing of ensuing investigations.Symptoms and signs are not specific in neonates and are absent in older children unless the hypertension is severe.
Children are at greater risk of hypertensive emergencies due to an underlying condition. Severe hypertension requires urgent consultation and management. Hypertension associated with encephalopathy is a medical emergency.

## Hypertension in Chronic Kidney Disease (CKD)

CKD is becoming more widespread in Bangladesh and its connection to the onset of CVD is notably significant. HTN plays a dual role as both a cause and consequence of CKD, impacting a substantial majority of CKD patients. Effectively managing HTN is crucial for individuals with CKD, lowering BP in CKD slows disease progression and reduces incident CVD.

Non-pharmacological interventions are useful in reducing BP in CKD but are rarely sufficient to control BP adequately.
Patients with CKD and hypertension will often require a combination of antihypertensive medications to achieve target BP. It's worth noting that specific pharmacological treatments not only contribute to blood pressure regulation but also offer additional kidney- and heart-protective benefits.

## Hypertensive disorder in pregnancy

Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide.Recent survey by NIPORT 2022, MOHFW has revealed that prevalence of pregnancy induced hypertension (PIH) in Bangladesh is 10.1% (95% CI, 9.0, 11.2) among pregnant women with gestational age >20 weeks.

Pre-eclampsia and eclampsia are one of the common obstetric emergencies. About 4.6% of pregnancy are complicated with pre-eclampsia.Eclampsia is the cause of 24% maternal death in Bangladesh. Most of the pre-eclampsia and eclampsia are preventable.

## Role of non-physician professionals in hypertension control

Strengthening primary health care for tackling the increasing burden of NCDs in Bangladesh is critically important, where the non-physician professional such as SACMO, nurse and CHW, who are based at community clinics, union-subcenters and Upazila Health Complexes could play a pivotal role in screening, provisional diagnosis, early detection, management, referral and follow-up of patients with NCDs.

# Chapter-1
# Introduction

# Chapter -1

## 1. Introduction

Hypertension or elevated blood pressure significantly increases the risk of disease of the heart, brain, kidney and other organs and it is the leading cause of death globally. About 1.4 billion people worldwide have high blood pressure[1,2] Despite the availability of effective treatments for hypertension, blood pressure control rates are poor especially in Low middle income countries[3]. According to the Bangladesh Non-Communicable Disease (NCD) Risk Factor Survey 2022, percentage with hypertension in adults aged 18-69 years, is 23.5% in general, 24.1% in men and 23.0% in women[4]. The prevalence of hypertension among elderly people (>60 years) of Bangladesh is 49%, 42% among male, and 56% among females[5]. Almost 50% of hypertensive adults in Bangladesh are unaware about their condition and 35% of hypertensives are under treatment, while only 14% have their blood pressure under control [5,6,7].

In Bangladesh treatment of hypertension is mostly provided by general practitioners and specialist physicians including cardiologists through government and private health care facilities. In union level government facilities, medical assistants, and community health care providers at community clinics screen for high blood pressure and refer for diagnosis and treatment to physicians. However, many hypertensive patients receive treatment from village doctors[8]. Adherence to hypertension treatment is low mainly due to lack of understanding about necessity of continued treatment once blood pressure level become lower after taking medication and cost of medication in case of poor patients. Lack of updated information and current recommendations on hypertension management for physicians at primary care level are also a barrier for providing proper management. Although several guidelines for hypertension treatment by various international professional organizations are available[9-13], a country specific guideline taking account of the context of Bangladeshi population is needed for effective management of hypertension by physicians and health care providers working at various tiers of health care system.

The National Guidelines for Management of Hypertension in Bangladesh was developed in 2013 by an expert committee of Directorate General of Health Services of Ministry of Health and Family Welfare, Government of Bangladesh[14]. Due to the global advancement in medicine, the guidelines need revision and updating in the light of new evidence and practice.

### 1.1. Objective

The objective of this guideline is to provide clear and concise information to all health care providers on the current concepts in the management of hypertension. Since hypertension is managed by various levels of health care providers in Bangladesh, attempts were made to ensure that different stakeholders benefit from this guideline. Non-Communicable Diseases Control (NCDC) Program of Directorate General of Health Services (DGHS) has developed a treatment protocol for management of diabetes and hypertension at primary health care settings in October 2019. In the first revision of the National Guidelines for Management of Hypertension in Bangladesh, those treatment protocols and new evidence from different global guidelines has been incorporated to make these guidelines easily available and usable by secondary and tertiary level health care providers working in limited resource settings.

### 1.2. Methods

For drafting of the guidelines, Directorate General of Health Services, Ministry of Health and Family Welfare convened a working group comprised of leading experts from cardiology, paediatric cardiology, internal medicine, neurology, nephrology, endocrinology, obstetrics and gynecology, primary care medicine and public health with the technical support of National Heart Foundation of Bangladesh. The working group reviewed recent hypertension and cardiovascular disease treatment and prevention guidelines published by various authoritative scientific and professional bodies and reviewed the recent reports on newer studies related to hypertension treatment. A core writing group compiled the suggestions put forward by the working group and prepared a draft revision of the existing national guidelines. Then consultations among the expert groups were done and a consensus document was finalized by a taskforce committee.

# Chapter-2
## Definition and classification of hypertension

# Chapter - 2

## 2. Definition and classification of hypertension

The classification of high blood pressure is useful as clinicians must make treatment decisions based on the measured BP and the patients' associated co-morbidities. Different guidelines published recently have proposed almost similar classification for treatment decision although different nomenclature was observed. The following classification has been adopted by the guideline committee. These criteria are for subjects who are adults (age 18 and older and not on any antihypertensive medication and not acutely ill (Table 1). In accordance with most major guidelines, it is recommended that hypertension be diagnosed when a person's systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg and/or their diastolic blood pressure (DBP) is ≥90 mm Hg following repeated examination. Table 2 provides ambulatory and home BP values used to define hypertension; these definitions apply to all adults (>18-year-old) adopted from ISH 2020 Guideline[9].

**Table 1. Classification of office blood pressure[a] and definition of hypertension grade[b]**

| Category | Systolic (mm Hg) | | Diastolic (mm Hg) |
|---|---|---|---|
| Normal BP | <130 | and | <85 |
| High-normal BP | 130–139 | and/or | 85–89 |
| Grade 1 hypertension | 140–159 | and/or | 90–99 |
| Grade 2 hypertension | ≥160 | and/or | ≥100 |
| Isolated systolic hypertension | ≥140 | and | <90 |

BP= Blood Pressure; SBP= Systolic blood pressure.
[a]BP Category is defined according to seated clinic BP and by the highest level of BP, whether systolic or diastolic
[b]Isolated systolic hypertension is graded 1 or 2 according to systolic BP value in the ranges indicated.
The same classification is used for all ages from 16 years

| Table 2. Criteria for Hypertension Based on Office-, Ambulatory (ABPM)-, and Home Blood Pressure (HBPM) Measurement | |
|---|---|
| Category | Systolic/Diastolic BP (mm Hg) |
| Office BP | ≥140 and/or ≥90 |
| ABPM | |
| 24-h average | ≥130 and/or ≥80 |
| Day time (or awake average) | ≥135 and/or ≥85 |
| Night time (or asleep average) | ≥120 and/or ≥70 |
| HBPM | ≥135 and/or ≥85 |

**How low is too low for blood pressure?**

While there is no specific number at which day-to-day blood pressure is considered too low, a reading of less than 90/60 mm Hg is considered hypotension. Hypotension is the term for blood pressure that is too low. The condition is benign as long as none of the symptoms showing lack of oxygen are present.

**Symptoms of low blood pressure**

Most health care professionals will only consider chronically low blood pressure as dangerous if it causes noticeable signs and symptoms, such as:

Confusion

Dizziness or lightheadedness

Nausea

Fainting (syncope)

Fatigue

Neck or back pain

Headache

Blurred vision

Palpitations

# Chapter-3
## Blood Pressure Measurement

# Chapter -3

# 3. Blood pressure measurement

Blood pressure should be measured correctly. Blood Pressure constantly varies and rises with stress, excitement and environment. To declare a patient as having hypertension may cause mental trauma, so think more to declare to have hypertension & be empathetic to the patient. There are four common devices used for the measurement of BP namely, (a) mercury column sphygmomanometer, (b) aneroid sphygmomanometer, (c) electronic devices and (d) automated ambulatory BP monitoring devices. The mercury and aneroid sphygmomanometer are gradually being replaced by the electronic blood pressure measurement device due to interobserver variation, environmental and health concerns. There are many calibrated electronic or ambulatory BP devices available in the market. Only professionally validated electronic models should be used.

### 3.1 Office or clinic blood pressure measurement

The measurement of BP in the office or clinic is most commonly the basis for hypertension diagnosis and follow-up. Care should be taken to follow the correct procedures regarding arm position, posture of the patient, cuff size and the number of readings that should be taken. Instructions for correct office blood pressure measurements are summarized in Box 1. Validated electronic (oscillometric) upper-arm cuff devices are recommended for measurement of clinic or office BP. Lists of accurate electronic devices for office, home and ambulatory BP measurement in adults, children and pregnant women are available at www.stridebp.org. Alternatively use a calibrated auscultatory device, (aneroid, or hybrid devices). Use of mercury sphygmomanometers is discouraged due to environmental pollution by mercury.

### 3.2 Self or ambulatory BP monitoring

If possible and available, the diagnosis of hypertension should be confirmed by out-of-office BP measurement[9,11]. Although recent guidelines have recommended the use of self BP monitoring (SBPM) and ambulatory BP monitoring (ABPM) for diagnosis of hypertension, the guideline expert group recommend using clinic blood pressure for diagnosis of elevated blood pressure taking considering the resources constrain for acquiring appropriate device and other logistics by the health care providers and patients. However, SBPM and ABPM are recommended in specific circumstances for selected target groups. For more information, see Annexure 1.

**Box 1**

**Recommendations for office blood pressure measurement**

**Conditions**

- Ensure quite room with comfortable temperature.
- Patients should avoid tobacco, caffeine-containing beverages (tea or coffee), or exercise in the preceding 30 minutes of BP measurement. Patients should also have an empty bladder.
- Neither the patient nor staff should talk before, during and between BP measurement.
- Patient should not read or use mobile before, during and between BP measurement.

**Position**

- Patient should be seated for at least 5 minutes before measurement.
- During measurement patient should be seated with the back supported, leg uncrossed, feet flat and parallel on floor.
- Arm should be resting on a surface at heart-level. Bare arm preferred. Take off thick or excess clothing, roll up long sleeves, ensure rolled up sleeve is not too tight on the upper arm. In some circumstances bare arm is not practical, in that case thin clothing may be accepted.

**Device**

- Validated electronic (oscillometric) upper-arm cuff device.
- Alternatively use a calibrated auscultatory device, (aneroid, or hybrid as mercury sphygmomanometers are banned in most countries) with 1st Korotkoff sound for systolic blood pressure and 5th for diastolic with a low deflation rate.

**Cuff**

- Size according to the individual's arm circumference (smaller cuff overestimates and larger cuff underestimates blood pressure). Use a standard bladder (12–13 cm long and 35 cm wide) but have a larger and a smaller bladder available for fat and thin arms, respectively. Use smaller bladder in children.
- Find the pulse at the bend in the elbow. Make sure to align the 'Arrow' on the cuff directly over it.
- Cuff should be wrapped snugly and fasten with Velcro. There should be enough space to slip two fingers under the bottom edge of the cuff.
- Cuff should cover most of the upper arm leaving a gap of about 1 cm below the axilla and 2-3 cm above the antecubital fossa. Use standard cuff size for adult and pediatric patient, which is available in the market.
- For manual auscultatory devices, cuff and sphygmomanometer should be placed at heart level and the inflatable bladder of the cuff must cover 75%–100% of the individual's arm circumference.
- For electronic devices use cuffs according to device instructions. Have the cuff at the heart level, whatever the position of the patient.

**Box 1 (Cont…..)**

**Recommendations for office blood pressure measurement**

**Protocol**

- Measure BP in both arms at first visit to detect possible differences. In this instance, take the higher value as the reference one.
- If BP of first reading is <130/85 mmHg no further measurement is required. If value is higher, ≥130/85 mmHg, measure two more BP in higher value arm with 1 min between them. Calculate the average of the last 2 measurements for diagnosis.
- Before measuring BP, history should be taken. BP should not be taken from an arm with arteriovenous fistula, for fear of damaging the fistula and should not be measured using the arm on the side of previous mastectomy for fear of upsetting the lymphatic drainage.

***For electronic (oscillometric) upper-arm cuff device***

- Turn the monitor on from the on/off button.
- Place the cuff in accurate position as stated above section
- Press the START/STOP button to begin the measurement.
- The BP cuff will start to inflate. During inflating, a pressure or tightness may appear on the arm. This might be uncomfortable for some. Reassure the patient that the pressure or tightness on the arm is temporary.
- The cuff will deflate slowly.
- When the systolic and diastolic readings and pulse rate will appear on the screen/monitor, the reading is complete.
- If the monitor/machine does not record the reading, Reconnect the cuff with the device and check the battery or power supply of the device. Then reposition the cuff on upper arm and try again after 1-2 minutes and repeat the above-mentioned steps.
- Regarding Blood pressure readings record the actual measurements shown in the screen.
- Turn the machine off and remove the cuff.
- Please ensure, to deflate the cuff of an electronic or digital BP device, never squeeze the cuff, as the sensor in the cuff may be damaged.

**Box 1 (Cont…..)**

**Recommendation for office blood pressure measurement**

***For Aneroid or Mercury BP device use***

* If auscultatory device used, (aneroid, or hybrid or mercury sphygmomanometers in most countries) SBP should be estimated first by palpation to avoid missing the auscultatory gap.
* The manometer should be at the same level of the cuff (if aneroid BP machine is used) on the patient's arm, Centre of the bladder (not the cuff) should be placed over the brachial artery.
* Place the stethoscope lightly over the brachial artery, slipped underneath the distal end of the cuff.
* Palpate the radial pulse while inflating the cuff to a level of 20-30 mmHg above the level at which radial pulse can no longer be felt. Then deflate the bladder slowly 2-3 mmHg/sec until you have a regular tapping sound.
* Systolic and diastolic BP should be recorded with 1st and 5th Korotkoff sound respectively with a low deflation rate (2 mmHg per second).

**Interpretation**

* Blood pressure of 2–3 office visits ≥140/90 mmHg indicates hypertension.
* Record the blood pressure which is higher and mentioning the site (right/left arm) for future follow up.
* Provide patient the SBP/DBP reading both verbally and in writing.
* Write BP with mentioning where and how it is recorded e. g- 120/60 mmHg, left/right arm, sitting/supine.

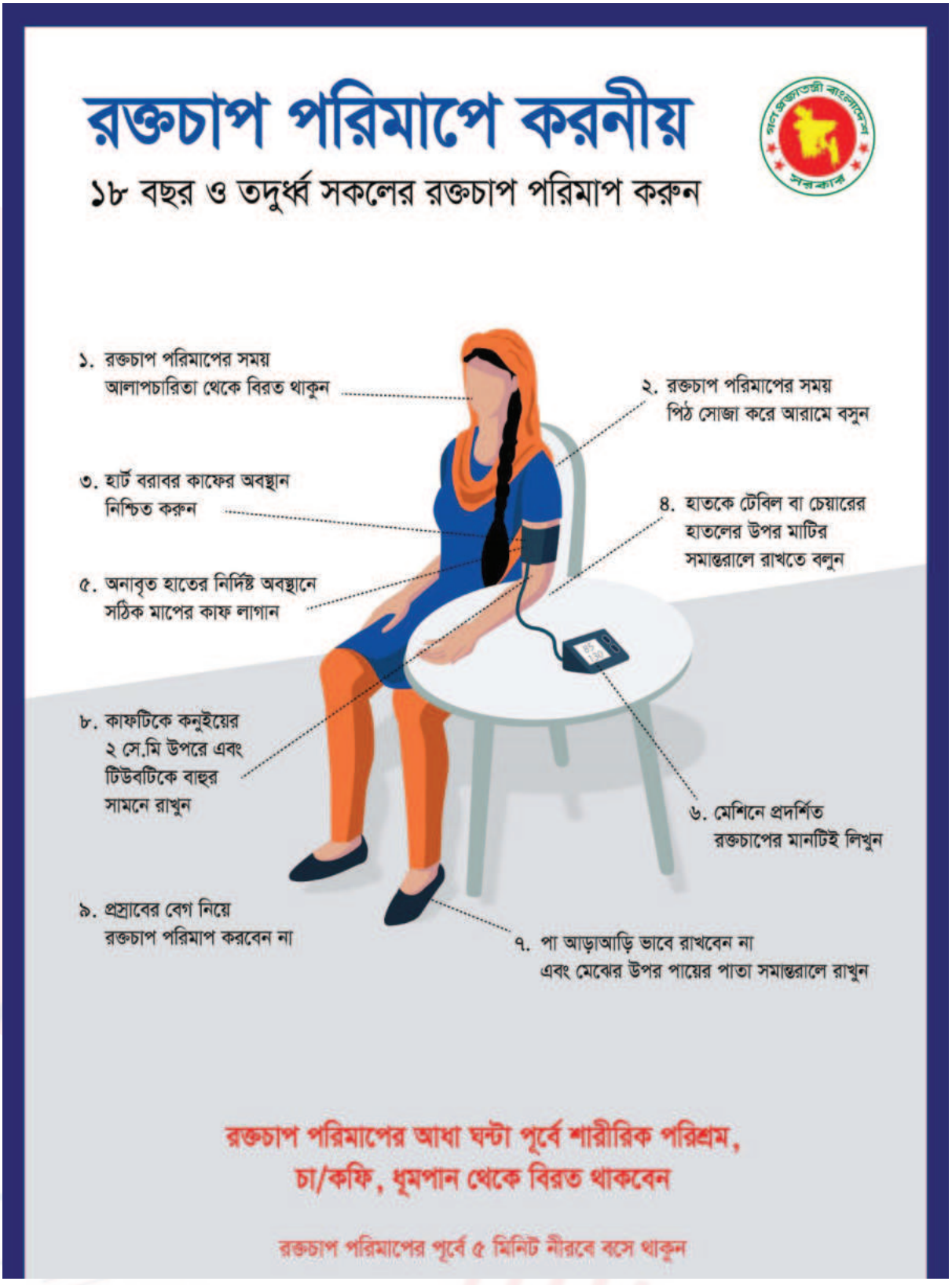



**Figure 1: Measures should be followed during BP measurement.**

**Leg Blood Pressure:**

* A large cuff (45-52cm long) other than traditional standard cuff (35-44 cm long) is placed over the mid-thigh. Patient lies prone and the stethoscope is placed in the popliteal fossa, behind the knee. Leg BP is normally higher than arm pressure (up to 20 mmHg higher).

* Ankle BP is measured in a supine position, using a cuff placed around the ankle/lower calf ensuring the bladder encircles ≥80% of the ankle circumference. Readings should be taken either by oscillometry or Doppler readings of return to flow at the dorsalis pedis or posterior tibial arteries (systolic readings only). Auscultation is not feasible in most subjects and is not therefore recommended. Ankle BPs are recommended rather than calf or thigh measurements because they generally cause less discomfort and the cuff is easier to fit, particularly in obese patients. As with standard clinic BP measurement, readings should be taken after a 5-min rest period. An ankle BP threshold of ≥155/90 mmHg to define high blood pressure in patients who do not have vascular disease[15].

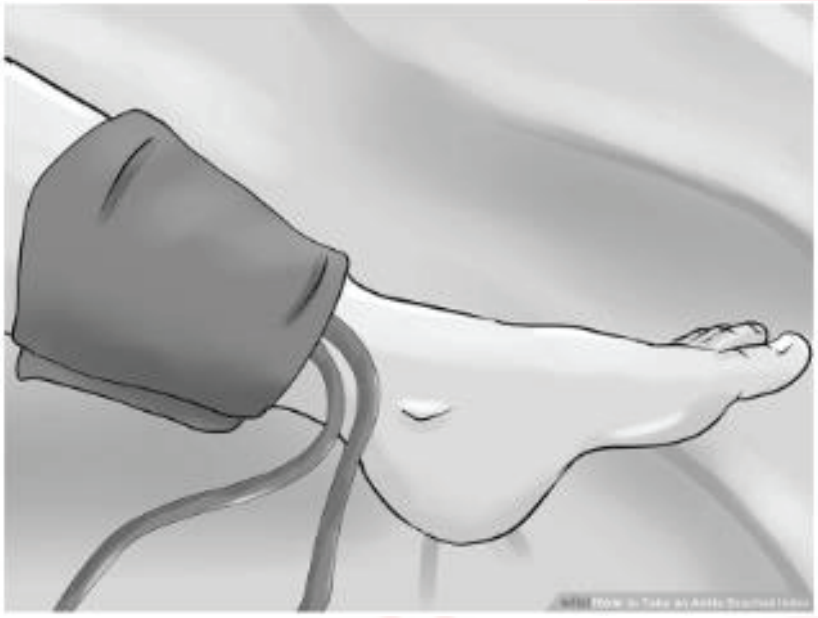


**Figure 2:** Positioning of the blood pressure monitoring cuff on the ankle/ lower calf.
Image taken from Wiki How to take an Ankle Brachial Index (https://www.wikihow.com/Take-an-Ankle-Brachial-Index)

# Chapter-4

## Diagnosis and Assessment of Patients with Hypertension

# Chapter -4

# 4. Diagnosis and assessment of patients with hypertension

### 4.1 Diagnosis

The diagnosis of hypertension should be based on multiple blood pressure measurements, taken on separate occasions over a period. BP can be highly variable; thus, the diagnosis of hypertension should not be based on a single set of BP readings at a single office visit. In general, the diagnosis of hypertension should be based on at least three blood pressure measurements per visit and at least two to three visits at 1–4-week intervals (depending on the BP level) to confirm the diagnosis of hypertension[9].

The diagnosis might be made on a single visit, if BP is ≥160/100 mmHg or there is accompanying evidence of hypertension mediated organ damage (HMOD) (e.g., hypertensive retinopathy with exudates and hemorrhages, or LVH, or vascular or renal damage)[10]. When the initial SBP is between 140 and 159 mmHg, or the DBP is between 90 and 99 mmHg, repeat measurements should be performed on three separate occasions within a period of 1 to 4 weeks to determine whether a diagnosis of hypertension is valid. All measurements should be taken in the same arm. If possible and available, the diagnosis of hypertension should be confirmed by out-of-office BP measurement (i.e., HBPM and/or ABPM)[9].

In the initial evaluation, measurement of blood pressure should be performed in both arms. If the difference in readings between arms is more than 10 mmHg, repeat the measurements at 1-2 mins interval. If the difference in readings between arms remains more than 10 mmHg on the second measurement, measure subsequent blood pressures in the arm with the higher reading and it should be noted. If the difference is >20 mmHg, consider further investigation[9].

If hypertension is not diagnosed, measure the person's clinic blood pressure at least every 3 years subsequently, and consider measuring it more frequently if the person's clinic blood pressure is close to 140/90 mmHg (Table 3).

| Table 3. Blood Pressure Measurement Plan According to Office Blood Pressure Levels[10] | | |
|---|---|---|
| Office Blood Pressure Levels (mmHg) | | |
| <130/85 | 130–159/85–99 | >160/100 |
| Remeasure within 3 years (1 year in those with other risk factors) | Confirm with repeated office visits. If possible, confirm with out-of-office BP measurement | Confirm within a few days or weeks |

**Postural Hypotension[16]:**

Patient should lie down for 5 minutes, and measure BP and pulse rate. Then have the patient stand and repeat BP and pulse rate measurements 1 and 3 minutes after standing. A drop in SBP of ≥20 mmHg, or in DBP of ≥10 mmHg, or experiencing lightheadedness or dizziness on standing is considered abnormal and indicates postural hypotension.

Measure standing blood pressure in treated hypertensives with symptoms of postural hypotension (falls or postural dizziness) and at the first visit in the elderly and people with diabetes. BP is to be measured first in supine or seated position, and again with the person standing for at least 1 minute prior to measurement. If the systolic BP falls by ≥ 20 mmHg when the person is standing, medication is to be reviewed, subsequent BP is to be measured with the person standing and the patient may be referred to specialist care if symptoms of postural hypotension persist.

