National Guidelines for Management of Hypertension in Bangladesh

NCDC
Directorate General of Health Services

National Heart Foundation
Hospital & Research Institute

World Health Organization
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ISBN 978-984-33-6855-3

Printed in Bangladesh
December 2013

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Message

Hypertension is the most common cardiovascular disorder globally. However detection, treatment and prevention of hypertension are far from adequate in most of the countries of the world. Several guidelines by various international professional organizations are available for hypertension treatment; however a country specific guidelines 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 especially in primary health care settings. These guidelines are the first ever national guidelines for hypertension management in Bangladesh developed by Directorate General of Health Services with the technical assistance of World Health Organization. It has already been tested and found useful to the primary care physicians.

I would like to extend my felicitations to those who have been involved in development of these guidelines for strengthening the capacity of primary health care system of the Country.

M M Neazuddin

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

Message

Hypertension is a major NCD related risk factor in Bangladesh. In this era of globalization, hypertension no longer remains an urban problem only. The ongoing epidemiological transition has been accompanying an increasing trend of hypertension in rural areas where vast majority of Bangladeshi people live. Fortunately Bangladesh has a good network of primary health care infrastructure. In every upazila there is a health complex. Doctors are posted there to provide essential health care to the people as well to prevent diseases. The role of doctors in the prevention, early detection and management of hypertension is well recognized. The current pro-people government has been actively promoting efforts to train doctors on NCDs in addition to the communicable diseases. I acknowledge the hard work of the contributors and editors to develop these guidelines and the excellent support provided by World Health Organization.

I urge everyone to use these guidelines in their clinical and public health practices.

Professor Dr Khondhaker Md Shefyetullah

World Health Organization
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Message

It is a great pleasure for me to see that a national guidelines for hypertension management in Bangladesh has been developed targetting primary health care physicians by NCD unit of the Directorate General of Health Services with the technical assistance of World Health Organization. With the ongoing epidemiological changes it is becoming increasing important to prevent and manage hypertension. I hope all physicians and health care providers will be benefitted from these guidelines in the context of Bangladesh.

I extend my gratitude to those involved in the development of this guidelines.

Dr Thushara Fernando
WHO Representative to Bangladesh

Contents

List of Acronyms

ABPM	Ambulatory Blood Pressure Monitoring
ACC	Associated Clinical Conditions
ACEIs	Angiotensin Converting Enzyme inhibitors
AMI	Acute Myocardial Infarction
ARBs	Angiotensin Receptor Blockers
BB	Beta Blocker
BHS	British Hypertension Society
BMI	Body Mass Index
CBC	Complete Blood Count
CCBs	Calcium Channel Blocker
CHCP	Community Health Care Providers
CHD	Coronary Heart Disease
CKD	Chronic Kidney diseases
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DGHS	Directorate General of Heath Service
DM	Diabetes Mellitus
ECG	Electrocardiogram
ESC	European Society of Cardiology
ESRD	End Stage Renal Disease
GFR	Glomerular Filtration Rate
HBP	High Blood Pressure
HTN	Hypertension
ICH	Intracerebral Haemorrhage
ICU	Intensive Care Unit
IHD	Ischemic Heart Disease
ISH	International Society of Hypertension
JNC-7	Joint National Committee Report-7

MAO-I	Monoamine Oxidase Inhibitor
MAP	Mean Arterial Pressure
MoHFW	Ministry of Health and Family Welfare
NCD	Non Communicable Diseases
NCHS	National Centre for Health Statistics
NICE	National Institute for Health and Clinical Excellence
NSAIDS	Non Steroidal Anti Inflammatory Drugs
OC	Oral Contraceptive
RAS	Renin-Angiotensin System
SAH	Subarachnoid Haemorrhage
SBP	Systolic Blood Pressure
SBPM	Self Blood Pressure Monitoring
TOC	Target Organ Complication
TOD	Target Organ Damage
USG	Ultrasonogram
UTP	Total Urinary Protein
WHO	World Health Organization

1. Executive Summary

Introduction

Hypertension is the most common cardiovascular disorder globally. However, detection, treatment and prevention of hypertension are far from adequate in most of the countries of the world. Several guidelines by various international professional organizations are available for hypertension treatment. However 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 especially in primary health care settings. Directorate General of Heath Services has convened a group comprised with leading relevant experts to prepare a hypertension management guideline with technical assistance of World Health Organization in 2013. A core writing group reviewed recent international hypertension and cardiovascular disease treatment and prevention guidelines, prepared a draft and finalized it after a consensus meeting.

Definition and classification of hypertension

The following classification has been adopted by the expert committee. Hypertension is defined as persistent elevation of systolic blood pressure (BP) of 140 mmHg or greater and/or diastolic BP of 90 mmHg or greater or on antihypertensive drug. The classification of high blood pressure is needed as clinicians must make treatment decisions based on the measured BP and the patients' associated co-morbidities.