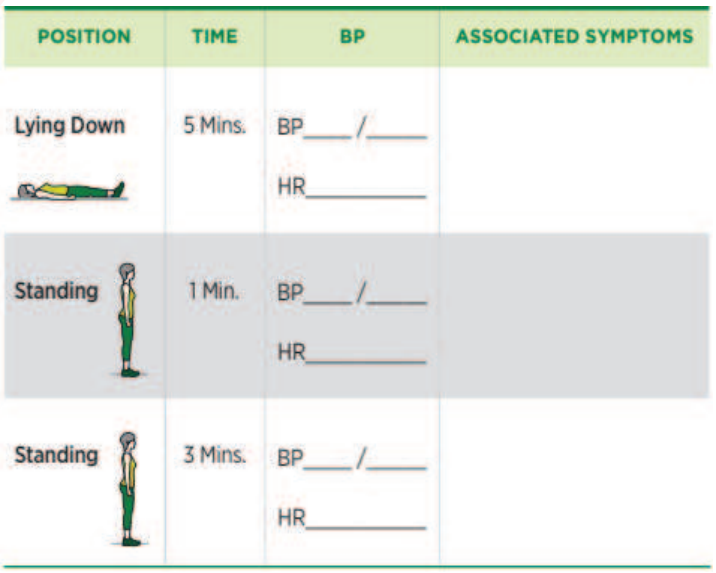



Figure 3: Assessing Postural Hypotension

## 4.2 Clinical evaluation and assessment of hypertension

### 4.2.1 Clinical evaluation:

The goals of the initial evaluation of the hypertensive patient are to

1. Establish the diagnosis and grade of hypertension.
2. Screening for potential secondary causes of hypertension.
3. Identify factors that potentially contribute to development of hypertension (lifestyle, concomitant medications, or family history).
4. Identify concomitant CV risk factors (including lifestyle and family history) (Table 4)
5. Identify concomitant diseases and establish whether there is evidence of HMOD or existing cardiovascular, cerebrovascular, or renal disease. (Table 5)

These goals are usually accomplished by a thorough medical history, physical examination, and simple laboratory investigations. While waiting for confirmation of a diagnosis of hypertension, carry out some routine investigations for assessment of HMOD. If hypertension is not diagnosed but there is evidence of HMOD, consider carrying out investigations for alternative causes of HMOD.

**History**

**Most patients with hypertension are asymptomatic**, the high blood pressure usually having been noted during an incidental clinical examination. A proportion of patients will present with a major complication of hypertension such as stroke or myocardial infarction, but only a small number will present with symptoms directly attributable to hypertension such as breathlessness or headache. That is why hypertension is called a 'Silent killer'. The key issues that need to be addressed in the history include:

**Risk factors assessment:**

* Family and personal history of hypertension, CVD, stroke, or renal disease.
* Family and personal history of associated risk factors (e.g., familial hypercholesterolaemia)
* Dietary history and salt intake
* Smoking history
* Alcohol consumption
* History of physical exercise/sedentary lifestyle
* History of erectile dysfunction

- Sleep history, snoring, sleep apnoea (information also from partner)
- Previous hypertension in pregnancy/pre-eclampsia
- History of oral contraceptive use.

**History of symptoms of HMOD, CVD, stroke, and renal disease**

- For Brain and eyes: headache, vertigo, syncope, impaired vision, TIA, sensory or motor deficit, stroke, carotid revascularization, cognitive impairment, dementia (in the elderly).
- Heart: chest pain, shortness of breath, oedema, myocardial infarction, coronary revascularization, syncope, history of palpitations, arrhythmias (especially AF), heart failure
- Kidney: thirst, polyuria, nocturia, haematuria, urinary tract infections.
- Peripheral arteries: cold extremities, intermittent claudication, pain free walking distance, pain at rest, peripheral revascularization, patient or family history of CKD (e.g., polycystic kidney disease).

**History of Antihypertensive Drug Treatment**

- Current/past antihypertensive medication including effectiveness, intolerance or side effects of previous medications.
- Adherence to therapy and in non-compliant patients the reason behind it (including financial constraint).

**Physical Examination**

The physical examination should include the following:

- Weight and height measured on a calibrated scale, with calculation of BMI
- Waist circumference
- Neurological examination and cognitive status
- Fundoscopic examination for hypertensive retinopathy
- Palpation and auscultation of heart and carotid arteries
- Palpation of peripheral arteries
- Comparison of BP in both arms (at least once)
- Skin inspection: cafe-au-lait patches of neurofibromatosis (phaeochromocytoma)
- Kidney palpation for signs of renal enlargement in polycystic kidney disease

- Auscultation of heart and renal arteries for murmurs or bruits indicative of aortic coarctation, or renal artery stenosis
- Comparison of radial with femoral pulse: to detect radio-femoral delay in aortic coarctation
- Signs of Cushing's disease or acromegaly
- Signs of thyroid disease

**Table 4: Major risk factors for cardiovascular diseases**

- Levels of SBP and DBP
- Tobacco use
- Dyslipidemia
  - Total cholesterol >5.1 mmol/L
  - LDL >3 mmol/l, OR
  - HDL <1 (men) and <1.2 mmol/l (women)
- Diabetes mellitus
- Age (>55 years for men, >65 years for women)
- Family history of premature cardiovascular diseases
  - (men <55 years or women <65 years)
- Central obesity
  - (Waist circumference >90 cm for men, >80 cm for women)

Table 5: Manifestations of hypertension mediated organ damage (HMOD)

| Organ system | **Manifestations & their suggestive signs** |
|---|---|
| **Cardiac** | Left ventricular hypertrophy, coronary heart disease, heart failure<br>➢ forcible and displaced apex beat<br>➢ accentuation of the aortic component of the second heart sound<br>➢ abnormal cardiac rhythms<br>➢ S4 (decreased ventricular compliance)<br>➢ ventricular gallop<br>➢ pulmonary rales or crackles |
| **Cerebrovascular** | Transient ischaemic attack, stroke<br>➢ carotid bruits; motor or sensory defects; |
| **Peripheral vasculature** | ➢ Absence of one or more major pulses in extremities (except dorsalis pedis) with or without intermittent claudication |
| **Renal** | ➢ GFR <60 ml/min/1.73 $m^2$<br>➢ proteinuria (1+ or greater)<br>➢ microalbuminuria (2 out of 3 positive tests over a period of 4-6 months)<br>➢ Dependent (leg) edema |
| **Retinopathy** | Fundoscopic abnormalities<br>- Haemorrhages or exudates, with or without papilloedema |

### 4.2.2 Investigations

All hypertensive patients should undergo a limited number of investigations. However, when starting pharmacological therapy for hypertension, WHO suggests obtaining tests to screen for comorbidities and secondary hypertension, but only when testing does not delay or impede starting treatment. In low-resourced areas or non-clinical settings, where testing may not be possible because of additional costs, and lack of access to laboratories and ECG, treatment should not be delayed, and testing can be done subsequently. Some medicines, such as long-acting dihydropyridine calcium-channel blockers (CCBs) are more suitable for initiation without testing, compared to diuretics or angiotensin-converting enzyme inhibitors (ACEi)/angiotensin-II receptor blockers (ARBs)[12].

All hypertensive patients should undergo a limited number of investigations, these include: -

- Blood test
    - Sodium, potassium, serum creatinine and estimated glomerular filtration rate, (eGFR)
    - If available lipid profile and fasting glucose
- Urine analysis: Dipstick urine test
- 12-lead ECG for detection of atrial fibrillation, left ventricular hypertrophy (LVH), ischemic heart disease.

For most patients: -

- Haemoglobin and/or haematocrit
- Chest X-ray: to detect cardiomegaly, heart failure, coarctation of the aorta
- Echocardiogram: to detect or quantify left ventricular hypertrophy

The nature and scale of further investigations will be determined by the index of suspicion of a secondary cause for hypertension and assessment for HMOD

**Tests for assessment for HMOD**

- Urine albumin: creatinine ratio: To detect elevations in albumin excretion indicative of possible renal disease.
- Blood creatinine and eGFR: To detect possible renal disease.
- Fundoscopy: To detect hypertensive retinopathy, especially in patients with grade 2 or 3 hypertension.

- Echocardiography: To evaluate cardiac structure and function when this information will influence treatment decisions.
- Carotid ultrasound: To determine the presence of carotid plaque or stenosis, particularly in patients with cerebrovascular disease or vascular disease elsewhere.
- Abdominal ultrasound and Doppler studies:
    i) To evaluate renal size and structure (e.g., scarring) and exclude renal tract obstruction as possible underlying causes of CKD and hypertension
    ii) Evaluate abdominal aorta for evidence of aneurysmal dilatation and vascular disease.
    iii) Examine adrenal glands for evidence of adenoma or phaeochromocytoma (CT or MRI preferred).
    iv) Renal artery Doppler studies to screen for the presence of renovascular disease, especially in the presence of asymmetric renal size
- Pulse Wave velocity (PWV): An index of aortic stiffness and underlying arteriosclerosis
- Ankle Branchial Index (ABI) Screen for evidence of Lower Extremity Artery Disease (LEAD)
- Cognitive function testing: To evaluate cognition in patients with symptoms suggestive of cognitive impairment.
- Brain imaging: To evaluate the presence of ischaemic or haemorrhagic brain injury, especially in patients with a history of cerebrovascular disease or cognitive decline.

# Chapter-5
# Management of Hypertension

# Chapter-5

## 5. Management of hypertension

### 5.1 Cardiovascular risk assessment

The presence of one or more additional cardiovascular risk factors proportionally increases the risk of coronary, cerebrovascular and renal diseases in hypertensive patients. The overall cardiovascular risk should be taken into consideration and patients need to be stratified according to the overall risk of development of CVD. Despite the availability of many CVD risk charts, all have shortcomings, particularly for administering in developing countries such as Bangladesh. The use of the risk assessment chart for taking decision to start treatment requires interpretation by the qualified physicians and resources to identify associated clinical conditions (ACC) or target organ damage. However, in a low resource setting like Bangladesh primary care physicians and trained health assistants are expected to do the detection and referral at primary health care level. In this situation diagnosis of hypertension and decision to refer should be based on the clinic blood pressure only[10].

- Most patients with SBP 140 ≥ or DBP ≥90 mmHg are at high risk and indicated for pharmacological treatment; they do not require cardiovascular (CVD) risk assessment prior to initiating treatment.
- CVD risk assessment is most important for guiding decisions about initiating pharmacological treatment for hypertension (HTN) in those with lower SBP (130–139 mmHg). It is critical for those with HTN that other risk factors must be identified and treated appropriately to lower total cardiovascular risk.
- Whenever risk assessment may threaten timely initiation of HTN treatment and/or patient follow up, it should be postponed and included in the follow-up strategy, rather than taken as a first step to initiate treatment.
- It is recommended to use WHO cardiovascular diseases risk chart for South Asia estimation of CVD risk [Annexure 2]. HEARTS technical package for cardiovascular disease management in primary health care: risk-based CVD management published by World Health Organization; 2020 may be consulted for detail discussion on CV risk assessment[17].

### 5.2 Non-pharmacological management

Healthy lifestyle choices can prevent or delay the onset of high BP and can reduce cardiovascular risk. Non-pharmacological management (therapeutic lifestyle modification) remains the cornerstone of managing hypertension regardless of BP level. It is the first line of anti-hypertensive treatment. In addition to decreasing BP, it enhances antihypertensive drug efficiency and decreases total cardiovascular risk.

Following lifestyle intervention should be taken in hypertensive patients.

***Achieving and maintaining ideal weight***

All hypertensive patients should be encouraged to achieve ideal body weight, i.e., BMI of 18.5 - 24.9 kg/$m^2$, however for Asians the normal range has been proposed to be 18.5 to 23.5 kg/$m^2$. Weight reduction is most beneficial in patients who are more than 10% overweight. Overweight and obese patients need to be advised to take drastic action for reducing weight and may be referred to dietician for further management. Particularly abdominal obesity should be managed. A practical target for overweight patients is a minimum reduction of 5% in body weight.

***Limiting total salt intake to <5 gm /day***

Reduction of sodium or salt intake results in reduction of blood pressure. WHO recommends limiting daily salt intake less than 5 g per day or which is about one teaspoon full per day. In Bangladesh, most of the salt in diet are added during cooking or taken during meal as extra salt although salt from processed food intake might also be important as availability of processed food, juice and beverages are increasing. Clinicians should inquire about salt intake by interview; aim for achieving a target range of 90-130 mmol per day (3-7 grams per day) and provide advice on reducing usage in cooking and seasoning and choosing low-salt foods (e.g., choosing fresh fruits and vegetables and avoiding pre-prepared foods). The removal of the salt cellar from the table and a gradual reduction in added salt in food preparation should be recommended. Patients must be informed that food may taste bland initially and that taste adaptation to reduce sodium intake occurs with time; the use of lemon juice, herbs and spices as alternative seasoning should be encouraged.

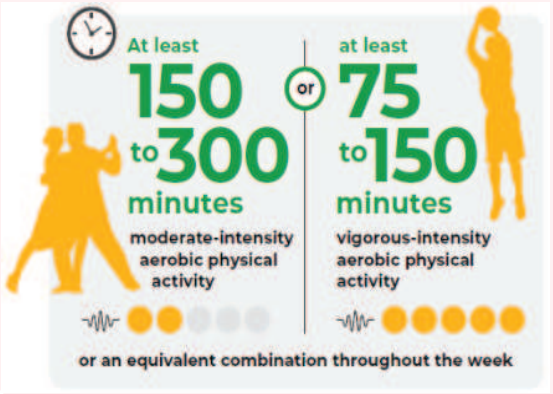
**Healthy Diet**

Eating a diet that is rich in whole grains, nuts, fruits, vegetables, polyunsaturated fats and dairy products and reducing food high in sugar, saturated fats and trans fats helps in lowering blood pressure.

**Healthy Drinks**

Discourage excessive consumption of tea, coffee, and other caffeinated drinks.

**Physical Activity**




Adults should do at least 150–300 minutes of moderate-intensity aerobic physical activity; or at least 75–150 minutes of vigorous intensity aerobic physical activity; or an equivalent combination of moderate-and vigorous-intensity activity throughout the week, for substantial health benefits. However, adults should also do muscle strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits.


Exercise bouts can be continuous or accumulated in shorter periods throughout the day. The benefit of exercise is dose dependent. Aerobic type exercise is more effective than exercise which involves resistance training, (e.g., weightlifting). Patients with uncontrolled hypertension should only embark on exercise training after evaluation and initiation of therapy. Suggested activities are brisk walking, swimming, gardening, taking staircases instead of lift etc[18].

**Avoiding tobacco use**

This is important in the overall management of patients with hypertension in reducing cardiovascular risk. Smoking can acutely increase BP. Counseling for quitting should be done for smokers and smokeless tobacco users. Nicotine replacement therapy may be used for a smoker with hypertension while under medical supervision.

**Avoiding alcohol drinking**

Alcohol has an acute effect in elevating BP. Hypertensives who are heavy drinkers are more likely to have hypertension resistant to drug treatment. The only way to reduce these patients' BP effectively is by stopping their alcohol intake.

**Others**

These include stress management, micronutrient alterations and dietary supplementation with fish oil, potassium, calcium, magnesium, and fibre. However, they have limited or unproven efficacy. Overall relaxation interventions were associated with reductions in systolic and diastolic blood pressure and clinicians should encourage stress relaxation by yoga, meditation (including religious activities), stretching and breathing exercise as appropriate.

**LIFESTYLE MODIFICATION ADVICE FOR ALL PATIENTS**

* Stop all tobacco use, avoid secondhand tobacco smoke.
* Stop taking alcohol.
* Increase physical activity to equivalent of brisk walk 150 minutes per week.
* If overweight, lose weight.
* Eat heart-healthy diet:
    - Reduce dietary salt intake
    - Eat ≥ 5 servings of vegetables/fruit per day.
    - Use healthy oils, such as soyabean, sunflower, olive, sesame (Til).
    - Eat nuts, peas, whole grains and foods rich in potassium like spinach, watermelon, yogurt and banana.
    - Limit red meat to once or twice a week at most.
    - Eat fish or other food rich in omega 3 fatty acids at least twice a week.
    - Avoid added sugar from sweets, cakes, cookies, fizzy drinks, sugar sweetened beverages

## 5.3 Pharmacological management

### 5.3.1 General guidelines

The ideal drug for treatment of hypertension must be efficacious, free from side-effects, able to prevent all the complications of hypertension, easy to use and affordable. Affordability is an important issue for maintaining compliance with treatment as many patients in Bangladesh would need to pay out of their own pocket for this chronic condition. Therefore, the guideline committee strongly reiterates the importance of lifestyle modification at all stages of hypertension. Currently, the price of antihypertensive and other drugs fluctuates considerably. Where possible, generic equivalents and combinations are encouraged and the cheapest generic in a class should be considered if it is a true equivalent. The drug should not be changed frequently from one generic to another in the same class, solely because of lower price. Best practice recommendations should be followed but compromises, based on limited resources, should be made deliberately and transparently.

### 5.3.2 Strategies for treatment initiation

The following must be considered prior to the selection of an antihypertensive agent: the cost of the drug class, patient-related factors such as the presence of major risk factors, conditions favoring use, contraindications and HMOD. For adults with hypertension requiring pharmacological treatment, guideline committee recommends the use of drugs from any of the following five classes of pharmacological antihypertensive medications as an initial treatment: ACE inhibitors, ARBs, beta-blockers, CCBs, and diuretics (thiazides and thiazide-like diuretics such as chlortalidone and indapamide)[9,11].

Guidelines have generated a variety of different strategies to initiate and escalate BP-lowering medication to improve BP control rates. In previous Guidelines, the emphasis was on initial use of different monotherapies, increasing their dose, or substituting for another monotherapy. However, increasing the dose of monotherapy produces little additional BP lowering and may increase the risk of adverse effects, whilst switching from one monotherapy to another is frustrating, time consuming, and often ineffective. For these reasons, most recent Guidelines have increasingly focused on the stepped- care approach, initiating treatment with different monotherapies and then sequentially adding other drugs until BP control is achieved. Figure 4 outlines the management

approach for starting treatment with monotherapy or free combination therapy of a patient with hypertension[10].

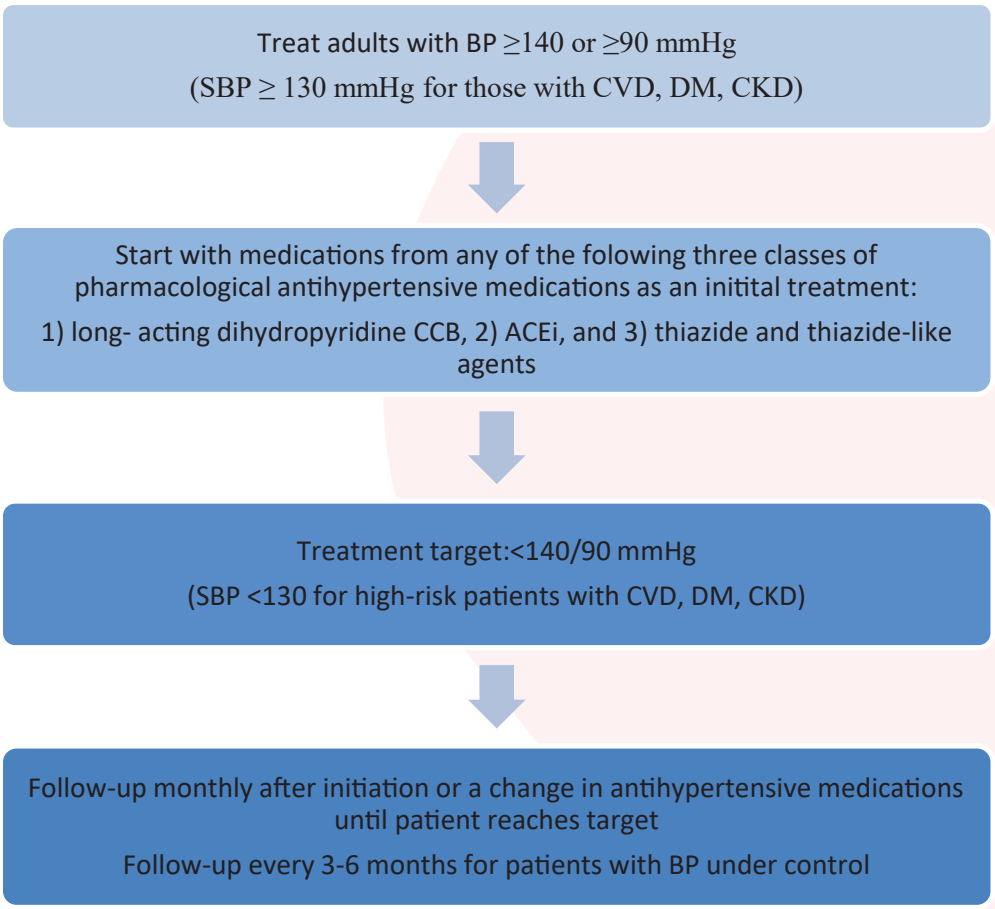
Despite this widely followed stepped care approach, BP control rates have remained poor worldwide. Therefore, for adults with hypertension requiring pharmacological treatment, WHO recommended to start with combination therapy, preferably with a single-pill combination (SPC) (to improve adherence and persistence), as an initial treatment (Fig 5). Antihypertensive medications used in combination therapy should be chosen from the following three drug classes: diuretics (thiazide or thiazide-like), angiotensin-converting enzyme inhibitors (ACEis) /angiotensin-receptor blockers (ARBs), and long-acting dihydropyridine calcium channel blockers (CCBs).

Following drug treatment algorithm has been developed to provide a simple and pragmatic treatment recommendation for the treatment of hypertension, based on a few key recommendations[11].

The initiation of treatment in most patients with a single-pill combination (SPC) comprising two drugs, to improve the speed, efficiency, and predictability of BP control.

- Preferred two-drug combinations are a RAS blocker with a CCB or a diuretic. A beta-blocker in combination with a diuretic or any drug from the other major classes is an alternative when there is a specific indication for a beta-blocker, e.g., angina, post-myocardial infarction, heart failure, or heart rate control.
- Use monotherapy for low-risk patients with stage 1 hypertension whose SBP is <150 mmHg, very high-risk patients with high–normal BP, or frail older patients.
- The use of a three-drug SPC comprising a RAS blocker, a CCB, and a diuretic if BP is not controlled by a two-drug SPC.
- The addition of spironolactone for the treatment of resistant hypertension, unless contraindicated
- The use of other classes of antihypertensive drugs in the rare circumstances in which BP is not controlled by the above treatments.