Table 2: Definitions and classification of blood pressure levels (mmHg)

Category	Systolic		Diastolic
Optimal	<120	and	<80
Pre hypertension	120-139	and/or	80-89
Stage 1 Hypertension	140-159	and/or	90-99
Stage 2 Hypertension	160-179	and/or	100-109
Stage 3 Hypertension	≥180	and/or	≥110
Isolated Systolic Hypertension	≥140	and	<90

Blood pressure measurement

A mercury sphygmomanometer is recommended for measuring of blood pressure in office or clinic settings. Aneroid BP machine and other non-invasive oscillometric semiautomatic devices may also be used for measuring BP. Although recent guidelines have recommended the use of self BP monitoring and ambulatory BP monitoring for diagnosis of hypertension, the guideline expert group recommend using clinic blood pressure for diagnosis of elevated blood pressure taking considering the resources constraint for acquiring appropriate device and other logistics by the health care providers and patients

Diagnosis and assessment of patient with hypertension

The diagnosis of hypertension should be based on multiple blood pressure measurements, taken on separate occasions over a period of time. The three main goals of the initial evaluation of the hypertensive patient are to

- assess the presence of target-organ damage related to hypertension, especially those that might influence choice of therapy
- determine the presence of other cardiovascular risk factors and disease
- assess for possible underlying secondary causes of hypertension

These goals are usually accomplished by a thorough medical history, physical examination, and simple laboratory investigations.

Investigations

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

- Urinalysis for blood, protein and glucose
- Blood glucose (fasting preferred)
- 12-lead ECG

For most patients-

- Random total cholesterol
- Electrolytes and creatinine
- Chest X-ray: to detect cardiomegaly, heart failure, coarctation of the aorta
- Echocardiogram: to detect or quantify left ventricular hypertrophy

For detection of secondary causes of hypertension several other investigations may be needed.

Management of hypertension

It is now widely accepted that decisions to start treatment for hypertension should not only base on the clinic blood pressure. The overall cardiovascular risk should be taken into consideration and patients need to be stratified according to the overall risk of development of CVD. However in a low resources 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. 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 guidelines committee strongly reiterates the importance of lifestyle modification or non-pharmacological management at all stages of hypertension, like-

- achieving and maintaining ideal weight,
- limiting total salt intake <5 gm/day,
- taking healthy diet,
- regular moderate intensity physical activity for at least 30 minutes on most – preferably all–days of the week,
- avoiding tobacco use,
- avoiding or limiting alcohol intake

For patients with Stage 1 hypertension, an observational period of three to six months is recommended unless target organ involvement is already evident. During this period, appropriate advice should be given on lifestyle modification.

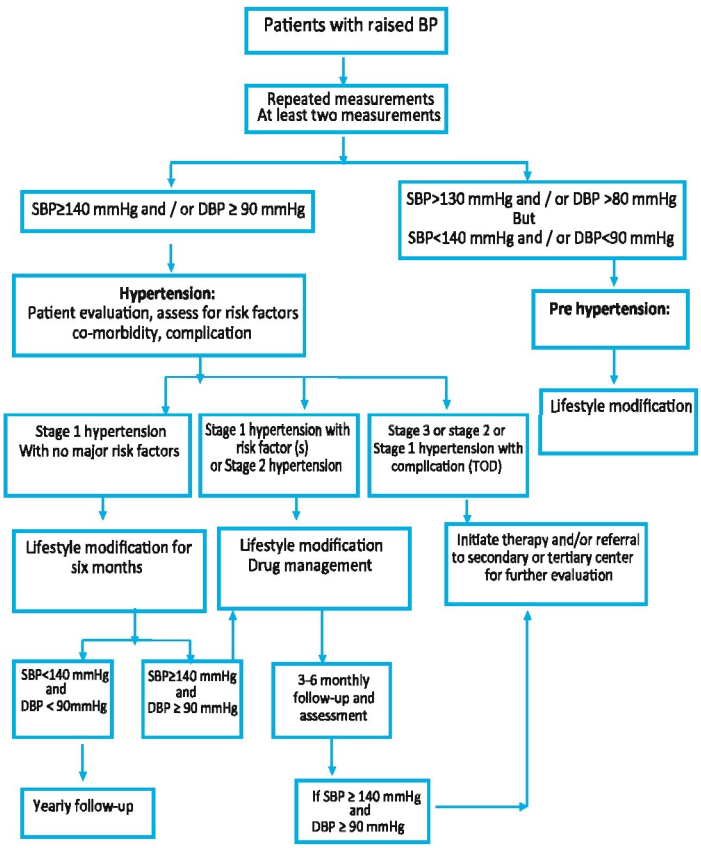
Selection of antihypertensive drugs

In otherwise uncomplicated essential hypertension, there are four important antihypertensive agents:

- Diuretics (thiazide and thiazide-like)
- Angiotensin-converting enzyme inhibitors (ACE-Is)
- Angiotensin receptor blocker (ARBs,)
- Calcium channel blockers (CCBs)

The most cost-effective antihypertensive drugs are a thiazide-like diuretic or a CCB. Although Beta-blockers are no longer recommended as first line monotherapy in recent guidelines given the low cost and availability of beta-blockers, it may be considered in resource constraint settings.