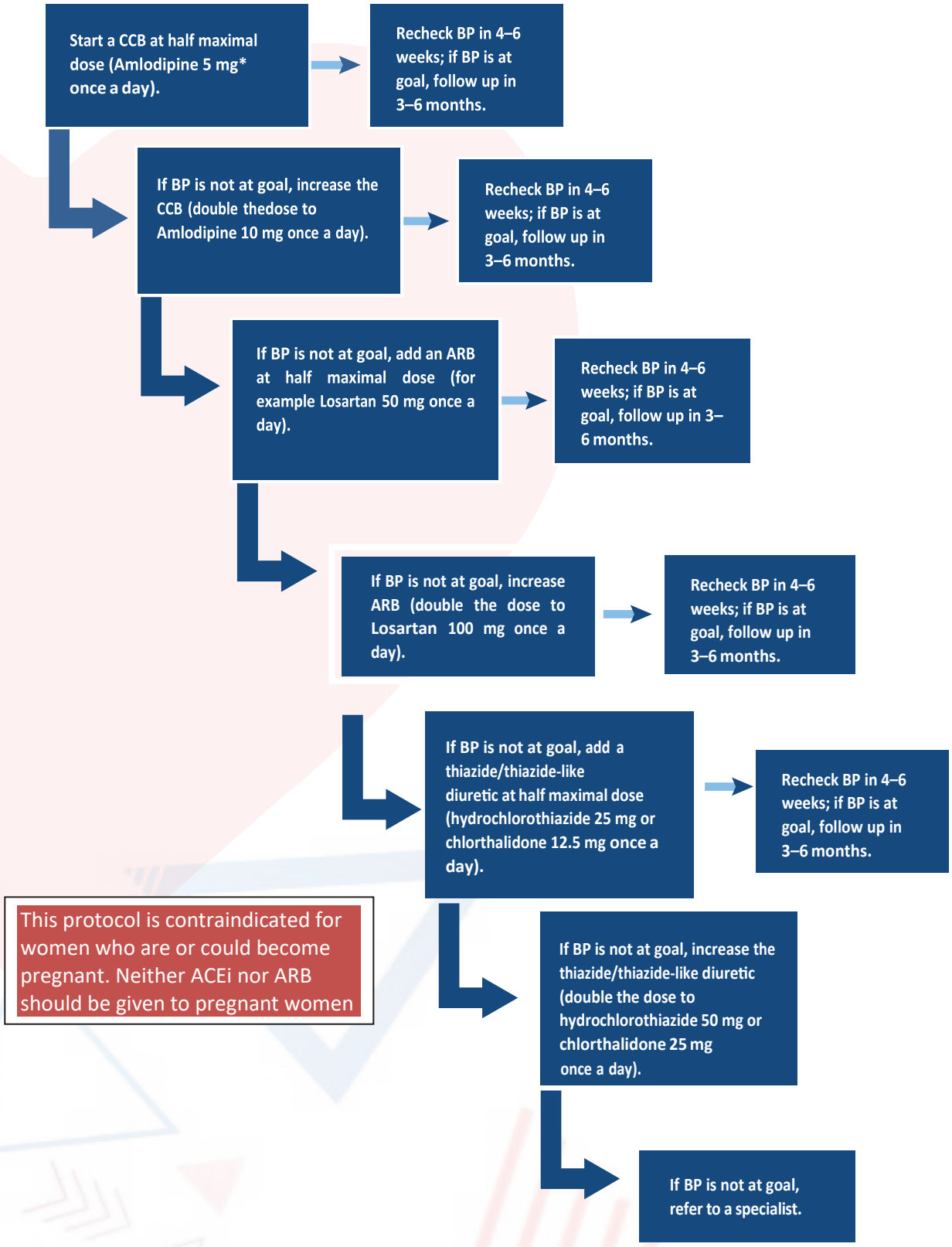
Fig 4. Algorithm 1: An approach for starting treatment with monotherapy or free combination therapy[10]. (Adapted from WHO 2021)




Pharmacological treatment to be initiated under the following circumstances:

- A diagnosis of HTN has already been made.
- Initiation of pharmacological HTN treatment should start no later than four weeks after diagnosis of HTN.
- If BP level is high or there is accompanying evidence of end organ damage, initiation of treatment should be started without delay.
- Patient should be counselled about starting medication therapy.
- Basic laboratory testing (electrolytes, creatinine, lipogram, glucose, HbA1C, urine dipstick, and ECG) to occur if it does not delay treatment.
- A cv risk assessment can be conducted immediately (as long as it does not delay initiation of treatment or at later visit)
- A CCB, rather than a thiazide-type diuretic or ACEi/ARB, should be selected as first-line medication if one agent is used, to avoid the need for electrolyte measurements or to alleviate concerns regarding potential change in GFR.
- Drugs affecting the renin-angiotensin system (ACEis, ARBs, and aliskiren) have been associated with serious fetal toxicity, including renal and cardiac abnormalities and death; they are contraindicated for use during pregnancy.
- Consider using diuretic or CCB in patients 65 years or older, beta-blockers (BBs) in post MI, ACEis / ARBs in those with DM, heart failure or CKD

Fig 5. Algorithm 2: Initiation of treatment with monotherapy or free combination therapy[10]




* Can be replaced with a thiazide/thiazide-like diuretic or an ACEi or ARB. An ACEi or ARB is preferred for proteinuria

Note: Monitor potassium and kidney function when starting or changing dose of ACEi/ARB or thiazide/thiazide-like diuretic, if testing is readily available and does not delay treatment.

Fig 6. Algorithm 3: An approach for starting treatment with single-pill combination (SPC)[10]

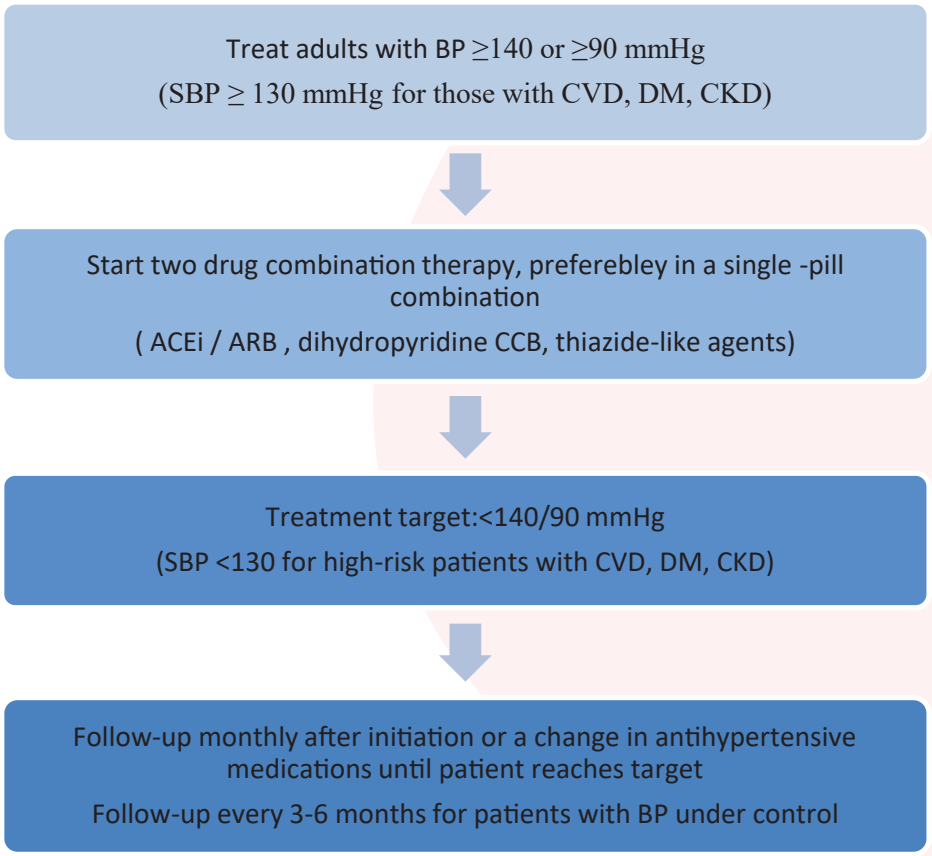
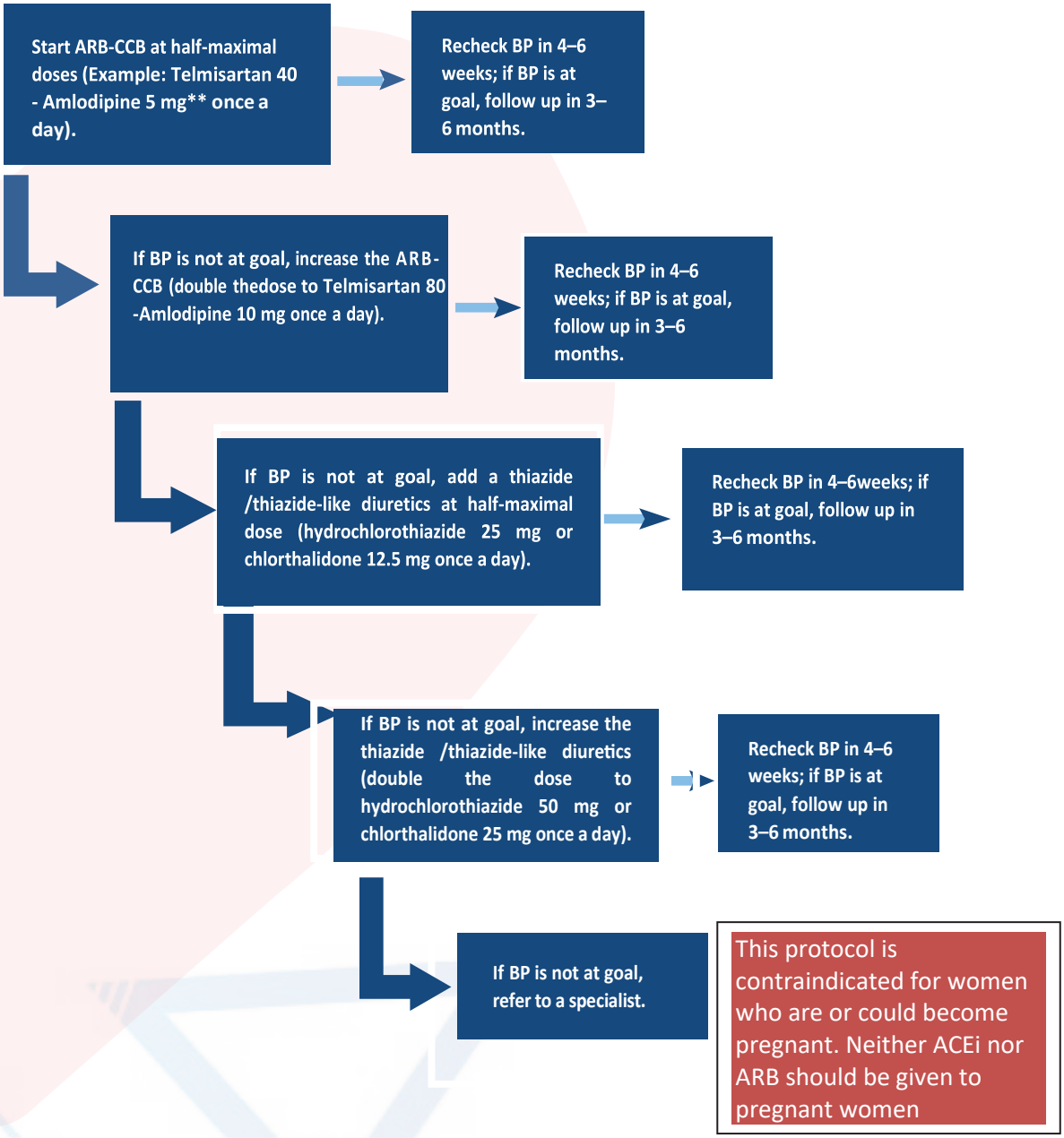


Fig 7. Algorithm 4: Initiation of treatment with a single-pill combination[10]




Note: Monitor potassium and kidney function when starting or changing dose of ACEi/ARB or thiazide/thiazide-like diuretic if testing is readilyavailable and does not delay treatment.

*The medications mentioned serve as examples and can be replaced with any two medications from any of the three drug classes (ACEis/ARBs, CCBs or thiazide/thiazide-like diuretics). Start two individual pills or, if available, both in a single-pill combination (fixed-dose combination).

** Can be replaced with other individual pills or, if available, other single-pill combinations (fixed-dose combinations).

### 5.3.3 National protocol for management of hypertension at primary care level

An expert group convened by Non communicable Disease Control Programme of Directorate General of Health Services has developed a protocol for diagnosis and management of hypertension at primary care level in 2017 (Fig 7)[14.] Currently, an adapted version of this protocol is being used at NCD corners of all Upazila Health complexes (Fig. 8).


**Figure 8:** Hypertension Management Protocol at Primary Health Care Settings adapted from NCDC, DGHS, MOHFW

### 5.3.4 Frequency of assessment and follow-up visits

A monthly follow up after initiation or a change in antihypertensive medications until patients reach target should be done. Once target BP is achieved, follow-up at three to six-month interval is appropriate. Recommended blood pressure measurement plan according to office blood pressure levels is as shown in Table 6.

**Table 6: Recommendations for follow-up based on initial blood pressure measurements for adults**

| Initial BP (mmHg) Systolic and Diastolic | Follow-up recommended to confirm diagnosis and/or review response to treatment |
|---|---|
| <130 and <85 | Remeasure within 3 years (1 year in those with other risk factors) |
| 130-159 and/or 85-99 | Confirm with repeated office BP measures within 1- 4 weeks |
| ≥160 and/or 100 | Evaluate and Initiate treatment immediately |

### 5.3.5 Goals for BP lowering treatment

Efforts must be made to reach the target BP level. These targets should be reached within 3 months. In general, once the BP is controlled, most patients will require life-long treatment.

- A target blood pressure treatment goal of <140/90 mmHg in all patients with hypertension without comorbidities.
- A target systolic blood pressure treatment goal of <130 mmHg in high-risk patients with hypertension (those with high CVD risk, known CVD, diabetes mellitus, chronic kidney disease)[10].

### 5.3.6 When to Refer

Patients with the following conditions should be referred to the appropriate specialist for further assessment. Indications for referral to the appropriate specialist include:

- accelerated or malignant hypertension
- suspected secondary hypertension
- resistant hypertension
- recent onset of target organ damage
- pregnancy
- children <18 years old

# Chapter-6

## The Therapeutic Approach in Special Situation

# Chapter -6

## 6. The Therapeutic approach in special situation

### 6.1 Hypertensive crisis

A rapid and severe elevation in BP is considered a hypertensive crisis. The presence or absence of target organ damage (TOD) is the guiding factor in classification of the crisis and ultimately the manner in which the crisis is treated.

Individuals with severe elevation of BP can be divided into three broad categories that can overlap.

a. **Severe hypertension:** BP >180/110 mmHg without symptoms or acute signs of organ damage.
b. **Hypertensive urgencies,** with BP >180/110mmHg without evidence of ongoing TOD.
c. **Hypertension emergencies** often with BP >180/110 mmHg with evidence of ongoing TOD.

Hypertensive urgencies may be treated on an outpatient basis, by gradually reducing BP using oral antihypertensives. Hypertensive emergencies, on the other hand, require more immediate treatment with IV antihypertensives in an inpatient setting.

These patients may present in the following manner. Patients presenting with hypertensive crisis typically have had either chronically elevated BP or may be completely unaware that they have hypertension. Subtherapeutic treatment regimens, nonadherence, and drug-induced etiologies have been attributed to its development.

Persons with hypertensive urgency may experience severe headache, shortness of breath, nosebleed, or anxiety. With hypertensive emergency, the clinical presentation will depend on the particular organ that is undergoing injury, in addition to other symptoms, such as headache.

A rapid but thorough assessment must be performed to differentiate between urgency and emergency. The clinician should inquire about use of all medications, including OTC and herbal therapies, and illicit drug use. Medication adherence, including time of last dose, should be evaluated in all patients previously diagnosed with hypertension. BP should be confirmed in both arms, using correct measurement techniques.

Physical examination is an essential component of diagnosis. The examination should include assessment for signs indicative of heart failure, myocardial infarction, aortic dissection, hypertensive encephalopathy, cerebrovascular accident, renal failure, retinopathy, retinal hemorrhage, and papilledema[3]. CTscan, MRI, echocardiogram, or chest x-ray may also be

necessary in assessing organ damage. Laboratory examinations should include a metabolic panel, urinalysis, a complete blood count, and urine toxicology.

**Treatment Approach: Hypertensive Urgency**

Hypertensive urgencies may be treated in an outpatient facility with oral antihypertensives; treatment consists of a slow lowering of BP over 24 to 48 hours. A reduction in BP of no more than 25% within the first 24 hours has been suggested. Adjusting current medication regimens to improve adherence or increasing the doses of current agents may be a sufficient management approach. However, additional agents may be necessary to attain desired results (Table 7).

**Table 7: Drugs for the management of hypertensive urgency.**

| Agent | Class | Onset of Action | Duration of Action | Dosing | Adverse Effects |
|---|---|---|---|---|---|
| Captopril | ACE-I | 5-15 min | 2-6 h | *Recommended:* 25 mg po or SL<br>*Dosing range:* 6.25-50 mg po<br>*Max dose:* 50 mg po | Hyperkalemia, angioedema, rash, decreased renal function in renal artery stenosis |
| Clonidine | Centrally-acting, $\alpha_2$-agonist | 15-30 min | 2-8 h | *Recommended:* 0.1-0.2 mg po, followed by 0.05-0.1 mg every hour until desired effect<br>*Max dose:* 0.8 mg | Dry mouth, sedation, orthostatic hypotension, rebound hypertension |
| Labetalol | $\alpha_1$-selective, β-nonselective antagonist | 2 h | 4 h | *Recommended:* 200 mg po, followed by 200 mg every hour until desired effect<br>*Max dose:* 1,200 mg | Hypotension, dizziness, headache, nausea, vomiting |

*ACE-I: Angiotensin-converting enzyme inhibitor; max: maximum; min: minute; po: by mouth; SL: sublingual.*
*Source: References 10-11, 14-16.*

**Treatment Approach: Hypertensive Emergency**

Hypertensive emergencies require immediate medical attention, including admission to the intensive care unit. Continuous cardiac monitoring, frequent measurement of urine output, and neurologic assessment are all necessary. Treatment with IV antihypertensive agents (TABLE 8) is warranted in this setting. Drug selection should be based on specific characteristics of the drug (i.e., adverse effects) and patient-specific attributes, such as volume status and the presence of comorbidities[16].

**Table 8: treatment options for hypertensive emergencies.**

| Agent | Class | Onset of Action | Duration of Action | Dosing | Adverse Effects |
|---|---|---|---|---|---|
| Labetalol | Mixed adrenergic receptor antagonist | 2-5 min | 2-18 h (dose dependent) | *Recommended:* 20 mg IV LD, followed by 20-80 mg every 10 min until desired effect; or 20 mg IV LD, followed by 1-2 mg/min infusion *Max dose:* 300 mg | Orthostasis, fatigue, dizziness, nausea |
| Esmolol | $\beta_1$-adrenergic receptor antagonist | 1-2 min | 10-30 min | *Recommended:* 0.5-1 mg/kg IV bolus, followed by 50-300 mcg/kg/min continuous infusion | Hypotension, injection site reactions, diaphoresis, dizziness, nausea, vomiting |
| Nicardipine | Calcium channel blocker | 5-15 min | 4-6 h | *Recommended:* 5 mg/h IV, increasing by 2.5 mg/h every 5 min until desired effect *Max dose:* 15 mg/h | Headache, hypotension, tachycardia, peripheral edema |
| Clevidipine | Calcium channel blocker | 2-4 min | 5-15 min | *Recommended:* 1-2 mg/h IV; may double dose every 90 sec until desired effect *Maintenance dose:* 4-6 mg/h *Max dose:* 32 mg/h | Headache, nausea, vomiting |
| Nitroglycerin | Nitric oxide dilator | 2-5 min | 3-5 min | *Recommended:* 5 mcg/min IV; may increase every 5 min until 20 mcg/min is reached. If response is inadequate, increase dose by 10-20 mcg/min every 5 min *Max dose:* 200 mcg/min | Severe hypotension, reflex tachycardia, headache |
| Sodium nitroprusside | Nitric oxide dilator | Within sec | 2-5 min | *Recommended:* 0.25 mcg/kg/min IV; titrate by 0.25 mcg/kg/min every 5-10 min until desired effect *Max dose:* 10 mcg/kg/min | Hypotension, cyanide toxicity |
| Fenoldopam | Dopamine agonist | Within 5 min | 30-60 min | *Recommended:* 0.1-0.5 mcg/kg/min IV; titrate by 0.05-0.1 mcg/kg/min every 15 min until desired effect *Max dose:* 1.6 mcg/kg/min | Headache, facial flushing, hypotension, nausea |
| Hydralazine | Direct arterial vasodilator | 5-20 min | 2-12 h | *Recommended:* 10-20 mg IV every 6 h as needed *Max dose:* 40 mg/dose | Tachycardia, angina pectoris exacerbation, hypotension, flushing |
| Enalaprilat | ACE-I | 15 min | 12-24 h | *Recommended:* 1.25-5 mg IV every 6 h *Max dose:* 5 mg/dose | Headache, dizziness, serum creatinine increase, orthostasis |

*ACE-I: Angiotensin-converting enzyme inhibitor; LD: loading dose; max: maximum; min: minute; sec: second.*
*Source: References 6, 15, 17, 18, 20, 22.*

**The primary goal would be to lower the mean arterial pressure by no more than 25% within the first hour, followed by BP reduction to 160/110-100 mmHg within the next 2 to 6 hours**[1]. BP reduction must be conducted in a controlled fashion in order to prevent organ hypoperfusion and subsequent ischemia or infarction[3]. However, in patients with aortic dissection, BP must be aggressively lowered[3]. Once the BP has stabilized and the risk of end-organ damage has dissipated, downward titration of the IV agent may begin, followed by conversion to oral therapy. The clinician should then attempt to ascertain causative factors for the event.

### 6.2 Secondary hypertension

Secondary hypertension is a type of hypertension which results from an identifiable underlying cause. It affects only 5% to 10% of hypertensive patients. The most common types of secondary hypertension in adults are renal parenchymal diseases, renovascular hypertension, primary aldosteronism, chronic sleep apnea, and substance/drug induced. Secondary causes of hypertension and their features are given in Table 9.

Additional investigations of patients for secondary causes of hypertension are particularly appropriate in the following groups:

- Patients with early onset hypertension under 30 years of age in particular in the absence of hypertension risk factors
- Patients with hypertension urgency or emergency
- Patients resistant to antihypertensive therapy
- Patients with abnormal renal function, proteinuria, or hematuria
- patients with hypokalemia without diuretic therapy
- BP begins to increase for uncertain reasons after being well controlled.
- Onset of hypertension is sudden.

Treatment of secondary hypertension depends on the causes of high blood pressure.

**Table 9. Features of Secondary Hypertension[9]**

| Secondary Hypertension | Clinical History and Physical Examination | Basic Biochemistry and Urine Analysis | Further Diagnostic Tests |
|---|---|---|---|
| Renal parenchymal disease | • Personal / familial history of CKD | • Proteinuria, hematuria, leukocyturia on dipstick urine analysis<br>• Decreased estimated GFR | • Kidney ultrasound |
| Primary aldosteronism | • Symptoms of hypokalemia (muscle weakness, muscle cramps, tetany) | • Spontaneous hypokalemia or diuretic-induced hypokalemia on blood biochemistry (50%–60% of patients are normokalemic).<br>• Elevated plasma aldosterone-renin activity ratio | • Confirmatory testing (eg, intravenous saline suppression test)<br>• Imaging of adrenals (adrenal computed tomography)<br>• Adrenal vein sampling |
| Renal artery stenosis | • Abdominal bruit<br>• Bruits over other arteries (ie, carotid and femoral arteries)<br>• Drop in estimated GFR >30% after exposure to ACE-inhibitors/ARBs<br>• For suspected atherosclerotic RAS, history of flash pulmonary edema or history of atherosclerotic disease or presence of cardiovascular risk factors<br>• For suspected fibromuscular dysplasia, young women with onset of hypertension < 30 years | • Decrease in estimated GFR | • Imaging of renal arteries (duplex ultrasound, abdominal computed tomography or magnetic resonance angiogram depending on availability and patient's level of renal function) |
| Pheochromocytoma | • Headaches<br>• Palpitations<br>• Perspiration<br>• Pallor<br>• History of labile hypertension | • Increased plasma levels of metanephrines<br>• Increased 24-hour urinary fractional excretion of metanephrines and catecholamines | • Abdominal/pelvic computational tomography or MRI |
| Cushing's syndrome and disease | • Central obesity<br>• Purple striae<br>• Facial rubor<br>• Signs of skin atrophy<br>• Easy bruising<br>• Dorsal and supraclavicular fat pad<br>• Proximal muscle weakness | • Hypokalemia<br>• Increased late-night salivary cortisol | • Dexamethasone suppression tests<br>• 24-hour urinary free cortisol<br>• Abdominal / pituitary imaging |

| | | | |
|---|---|---|---|
| Coarctation of the aorta | • Higher blood pressure in upper than lower extremities<br>• Delayed or absent femoral pulses | | • Echocardiogram<br>• Computational tomography angiogram<br>• Magnetic resonance angiogram |
| Obstructive sleep apnea | • Increased BMI<br>• Snoring<br>• Daytime sleepiness<br>• Gasping or choking at night<br>• Witnessed apneas during sleep<br>• Nocturia | | • Home sleep apnea testing (e.g., level 3 sleep study)<br>• Overnight polysomnography testing |
| Thyroid disease | • Symptoms of hyperthyroidism: heatintolerance, weight loss, tremor, palpitations<br>• Symptoms of hypothyroidism: cold intolerance, weight gain, dry brittle hair | • TSH, Free T4 | |

### 6.3 Resistant hypertension

Resistant hypertension is defined as high blood pressure that remains uncontrolled in a patent treated with three or more antihypertensive medications at optimal (or maximally tolerated) doses including a diuretic and after excluding pseudo-resistance as well as the substance/drug-induced hypertension and secondary hypertension. Resistant hypertension affects around 10% of hypertensives. A diagnosis of true resistant hypertension should be made only after a thorough assessment to exclude apparent or pseudo-resistant hypertension. Almost 50% of patients diagnosed with resistant hypertension have pseudo-resistance rather than true resistant hypertension[19].