Algorithm for management of hypertension



In patients with stage 1 hypertension, treatment should be started with a single drug at low dose. If after a sufficient period of treatment (up to six weeks) with monotherapy BP is still not controlled, increasing the dose of the initial antihypertensive agent or adding a second agent is preferred if the patient shows response to the initial drug but target BP is not achieved. To improve compliance, a fixed-dose combination drug may be considered. If the patient does not show response or does not tolerate the initial drug, drug substitution is recommended. In patients presenting with stage 2 hypertension or beyond, combination therapy is recommended.

In patients presenting with stage 3 hypertension (BP >180/110 mmHg) without symptoms or acute signs of organ damage, it is usually appropriate to prescribe a two-drug therapy. It is also important to counsel the patient on the importance of long term BP control and to schedule follow-up within one week or less. In case of hypertensive urgency (BP>180/110mmHg and severe headache, shortness of breath, oedema, target organ damage or clinical cardiovascular disease) or hypertensive emergencies characterized by (severe elevations or BP >220/140mmHg complicated by evidence of impending or progressive target organ dysfunction, patients should be admitted to hospital for continuous monitoring of BP and parenteral administration of an appropriate agent. For diagnosis of secondary hypertension and resistant hypertension further clinical and laboratory evaluation is needed.

Special considerations in terms of diagnosis, drug of choice, evaluation are needed in case of hypertension in elderly, pregnancy, children, with concomitant morbidity such as diabetes, kidney disease, and coronary heat diseases.

When to refer

Most patients can be effectively managed by their own family practitioners. 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

Goals for BP lowering treatment

Efforts must be made to reach target BP level. However guidelines differ on the target BP level. The target BP levels are based on the age and the presence of diabetes and chronic kidney diseases. These targets should be reached within 3 months. In general once the BP is controlled, most patients will require life-long treatment.

Goals for BP lowering treatment	
	Target BP level
Age <60 years	<140/90 mmHg*
Age ≥60 years	<150/90 mmHg*
All ages with Diabetes mellitus and / or Chronic kidney disease	 <140/90 mmHg* <130 / 80 mmHg**
* According to JNC 8 recommendations **According to KDIGO 2012	

2. Introduction

Hypertension or high blood pressure is the most common cardiovascular disorder affecting about 40% of adult population worldwide.[1] Hypertension is the most important risk factor for heart disease and stroke accounting for 64% of strokes and 49% of coronary heart disease. In Bangladesh, approximately 11-18% of adult and 40–65% of elderly people suffer from hypertension.[2-4] Non-communicable diseases risk factors survey 2010, done on a nationally representative sample of about 10,000 adults, reported that 17.9% of adult aged 25 years or more have hypertension based on cutoff value systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg or on antihypertensive drug (Table 1).[5] Despite the availability of effective treatments for hypertension, blood pressure control rates are poor across the world. About one third (32.9%) of adults in Bangladesh never measured their BP and only half of the hypertensive patients (52.3%) take antihypertensive drug.[5]

Table 1. Prevalence of hypertension among adults aged 25 year or more in urban and rural areas of Bangladesh (NCD risk factor survey 2010)

	Urban	Rural
Men:	**21.1%**	**15.9%**
Women:	**18.8%**	**15.9%**
Both sex:	**19.9%**	**15.9**

In Bangladesh treatment of hypertension is mostly provided by general practitioners and specialist physicians including cardiologists through government and private health care facilities. However in some union level government facilities, medical assistants detect high blood pressure and refer for treatment to physicians. Compliance 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, 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 especially in primary health care settings.

3. 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 the different stakeholders will benefit from this guideline. Particular emphasis was given to make this guideline easily usable by primary care physicians working in a setting with limited resources.

4. Methods

For drafting of the guidelines, Directorate General of Heath Services, Ministry of Health and Family Welfare convened a group comprised of leading experts from cardiology, internal medicine, neurology, nephrology, obstetrics and gynecology, primary care medicine and public health with the technical support of World Health Organization, in 2013. A core writing group was formed and it reviewed recent hypertension and cardiovascular disease treatment and prevention guidelines published by various authoritative scientific and professional bodies, and also reviewed the recent reports on newer studies related to hypertension treatment.[6-14] A draft was prepared and then consultations among the expert group were done and a consensus document was finalized by the expert group.

5. Definition and classification of hypertension

Hypertension is defined as persistent elevation of systolic BP of 140 mmHg or greater and/or diastolic BP of 90 mmHg or greater. 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 2)

Table 2: Definitions and classification of blood pressure levels (mmHg)*

Category	Systolic		Diastolic
Optimal	<120	and	<80
Pre hypertension	120-139	and/or	80-89
Stage 1 Hypertension	140-159	and/or	90-99
Stage 2 Hypertension	160-179	and/or	100-109
Stage 3 Hypertension	≥180	and/or	≥110
Isolated Systolic Hypertension	≥140	and	<90

* when a patient's systolic and diastolic blood pressures fall into different categories the higher category should apply for the quantification of total cardiovascular risk, decision about drug treatment and estimation of treatment efficacy.

6. Blood pressure measurement

Blood pressure should be measured correctly. 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 sphygmomanometer is gradually being replaced by the electronic blood pressure measurement device due to 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.

Office or clinic blood pressure

A mercury sphygmomanometer is recommended for measuring of blood pressure in office or clinic settings. For accurate measure the various parts of the device such as rubber tubes, valves, quantity of mercury, etc should be in proper working order. Aneroid BP machine and other non-invasive oscillometric semiautomatic devices may be used for measuring BP. However, these devices should be validated according to standardized protocols and their accuracy should be checked periodically by comparison with mercury sphygmomanometric values. 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.

Self or ambulatory BP monitoring

Although recent guidelines[8] have recommended the use of self BP monitoring (SBPM) and ambulatory BP monitoring (ABPM) for diagnosis of hypertension, the guideline expert group recommend to use 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. [6]

Box 1 : Blood pressure measurement

When measuring BP,

- Patients should not have smoked, or ingested caffeine-containing beverages or food in the preceding 30 minutes
- Patient should be seated for at least 5 minutes before measurement with the back supported, and arm bared and resting on a surface at heart-level.
- 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. The bladder within the cuff should encircle 80% of the arm.
- Have the cuff at the heart level, whatever the position of the patient.
- SBP should be estimated first by palpation to avoid missing the auscultatory gap.
- Take at least two measurements spaced by 1–2 minutes, and additional measurements if the first two readings differ by >5 mmHg. The BP recorded should be the average of 2 readings.
- Use phase I and V (disappearance) Korotkoff sounds to identify systolic and diastolic BP, respectively
- Measure BP in both arms at first visit to detect possible differences due to peripheral vascular disease. In this instance, take the higher value as the reference one.
- Measure BP 1 and 5 min after assumption of the standing position in elderly subjects, diabetic patients, and in other conditions in which postural hypotension may be frequent or suspected

7. Diagnosis and assessment of patient with hypertension

7.1 Diagnosis

The diagnosis of hypertension should be based on multiple blood pressure measurements, taken on separate occasions over a period of time. 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, although in particularly severe cases (stage 3) the diagnosis can be based on measurements taken at a single visit. At least 2 measurements should be obtained once the patient is seated comfortably for at least 5 minutes with the back supported, feet on the floor, arm supported in the horizontal position, and the BP cuff at heart level. When the initial SBP is between 140 and 160 mmHg, or the DBP is between 90 and 100 mmHg, repeat measurements should be performed on three separate occasions within a period of 2 months, to determine whether a diagnosis of hypertension is valid. All measurements should be taken in the same arm. In people with symptoms of postural hypotension (falls or postural dizziness), BP is to be measured at 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.

7.2 Assessment

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

- assess the presence of target-organ damage related to hypertension, especially those that might influence choice of therapy
- determine the presence of other cardiovascular risk factors and disease
- assess for possible underlying secondary causes of hypertension

These goals are usually accomplished by a thorough medical history, physical examination, and simple laboratory investigations.

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. The key issues that need to be addressed in the history include:

- Duration, age of onset, and previous levels of high blood pressure
- Previous antihypertensive therapy, its impact on blood pressure and adverse effects
- Symptoms suggestive of secondary causes of hypertension
- Lifestyle factors, such as tobacco use (smoking & smokeless), dietary intake of fat, salt, alcohol drinking habit, physical activity and weight gain since early adult life
- Symptoms of concomitant diseases that will affect prognosis or treatment, e.g. diabetes mellitus, renal disease and gout
- Family history of hypertension, CHD, stroke, diabetes, renal disease or dyslipidaemia
- History of symptoms of neurologic dysfunction, heart failure, coronary heart disease, or peripheral arterial target-organ damage;
- Use of medications that influence blood pressure such as oral contraceptives, licorice, carbenoxolone, nasal drops, cocaine, amphetamines, steroids, non-steroidal anti-inflammatory drugs, erythropoietin, and cyclosporine and herbal treatment
- Presence of other cardiovascular risk factors

Physical Examination

The physical examination should include the following:

- general examination including measurement of height, weight and waist circumference
- two or more BP measurements separated by two minutes with the patient either supine or seated; and after standing for at least one minute
- measurement of BP on both arms

In addition to blood pressure measurement, the physical examination should search for signs of secondary hypertension and for evidence of organ damage.

- Assessment for presence of signs suggestive of target organ damage (Table 3)
- Assessment for presence of signs suggestive of secondary hypertension (Table 5).