**Causes of pseudo-resistant hypertension:**

- Improper blood pressure measurement
- Heavily calcified or arteriosclerotic arteries that are difficult to compress (in elderly persons)
- White-coat effect
- Side effects of medication
- Poor doctor patient relation
- Inadequate patient education
- Memory or psychiatric problems

- Antihypertensive medication issues such as inadequate doses, inappropriate combinations, poor patient adherence, complicated dosing schedules and physician inertia (failure to change or increase dose regimens when not at goal)

**Typical characteristics of patients with resistant hypertension**

- Old age, especially >75 years
- High baseline blood pressure and chronicity of uncontrolled hypertension
- Target organ damage
- Diabetes
- Obesity
- Atherosclerotic vascular disease
- Aortic stiffening
- Women
- Excessive dietary salt

**Factors contributing to resistant hypertension**

**A. Lifestyle factors**

- Inadequate physical activity
- Excess alcohol intake
- Excess dietary salt
- Cocaine and amphetamines misuse (e.g., yaba)

**B. Drug related causes**

- Non-steroidal anti-inflammatory drugs
- Contraceptive hormones
- Adrenal steroid hormones
- Sympathomimetic agents (nasal decongestants, diet pills)
- Erythropoeitin, cyclosporin, and tacrolimus
- Liquorice (suppresses the metabolism of cortisol)
- Herbal supplements (ephedra, bitter orange, etc.)

**C. Volume overload**

- Progressive renal insufficiency
- High salt intake

- Inadequate diuretic therapy

**Secondary causes of resistant hypertension**

- Primary hyperaldosteronism
- Renal artery stenosis
- Renal parenchymal disease
- Obstructive sleep apnoea
- Phaeochromocytoma – (Episodic palpitations, headaches, sweating)
- Thyroid diseases
- Cushing's syndrome
- Coarctation of the aorta
- Intracranial tumors

**Treatment of Resistant Hypertension**

**Non-pharmacologic intervention**

All non-pharmacological interventions mentioned in the chapter on management of hypertension should be implemented vigorously.

**Pharmacologic intervention**

Use of low dose Spironolactone (25 mg once daily, increasing to 50 mg once daily) as the preferred fourth agent if the blood potassium concentration is less than 4.5 mmol/L. If Spironolactone causes painful gynecomastia then Amiloride or Eplerenone can be considered as a substitute. Centrally acting agonist (Methyldopa and Clonidine) or direct vasodilators (Hydralazine or Minoxidil) are further options. With direct vasodilators, concomitant high-dose beta-blockers (Metoprolol or Bisoprolol or Nebivolol) and loop diuretics (Furosemide) will be needed to counteract reflex tachycardia and edema. Combined alpha- and beta-blockers (Labetalol and Carvedilol) may improve blood-pressure control. Whatever the final combination of treatments, a patient with resistant hypertension is likely to be receiving at least four antihypertensive drugs daily.

**Device therapy**

Interest is growing in device therapy for resistant hypertension, with the objective of improving blood pressure control without resorting to further medication. Two techniques have recently been evaluated: percutaneous transluminal radiofrequency sympathetic denervation of the renal arteries and carotid baroreflex activation.

### 6.4 Hypertension in elderly

The definition of hypertension in the elderly is the same as in general adult population. The prevalence of hypertension increases with age. Hypertension in the elderly is an increasingly important public health concern as our population ages. According to the Bangladesh Non-Communicable Disease (NCD) Risk Factor Survey 2022, percentage with hypertension in adults aged 18-69 years, is 23.5% in general, 24.1% in men and 23.0% in women[4]. Other reports stated a prevalence of ~60% over the age of 60 years and ~75% over the age of 75 years[20]. For the purposes of these Guidelines, older is defined as ≥ 65 years and the very old as ≥ 80 years [11]. According to ESH guidelines, in older patients treated for hypertension should be lower to less than 140/ 80 mmHg, but not below an SBP of 130 mmHg[11].

#### Special features of hypertension in elderly

Advanced age has been a barrier to the treatment of hypertension because of concerns about potential poor tolerability, and even harmful effects of BP-lowering interventions in people in whom mechanisms preserving BP homeostasis and vital organ perfusion may be more frequently impaired. However, evidence from RCTs has shown that in old and very old patients, antihypertensive treatment substantially reduces CV morbidity and CV and all-cause mortality. Moreover, treatment has been found to be generally well tolerated. However, older patients are more likely to have comorbidities such as renal impairment, atherosclerotic vascular disease, and postural hypotension, which may be worsened by BP-lowering drugs. Older patients also frequently take other medications, which may negatively interact with those used to achieve BP control. Other important factors are -

Blood pressure may be falsely high due to excessive arterial stiffness (pseudo-hypertension).

Isolated systolic hypertension (SBP ≥140 mmHg and DBP <90 mmHg) is more common.

White-coat hypertension is more common in the elderly.

Postural hypotension and hypertension are more commonly seen.

Co-morbidities are common.

Adverse effects of drugs are more probable.

**Management**

**Clinical assessment and diagnosis**

Recommendations for BP measurements in elderly patients are like those for the general population. Postural hypotension, i.e., a drop in systolic BP of >20 mmHg upon standing, is a common problem in the elderly. Blood pressure should therefore be measured in both the seated/supine and standing positions. If there is a significant postural drop, the standing BP is used to guide treatment decisions. Ambulatory BP monitoring is indicated when hypertension diagnosis or response to therapy is unclear from office visits, when syncope or hypotensive disorders are suspected, and for evaluation of vertigo and dizziness. Home BP measurements may be important to avoid potential hazards of excessive BP reduction in older people. Initial assessment should follow the general principles of evaluation of hypertensive patients stated in the earlier section.

**Goals of treatment**

The general recommended BP goal in uncomplicated hypertension is <140/90 mm Hg. Provided the treatment is well tolerated in older patient (>65 years) SBP should be targeted to between 130 and 140 mmHg and DBP < 80 mmHg. Treated SBP should not be targeted to <120 mmHg[11]. Patients with diabetes mellitus, chronic kidney disease, coronary artery disease or heart failure should have a BP <130/80 mmHg[11].

**Non-pharmacological Treatment**

Lifestyle modification may be the only treatment necessary for milder forms of hypertension in the elderly. Reduction of excess body weight increased physical activity, no-added salt, increased potassium intake and avoidance of mental stress are recommended. Associated risk factors of ischaemic heart disease, i.e., smoking, must be given up.

**Pharmacological Treatment**

It is recommended that older patients are treated according to the algorithm shown in Figures 4 and 5 in section 5. In very old patients, it may be appropriate to initiate treatment with monotherapy. In all older patients, when combination therapy is used, it is recommended that this is initiated at the lowest available doses[11]. In all older patients, and especially very old or frail patients, the possible occurrence of postural BP should be closely monitored and symptoms of possible hypotensive episodes checked by ABPM. Unless required for concomitant diseases, loop diuretics and alpha-blockers should be avoided because of their association with injurious falls.

A key emphasis in treating older patients, and especially the very old, is to carefully monitor for any adverse

effects or tolerability problems associated with BP-lowering treatment. Renal function should be frequently assessed to detect possible increases in serum creatinine and reductions in eGFR as a result of BP-related reductions in renal perfusion.

**6.5 Hypertension management in stroke**

Stroke is the second most common cause of mortality and the most common cause of disability worldwide. The prevalence of stroke in different parts of the world is 4.7-10.2/1000 and in Bangladesh is from 3-9 per 1000[21,22]. Hypertension is the most common risk factor for a stroke of any type. In addition to the degree and duration of hypertension, both systolic and diastolic BP are equally responsible for a stroke. As stroke occurs commonly in the elderly, systolic BP is more related to stroke at admission, and 70-80% may have high BP immediately after the stroke. The incidence of stroke is 3 times higher in persons with stage 2 or stage 3 hypertension, and a reduction of systolic BP 10-12 mmHg and diastolic BP 5-6 mmHg is associated with a 38% reduction in stroke incidence.

The treatment of hypertension in acute stroke is controversial. About 10-20% of patients with acute stroke may have reactionary high BP for 5-7 days. Usually, mild to moderate reactionary blood pressure does not need treatment. A significant fall or increase in BP is associated with poor outcomes in acute stroke. High BP (220/110 mmHg) during acute stroke aggravates cerebral edema and reduces cerebral perfusion pressure, resulting in more ischemia. On the other hand, lower pressure (<100/60 mmHg) aggravates ischemic penumbra, so a judicious approach is necessary for treating hypertension in acute stroke.

The treating physician should consider the following fundamental issues in managing hypertension in acute stroke[23-27].

- When to initiate anti-hypertensive drugs?
- Type of stroke
- The target blood pressure
- Presence of co-morbid diseases
- How to reduce blood pressure?
- Drug selection
- Whether a candidate for rt-PA or not
- Duration of treatment

**Timing of anti-hypertensive drugs initiation:**

It depends on the level of BP, previously known as hypertensive or not, and whether on any medication. It is better to wait for 5-7 days in case of mild to moderate blood pressure rise (up to 180/110 mmHg) in previously unknown hypertensive patients. In case of known hypertensive or on treatment, the physician should continue the previous medication or add an anti-hypertensive drug. But one should be careful about precipitous fall of blood pressure; it should be reduced to target over 2-3 days. In the case of previously unknown hypertensive patients without any target organ damage, treatment should be started after 5-7 days. In case of target organ damage, it should be started immediately but slowly buildup to reduce BP gradually. Again, in the case of a thrombolysis candidate, blood pressure should be reduced below 185/110 mmHg and blood pressure should be maintained <180/105 for first 24-hour after the treatment. In patients for whom mechanical thrombectomy is planned and who have not received IV fibrinolytic therapy, it is reasonable to maintain BP ≤185/110 mmHg before the procedure. If there is severe hypertension (>220/120 mmHg), an immediate reduction of BP is necessary (10-20% reduction of the BP in first hour, up to 160/100 mm in 6 hours, Reduce to target in 2-3 days).

**Types of Stroke:** Stroke consists of ischemic (80-85%) and hemorrhagic (15-20%). Hemorrhagic stroke is again two types, intracerebral hemorrhage (ICH) (80-85%) and subarachnoid hemorrhage (SAH) (15-20%). The treatment strategy differs according to the type of stroke.

**In hemorrhagic stroke:**

If SBP >220 mm of HG or mean BP >150, acute blood pressure reduction is necessary; starting treatment within 2 hours and reaching the target Blood pressure within 1 hour is recommended.

If the SBP is between 150-220 mm of Hg, it is reasonable to start antihypertensive as soon as possible and gradually titrate the BP to <130 mm of Hg. In case of raised ICP it is recommended to maintain cerebral perfusion pressure of 60-80 mm of Hg. For the secondary prevention target BP is <140/90 mm of Hg in general and <130/80 for CKD and diabetic patient.

**In subarachnoid hemorrhage:**

In subarachnoid hemorrhage, the risk of rebleeding is higher if the systolic blood pressure is>160 mm of Hg. Acute lowering of SBP to 140-160 mm of Hg is beneficial. But maintaining

the cerebral perfusion pressure (CPP) at 60-80 mm of Hg is essential. Avoiding large degrees of blood pressure variability improves clinical outcomes in aneurysmal SAH.

**In ischemic stroke:**

The treatment of BP is generally the same as mentioned earlier. e.g., no immediate treatment in mild to moderate hypertension except in previously known hypertensive or if there is any target organ involvement. If there is severe hypertension, it needs immediate treatment by the agents mentioned above.

**The target of BP:** In ischemic stroke, Mean Arterial Pressure (MAP) is to be kept around 105-110 mmHg, but if there is target organ involvement, MAP should be approximately 90-95 mmHg. In hemorrhagic stroke, the target BP is 5 mm more in SAH and 5 mm less in ICH than in ischemic stroke.

**Presence of any co-morbid disease:** If there is any other co-morbid disease, e.g., renal failure, diabetes mellitus, cardiac failure, these should guide the drug selection. The target mean BP is around 100 mmHg.

- Anti-hypertensive treatment in people with acute ischaemic stroke is recommended only if there is a hypertensive emergency with one or more of the following serious concomitant medical issues:
  - Hypertensive encephalopathy
  - Hypertensive nephropathy
  - Hypertensive cardiac failure/myocardial infarction
  - Aortic dissection

**Ways of BP reduction:** It is a rule to reduce BP slowly in treating hypertension in acute stroke. The agents which reduce BP Slowly are preferred except in severe hypertension. No more than 20% reduction in any situation within 24 hours. Always oral agents are preferred.

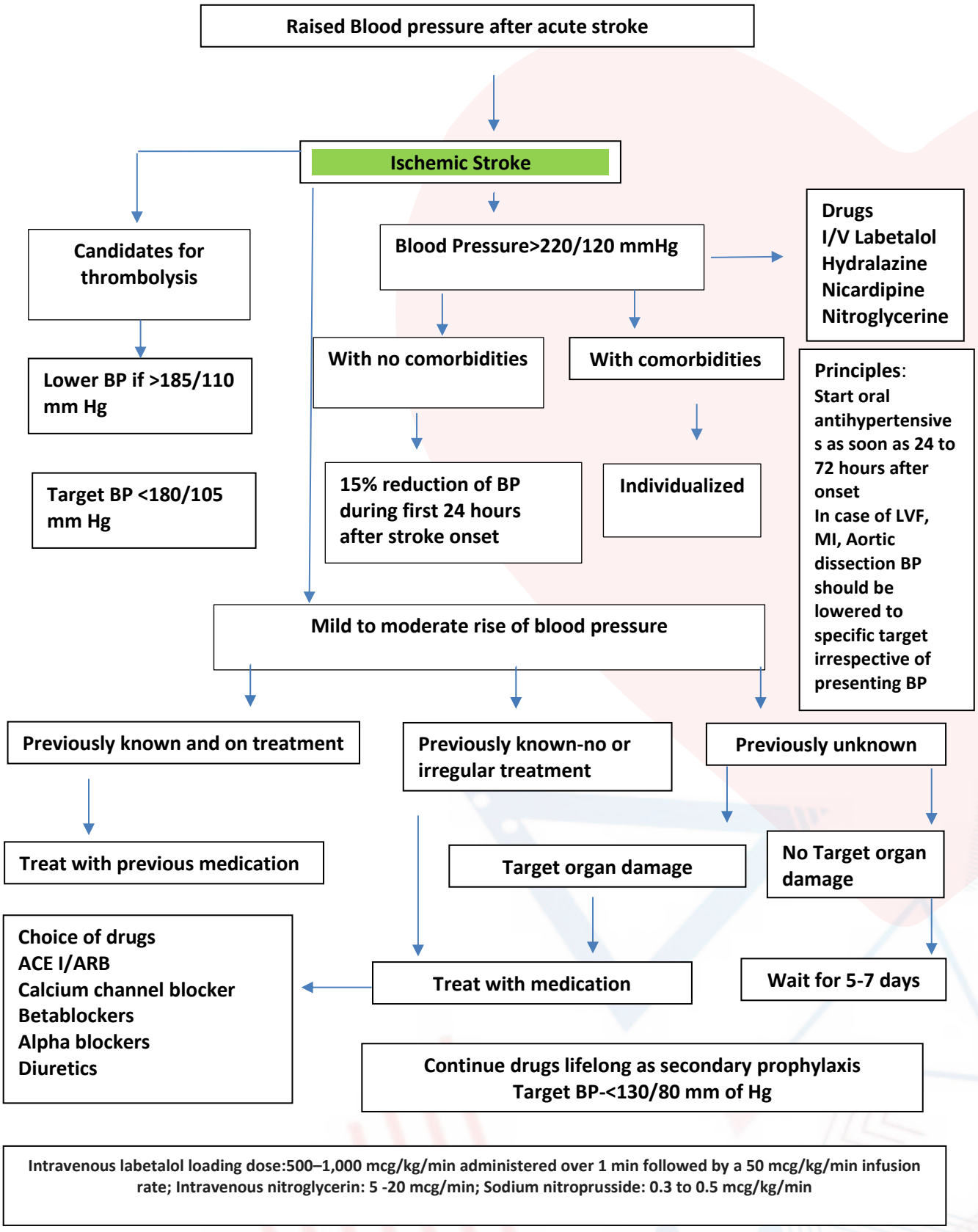
**Drug Selection:** It is crucial to select drugs judiciously**.** Many groups of anti-hypertensive agents are on the market, but all are not equally preferred for stroke. Few multicentric trials showed ARB or ACEI has an additional benefit in stroke. Among all the groups of drugs according to the priority of ARB, ACEI, Calcium Channel Blocker, Alpha Blocker, Beta Blocker,

and Diuretics are used. The use of diuretics needs particular attention because sometimes the stroke patient may be dehydrated and have hyponatremia. The use of diuretics may aggravate the situation. For intravenous use IV labetalol, Nicardipine and Clevidipine are recommended drugs.

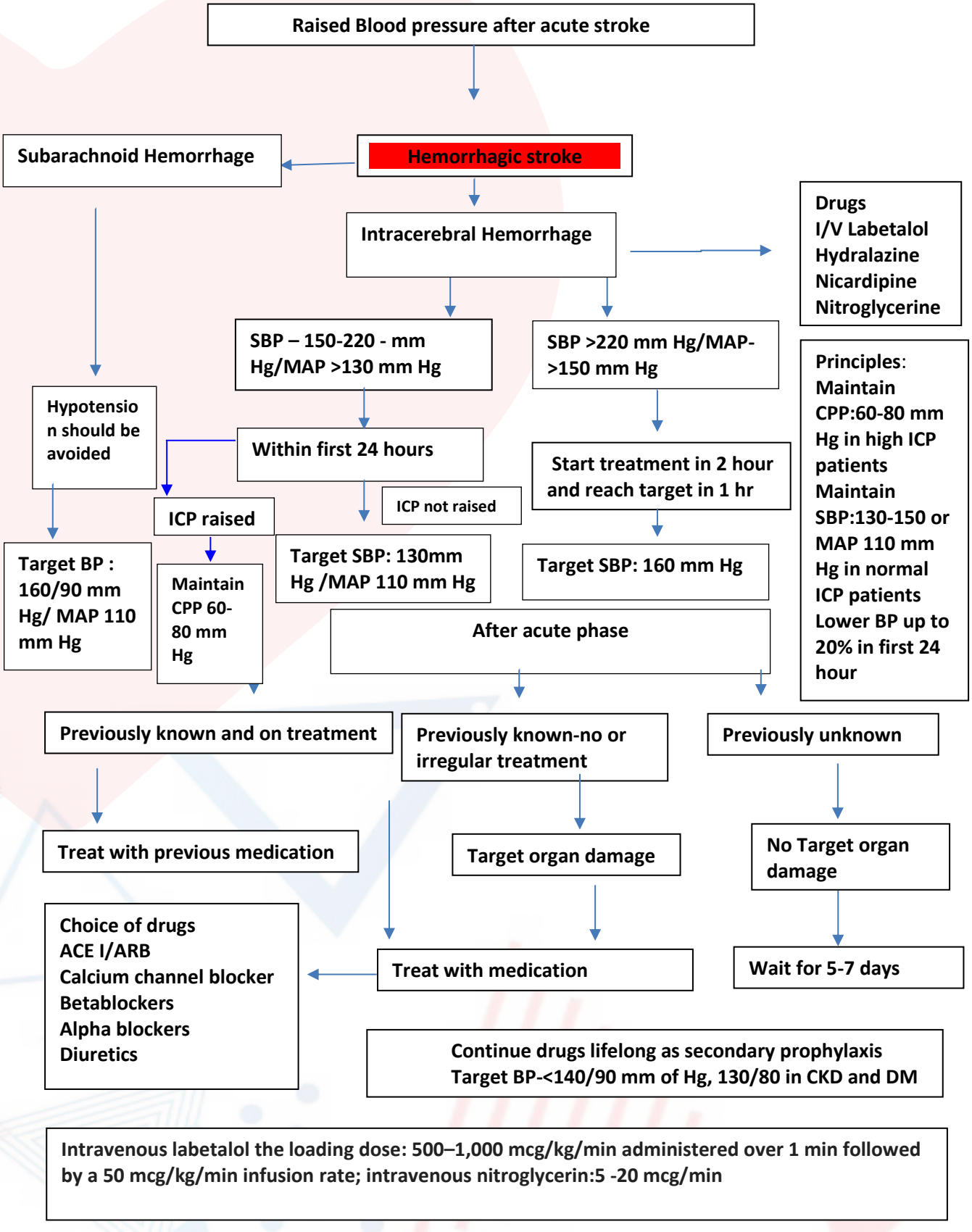
**Whether a candidate for r-TPA or not:** If the patient is a candidate for r-tPA, then there is necessary intervention because high BP >185/110 mm Hg is a contraindication for rt-PA in ischemic stroke. Blood pressure should be maintained <180/105 for the first 24-hour after the treatment. The approach is the same for ischemic stroke.

**Duration of Treatment:** Blood pressure medication is to be continued for life because blood pressure is not a curable disease. It has to be kept under control by medication. There are some misconceptions about BP treatment among the general population as some people may have an idea that if drug treatment is started, then it will continue lifelong, so it is better not to start; some feel that with medication, if the BP is under control, the drug can be stopped. Somebody thinks it is better to take medicine when the symptoms appear, but all these are harmful. He is wise to start treatment and continue treatment because many severe complications of hypertension can be avoided if the BP is controlled.

**Figure 9: Flow chart for management of ischaemic stroke with hypertension**



Percentage hematoma growth, initial ICH volume, Glasgow Coma Scale score, and presence of intraventricular hemorrhage were all associated with increased mortality; however, BP was not.




Intravenous labetalol the loading dose: 500–1,000 mcg/kg/min administered over 1 min followed by a 50 mcg/kg/min infusion rate; intravenous nitroglycerin:5 -20 mcg/min

**Whether a candidate for r-TPA or not:** If the patient is a candidate for r-tPA, then intervention is necessary because high BP >185/110 mm Hg is a contraindication for rt-PA in ischemic stroke. The approach is the same for ischemic stroke.

### 6.6 Perioperative Hypertension

**The perioperative period has three distinct phases:**

- Preoperative: before surgery.
- Intraoperative: during surgery.
- Postoperative: after surgery.

Hypertension is generally managed by primary care providers such as family practitioners, Severe perioperative HTN may result in excess surgical bleeding, myocardial ischemia and/or infarction, congestive heart failure (CHF) and acute pulmonary edema (APE). Therefore, it is vital that anesthesiologists, nurses, and all healthcare professionals who manage patients in preparation for surgery, and during the perioperative period, are knowledgeable regarding the care of patients with HTN.

Most patients with HTN report their diagnosis when presenting for a preoperative visit. History should focus on symptoms associated with end-organ damage. Hypertensive heart disease may result in coronary artery disease or LVH. The clinician should inquire about symptoms, including chest pain or pressure, dyspnea on exertion, orthopnea, or paroxysmal nocturnal dyspnea. The distance a patient can walk on level ground, and the number of flights of stairs they can climb before the onset of symptoms should be documented. Symptoms of stroke or transient ischemic attacks should be sought. Symptoms of kidney disease, such as those related to fluid overload, are only present in patients with severe kidney disease. Recent changes in visual acuity may reflect hypertensive retinopathy.

**Preoperative Evaluation**

If BP is well controlled, and history and physical examination are unremarkable, further testing may be unnecessary for uncomplicated surgery or procedures, but is appropriate if history or physical are concerning, and for larger and invasive surgeries. Electrocardiography (ECG) and transthoracic echocardiography (TTE) detect the presence of LVH.

Echocardiography can also measure its severity. Wall motion abnormalities and left ventricular ejection fraction (LVEF) can be detected with TTE. Referral to a cardiologist may be advisable to determine appropriate preoperative tests, assess perioperative risk, and make focused recommendations for perioperative care. Cardiac catheterization is usually only performed when indicated by symptoms, and the cardiologist believes preoperative intervention may be indicated, such as percutaneous coronary intervention in a patient with worsening angina. A neurologist should assess neurologic signs or symptoms before elective surgery. Serum creatinine can indicate impaired renal function, though it needs to be appreciated that approximately 50% of kidney function may be lost before creatinine begins to rise. Electrolytes should be performed if patients are on antihypertensives that impact electrolytes, such as diuretics. Complete blood count and platelet count are indicated if the procedure is likely to be associated with significant blood loss. Still, many preoperative clinics will perform a complete blood count prior to all but minor procedures. In patients with HTN, a basic metabolic panel should be performed to document the preoperative state of kidney function with serum creatinine.