Table 3: Major risk factors for cardiovascular diseases

- Levels of SBP and DBP
- Tobacco use
- Dyslipidemia
  - Total choelesterol >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
  - (men <55 years or women <65 years)
- Central obesity
  - (waist circumference >90 cm for men,>80 cm for women)

Table 4: Manifestations of target organ damage (TOD)/ target organ complication (TOC) and their suggestive signs

Organ system	Manifestations & their suggestive signs
Cardiac	Left ventricular hypertrophy, coronary heart disease, heart failure • forcible and displaced apex beat • accentuation of the aortic component of the second heart sound • abnormal cardiac rhythms • S4 (decreased ventricular compliance) • ventricular gallop • pulmonary rales
Cerebrovascular	Transient ischaemic attack, stroke • 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 • proteinuria (1+ or greater) • microalbuminuria (2 out of 3 positive tests over a period of 4-6 months) • Dependent (leg) edema
Retinopathy	Fundoscopic abnormalities - Haemorrhages or exudates, with or without papilloedema

Table 5: Secondary causes of hypertension and their suggestive signs

- Sleep apnoea
- Obesity, short neck, daytime somnolence, snoring, frequent night time awakenings, witnessed apnoea
- Drug-induced or drug-related (Steroids, NSAIDS, oral contraceptive, MAO-I, adrenergic drugs)
- Chronic kidney disease
  - palpation of enlarged kidneys (polycystic kidney);
- Primary aldosteronism
- Renovascular disease
  - abdominal or loin bruits (renal artery stenosis);
- Chronic steroid therapy and Cushing syndrome
  - truncal obesity, acne, plethora, fat pads, bruising, moon face with purple striae
- Phaeochromocytoma
  - inappropriate tachycardia
- Acromegaly
- Thyroid or parathyroid disease
  - enlarged thyroid gland
- Coarctation of the aorta
  - precordial murmurs, rib bruits
  - radio-femoral delay, decreased blood pressure in the lower extremities,
- Takayasu Arteritis
- Tuberous sclerosis or skin stigmata of neurofibromatosis

Investigations

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

- Urinalysis for blood, protein and glucose
- Blood glucose (fasting preferred)
- 12-lead ECG

For most patients-

- Random total cholesterol
- Electrolytes and creatinine
- Chest X-ray: to detect cardiomegaly, heart failure, coarctation of the aorta
- Echocardiogram: to detect or quantify left ventricular hypertrophy

Investigation of selected patients:-

- Renal ultrasound: to detect possible renal disease
- Renal angiography: to detect or confirm presence of renal artery stenosis
- Urinary catecholamines: to detect possible phaeochromocytoma.
- Urinary cortisol and dexamethasone suppression test: to detect possible Cushing's syndrome.
- Plasma renin activity and aldosterone: to detect possible primary aldosteronism.
- Ambulatory BP recording: to assess borderline or 'white coat' hypertension

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

8. Management of hypertension

Sustainable hypertension management and scarce resources

It is now widely accepted that decisions to start treatment for hypertension should not only base on the clinic blood pressure. 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 resources 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.

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 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, provided that 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.

8.1 Non-phrmacological management

Non-pharmacological management (therapeutic lifestyle modification remains the cornerstone of managing hypertension regardless of BP level. It may be the only treatment necessary in Stage 1 hypertension. 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, however for Asians the normal range has been proposed to be 18.5 to 23.5 kg/m2.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. 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 to limit daily salt intake less than 5 g per day or whichs about one t.s.f 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 reduced sodium intake occurs with time; the use of lemon juice, herbs and spices as alternative seasoning should be encouraged.

- **Diet:** Follow the nutrition guidelines published by the WHO, which emphasizes a diet low in total fat with high intake of fruit and vegetables (5 servings per day, 1 serving = apprx. 80 gm), regular low-fat dairy products, high intake of high-fibre whole grain foods, fish rather than red meat, products low in saturated fat, low salt, and sugar-containing foods. Discourage excessive consumption of tea, coffee and other caffeinated drink.

- **Physical Activity:** Regular moderate intensity physical activity for at least 30 minutes on most – preferably all–days of the week. Exercise bouts can be continuous or accumulated in shorter periods throughout the day. The benefit of exercise is dose-responsive.

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 stair cases instead of lift etc.

- **Avoiding Tobacco Use:** This is important in the overall management of the patients with hypertension in reducing cardiovascular risk. Smoking can also acutely increase BP. Counseling for quitting should be done to all tobacco users. Nicotine replacement therapy may be used for a patient with hypertension, while under medical supervision.

- **Avoiding drinking or limiting alcohol intake.** Alcohol has an acute effect in elevating BP. It is advisable to avoid drinking or limit to 2 standard drinks per day for men and 1 standard drink per day for women. A standard drink (approximately 10 g of ethanol) is equivalent to 25 ml of liqueur/spirits, 125 ml of wine, 340 ml of beer, or 60 ml of sherry. 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 reducing or 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 statistically significant reductions in systolic (3.7 mmHg, 95%CI: 1.3 to 6.0) and diastolic (3.5 mmHg, 95%CI: 1.9 to 5.1) blood pressure[7] and clinicians should encourage stress relaxation by yoga, meditation, stretching and breathing exercise as appropriate.

8.2 Pharmacological management

8.2.1 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. It may not matter which class of drug is used, it is the reduction of BP to the goal or target level which provides the main benefits in the general hypertensive population. 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 favouring use, contraindications and TOD .

For patients with Stage 1 hypertension, an observational period of three to six months is recommended unless target organ involvement is already evident. During this period, appropriate advice should be given on lifestyle modification. Follow-up at this juncture should be about two monthly so that there will be between one to three visits over the period. Efficacy of the above intervention should be assessed. Figure 1 outlines the management algorithm of a patient with hypertension.

In patients with stage 1 hypertension, treatment should be started with a single drug at low dose. Monotherapy can lower BP to<140/90 mmHg in approximately 40– 60% of patients with mild to moderate hypertension. If after a sufficient period of treatment (upto six weeks) with monotherapy BP is still not controlled, three options are available

- the dose of the initial drug can be increased
- the drug can be substituted with another class of drug
- a second drug can be added

Increasing the dose of the initial antihypertensive agent or adding a second agent is preferred if the patient shows response to the initial drug but target BP is not achieved. The former, however, may give rise to dose-related adverse effects. Properly selected antihypertensive combinations may also mitigate the adverse effects of each other. To improve compliance, a fixed-dose combination drug may be considered. If the patient does not show response or does not tolerate the initial drug, drug substitution is recommended.

In patients presenting with stage 2 hypertension or beyond, combination therapy is recommended. Data show that the reductions in BP produced by monotherapy are too small to achieve recommended BP targets. The use of combination therapy is recommended, especially if the BP >20/10 mmHg above goal and there are co-morbidities to consider such as diabetes, ISH, CKD or overt CVD. Effective drug combinations include, diuretics with long-acting CCBs, ACE-Is or ARBs, and diuretics with beta-blockers and beta- and alpha-blockers. (Table 8)

8.2.2 Follow–up visits

Recommended duration of follow up is as shown in Table 9. Once target BP is achieved, follow-up at three to six-month interval is appropriate.[10]

Table 9. Recommendations for follow-up based on initial blood pressure measurements for adults (Modified from JNC-7 report / WHO-ISH 2003)

Initial BP (mmHg) Systolic and Diastolic	Follow-up recommended to confirm diagnosis and/or review response to treatment
<130 and <85	Recheck in one year
130-139 and 85-89	Recheck within 3-6 months
140-159 and/or 90-99	Confirm within two months
160-179 and/or 100-109	Evaluate within one month and treat if confirmed
≥180 and/or ≥110	Evaluate and initiate treatment immediately

8.2.3 Step-down therapy

An effort to decrease the dosage and number of antihypertensive drugs should be considered after hypertension has been controlled effectively for at least 1 year.10 The reduction should be made in a deliberate, slow and progressive manner. Step down therapy is more often successful in patients who also are making lifestyle modifications. Patients whose drugs have been discontinued should have scheduled follow-up visits because BP usually rises again to hypertensive levels, sometimes months or years after discontinuance, especially in the absence of sustained improvements in lifestyle.

8.2.4 When to refer

Most patients can be effectively managed by their own family practitioners; 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

8.2.5 Goals for BP lowering treatment

Efforts must be made to reach target BP level. However guidelines differ on the target BP level. According to JNC 8 recommendation the target BP levels are based on the age and the presence of Diabetes and Chronic kidney diseases (Table 6). These targets should be reached within 3 months. However, other guidelines suggested lower target level for Diabetes and Chronic kidney diseases patients. In general once the BP is controlled, most patients will require life-long treatment.

Table 6: Goals for BP lowering treatment

	Target BP level
Age <60 years	<140/90 mmHg*
Age ≥60 years	<150/90 mmHg*
All ages with Diabetes mellitus and / or Chronic kidney disease	<140/90 mmHg* <130 / 80 mmHg**
* According to JNC 8 recommendations [14] **According to KDIGO 2012 [13]	

8.2.6 Selection of antihypertensive drugs

In otherwise uncomplicated essential hypertension, there are four important antihypertensive agents:

- Diuretics (thiazide and thiazide-like)
- Angiotensin-converting enzyme inhibitors (ACE-Is)
- Angiotensin receptor blocker (ARBs,
- Calcium channel blockers (CCBs)

Studies have led to reconsideration of the drugs of choice for the management of uncomplicated hypertension. The most cost-effective antihypertensive drugs are a thiazide-like diuretic or a CCB. Although Beta-blockers are no longer recommended as first line monotherapy in recent guidelines [8, 14,] however, given the low cost and availability of Beta-blockers, it may be considered in resource constrain settings. The combination of a thiazide diuretic with a β-blocker is discouraged, especially where there is abdominal obesity combined with hypertension; both classes of drugs have adverse metabolic consequences and increase the risk of new diabetes. Table 7 lists the clinical considerations and possible contraindications of the major antihypertensive drug groups.