In general, patients should be instructed to take their oral antihypertensive medications the day of surgery, with a sip of water. It is widely accepted to withhold diuretics, due to the overnight fast. Still, in patients with severe CHF, a reduced dose of diuretic, or even the usual dose, might be considered. Perhaps this decision should be made by the anesthesiologist in the preoperative area, after measurement of BP and auscultation of the lungs. Patients on chronic beta-blocker therapy should receive their beta-blocker on the day of surgery. However, beta-blockade therapy should not be initiated immediately before surgery, for although it has been shown to decrease the incidence of cardiac events, it also increases the risk of bradycardia, stroke, and death.

**Preoperative Evaluation on the Day of Surgery (DOS)**

Patients who present for anesthesia should have normal BP on the DOS, although it may be somewhat increased above their usual level due to anxiety. Once SBP reaches 170 mm Hg or DBP reaches 100 mm Hg, it is likely the patient will manifest BP gyrations in the perioperative period. These can usually be managed safely with appropriate administration of anesthetics, analgesics, and antihypertensives. If a patient presents with SBP of 180 or DBP of 110 and has no prior history of HTN or manifests these BP measurements despite having taken their BP

medications the DOS, elective surgery should be postponed until BP is better controlled. If SBP is 180 or DBP is 110 and the patient has not taken their antihypertensives that morning, they should be given with a small dose of an anxiolytic such as midazolam with a sip of water, or a comparable intravenous antihypertensive administered.

If surgery is emergent and must proceed despite poorly controlled BP, precautions should be taken. A recent ECG and echocardiogram should be reviewed. In patients in whom such information is not available, a brief delay to obtain a STAT ECG and echocardiogram may be appropriate.

If surgery is of an emergent nature, careful monitoring of BP with an arterial line is advised, and pharmacologic therapies should be immediately available to treat HTN. Such treatment may need to be continued into the post-anesthesia care unit (PACU) and/or intensive care unit (ICU).

**Intraoperative Management**

Anesthesiologist's primary responsibility is to ensure safe levels of BP. This may be achieved with anesthetics, analgesics, and antihypertensive agents, with the choice of specific techniques and drugs tailored to the specific patient's comorbidities. Poor management of BP in the perioperative period may cause end-organ complications. However, assuming BP is carefully managed during anesthesia, it is more likely that the anesthesiologist will be tailoring management of the patient based upon preexisting end-organ complications of HTN, or the measured BP on the DOS.

In 80%-90% of surgical patients, the standard intermittent non-invasive blood pressure (BP) that is obtained using oscillometry with a brachial cuff has been shown to have only poor agreement with IBP in critically ill patients. Invasive blood pressure (IBP) is the gold standard of arterial pressure measurement in 10-20% of high-risk patients.

Regional nerve blocks provide surgical anesthesia with minimal hemodynamic changes. Spinal and epidural techniques similarly permit maintenance of spontaneous ventilation, but BP may drop significantly. Such decreases may be ameliorated with volume infusion and/or vasoconstrictors. Rigid adherence to certain anesthetics for specific procedures is not recommended, as each patient's comorbidities need to be considered. Still, the application of regional techniques and patient-controlled analgesia help minimize postoperative pain and

the stress response. In addition, postoperative mobilization may be more rapid after regional techniques.

Poorly controlled HTN may lead to large reductions in BP during the administration of anesthesia, and both treated and untreated hypertensive patients often display a lower BP nadir than normotensive patients. Severe HTN and significant hypotension are both associated with increased risk of perioperative complications. Maintenance of appropriate intraoperative BP targets is important to minimize the risk of CHF.

Intravenous agents that may be used to treat severe intraoperative HTN under anesthesia include sodium nitroprusside, nicardipine, and nitroglycerin. Infusion of these agents, with appropriate adjustments, can provide control of even severely elevated BP. Rapid dose adjustments can be facilitated with beat-to-beat arterial line monitoring. Once a steady state is reached, hydralazine. may be used to provide longer-term control, and to facilitate weaning from such infusions.

In summary, in patients with HTN and/or significant cardiovascular disease, overall appropriate targets for intraoperative BP can be summarized as SBP approximately 130 mm Hg, MAP 60 to 65 mm Hg, and DBP 70 to 90 mm Hg.

It is understood that young, healthy patients, such as those with baseline BP of 110/65 mmHg, can tolerate lower values than the recommendations above for patients with HTN or cardiovascular disease (CVD). Still, even in healthy patients, a prolonged period of hypotension may increase morbidity and mortality.

Even patients with baseline BP of 150/90 mm Hg may demonstrate significant fluctuations in BP during the perioperative period. If the planned procedure is intracranial, intrathoracic, or major abdominal, insertion of an arterial line for beat-to-beat measurement of BP may be advisable. For less invasive procedures, an arterial line may not be necessary but, as the risk/benefit ratio of an arterial line is low, any significant fluctuations in BP should result in arterial line placement. If perioperative BP fluctuations are significant, hospitalization for 24 to 48 hours postoperatively may be necessary to begin an antihypertensive regimen to control BP prior to hospital discharge.

In critically ill patients in whom invasive blood pressure monitoring is not immediately available, non-invasive BP should be repeated every one to two minutes. Still, in patients who are severely hypertensive, hypotensive, receiving drugs that rapidly change blood pressure, or are undergoing surgical procedures that may result in significant fluctuations in BP or bleeding, invasive measurement of BP via an arterial catheter should be initiated as soon as possible. The radial artery is the most common location where arterial catheters are inserted, but other possible sites include the femoral, axillary, brachial, and dorsal pedis arteries. In neonates, the umbilical artery may be the easiest artery to cannulate.

If surgery is performed in the sitting position, as is sometimes done during neurosurgery and shoulder surgery, it should be appreciated that non-invasive BP measured at the level of the brachial artery does not reflect BP perfusing the brain. Therefore, cuff BP goals should be maintained higher than normal. If an arterial line is inserted, the transducer should be placed and zeroed at the level of the ear. Placement of the arterial line transducer at the level of the operating room table, and management of BP to that arterial line, has resulted in brain injury in a patient undergoing neurosurgery in the sitting position.

In Pheochromocytoma preoperative preparation includes alpha blockade, followed by the addition of CCB or beta-blockers as needed to control BP. Several measurements of SBP should be less than 160 mm Hg before surgery. As alpha blockade takes effect, patients are advised to increase liquid and salt intake orally. Beta-blockade should never be initiated before alpha-blockade in patients with pheochromocytoma, as the unopposed alpha effect can result in severe HTN.

**Postoperative hypertension**

Postoperative hypertension is an acute, transient increase in blood pressure that develops within 30 to 90 minutes following a surgical procedure and typically lasts for 4 to 8 hours after surgery. It is defined as a systolic blood pressure greater than 160 mm Hg or a diastolic blood pressure greater than 90 mm Hg.

Reversible or treatable causes of hypertension, including pain, anxiety, hypothermia, and hypoxemia, should be considered and treated before the implementation of antihypertensive therapy. The ideal agent for treating APH is intravenously administered, is fast acting, and has

a short duration of action, allowing the rapid and safe adjustment of therapy to achieve a targeted BP range. Sodium nitroprusside has long been considered the standard therapy and has many of the ideal characteristics. However, because of the need for invasive hemodynamic monitoring and concerns about toxicity in patients given sodium nitroprusside, several newer agents may be preferable in routine clinical practice. Labetalol, nicardipine, and nitroglycerin have been widely studied or used. Hydralazine, esmolol, fenoldopam, angiotensin-converting-enzyme inhibitors, and clonidine may also be useful treatment options.

**Conclusion.**

The perioperative period is unique in that multiple healthcare providers contribute to the care of the patient. Communication between these providers will ensure patient safety preoperatively. Referral to existing or new providers if perioperative BP values are concerning is emphasized. This will ensure that an antihypertensive regimen is initiated and follow up visits are scheduled to optimize the antihypertensive regimen. When treatment of APH is necessary, therapy should be individualized for the patient.

In general, the treatment goal should be based on the patient's preoperative BP. A conservative target would be approximately 10% above that baseline; however, a more aggressive approach to lowering BP may be warranted for patients at very high risk of bleeding or with severe heart failure who would benefit from after load reduction. Careful monitoring of patient response to therapy, and adjustment of treatment, are paramount to safe and effective treatment of perioperative hypertension. After surgery, the clinician can safely transition the patient to an effective oral antihypertensive regimen to manage the long-term risks of hypertension and cardiovascular diseases.

### 6.7 Hypertensive disorders in pregnancy

Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide[28]. Recent survey by NIPORT 2022, MOHFW has revealed that prevalence of pregnancy induced hypertension (PIH) in Bangladesh is 10.1% (95% CI, 9.0, 11.2) among pregnant women with gestational age >20 weeks[29]. Preeclampsia and eclampsia are one of the common obstetric

emergencies. About 4.6% of pregnancy are complicated with preeclampsia.[20] Eclampsia is the cause of 24% maternal death in Bangladesh[29].Most of the preeclampsia and eclampsia are preventable. Maternal risks include placental abruption, stroke, multiple organ failure (liver, kidney), disseminated vascular coagulation. Fetal risks include in tra uterine growth retardation, preterm birth, intrauterine death.

**Hypertensive disorders in pregnancy can be classified into the following groups.**

1. Pregnancy induced hypertension or gestational hypertension: Defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg in a previously normotensive pregnant woman after ≥20 weeks of gestation in the absence of proteinuria or new signs of end-organ dysfunction. The blood pressure readings should be documented on at least two occasions 4 hours apart.
2. Pre-eclampsia: Occurrence of new-onset hypertension plus new–onset proteinuria after 20 weeks of gestation with high blood pressure:
    - SBP ≥140 or DBP ≥90 mmHg on two occasions at least 4 hours apart after 20 weeks of gestation, at the time or after delivery in a woman with a previously normal blood pressure.

    And significant proteinuria:
    - ≥ 300 mg / 24-hour urine collection or
    - Protein/creatinine ratio ≥0.3 (each measured as mg/dl)
    - Dipstick reading of 1+ (used only if other quantitative methods not available)

    1. Mild pre-eclampsia: SBP ≥140 to <160mmHg & DBP ≥90 to <110mmHg after 20 weeks gestation without significant proteinuria with no evidence of organ dysfunction
    2. Severe pre-eclampsia: SBP ≥ 160 mmHg and / or DBP ≥ 110 mmHg after 20 weeks gestation with significant proteinuria or new-onset hypertension with the new onset of any of the following:
        - Thrombocytopenia- platelet count <100000/microliter
        - Renal insufficiency- serum creatinine>1.1 mg dl or a doubling of serum creatinine concentration
        - Impaired liver functions- elevated liver transaminases ≥ twice normal concentration

- Pulmonary edema
- Cerebral or visual symptoms

  -Headache (increasing frequency, not relieved by regular analgesics).

  -Blurred vision.
- Oliguria (passing less than 400 mL urine in 24 hours).
- Upper abdominal pain (epigastric pain or pain in right upper quadrant)

3. Eclampsia: New onset hypertension after 20 weeks gestation with significant proteinuria or ≥1+ on dipstick and sometimes with altered sensorium or loss of consciousness with other symptoms and signs of severe preeclampsia along with convulsions.
4. Chronic Hypertension**:** Elevated blood pressure (≥ 140/90 mmHg) diagnosed before pregnancy or developed during pregnancy before 20 weeks and persists after delivery is known as chronic hypertension.
5. Chronic hypertension with superimposed preeclampsia: Women with hypertension only in early gestation who develop proteinuria after 20 weeks gestation. Women with hypertension with proteinuria before 20 weeks of gestation who-
   a) Experience a sudden exacerbation of hypertension or need to escalate dose of antihypertensive drug in previously well controlled BP
   b) Sudden increase in liver enzymes to abnormal levels
   c) Presence with decrement in platelet levels to below 100,000/ microliter
   d) Manifest symptoms such as right upper quadrant pain and severe headache
   e) Develop pulmonary edema
   f) Develop renal insufficiency
   g) Have sudden, substantial and sustained increases in protein excretion

**Diagnosis of Preeclampsia and Eclampsia**[30,31]

Preeclampsia and Eclampsia is diagnosed mainly by symptoms and signs

**Symptoms:** 1) Generalized or localized headache, 2) nausea, vomiting and epigastric pain, 3) restlessness, dizziness, blurred vision, 4) swelling of feet, hands and or face, 5) history of convulsions

**Signs:** 1) oedema of feet, hands and or face plus other signs of pre-eclampsia, 2) high blood pressure, 3) proteinuria, 4) eclamptic fit, 5) hypertensive retinal changes

**Investigations**

- Complete blood count- platelet count <100000/microliter (Thrombocytopenia)
- Random Blood sugar
- Serum creatinine- serum creatinine >1.1 mg/dl or a doubling of serum creatinine concentration (Renal insufficiency)
- Serum electrolytes
- Liver Function Test- elevated liver transaminases ≥ twice normal concentration (impaired liver functions)
- Coagulation profile
- Bed side clotting test
- Urine parameters-
    - Test for 24 hours urinary protein- Greater than or equal to 300 mg per 24-hour urine collection
    - Urine for albumin and sugar
    - Protein creatinine ratio- 0.3 or ≥1+ on Dipstick (each measured as mg/dl
    - Dipstick reading of 1+ (used only if other quantitative methods not available)

**Prevention of hypertension in pregnancy**

**Primary prevention**

1. Right timing of pregnancy
    - Delaying the first pregnancy so that a woman can begin her gestation at the age of 20 or more
    - Women aged 35 years or more should not go for a baby if not absolutely necessary
    - Birth spacing of 2-5 years
2. Controlling weight
    - Those women whose pregnancy has begun with overweight should take balanced food regularly (an increase of 5-7 kgs of weight during pregnancy)
3. Calcium tablets during pregnancy
    - After 12th week of pregnancy, women should take one-gram (1000mg – 2 tablets of 500 mg) calcium tablet every day until delivery
4. Low dose aspirin during pregnancy

- Intake of 150 mg of aspirin orally starting from 12$^{fth}$ week – 19$^{th}$ week of gestation by women at high risk for developing PE and continue until delivery.
- Women at risk of preeclampsia are defined based on the presence of one or more high risk factors such as history of preeclampsia, multifetal gestation, renal disease, autoimmune disease, type 1 or type 2 diabetes, chronic hypertension or presence of more than one of several moderate risk factors such as first pregnancy, maternal age of 35 years or older, body mass index greater than 30, family history of preeclampsia, sociodemographic characteristics, and personal history factors (LBW or previous adverse pregnancy outcome).

**Secondary prevention**:

Secondary prevention includes measuring high blood pressure as well as albumin in urine at primary stage at all opportunity in 8 ANC, including self-measurement.

**Management:**

A) General Management
- Close supervision, restriction of activities, Diet: high protein diet

B) Specific Management:

Gestational hypertension:

Start drug treatment if gestational hypertension with blood pressure levels >140/90mmHg, Hospitalization if blood pressure levels SBP ≥170 or DBP ≥110mmHg.

Anti-hypertensive drugs:-
- Tab. Labetalol (The initial dose is 100mg twice daily, may be increased up to 200-400mg twice daily, a maximum dose of 2.4 gm)
- Tab. Methyl dopa (250 mg tds, max 8 g/ day)
- Tab. Nifedipine 10-20 mg bid (extended release)

Severe Pre-eclampsia
- Anti-hypertensive drugs (IV)
- Anti-convulsant ($MgSO_4$ therapy for prevention of convulsion)

Anti-hypertensive drugs:
- Labetalol regime

- Injection labetalol 1 amp (50mg/10ml)
  - 4 ml (20mg) slow IV then 8-10ml (40-80 mg) every 15 min until DBP is 90 mmHg. Maximum dose 300 mg (60ml)
  - (Include maintaining dose)

- Hydralazine regime
  - IV bolus regime
    - Injection hydralazine 1 amp (20mg) + 10 ml distilled water
    - ml (5mg) slow IV over 3 to 4 min
    - Repeat 1 ml (2mg) every 15 min until DBP is 90 mmHg
  - IV infusion regime
    - Injection hydralazine 1 amp (20mg) dissolved in NS (200ml) in IV infusion at 8-10 drops/min
    - BP checked at every 15 mins interval until DBP is 90 mmHg

Pre-eclampsia with pulmonary edema:

- Diuretics: used only in cardiac failure and pulmonary edema (IV Frusemide).
- Nitroglycerin: short term therapy may be given only when other drugs have failed.

**Referral criteria**

Consider referral for tertiary level care of women who have:

- Oliguria that persists for 48 hours after delivery
- Coagulation failure (e.g., coagulopathy)
- Hemolysis, elevated liver enzymes and low platelets (HELLP syndrome)
- Persistent coma lasting more than 24 hours after convulsion.

### 6.8 Hypertension in patients with diabetes mellitus

Hypertension is a common problem in patients with diabetes mellitus. Its presence increases the risk of morbidity and mortality. The Hypertension in Diabetes Study Group reported a 39% prevalence of hypertension among newly diagnosed patients, and in approximately half of them the elevated BP predated the onset of microalbuminuria and was strongly associated with obesity. Hypertension should be detected and treated early in the course of diabetes mellitus to prevent cardiovascular disease and to delay the progression of renal disease and diabetic retinopathy.

**Threshold for treatment**[32]

Pharmacological treatment should be initiated in patients with diabetes when the BP is persistently >130 mmHg systolic and/or >80 mmHg diastolic. The presence of microalbuminuria or overt proteinuria should be treated even if the BP is not elevated. An ACEI or ARB is preferred.

**Target blood pressure**

Tight BP control should take precedence over the class of antihypertensive drug used. This often will require combination therapy. There are suggestions that a lower target BP may be necessary to maximally protect against the development and progression of cardiovascular and diabetic renal disease. In general, the SBP should be targeted to <130 mmHg and diastolic pressure<80 mmHg. The BP should be lowered even further to <125/75 mmHg in the presence of proteinuria of >1 g/24 hours.

**Management**

The approach to the treatment of hypertension in diabetes should be very much along the guidelines for treatment of hypertension in general. Nonetheless, a few important issues concerning nonpharmacological management and drug treatment need to be highlighted.

**Non-pharmacological management**

Dietary counseling should target optimal body weight and take into consideration glycaemic control and the management of concomitant dyslipidaemia. Moderate dietary sodium restriction is advisable. It enhances the effects of BP lowering drugs especially ACEIs and the ARBs. Further sodium restriction, with or without a diuretic, may be necessary in the presence of nephropathy or when the BP is difficult to control.

**Pharmacological management**

The use of certain classes of antihypertensive drugs may be disadvantageous to the diabetic patient by virtue of their modes of action or adverse effects. Diabetic control may be compromised, and various diabetic complications aggravated.

- Decreased insulin responsiveness with higher doses of diuretics
- masking of early symptoms of hypoglycaemia with beta-blockers and slowing of recovery from hypoglycaemia with non-selective beta-blockers
- Aggravation of symptoms of peripheral vascular disease with beta-blockers
- Dyslipidemia with most beta-blockers and diuretics

- Worsening of orthostatic hypotension with peripheral alpha blockers or centrally acting drugs.

ACEIs are drugs of choice based on extensive data attesting to their cardiovascular and renal protective effects in diabetic patients. In addition, they do not have adverse effects on lipid and carbohydrate metabolism. If an ACEI is not tolerated, an ARB should be considered. They have been shown to be of similar efficacy as ACEIs but better tolerated. There have been no reports of adverse effects on carbohydrate and lipid metabolism. Diuretics can be used as initial therapy or added on when mono therapy is inadequate. The lowest possible dose should be used to minimize adverse metabolic effects. Also, adverse metabolic effects with higher doses of diuretics have also been reportedly reduced when used in combination with an ACEI or an ARB.

CCBs do not have significant adverse metabolic effects or compromise diabetic control. Some studies suggest that non-dihydropyridine CCBs may be superior to dihydropyridine CCBs in reducing proteinuria in diabetic nephropathy. Beta-blockers may be used when ACEIs, ARBs or CCBs cannot be used or when there are concomitant compelling indications. However, they should be used with caution, especially in patients with type 1 diabetes. Peripheral alpha blockers do not have adverse effects on carbohydrate or lipid metabolism. Orthostatic hypotension due to autonomic neuropathy may be aggravated with their use.

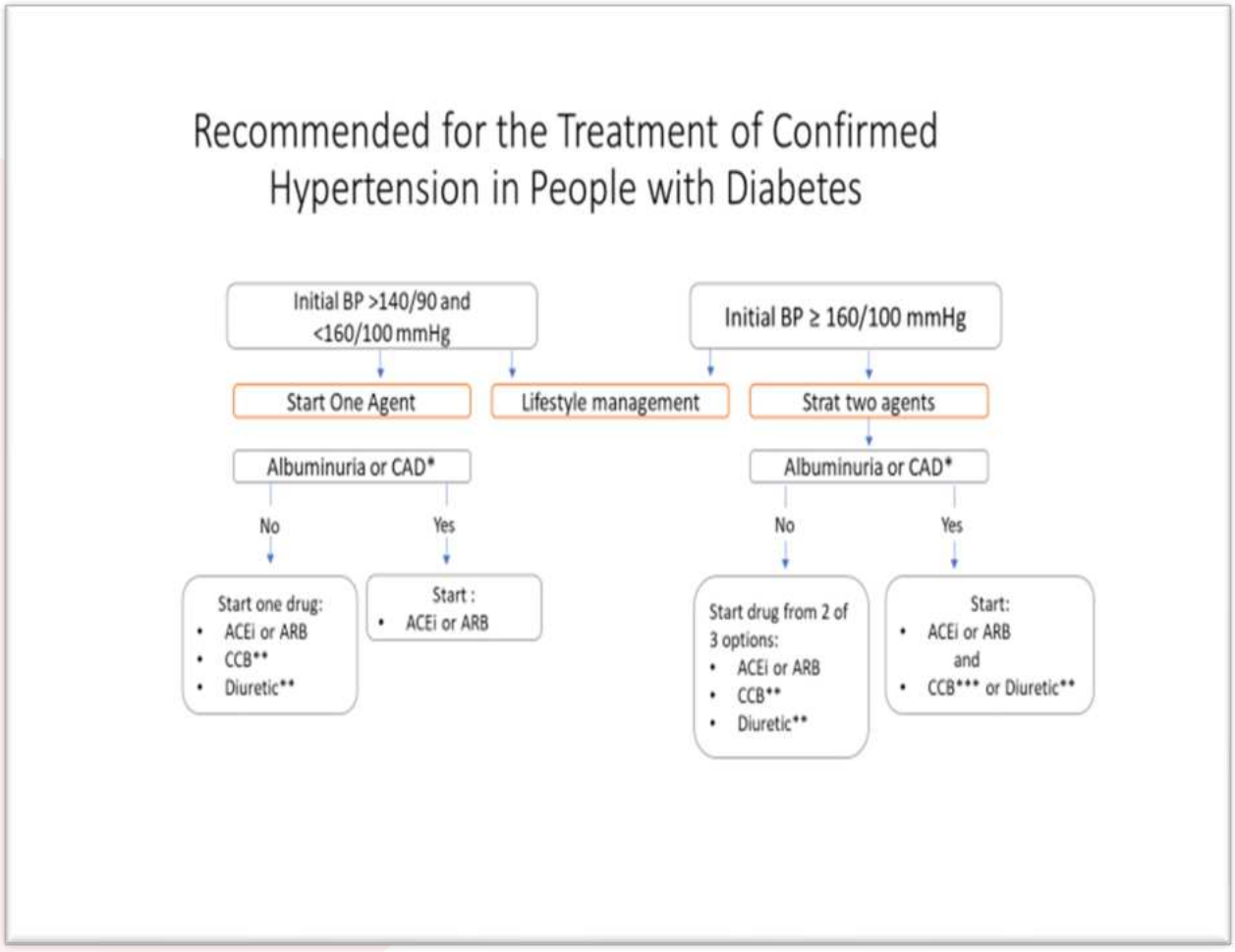



**Figure 10: Schematic diagram for the management of high blood pressure in patients with diabetes mellitus**

### 6.9 Hypertension in chronic kidney disease

850 million people have been suffering from chronic kidney disease (CKD); Of them 2.7-7 million people are dying of CKD every year. It has now become the leading cause of death among noncommunicable diseases world-wide and is a public health threat. The disease is increasingly being recognized in Bangladesh. The commonest causes of CKD in Bangladesh are glomerular and tubulointerstitial diseases (40%), diabetic kidney disease (35%) and hypertensive kidney disease (26%)[33]. Hypertension is both a cause and effect of CKD. Hypertension in kidney disease is usually associated with an elevated serum creatinine, micro-albuminuria, macro-albuminuria and or hematuria. Approximately 50-70% of individuals with CKD have hypertension. Hypertension accelerates the progression of kidney disease and leads to end stage renal disease (ESRD).