The choice of diuretic should be a low-dose hydrochlorothiazide (12.5 - 25 mg) or a thiazide-like diuretic-like indapamide (1.25 - 2.5 mg daily). Chlorthalidone (15 - 30 mg daily) is more potent compared with hydrochlorothiazide; it produces a sustained 24-hour BP-lowering response, and may replace hydrochlorothiazide as a hypotensive agent.[9]

The use of ARBs and ACE-Is results in up to 95% and 75% blockade, respectively, of the renin-angiotensin system. No difference in this outcome was found in patients with diabetes and microalbuminuria or in patients post myocardial infarction, with heart failure and/or impaired left ventricle (LV) dysfunction. Hence, there appears to be little difference between ACE-Is and ARBs; choice of therapy should be determined by cost and tolerability.[9]

Table 7: Indications and contraindications for the major classes of antihypertensive drugs*

Class	Conditions favouring use	Contraindications	
		Compelling	Possible
Diuretics (thiazide/thiazide-like)	HF Elderly hypertensives ISH	Gout	Pregnancy β-blockers(especially atenolol)
Diuretics (loop)	Renal insufficiency HF		Pregnancy
Diuretics (anti-aldosterone)	HF Post-myocardial infarction Resistant hypertension	Renal failure Hyperkalaemia	
CCB long-acting only (dihydropyridine)	Elderly patients ISH Angina pectoris Peripheral vascular disease Carotid atherosclerosis Pregnancy (nifedipine only)		*Tachyarrhythmias* HF
Non-dihydropyridine CCB (verapamil, diltiazem)	Angina pectoris Carotid atherosclerosis Supraventricular tachycardia	AV block (grade 2 or 3) HF	*Constipation (verapamil)*
ACE-Is	HF LV dysfunction Post-myocardial infarction Non-diabetic nephropathy Type 1 diabetic nephropathy Prevention of diabetic microalbuminuria Proteinuria	Pregnancy Hyperkalaemia Bilateral renal artery stenosis Angioneurotic oedema	
ARBs	Type 2 diabetic nephropathy Type 2 diabetic microalbuminuria Non-diabetic nephropathy LVH ACE-I cough or intolerance Patients at high CV risk	Pregnancy Hyperkalaemia Bilateral renal artery stenosis	
β-blockers	Angina pectoris Post-myocardial infarction HF (selected) Tachyarrhythmias	Asthma Chronic obstructive pulmonary disease AV block (grade 2 or 3) Pregnancy (atenolol)	Peripheral vascular disease Bradycardia Glucose intolerance Metabolic syndrome Athletes and physically active Patients Non-dihydropyridine CCBs (verapamil, diltiazem)

* Adapted from the JNC7 guidelines[4] and South African Hypertension Guideline[7]

Fig. 1 Algorithm for Management of Hypertension

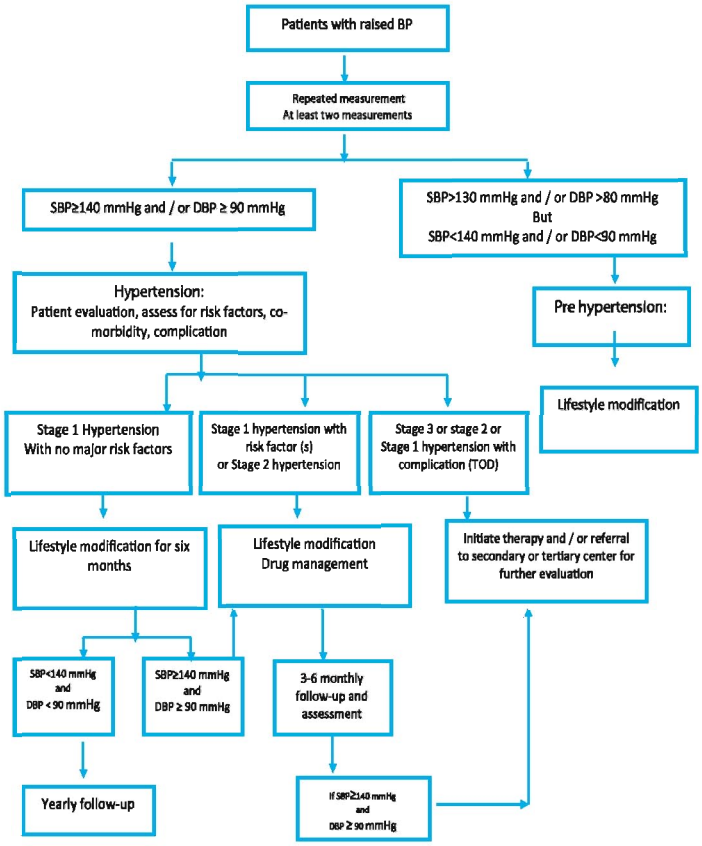


Table 8. Effective antihypertensive combinations

Effective combinations	Comments
ACEIs + diuretics	Appropriate for concurrent heart failure, diabetes mellitus and stroke
ARBs + diuretics	Appropriate for concurrent heart failure and diabetes mellitus
CCBs + ACEIs/ARBs	Appropriate for concurrent dyslipidaemias and diabetes mellitus
CCB + Beta-blockers	Relatively cheap, appropriate for concurrent CHD
Beta-blockers + diuretics	Benefits proven in the elderly, cost-effective. However, may increase risk of new onset diabetes

8.2.7 Management of severe hypertension

Severe hypertension is defined as BP >180/110 mmHg. These patients may present in the following manner:

- incidental finding in an asymptomatic patient
- non-specific symptoms like headache, dizziness, lethargy
- symptoms and signs of acute target organ damage. These include acute heart failure, acute coronary syndromes, acute renal failure, dissecting aneurysm, hypertensive encephalopathy and stroke

Management of these patients depends on the clinical presentation and laboratory investigations. The evaluation of these patients should include a thorough history and physical examination, particularly looking for signs of acute target organ damage and causes of secondary hypertension.