**Hypertension due to non-diabetic kidney disease:**[34-36]

Non-diabetic kidney diseases causing hypertension are glomerulonephritis / nephrotic syndrome, tubule-interstitial disease, polycystic kidney disease, vascular diseases and Renal Artery Stenosis.

Glomerular diseases are associated with high level of proteinuria and faster progression to CKD, along with high risk of cardiovascular disease. Target blood pressure in non-diabetic kidney disease ≤ 120/80 mm Hg (SPRINT TRIAL). Control of blood pressure and proteinuria are the most important factors in terms of retarding the progression of renal disease. Anti-hypertensive agents that reduce proteinuria have dual advantages. Several comparative trials concluded that both ACE-inhibitors (ACEi) and angiotensin receptor blockers (ARBs) have greater advantage over other agents like calcium channel blockers (CCB) or beta blockers.

The combination of ACE inhibitor and angiotensin receptor blocker is no longer used and is considered to be harmful. Renal insufficiency is not a contraindication to the use of ACEi or ARB. However, there is a need to monitor the rise of serum potassium level. If eGFR is less than 30 ml, dose of ACE or ARB may need to be reduced. In all patients with hypertension base-line serum creatinine is to be estimated before giving ACEi or ARB in CKD patients. Moreover, if there is a rise of creatinine of more than 30% after receiving ACEi or ARB, it needs to be stopped, with a suspicion of pre-existing renal artery stenosis. There may be changes in both renal arteries in advanced kidney disease.

If serum creatinine is greater than 200 umol/L, thiazide diuretics need to be replaced with loop diuretics. Concurrent therapy with loop diuretics will often be necessary in patients with CKD stage 2-4, since salt and water retention are important determinants of hypertension in patients with CKD. If ACEi or ARB at high doses cannot control blood pressure at a satisfactory level, CCB including non-dihydropyridine CCBs and peripheral vasodilator can be used along with ACEi or ARB.

**Diabetic kidney disease (DKD):**

Diabetic kidney disease (DKD) causes hypertension in 30-75% of cases of CKD. The presence of microalbuminuria and later frank proteinuria is the effect of DKD and responsible for developing hypertension later. Use of ACEi or ARB are the gold standard to prevent proteinuria and DKD. The BP target for hypertension in DKD is ≤120/80 mm Hg according to K/DOQI, ESH and ASH[11,13,37].

**Hypertensive nephrosclerosis:**

Hypertensive nephrosclerosis (HTNS) is found in patients with essential hypertension with poor control of BP, older age group and irregular use of drugs. Arterial hyalonosis and glomerular sclerosis is seen on kidney biopsy. It can cause CKD and ESRD in 23-35% of cases. ACEi or ARB is the first choice of drug if kidney function in normal or close to normal. B-Blocker is used if associated cardiovascular disease or coronary artery disease is present. Other used drugs are CCB and vasodilator drugs.

**Hypertension in haemodialysis patients**

The management of blood pressure (BP) in patients with ESRD treated with dialysis is difficult. Up to 70-80% of dialysis patients carry a diagnosis of hypertension. There are multiple comorbidities, like coronary artery disease, left ventricular failure, automatic nephropathy etc. usually associated with hypertension in hemodialysis patients. Sodium retention and volume expansion are the prominent mechanisms of hypertension in dialysis patients. But other pathways such as arterial stiffness, activation of renin angiotensin aldosterone system and sympathetic nervous system, endothelial dysfunction, sleep apnea and use of erythropoietin may also be involved. Non-pharmacologic interventions targeting sodium and volume expansion are fundamental for the control of hypotension in this population. If BP

remains elevated after appropriate treatment of sodium and volume excess, the use of antihypertensive agents is necessary.

According to the 2004 National Kidney Foundation Kidney Disease Outcome Quality Initiative guideline when pre-dialysis BP is>140/90 or when post dialysis BP is >130/80, antihypertensives are required.

Many authors suggest that ambulatory blood pressure monitoring (ABPM) is the gold standard for diagnosing hypertension in patients receiving dialysis. ABPM is also strongly recommended by adhoc ESH working group (Nice guideline and the US preventive service)

- If ABPM is not available, the diagnosis is made on the basis of office/home BP measurement taken in a mid-weekday free of hemodialysis, that is the average of three measurements with 1-2 minutes intervals in sitting position.
- The threshold office BP is 140/90 mm Hg.

**Hypertension in peritoneal dialysis:**

**Home BP in peritoneal dialysis:**

- An average BP ≥135/85 mmHg over 7 consecutive days in both recumbent and supine positions recorded per occasion taken 1-2 minutes apart (if ABPM is not available) is considered hypertension.

**Pharmacological treatment:**

Drugs like CCB, ACEi, ARBs, Vasodilator, mineralocorticoid receptor antagonists can be used. B-blockers including carvedilol are important for patients with cardiovascular disease, stroke, and ischaemic heart disease.

**Hypertension in renal transplant:**

Hypertension in Renal Transplant patients is common and ranges from 50% to 80% in adult recipients and from 47% to 82% in pediatric recipients. Cardiovascular events and shortened allograft survival are consequences of inadequate control of hypertension. There is no specific anti-hypertensive medication that has been shown to be more effective than others in improving either patient or graft survival. Identifying the pathophysiology and mechanisms is important for achieving treatment goals and important for improving long-term patient and graft survival. The causes of hypertension in transplants depend on recipient factors like acute rejection, chronic allograft injury and recurrence glomerulonephritis. Other factors for post-

transplant hypertension are use of corticosteroids, Cyclosporine/Tacrolimus and Mycophenolate mofetil. The other factors contributing to hypertension include donor age, re-transplantation, poor allograft quality and the size of the donor kidney relative to the recipient.

### 6.10 Hypertension in coronary artery diseases and heart failure

There are strong relationships between CAD and hypertension[11]. Different RCTs show that there is compelling beneficial effect of BP treatment on reducing the risk of myocardial infarction. A recent meta-analysis of RCTs of antihypertensive therapy showed that for every 10-mmHg reduction in SBP, CAD was reduced by 17%[38,39]. The benefits of reducing cardiac events are also evident in high-risk groups, such as those with diabetes[36, 38-40].

A target BP approximately <130/80 mmHg in patients with CAD appears safe and can be recommended[11]. In hypertensive patients with CAD, beta-blockers and RAS blockers may improve outcomes in post-myocardial infarction period and reduces the mortality in ACS[9,11]. In patients with symptomatic angina, beta-blockers and rate limiting calcium antagonists are the preferred components of the drug treatment strategy. In STEMI in addition to antiplatelet and statin, beta-blockers and RAS blockers are the treatment of choice. If BP is not controlled with beta-blockers and RAS blockers, Alpha-1 blockers can be used[11]. Calcium antagonists both dihydropyridine and non-dihydropyridine are contraindicated with CAD with reduced ejection fraction (LVEF <40%)[11]. Non-dihydropyridine CCBs should be avoided with concomitant use of Beta Blockers as there is increased risk of Bradycardia and AV block[11].

Hypertension is the leading risk factor for the development of heart failure and most patients with heart failure will have an antecedent history of hypertension. This may be a consequence of CAD, which results in heart failure with reduced ejection fraction (HFrEF)[11,41]. Hypertension also causes left ventricular hypertrophy (LVH), which impairs LV relaxation (so-called diastolic dysfunction) and is a potent predictor of heart failure, even when LV systolic function is normal and there is no preceding myocardial infarction[42].

Treating hypertension has a major impact on reducing the risk of incident heart failure and heart failure hospitalization, especially in old and very old patients[27]. The most effective antihypertensive in the above-mentioned conditions are diuretics, beta-blockers, ACE inhibitors, or ARBs[1,6]. This has been observed that CCBs are being less effective in comparative trials[9].

Reducing BP can also lead to the regression of LVH, which has been shown to be accompanied by a reduction of CV events and mortality[11,43]. The magnitude of LVH regression is associated with baseline LV mass, duration of therapy, and the SBP reduction. The drugs used with ARBs, ACE inhibitors and CBBs causing more effective LVH regression than beta-blockers or diuretics[11,43].

In patients with HFrEF, antihypertensive drug treatment should start (if not already initiated) when BP is >140/90 mmHg. It is unclear how low BP should be lowered in patients with heart failure. Outcomes for patients with heart failure have repeatedly been shown to be poor if BP values are low, which suggests (although data interpretation is made difficult by the possibility of reversed causality) that it may be wise to avoid actively lowering BP to <120/70 mmHg[11,44].

Heart failure guideline-directed medications are recommended for the treatment of hypertension in patients with HFrEF. ACE inhibitors, ARBs, Angiotensin receptor-neprilysin inhibitor (ARNI) (i.e. sacubitril and valsartan),beta-blockers, and MRAs (e.g. spironolactone and epleronone) are all effective in improving clinical outcome in patients with established HFrEF, whereas for diuretics, evidence is limited to symptomatic improvement. Sacubutril / valsartan lowers BP and has also been shown to improve outcomes in patients with HFrEF and is indicated for the treatment of HFrEF as a better alternative to ACE inhibitors or ARBs.54 Non-dihydropiridine CCBs (diltiazem and verapamil), alpha-blockers, and centrally acting agents, such as moxonidine, should not be used. Carvedilol is the preferred beta blocker (combined alpha & beta blocker) in patients with heart failure with reduced ejection fraction[44]. Other beta blockers indicated for use in heart failure are Bisoprolol, Metoprolol, Succinate and Nebivolol.
Antihypertensive treatment is commonly needed in patients with heart failure with preserved ejection fraction (HFpEF). The same BP threshold and target for drug treatment

is indicated for HFrEF should be used. HFpEF patients commonly have multiple comorbidities that may adversely affect outcomes and complicate management[44,45].

### 6.11 Hypertension in children and adolescents

High blood pressure affects people of all ages including young children. Childhood hypertension has become a significant health concern. Hypertension in childhood is a key predictor of risk for hypertension, cardiovascular disease, and end organ damage in adulthood. Prevalence of hypertension in children and adolescents is increasing with the increasing prevalence of obesity in this group of individuals. Prevalence of HTN in children and adolescents is around 3.5%[46,47]. Prevalence of HTN among children of Bangladesh is not well studied. In a study among secondary school children of Dhaka city prevalence of HTN was 1.8%[48]. Primary/essential hypertension accounts for the majority of hypertension in children >6 years old and is generally associated with obesity or a family history of hypertension. Secondary hypertension is more common in younger children (<6 years old) with renal disease being the most prevalent cause. This population is at greater risk of hypertensive emergencies due to an underlying condition. Severe hypertension requires urgent consultation and management. Hypertension associated with encephalopathy is a medical emergency.

Interest in childhood hypertension (HTN) has increased since the 2004 publication of the "Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children an Adolescents" (Fourth Report)[49-51]. Recognizing ongoing evidence gaps and the need for an updated, thorough review of the relevant literature, DGHS has developed this practice guideline to provide an update on topics relevant to the diagnosis, evaluation, and management of pediatric HTN. This guideline will focus on the paediatric population aged 1–17 years (not infants).

**Measuring blood pressure in children**

Measurement of BP in children follows the same principles as set out in the section on BP measurement (For more information, see Annexure 3). Special attention needs to be paid in the selection of an appropriate cuff size in relation to the child's right upper arm (Annexure 4). Blood pressure readings obtained in the school setting were recommended not to be used for diagnosis of hypertension.

Children younger than three years warrant regular measurements if they have any of the followings: congenital heart disease, recurrent urinary tract infection, urological malformation, solid organ transplant, bone marrow transplant, malignancy, neurofibromatosis, tuberous sclerosis or sickle cell disease. Small for gestational age newborns, premature (<32 weeks), or very low birth weight babies and those with umbilical arterial catheterization also require regular blood pressure checks.

**Definition and classification**

Table 10: New definition for hypertension in children and adolescents[49].

| Classification | Children aged 1-12 yr. (Percentile based) | Adolescents ≥13 yr. (mmHg based) |
|---|---|---|
| Normotensive | < 90th percentile | < 120/<80 |
| Elevated BP (Previously called pre-hypertension) | ≥90th percentile to <95th percentile or 120/80mm Hg to <95th percentile (Whichever is lower) | 120/<80 to 129/<80 mmHg |
| Stage 1 Hypertension | ≥95th percentile to <95th percentile + 12 mmHg or 130/80 to 139/89 mmHg (Whichever is lower) | 130/80 to 139/89 mmHg |
| Stage 2 Hypertension | ≥95th percentile + 12 mm Hg, or ≥140/90 mm Hg (Whichever is lower) | ≥140/90 mmHg |
| Hypertensive Urgency | >95$^{th}$ centile + 30 mmHg without symptoms/signs of target end organ damage | >180/120 without symptoms/signs of target end organ damage |
| Hypertensive Emergency | >95$^{th}$ centile + 30 mmHg associated with encephalopathy, e.g., headache vomiting, vision changes and neurological symptoms (facial nerve palsy, lethargy, seizures, coma) +/- target-end organ damage | >180/120 associated with encephalopathy, e.g., headache vomiting, vision changes and neurological symptoms (facial nerve palsy, lethargy, seizures, coma) +/- target-end organ damage |

**Assessment of hypertension in children and adolescent**

**Risk factors:**

- Overweight/obesity
- Male sex
- Family history of hypertension
- Low birth weight/intrauterine growth restriction
- Prematurity
- History of neonatal umbilical procedure (catheterization, exchange transfusion)
- Excess dietary salt intake
- Physical inactivity
- Chronic health concerns, e.g. chronic kidney disease, diabetes

**History**

A well-taken history provides clues about the cause of hypertension and guides the selection and sequencing of ensuing investigations. Presenting symptoms and signs are not specific in neonates and are absent in older children unless the hypertension is severe.

Relevant information includes the following:

- Prematurity, bronchopulmonary dysplasia, history of umbilical artery catheterization
- History of head or abdominal trauma
- Family history of heritable diseases (e.g., neurofibromatosis & hypertension)
- Medications (e.g., pressure substances, steroids, tricyclic antidepressants
- Episodes of pyelonephritis (perhaps suggested by unexplained fevers) that may, result in renal scarring
- Dietary history, including caffeine, high salt consumption
- Sleep history, especially snoring history
- Habits, such as smoking, wrong type of food such as irregular eating of snacks and sugary beverage
- Risk factors for high blood pressure include obesity and family history of high blood pressure.

Signs and symptoms that should alert the physician to the possibility of hypertension in neonates includes failure to thrive, seizure, irritability or lethargy, respiratory distress, congestive heart failure.

Signs and symptoms that should alert the physician to the possibility of hypertension in older children include headache, shortness of breath, chest pain, vomiting, fatigue, blurred vision, epistaxis, bell's palsy etc.

**Examination**

- Confirm hypertension (See measuring blood pressure section above)
- Vitals: tachycardia, four limb BP for upper and lower limb discrepancy
- Height and weight: obesity, growth retardation
- Signs of end organ damage
    - Fundoscopy: hypertensive retinopathy
    - Cardiovascular: apical heave, hepatomegaly, oedema
    - Chronic renal failure: palpable kidneys
    - Focal neurology (e.g. facial nerve palsies)
- Signs of underlying cause
    - General appearance: Cushingoid, proptosis, goitre, webbed neck (Turner syndrome), elfin facies (William syndrome)
    - Skin: Cafe-au-lait spots, neurofibromas, acanthosis nigricans, hirsutism, striae, acne, rash (vasculitis)
    - Cardiovascular: murmurs +/- radiation, apical heave, reduced femoral pulses, oedema, hepatomegaly (CCF)
    - Abdomen: masses, palpable kidneys, flank bruits
    - Genitourinary: ambiguous/virilized genitalia (e.g., CAH)

**Investigations**

First-line investigations

- CBC with PBF, UEC (Urea, electrolytes, creatinine), urinalysis +/- renal ultrasound
- CMP (Comprehensive metabolic panel): Consider LFT, glucose, Hb1Ac, calcium, fasting lipids, particularly in children with BMI >95$^{th}$ centile

Further investigations should only be considered in consultation with a general or renal pediatrician

Consider further testing if child meets one of the following criteria:

- <6 years
- Concerns for secondary causes on history/examination
- Abnormal first-line investigations

Further Investigations

- Bloods: renin/aldosterone ratio, TFT (thyroid function test), plasma metanephrins, cortisol, fasting glucose
- Urine: microscopy, protein/creatinine ratio, metanephrins, drug screen
- Imaging: renal doppler ultrasound, DMSA, CTA/MRA
- Other: echocardiogram, CT abdomen, sleep study

## Management[50, 52-56]

**Overall Goals in management of pediatric HTN**:

An optimal BP level to be achieved with treatment of childhood HTN <90$^{th}$ percentile or <130/80 mm of Hg whichever is lower. Management should be started with history, physical examination and appropriate investigations.

1. **Lifestyle and Non-pharmacologic Interventions:**

**The Dietary Approaches to Stop Hypertension (DASH):**

**Table 11:** DASH Diet Recommendations

| Food | Servings per Day |
|---|---|
| Fruits and vegetables | 4–5 |
| Low-fat milk products | ≥2 |
| Whole grains | 6 |
| Fish, poultry, and lean red meats | ≤2 |
| Legumes and nuts | 1 |
| Oils and fats | 2–3 |
| Added sugar and sweets (including sweetened beverages) | ≤1 |
| Dietary sodium | <2300 mg per day |

**Physical Activity & weight reduction**

Advice on moderate to vigorous physical activity at least 3 to 5 days per week (30–60 minutes per session) to help reduce BP.

**Stress Reduction** to reduce 24-hour SBP (3–4 mmHg) and DPB (1 mmHg) in elevated BP.

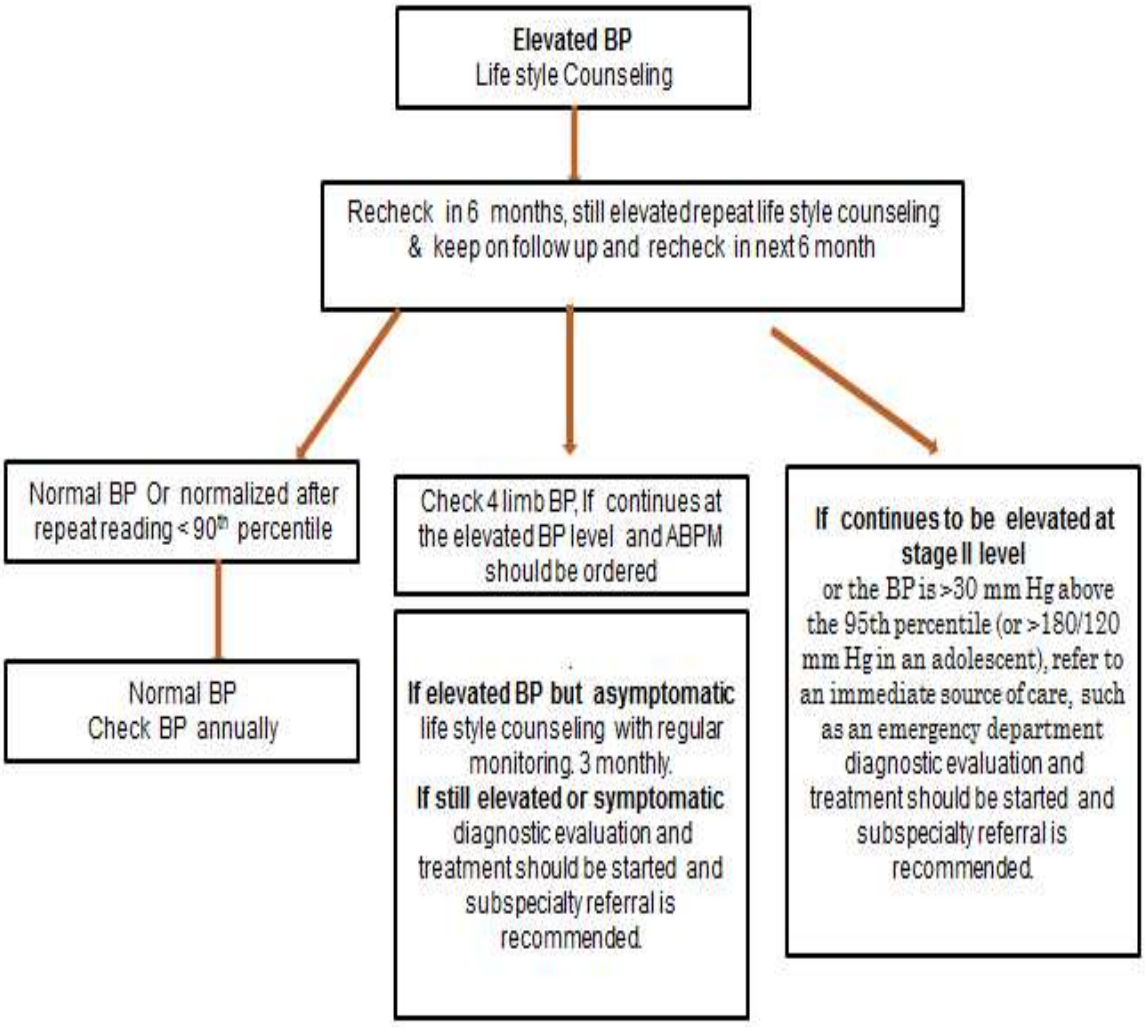



**Figure 11: Algorithm of non-pharmacologic Interventions in Elevated BP**

**2. Pharmacologic Treatment**

**a. Choice of antihypertensive in children**

- Treatment should be initiated with an ACE inhibitor/ ARB.
- Long-acting calcium channel blocker, or a thiazide diuretic
- B-blockers are not recommended as initial treatment in children.

**b. Treatment approach should be as follows:**

Start with mono therapy with low dosage and increase up to mid-dosage range depending on response. Then if BP is not improved, add 2nd drug of different class but with complementary mechanism of action. In this approach, dose-dependent adverse effects of drugs can be avoided.

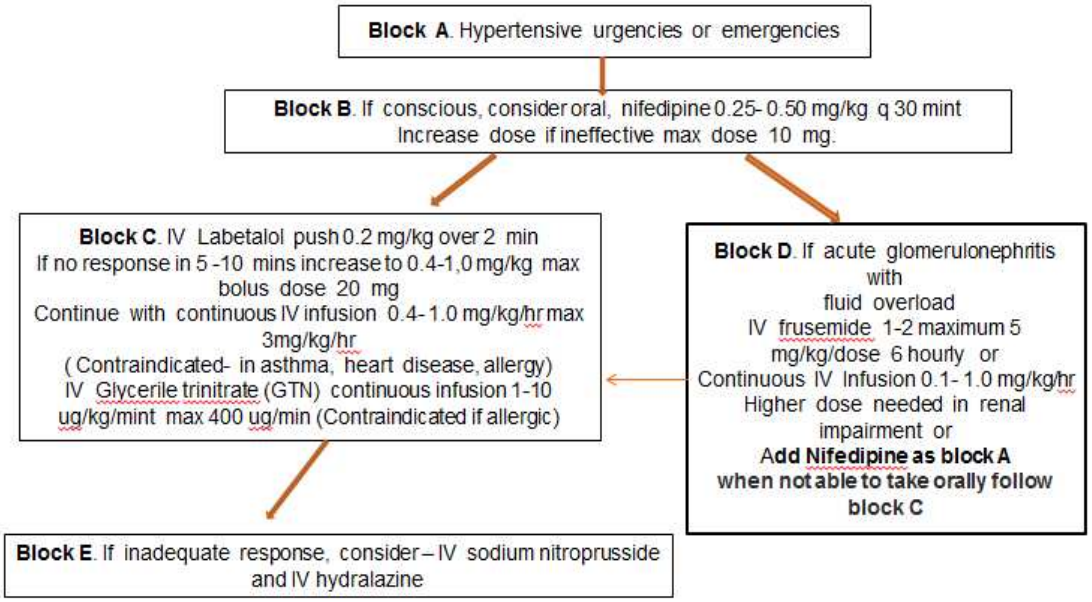
**c. Treatment approach of severe HTN should be as follows:**

**Hypertensive emergency**: symptomatic with complaints such as nausea, dyspnea, headaches and blurred vision. End organ damage such as cerebral infarction, cerebral hemorrhage, encephalopathy (altered mental status or seizures), pulmonary edema and kidney failure.

**Hypertensive urgency**: no end organ damage, no or minimal symptoms

- Children with acute severe HTN require immediate treatment with short-acting antihypertensive medications. Treatment may be initiated with oral agents if the patient is able to tolerate oral therapy. Intravenous agents are indicated when oral therapy is not possible (such as congestive heart failure). BP should be reduced by no more than 25% of the planned reduction over the first 8 hours, with the remainder of the planned reduction over the next 12 to 24 hours.

- The ultimate short-term BP goal in such patients should be around the 95th percentile.




- Maintenance treatment with appropriate oral antihypertensive like ACE inhibitors and or Ca channel blockers. ACE inhibitors and ARBs are contraindicated in Acute Glomerulonephritis due to adverse effects of hyperkalemia and raised serum creatinine. Convulsion to be controlled simultaneously with per rectal diazepam 0.5mg/kg or injection Midazolam (0.2 mg/kg slowly mixed with distilled water).

**d. Secondary Causes:**

**Renal and/or Reno vascular**

Renal parenchymal disease and renal structural abnormalities account for 34% to 79% of secondary HTN. ACE inhibitors and ARBs are the choice of anti- hypertensive.

**Cardiac, Including Aortic Coarctation**

Coarctation of the aorta (CoA) is associated with HTN and right arm BP that is 20 mm Hg (or more) greater than the lower extremity BP. Relief of CoA is the mainstay of treatment.

**Endocrine HTN**

HTN resulting from hormonal excess accounts for a relatively small proportion of children with secondary HTN. Although rare (prevalence 0.05% to 6% in children). Treatment is according to cause.

**3. Special situation:**

**Treatment of hypertension in Acute Post Streptococcal Glomerulonephritis (APSGN): See 2. C Block D.**

**Treatment of children and adolescent with chronic kidney disease (CKD) and hypertension**

Children and adolescents with CKD should be evaluated for HTN at each medical encounter.

Children or adolescents with both CKD and HTN should be treated to lower 24-hour MAP to <50$^{th}$ percentile by ambulatory blood pressure monitoring.

**Treatment of children and adolescent with proteinuria and hypertension**

Children and adolescents with CKD and HTN should be evaluated for proteinuria.

Children and adolescents with CKD, HTN, and proteinuria should be treated with an ACE inhibitor or ARB.

**Treatment of Patients with Diabetes**

Children and adolescents with type 1 DM or type 2 DM should be evaluated for HTN at each medical encounter and treated if BP is ≥95th percentile or >130/80 mmHg in adolescents ≥13 years of age. Drug of choice ACEi (e.g., Ramipril) and or ARB (Losartan Potassium).

4. **Hypertension with comorbidities**

**a. Dyslipidemia**

Children with hypertension should be screened for dyslipidemia. Simvastatin for pediatric use with lifestyle advice, including weight loss and pharmacotherapy, as necessary.

**b. Obstructive sleep apnea syndrome (OSAS)**

Children with snoring, daytime sleepiness (in adolescents), or hyperactivity (in younger children) may have OSAS and consequent HTN. Symptomatic children with signs of OSAS (e.g., daytime fatigue, snoring, hyperactivity, etc.) should undergo evaluation for elevated BP. The use of ABPM is the recommended method for assessing the BP of children with suspected OSAS. In these children hypertension may not resolve even after treatment of OSAS with continuous positive airway pressure or adenotonsillectomy.

**c. Hypertension in athletes**

It is recommended that athletes with hypertension be promptly referred and evaluated by a qualified pediatric medical subspecialist within 1 week if they are asymptomatic or

immediately if they are symptomatic. In stage 2 HTN children be restricted from high-static sports in the absence of end organ damage, including LVH or concomitant heart disease, until their BP is in the normal range after lifestyle modification and/or drug therapy.

### Complications

Children who have high blood pressure are likely to continue to have high blood pressure as adults unless they begin treatment. A common complication associated with high blood pressure in children is sleep apnea, a condition in which a child may snore or have abnormal breathing when he or she sleeps. Children who have sleep-disordered breathing, such as sleep apnea, often have problems with high blood pressure - particularly children who are overweight. If, as often happens, a child's high blood pressure persists into adulthood, the child could be at risk of stroke, heart attack, heart failure, kidney disease.

# Chapter-7
## Role of Non-Physician Professionals in Hypertension Control

# Chapter 7

# 7. Role of non-physician professionals in hypertension control

## 7.1 Incorporating community health care workers in the hypertension care model

Strengthening primary health care for tackling the increasing burden of NCDs in Bangladesh is critically important, where the non-physician professional such as sub assistant community medical officer (SACMO), nurse and community health workers (CHW) who are based at community clinics, union-level health centers and Upazila Health Complex (UHC) could play a pivotal role in screening, provisional diagnosis, early management, referral and follow-up of patients with NCDs[57-59]. Evidence shows that CHWs involvement in the delivery of primary healthcare can potentially be effective and result in cost and time savings without compromising the quality of care or health outcomes for patients[59-61]. Reviewing the current evidences and suggestions of World Health Organization, the guideline committee suggests that[10]

- Community Health Care Workers (HCWs) may assist in tasks such as education, delivery of medications, blood pressure (BP) measurement and monitoring through an established collaborative care model.
- Telemonitoring and community-based care are encouraged to enhance the control of BP as a part of an integrated management system, when deemed appropriate by the treating medical team and found feasible and affordable by patients.
- Physician oversight can be done through telemonitoring and tele consultation to ensure access to treatment is not delayed.

## 7.2 Information for Medical Assistants, Community Health Care Providers (CHCP) for high blood pressure detection and referral

**প্রাইমারি কেয়ার স্তরে চিকিৎসা সহকারী ও কমিউনিটি হেলথ কেয়ার প্রভাইডারদের জন্য প্রাথমিক পর্যায়ে উচ্চ রক্তচাপ নির্ণয় ও রেফারেল সংক্রান্ত তথ্য**

**উচ্চ রক্তচাপ বা হাইপারটেনশন কি?**

রক্তচাপ হচ্ছে রক্তনালীর উপরে রক্তের প্রদেয় চাপ। স্বাভাবিক ভাবে সমস্ত দিনে বিভিন্ন সময়ে রক্তচাপ বাড়তে বা কমতে পারে। যখন এই রক্তচাপ দীর্ঘ সময়/ দীর্ঘ দিন ধরে একই ভাবে বৃদ্ধি পেয়ে থাকে তখন এই রক্তচাপকে উচ্চ রক্তচাপ বা হাইপারটেনশন বলে। সকল বয়সের লোকেরই এই উচ্চ রক্তচাপ হতে পারে। যাদের উচ্চ রক্তচাপ আছে তাদের অর্ধেকর ও বেশি মানুষ  জানেনা যে তারা উচ্চ রক্তচাপে ভুগছেন । দৈনন্দিন জীবন যাপনের অথবা প্রয়োজন ভেদে ঔষধের মাধ্যমে/ঔষধ ও স্বাস্থ্য সম্মত জীবন আচরণ অনুশীলনের মাধ্যমে উচ্চ রক্তচাপ প্রতিরোধ /বিলম্বিত অথবা নিয়ন্ত্রণ করা যায়। রক্তচাপ সাধারনতঃ দুইটি পরিমাপের মাধ্যমে প্রকাশ বা লিপিবদ্ধ করা হয়। প্রথম এবং উপরের পরিমাপকে সিস্টোলিক (Systolic) এবং শেষ বা নীচের পরিমাপকে ডায়াস্টলিক (Diastolic) ব্লাড প্রেসার বলা হয়।

পূর্ণ বয়স্কদের ক্ষেত্রে সিস্টোলিক রক্তচাপ ১৪০ মিমি মার্কারী অথবা এর উপরে অথবা ডায়াস্টলিক রক্তচাপ ৯০ মিমি মার্কারী অথবা এর উপরে হলে উচ্চ রক্তচাপ ধরা হয়ে থাকে।  সিস্টোলিক রক্তচাপ ১২০ মিমি মার্কারী এর কম এবং ডায়াস্টলিক রক্তচাপ ৮০ মিমি মার্কারী কম রাখাটা কাম্য। সিস্টোলিক রক্তচাপ ১২০-১৩৯ মিমি মার্কারী  অথবা ডায়াস্টলিক রক্তচাপ ৮০-৯০ মিমি মার্কারী হলে, এই গ্রুপের রোগীদের ভবিষ্যতে উচ্চ রক্তচাপ  হওয়ার  সম্ভাবনা বেশি, যদি তারা স্বাস্থ্য সম্মত জীবনযাত্রা নির্বাহ না করে।

সিস্টোলিক এবং ডায়াস্টলিক রক্তচাপ, যে কোন একটির বৃদ্ধিকে উচ্চ রক্তচাপ বলা হয়। যেমন কোন ব্যক্তির সিস্টোলিক রক্তচাপ স্বাভাবিক মাত্রার চেয়ে বেশি হলেও তাকে উচ্চ রক্তচাপ বলা হয়। এক্ষেত্রে একে সিস্টোলিক উচ্চ রক্তচাপ বলা হয়।, তেমনি কোন ব্যক্তির কেবলমাত্র ডায়াস্টলিক রক্তচাপ স্বাভাবিক মাত্রার চেয়ে অধিক হয় তখন তাকে ডায়াস্টলিক উচ্চ রক্তচাপ বলা হয়। উচ্চ রক্তচাপ রোগী নির্ণয়ের পূর্বে বিভিন্ন সময়ে কমপক্ষে দুই বা ততোধিকবার উচ্চ রক্তচাপ পাওয়া বাঞ্ছনীয়।

**উচ্চ রুক্তচাপের প্রকারভেদঃ**

**ক) এসেনশিয়াল হাইপারটেনশন (Essential hypertension) :** শতকরা প্রায় ৯০ ভাগ রোগীর উচ্চ রক্তচাপের কোন কারণ খুঁজে পাওয়া যায় না। এই ধরণের উচ্চ রক্তচাপকে এসেনশিয়াল হাইপারটেনশন বলে।

**খ) সেকেন্ডারী হাইপারটেনশন (Secondary hypertension):** কিছু ক্ষেত্রে উচ্চ রক্তচাপের সুনির্দিষ্ট কারণ খুঁজে পাওয়া যায়। এই জাতীয় উচ্চ রক্তচাপকে সেকেন্ডারী হাইপারটেনশন বলে। এই জাতীয় উচ্চ রক্তচাপ কিডনী রোগ, জন্মগত ত্রুটি অথবা অন্যান্য কারণে হতে পারে। অনেক ক্ষেত্রে এই জাতীয় রক্তচাপের সুনির্দিষ্ট চিকিৎসা সম্ভব।

**রক্তচাপ পরিমাপঃ**

রক্তচাপ সাধারনতঃ রক্তচাপ মাপার যন্ত্র (Sphygmomnometer) এর মাধ্যমে মাপা হয়। রক্তচাপকে মিমি মার্কারী (mm of Hg) হিসাবে প্রকাশ করা হয়। বিভিন্ন প্রকার যন্ত্রের সাহায্যে রক্তচাপ মাপা যায়, যেমন- ডিজিটাল, অ্যানরয়েড , মার্কারী, ।

সঠিকভাবে রক্তচাপ পরিমাপের জন্য নিম্নলিখিত বিষয়গুলো খেয়াল রাখা প্রয়োজনঃ

- সঠিক যন্ত্র ব্যবহার করতে হবে।
- সাধারণতঃ বসে বা শুয়ে রক্তচাপ মাপতে হবে। বৃদ্ধ, ডায়াবেটিক রোগী এবং যাদের Postural hypertension আছে বলে মনে হয় তাদের ক্ষেত্রে দাঁড়ানো অবস্থাতেও রক্তচাপ মাপতে হবে।
- রক্ত চাপ পরিমাপের পূর্বে আধঘন্টার মধ্যে ধূমপান বা ক্যাফিনযুক্ত কোন কিছু (চা, কফি ইত্যাদি)ব্যবহার বা গ্রহণ করেছেন কিনা জেনে নিতে হবে।
- রক্তচাপ পরিমাপের পূর্বে রোগীকে ১৫-২০ মিনিট বিশ্রাম নেওয়ার জন্য অনুরোধ করতে হবে।
- রোগীর প্রস্রাব/পায়খানার বেগ আছে কিনা জানতে হবে, থাকলে টয়লেট থেকে আসার পর রক্তচাপ পরিমাপ করতে হবে।
- বাহু থেকে শক্ত ভাবে এটে থাকা কাপড় সরাতে হবে।
- বাহুকে হার্টের সমান সমতলে রাখতে হবে।
- যথাযথ মাপার কাফ (Cuff) ব্যবহার করতে হবে। রক্তচাপ মাপার যন্ত্রের ব্লাডার, বাহুর দুই তৃতীয়াংশের বেশি জায়গা জড়িয়ে থাকতে হবে।
- রক্তচাপ পরিমাপ এর পূর্বে রোগীকে আশ্বস্ত করতে হবে।
- রক্তচাপ মাপার সময় রোগী হাতল ওয়ালা চেয়ারে পিছনে হেলান দিয়ে আরাম করে বসবেন এবং পায়ের উভয় পাতা মেঝেতে আলতোভাবে লাগিয়ে রাখবেন, পায়ের উপর পা তুলে রাখা বা পা আড়াআড়ি রাখা যাবেনা।
- ২ মিনিট ব্যবধানে ২ বার রক্তচাপ মাপতে হবে এবং উভয়ের গড় অথবা যেটি অধিক, সেটি বিবেচনায় নিতে হবে।
- সম্ভব হলে উভয় বাহুতে রক্তচাপ মাপতে হবে এবং যে বাহুতে বেশি থাকবে, সেটিই বিবেচনায় নিতে হবে।
- রক্তচাপ পরিমাপের সময় রোগীকে কোন কথা বলতে নিষেধ করতে হবে।

**উচ্চ রক্তচাপের উপসর্গগুলি কি?**

উচ্চ রক্তচাপকে অনেক সময় "নিরব ঘাতক" বলা হয়, কারণ বেশিরভাগ সময় তেমন কোন উপসর্গই থাকে না। তাই অনেকে মনে করে তার কোন উচ্চ রক্তচাপ জনিত সমস্যা নেই। তাই তারা কোন চিকিৎসক বা স্বাস্থ্য প্রতিষ্ঠানে যান না। তাদের ক্ষেত্রে নিয়মিত রক্তচাপ পরীক্ষা বা কোন জটিলতা দেখা দেওয়ার পর রক্তচাপ পরিমাপ করার মাধ্যমেই এই রোগ নির্ণীত হয়ে থাকে।

**ল্যাবরেটরী পরীক্ষাঃ**

শুধুমাত্র উচ্চ রক্তচাপ নির্ণয়ের জন্য কোন ল্যাবরেটরী পরীক্ষার প্রয়োজন নেই। সেকেন্ডারী হাইপারটেনশন সন্দেহ হলে ল্যাবরেটরী পরীক্ষা করতে হবে । তবে উচ্চ রক্তচাপের কারণে শরীরে কোন ক্ষতি হয়েছে কিনা তা নির্ণয়ের জন্য নিম্নলিখিত পরীক্ষাগুলো করা যেতে পারেঃ

১. প্রস্রাবের রুটিন পরীক্ষা

২. রক্তে গ্লুকোজের পরিমান

৩. রক্তে ক্রিয়াটিনিনের মাত্রা

৪. রক্তে কোলেস্টেরলের মাত্রা

৫. বুকের এক্স-রে

৬. ইসিজি (ইলেক্ট্রোকার্ডিওগ্রাম)

এছাড়া কিছু ক্ষেত্রে অন্যান্য পরীক্ষা নিরীক্ষার প্রয়োজন হতে পারে।

**উচ্চ রক্তচাপের চিকিৎসাঃ**

উচ্চ রক্তচাপের চিকিৎসাঃ প্রধানত দুই প্রকার-

১. জীবন শৈলীর / স্বাস্থ্য সম্মত জীবনাচার /জীবনযাত্রা নির্বাহের পদ্ধতি পরিবর্তনের মাধ্যমে

২. ঔষধের মাধ্যমে/ ঔষধ ও স্বাস্থ্য সম্মত জীবনাচার /জীবনযাত্রা নির্বাহের পদ্ধতি অনুশীলনের মাধ্যমে।

জীবন যাত্রার পরিবর্তনের মাধ্যমে উচ্চ রক্তচাপ চিকিৎসার সাফল্য সন্দেহাতীতভাবে প্রমানিত। এজন্য ঔষধ লাগুক কিংবা না লাগুক, সকল উচ্চ রক্তচাপের রোগীর জীবনযাত্রার পরিবর্তন প্রয়োজনীয়। এই বিষয়ে নিচের ছকটি দেখুন।

উচ্চ রক্তচাপ ব্যবস্থাপনায় জীবনযাত্রার মানের পরিবর্তনে কার্যকর পদ্ধতি সমূহঃ

| পরিবর্তন | নির্ধারিত মাত্রা |
|---|---|
| ওজন কমানো | শারীরিক স্বাভাবিক ওজন বজায় রাখা (BMI ১৮.৫- ২৪.৯ কেজি/মিটার২) একান্ত আবশ্যক। |
| স্বাস্থ্য সম্মত খাবারের অভ্যস্ত হওয়া | তাজা ফলমূল, শাকসবজি বেশি খাওয়া এবং চর্বি জাতীয় খাবার যতটা সম্ভব কম খাওয়া |
| খাবারে লবন কমানো | খাওয়ার লবন কম করে খেতে হবে। প্রতিদিন ৫ গ্রাম এর কম লবন খেতে হবে। পাতে লবন পরিহার করতে হবে। খাবারের টেবিল ( Dining Table) এ লবনের পাত্র রাখা যাবেনা। |
| শারীরিক পরিশ্রম | নিয়মিত কায়িক পরিশ্রম বা ব্যায়াম করতে হবে, যেমন- দৌড়ানো, হাঁটা, সাঁতার কাটা ইত্যাদি। দৈনিক কমপক্ষে ৩০ মিনিট করে সপ্তাহে পাঁচদিন হাটলেই যথেষ্ট। সপ্তাহে ৫ দিন (১৫০ মিনিট ), তবে পর পর ২ দিন শারিরিক পরিশ্রম বা ব্যায়াম বন্ধ রাখা যাবেনা। |
| ধূমপান ও তামাকজাত দ্রব্য পরিহার | বিড়ি, সিগারেট, জর্দা, সাদাপাতা, গুল, ইত্যাদি সকল প্রকার তামাকজাত দ্রব্য পরিহার করা। |
| মদ্যপান পরিত্যাগ করা | মদ্যপান পরিত্যাগ করতে হবে। অপারগতার ক্ষেত্রে প্রতিদিন দুইবার পান করে ১ আউন্স অথবা ৩০ মি.লি. ইথানল অর্থাৎ ২৪ আউন্স বিয়ার, ৩ আউন্স হুইস্কি ইত্যাদির কম খেতে হবে। |

**একজন প্রাপ্ত বয়স্ক মানুষের দৈনন্দিন প্রধান খাবারের (Main meals) আদর্শ প্লেটে নিম্নোক্ত খাদ্য সামগ্রী থাকা**


**আবশ্যক । সাথে স্থানীয় পর্যায়ে সহজলভ্য মৌসুমি ফল নিয়মিত খেতে হবে।**

## প্লেট পদ্ধতিতে খাবারের পরিমাপ নির্ধারণ

প্লেট পদ্ধতির মাধ্যমে পরিমাণ মতো খাদ্য বাছাই করা খুবই সহজ। এ ক্ষেত্রে প্লেটের মাপ হবে ৬"-৯"। এই পদ্ধতিতে:

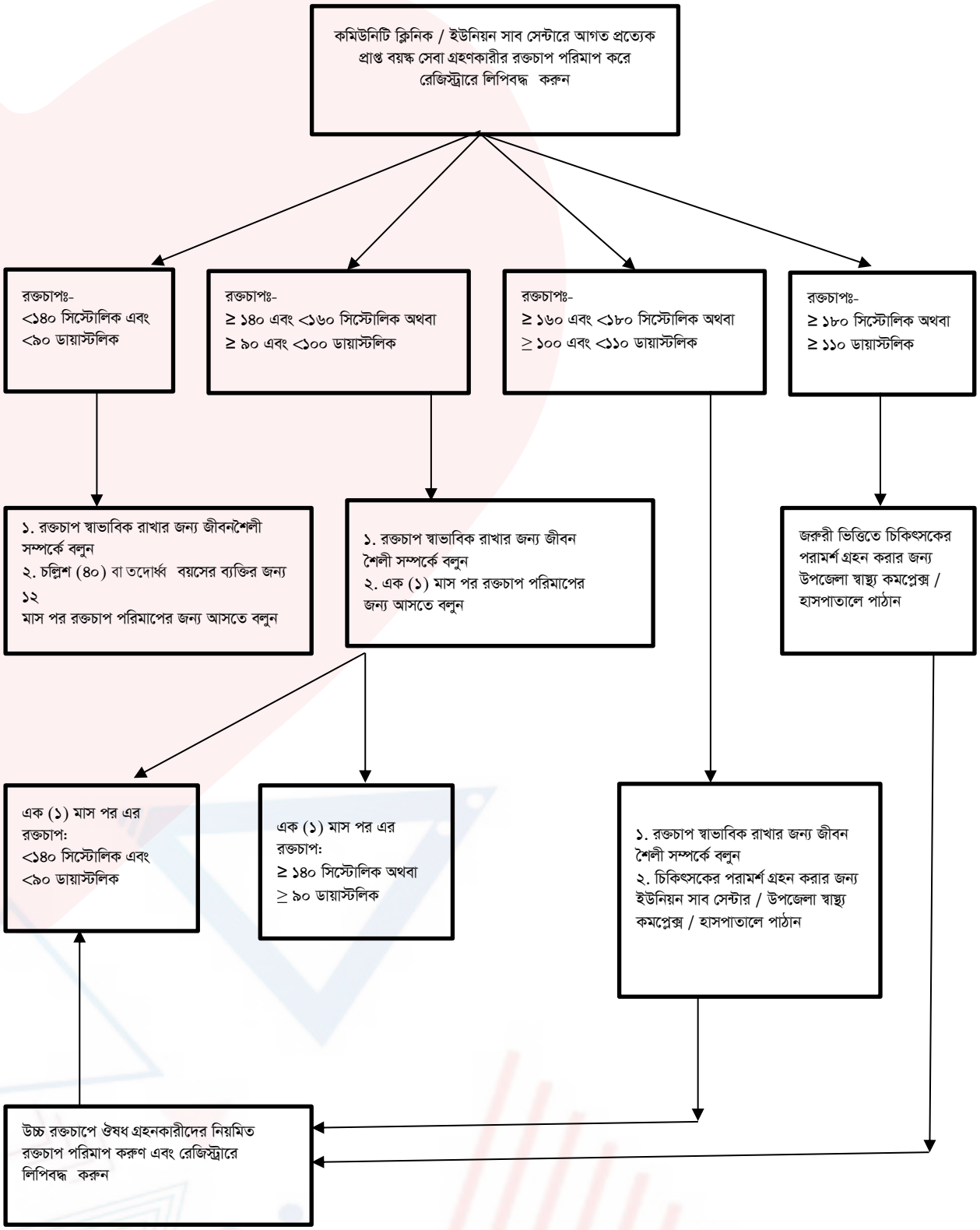
- প্লেটের ১/২ (অর্ধেক) হবে শাকসবজি যেমন- সব ধরনের শাক, ফুলকপি, বাঁধাকপি, কাঁচা টমেটো, কাঁচা পেঁপে, শশা, খিরা, উচ্ছে, লাউ, মূলা ইত্যাদি।
- প্লেটের ১/৪ (এক-চতুর্থাংশ) হবে শর্করা জাতীয় খাবার। যেমন- ভাত, রুটি, মুড়ি, আলু, চিড়া, খই ইত্যাদি।
- প্লেটের ১/৪ (এক-চতুর্থাংশ) হবে আমিষ জাতীয় খাবার। যেমন- মাছ, মাংস, কলিজা, ডিম, ডাল ইত্যাদি।

সাধারণ স্বাস্থ্যসম্মত, এবং অস্বাস্থ্যসম্মত খাবারের তালিকা। তবে রোগীভেদে পুষ্টিবিদের পরামর্শ অনুযায়ী খাদ্য তালিকা ভিন্ন ভিন্ন হতে পারেঃ

| স্বাস্থ্য সম্মত খাবার | অস্বাস্থ্য সম্মত খাবার |
|---|---|
| ভাত/রুটি/আলু স্বল্প পরিমানে, খাবারের প্লেটের এক চতুর্থাংশ;<br><br>আমিষ পরিমান মত (হাতের তালুর পরিমান এবং হাতের কনিষ্ঠ আঙুলের সমান পুরু)- মাছ বিশেষত ছোট ও সামুদ্রিক মাছ, ছোট মুরগি,ডাল ইত্যাদি;<br><br>মাছ, ছোট মুরগির মাংস খেতে হবে। অধিক চর্বিযুক্ত লাল মাংস একেবারে ত্যাগ করতে না পারলে, মাঝে মধ্যে অল্প পরিমানে খেতে পারবেন, সম্ভব হলে পরিত্যাগ করাই শ্রেয়;<br><br>রান্নাতে তেল মশলা কমিয়ে আনতে হবে;<br><br>তেল- (অলিভ/ ক্যানোলা/সয়াবিন/ সূর্যমুখী) হাতের বৃদ্ধআঙুলের নখের সমপরিমান) – সর্বদাই সচেষ্ট থাকতে হবে যতটা কমানো সম্ভব, দৈনিক জনপ্রতি ১ চা চামচ এর কম হওয়াই উত্তম;<br><br>লবন (জনপ্রতি দৈনিক ১ চা চামচের কম এবং চিনি ১২ চা চামচের কম), কাঁচা, ভাজা, ঝোলে থাকা এমনকি বিট লবন ও সমান ক্ষতিকর;<br><br>প্রচুর পরিমানে হলুদ ও সবুজ শাকসবজি। যে সকল সবজি কাচা খাওয়া যায়-- শশা, ক্ষীরা, গাজর, মুলা, শালগম, বিট, টমেটো ইত্যাদি কাঁচাই খেতে হবে;<br><br>শাক সবজি –লাউ কুমড়া, পালং, পুঁই,ডাটা, কচু, সরিষা, কলমি ও লাল শাক, সজিনা পাতা ইত্যাদি এবং সবজি- লাউ, চাল কুমড়া ও সবুজ মিষ্টি কুমড়া, পটল, ঝিঙ্গা, চিচিঙ্গা, কাঁকরোল, মটরশুটি,ফুল কপি, বাঁধা কপি, সজিনার ডাটা/ফল, বাদাম ইত্যাদি কম জ্বালে রান্না করতে হবে;<br><br>স্থানীয় ও সহজলভ্য মৌসুমি ফল; পেয়ারা, জাম্বুরা, কদবেল, কামরাঙ্গা , জাম,আমড়া , আনারস, লেবু, কমলা, কলা, আম, জাম ইত্যাদি নিয়মিত খেতে হবে। (তবে ডায়াবেটিস থাকলে মিষ্টি জাতীয় ফল সীমিত পরিমানে খাওয়া যেতে পারে);<br><br>বিদেশী ফল সাধারনত বিবেচনায় না আনাই শ্রেয়। | প্লেট এর বেশিরভাগ অংশ জুড়ে ভাত, পাতে লবন, অল্প পরিমানে শাক সবজি, প্রচুর তেল ও মশলাযুক্ত ভাজা/ রান্না করা তরকারি,সামান্য পরিমানে ফল, তৈলাক্ত মাংস, গাড় সরযুক্ত দুধ ইত্যাদি;<br><br>ডুবানো তেলে ভাঁজা/ বারবার ভাঁজা মুখরোচক খাবার-সিঙ্গারা,পিয়াজু, পুরি, নিমকি, সামুসা, চানাচুর,ফ্রায়েড চিকেন, ফ্রেঞ্চ ফ্রাই, পরোটা, ফুস্কা,জিলাপি, স্যান্ডুইচ ইত্যাদি;<br><br>নোনা ইলিশ , পান্তা ভাতের সাথে অনেক বেশি লবন, শুঁটকি মাছ, পাতে কাচা/ভাজা লবন;<br><br>সকল প্রকার প্রক্রিয়াজাত খাবার- চিপস,কেক, পেস্ট্রি, নাগেটস,ডাল ভাঁজা, কোমল পানীয়,বিভিন্ন রকম জুস, বিস্কুট, লাবাং,মাঠা, সকল রকম ফাস্ট ফুড ইত্যাদি।<br><br>পোলাও, বিরিয়ানি, বোরহানি, খুব বেশি চর্বিওয়ালা মাংস, ডালডা, হাঁস ও মুরগির চামড়া ইত্যাদি।<br>দুগ্ধজাত সামগ্রি- ঘি, মাখন, দুধের সর,ক্ষীর, পনির, |

**প্রাইমারি কেয়ার স্তরে উচ্চ রক্তচাপ নির্ণয় ও রেফারলঃ**

চিকিৎসা সহকারী ও কমিউনিটি হেলথ কেয়ার প্রভাইডার স্বাস্থ্য ব্যবস্থার একেবারে প্রাথমিক স্তর থেকেই উচ্চ রক্তচাপের নিয়ন্ত্রনে গুরুত্বপূর্ণ ভূমিকা রাখতে পারে। কেন্দ্রে আগত সকল প্রাপ্ত বয়স্ক সেবা গ্রহণকারীর এবং গর্ভবতী মহিলাদের রক্তচাপ পরিমাপ করে একটি আলাদা রেজিস্ট্রারে লিপিবদ্ধ করা প্রয়োজন /করতে হবে। নিম্নের ছকে বর্ণিত রক্তচাপের স্তর অনুযায়ী ব্যবস্থা গ্রহণ করুন


কমিউনিটি ক্লিনিক / ইউনিয়ন সাব সেন্টারে আগত প্রত্যেক প্রাপ্ত বয়স্ক সেবা গ্রহণকারীর রক্তচাপ পরিমাপ করে রেজিস্ট্রারে লিপিবদ্ধ করুন
রক্তচাপঃ- <১৪০ সিস্টোলিক এবং <৯০ ডায়াস্টলিক
রক্তচাপঃ- ≥ ১৪০ এবং <১৬০ সিস্টোলিক অথবা ≥ ৯০ এবং <১০০ ডায়াস্টলিক
রক্তচাপঃ- ≥ ১৬০ এবং <১৮০ সিস্টোলিক অথবা ≥ ১০০ এবং <১১০ ডায়াস্টলিক
রক্তচাপঃ- ≥ ১৮০ সিস্টোলিক অথবা ≥ ১১০ ডায়াস্টলিক
১. রক্তচাপ স্বাভাবিক রাখার জন্য জীবনশৈলী সম্পর্কে বলুন
২. চল্লিশ (৪০) বা তদোর্ধ্ব বয়সের ব্যক্তির জন্য ১২ মাস পর রক্তচাপ পরিমাপের জন্য আসতে বলুন
১. রক্তচাপ স্বাভাবিক রাখার জন্য জীবন শৈলী সম্পর্কে বলুন
২. এক (১) মাস পর রক্তচাপ পরিমাপের জন্য আসতে বলুন
জরুরী ভিত্তিতে চিকিৎসকের পরামর্শ গ্রহন করার জন্য উপজেলা স্বাস্থ্য কমপ্লেক্স / হাসপাতালে পাঠান
এক (১) মাস পর এর রক্তচাপ: <১৪০ সিস্টোলিক এবং <৯০ ডায়াস্টলিক
এক (১) মাস পর এর রক্তচাপ: ≥ ১৪০ সিস্টোলিক অথবা ≥ ৯০ ডায়াস্টলিক
১. রক্তচাপ স্বাভাবিক রাখার জন্য জীবন শৈলী সম্পর্কে বলুন
২. চিকিৎসকের পরামর্শ গ্রহন করার জন্য ইউনিয়ন সাব সেন্টার / উপজেলা স্বাস্থ্য কমপ্লেক্স / হাসপাতালে পাঠান
উচ্চ রক্তচাপে ঔষধ গ্রহনকারীদের নিয়মিত রক্তচাপ পরিমাপ করুণ এবং রেজিস্ট্রারে লিপিবদ্ধ করুন

যে সকল উচ্চরক্তচাপ এর রোগী উপজেলা স্বাস্থ্য কমপ্লেক্সের এনসিডি কর্নারে চিকিৎসা ও স্বাস্থ্য সম্মত জীবনযাত্রা অনুশীলনের মাধ্যমে উচ্চ রক্তচাপ কাঙ্খিত পর্যায়ে নিয়ন্ত্রিত, সে সকল রোগী নিকটস্থ উপস্বাস্থ্য কেন্দ্র বা কমিউনিটি ক্লিনিক হতে নির্দিষ্ট সময় অন্তর ফলোআপ (স্বাস্থ্য সম্মত জীবন যাপন সংক্রান্ত পরামর্শ ) এবং চিকিৎসকের লিখিত ব্যবস্থাপত্র অনুসারে ঔষধ সংগ্রহ করতে পারেন (নিম্নমুখী রেফারেল ও রিফিলিং এর মাধ্যমে) । এটি রোগীর জন্য ব্যয়সাশ্রয়ী এবং ফলে উপজেলা স্বাস্থ্য কমপ্লেক্সের এনসিডি কর্নারের চাপ বহুলাংশে হ্রাস করা সম্ভব। তবে কমিউনিটি ক্লিনিক বা উপস্বাস্থ্য কেন্দ্রে ফলো আপ এর সময় রক্তচাপ স্বাভাবিকের চেয়ে বেড়ে গেলে সেই রোগীকে পুনরায় এনসিডি কর্নারে প্রেরন করতে হবে। উল্লেখ্য যে চূড়ান্তভাবে নির্ণীত রোগীদের রোগ নিরাময় সহ অন্য সকল ব্যক্তির ক্ষেত্রে স্বাস্থ্য সম্মত জীবনযাত্রার পদ্ধতি অনুশীলনের মাধ্যমে উচ্চ রক্তচাপ প্রতিরোধই উত্তম এবং এ বিষয়ে আমাদের সর্বাধিক গুরুত্ব দিতে হবে।

**উচ্চ রক্তচাপের চিকিৎসায় ব্যবহৃত ঔষধসমূহঃ**

উচ্চ রক্তচাপ চিকিৎসা বিভিন্ন ধরণের ঔষধ ব্যবহৃত হয়ে থাকে। প্রায়শই একের অধিক ঔষধ প্রয়োজন হয়ে থাকে। ডাক্তারের ব্যবস্থাপত্র অনুসারেই এই ঔষধ নিয়মিত সেবন করা উচিৎ।

প্রথম সারির ব্যবহৃত ঔষধসমূহঃ

**(ক) ক্যালসিয়াম চ্যানেল ব্লকার (Calcium channel blocker) :** রক্তনালী প্রসারণের মাধ্যমে এই ঔষধগুলো রক্তচাপ কমায়। যেমন - নিফিডিপিন, এমলোডিপিন, ভেরাপামিল ইত্যাদি । হার্ট ফেইলিওর রোগীকে এই সাবধানে ব্যবহার করা উচিত।

**(খ) এনজিওটেনসিন রিসেপ্টর ব্লকার (ARB):** এই ঔষধ সমূহ অত্যন্ত কার্যকর ও নিরাপদ। লোসারটান, ভালসারটান, কেন্ডেসারটান ইত্যাদি। গর্ভাবস্থায় এই ঔষধ সমূহ নিষিদ্ধ।

**(গ) এনজিওটেনসিন - কনভারটিং এনজাইম ইনহিবিটর (ACE inhibitor):** এ ঔষধ সমূহ অত্যন্ত কার্যকর । রেমিপ্রিল, লিসিনোপ্রিল, ক্যাপটোপ্রিল, ইনালাপ্রিল ইত্যাদি। **গর্ভাবস্থায় এই ঔষধ দেয়া যাবে না।**

**(ঘ) ডাইইউরেটিক্স (Diuretics):** এটা কিডনীর উপর কাজ করে শরীরের অতিরিক্ত পানি এবং লবন নিষ্কাশন করে উচ্চ রক্তচাপ কমায়। ফ্রুসেমাইড (Frusemide), থায়াজাইড, স্পাইরোনোলেকটোন, ইনডেপামাইড ইত্যাদি একক ভাবে অথবা অন্য ঔষধের সঙ্গে ব্যবহার করা যেতে পারে।

**(ঙ) বিটা ব্লকার (Beta blockers):** ইহা হার্টের স্পন্দন কমায় যেমন - প্রোপানোলল, এটিনোলল, ক্যার্ভিডিলোল ইত্যাদি । হাপানি, COPD রোগীর এই ঔষধ ব্যবহার করা উচিৎ নয়।

**উচ্চ রক্তচাপের ফলাফল/জটিলতাঃ**

অনিয়ন্ত্রিত উচ্চ রক্তচাপ, ব্রেইন স্ট্রোক, ইস্কেমিক হার্ট ডিজিজ, হার্ট এটাক, হার্ট ফেইলিওর, কিডনী রোগ, কিডনী ফেইলিওর, অন্ধত্ব ইত্যাদি রোগের ঝুঁকি বহুলাংশে বৃদ্ধি করে। উচ্চ রুক্তচাপ নিয়ন্ত্রণ করলে উপরোক্ত রোগসমূহ হওয়ার হার এবং মৃত্যুহার উল্লেখযোগ্যভাবে কমে। উচ্চ রক্তচাপ চিকিৎসার ফলাফল জাতি, ধর্ম, বর্ণ, গোষ্ঠী, বয়স নির্বিশেষে অত্যন্ত কার্যকর।

অনেকে রক্তচাপ নিয়ন্ত্রণ (Normal) হয়ে গেলে ঔষধ ছেড়ে দেন যার ফলে কিছুদিন পর আবার রক্তচাপ বেড়ে যায়। কাজেই উচ্চ রক্তচাপ একবার ধরা পড়লে, এর উপসর্গ এবং ক্ষতি থেকে বাঁচতে হলে মাঝে মাঝে রক্তচাপ পরীক্ষা করিয়ে নিয়মিত ঔষধ সেবন করতে হবে। একমাত্র ডাক্তারের পরামর্শ ছাড়া ঔষধ পরিবর্তন অথবা বন্ধ করা যাবেনা ।

*উল্লেখ্য যে, উচ্চ রক্তচাপের রোগীদের নিরবচ্ছিন্নভাবে ঔষধ ব্যাবহার করা অপরিহার্য । সরকারী পদ্ধতিগত জটিলতা/দীর্ঘসুত্রতার কারনে নিরবচ্ছিন্নভাবে ঔষধ সংগ্রহ ও সরবরাহ বিঘ্নিত হওয়ার আশংকা থাকে। তাই রোগীদের বুঝাতে হবে যাতে এ সাময়িক সময়ের জন্য একটু কষ্ট হলেও যেন ঔষধ বাদ না দিয়ে নিজের ভালোর জন্য কিছু দিনের ঔষধ নিজে ক্রয় করে ব্যবহার করেন, অন্যথায় তার মারত্মক কোন জটিলতা দেখা দিতে পারে। কিছুদিনের মধ্যে সরকারি সরবরাহ পেলেই তাকে পূর্বের ন্যায় ঔষধ প্রদান করা হবে।

# Chapter-8
# References

# Chapter -8

## 8. References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# ANNEXURE

# ANNEXURE

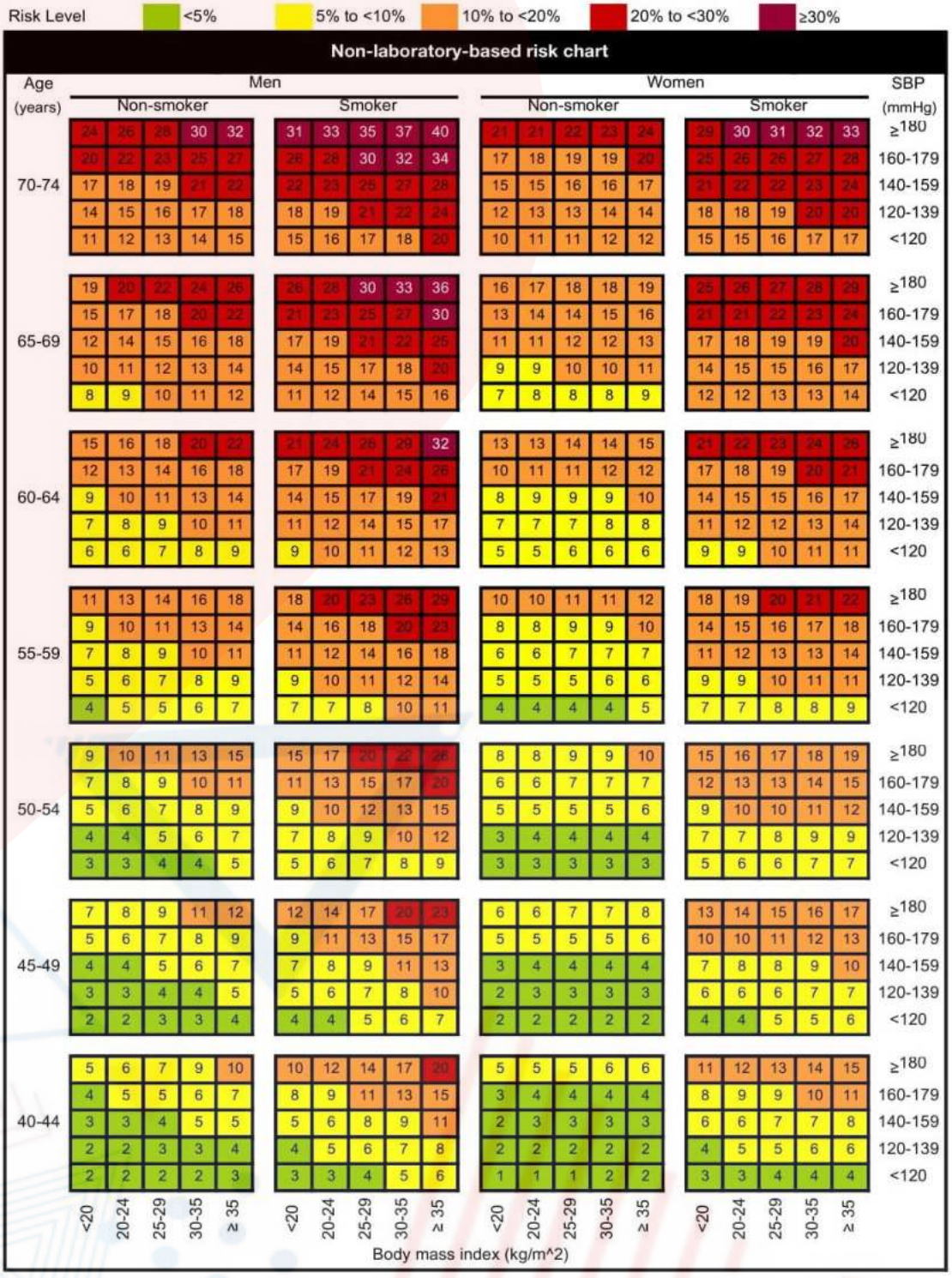
## Annexure 1: Ambulatory Blood Pressure Monitoring (ABPM)

It is used to record blood pressure for 24 hours by a small portable BP monitoring device. This method is very useful to assess -White coat hypertension (even in children less than 3 years of age), Masked hypertension, to see the efficacy of prescribed interventions and to assess circadian blood pressure profile.

**White coat hypertension:** elevated BP in clinic BP, but ambulatory BP remains normal.

**Masked Hypertension:** normal clinic BP but elevated ABPM.

**Annexure 2: WHO- cardiovascular disease risk chart**



**Annexure 3: Best BP measurement techniques in children**

| |
|---|
| 1. The child should be seated in a quiet room for 3–5 min before measurement, with the back<br>supported and feet uncrossed on the floor. |
| 2. BP should be measured in the right arm for consistency, for comparison with standard tables, and to avoid a falsely low reading from the left arm in the case of coarctation of the aorta. The arm should be at heart level, supported, and uncovered above the cuff. The patient and observer should not speak while the measurement is being taken. |
| 3. The correct cuff size should be used. The bladder length should be 80%–100% of the circumference of the arm, and the width should be at least 40%. |
| 4. For an auscultatory BP, the bell of the stethoscope should be placed over the brachial artery in the antecubital fossa, and the lower end of the cuff should be 2–3 cm above the antecubital fossa. The cuff should be inflated to 20–30 mm Hg above the point at which the radial pulse disappears. Overinflation should be avoided. The cuff should be deflated at a rate of 2–3 mm Hg per second. The first (phase I Korotkoff) and last (phase V Korotkoff) audible sounds should be taken as SBP and DBP. If the Korotkoff sounds are heard to 0 mm Hg, the point at which the sound is muffled (phase IV Korotkoff) should be taken as the DBP, or the measurement repeated with less pressure applied over the brachial artery. The measurement should be read to the nearest 2 mm Hg. |
| 5. To measure BP in the legs, the patient should be in the prone position, if possible. An appropriately sized cuff should be placed at mid-thigh and the stethoscope placed over the popliteal artery. The SBP in the legs is usually 10%–20% higher than the brachial artery pressure. |

**Annexure 4: Accurate size of BP cuff for pediatric patients**

For an accurate determination of BP appropriate cuff size is essential. Children in whom the appropriate cuff size is difficult to determine, the mid arm circumference (measured as the midpoint between the acromion of the scapula and olecranon of the elbow, with the shoulder in a neutral position and the elbow flexed to 90° should be obtained for children. Bladder cuff length should be 80% of mid arm circumference and bladder cuff width should be 40% of upper arm length from Acromion to Olecranon**. [**Available at: https://image.slidesharecdn.com/pediatrichypertension-170215161201/85/pediatric-hypertension-7-320.jpg]

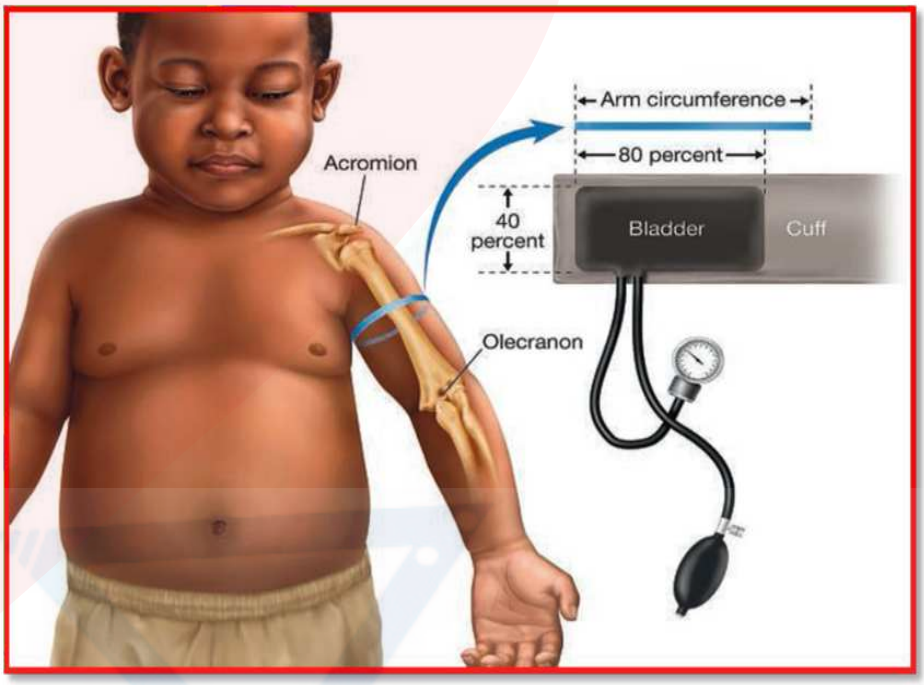



**Fig: Accurate size of BP cuff for pediatric patients**

**Annexure 5: Antihypertensive drugs with doses**

ACE inhibitors: Enalapril 0.08 mg/kg/day to a maximum 0.6-1 mg/kg/day 12-24 hourly (monitor serum creatinine and potassium).

ARBs: Losartan Potassium 0.5-0.7 mg/kg/dose to maximum 1.4mg/kg/dose 24 hourly

Amlodipine: 1-5 year: 0.1-0.6 mg/kg/day

>6 years: 2.5 mg/day to maximum 10 mg/day

Carvedilol: 0.1mg/kg/dose to maximum 0.8mg/kg/dose 12hourly

Labetolol: 1-2mg/kg/dose up to 10 mg/kg/dose 6-12 hourly. (Contraindicated in asthma, heart failure, diabetes.)

Thiazide diuretic: 1-2 mg/kg/day 12-24 hourly, (monitor serum creatinine and potassium).

# Notes


NCDC
Non-Communicable Disease Control
D G H S M O H F W