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 and symptoms of modest organ damage.
c. Hypertension emergencies often with BP>220/140 mmHg associated with life threatening organ dysfunction.

Severe Hypertension: BP 180/110mmHg often asymptomatic may complain of headache, anxiety, no target organ damage / clinical cardiovascular disease.

Management: The most important aspect of management of severe hypertension (BP>180/110 mmHg) is the recognition that immediate normalization of the BP is not necessary. Abrupt withdraw of prior therapy or acute pain or emotional distress can cause transient BP elevations. It is usually appropriate to prescribe a two-drug therapy. It is also important to counsel the patient on the importance of long term BP control and to schedule follow-up within one week or less.

Hypertensive urgency: BP>180 /110 mmHg and severe headache, shortness of breath, oedema, target organ damage/clinical cardiovascular disease may be present. These include patients with grade III or IV retinal changes (also known as accelerated and malignant hypertension respectively), but no overt organ failure.

Management: These patients may need admission. BP measurement should be repeated after 30 minutes of bed rest. Lower BP with oral or parenteral agents as underlying conditions warrant. Initial treatment should aim for about 25% reduction in BP over 24 hours but not lower than 160/90 mmHg. Adjust current therapy, observe for 3-4 hours, arrange follow-up evaluation. Oral drugs proven to be effective are outlined in Table 10. Combination therapy is often necessary.

Table 10: Oral treatment for hypertensive urgencies

Drug	Dose	Onset of Action (hrs)	Duration of Action (hr)	Frequency (prn)
Captopril	25 mg	0.5	6	1 – 2 hrs
Labetalol	200 – 400 mg	2.0	6	4 hrs

Hypertensive Emergency: Hypertensive Emergencies are characterized by severe elevations or BP(>220/140mmHg) complicated by evidence of impending or progressive target organ dysfunction such as-

i. Hypertensive encephalopathy
ii. Severe shortness of breath
iii. Prolonged chest pain / unstable angina
iv. Acute MI
v. Acute Left Ventricular failure with pulmonary odema.

Patient with hypertensive emergency should be admitted to an ICU for continuous monitoring of blood pressure and parenteral administration of an appropriate agent. The initial goal of therapy in hypertensive emergencies is to reduce mean arterial BP by no more than 25% (within minutes to 1 hour), then, if stable, to 160/100 to 110 mmHg within the next 2 to 6 hours. Excessive falls in pressure that may precipitate renal, cerebral, or coronary ischemia should be avoided. For this reason, short-acting Nifedipine is no longer considered acceptable in the initial treatment of hypertensive emergencies or urgencies. If this level of BP is well tolerated and the patient is clinically stable, further gradual reductions toward a normal BP can be implemented in the next 24 to 48 hours. There are exceptions to the above recommendation- patients with an ischemic stroke in which there is no clear evidence from clinical trials to support the use of immediate antihypertensive treatment, patients with aortic dissection who should have their SBP lowered to <100 mmHg if tolerated, and patients in whom BP is lowered to enable the use of thrombolytic agents.

Table 11 : Parenteral Drugs for Treatment of Hypertension Emergencies

Drug	Dose	Onset of Action	Duration of Action	Adverse Effects	Special Indications
Vasodilators					
Sodium nitroprusside	0.25-10 µg/kg/min as IV infusion	Immediate	1-2 min	Nausea, vomiting, muscle twitching, sweating, thiocynate and cyanide intoxication	Most hypertensive emergencies; caution with high intracranial pressure or azotemia
Nitroglycerin	5-100 µg/kg/min as IV infusion	2-5 min	5-10 min	Headache, vomiting, methemoglobinemia, tolerance with prolonged use	Coronary ischemia
Enalaprilat	1.25-5 mg every 6 h IV	15-30 min	6-12 h	Precipitous fall in pressure in high-renin states; variable response	Acute left ventricular failure; avoid in acute myocardial infarction
Hydralazine hydrochloride	10-20 mg IV	10-20 min IV	1-4 h IV	Tachycardia, flushing, headache, vomiting, aggravation of angina	Eclampsia

8.2.8 Management of secondary hypertension

Secondary hypertension is a type of hypertension which by definition is caused by an identifiable underlying secondary cause. It is much less common than the other type, called essential hypertension, affecting only 5% of hypertensive patients. It has many different causes including endocrine diseases, kidney diseases, and tumors. It also can be a side effect of many medications. Secondary causes of hypertension and their suggestive signs are given in Table 5. Additional investigations of patients for secondary causes of hypertension are particularly appropriate in the following groups:

- Young patients under 40 years of age
- Patients with malignant hypertension
- Patients resistant to antihypertensive therapy
- Patients with unusual symptoms (such as sweating attacks or weakness)
- Patients with abnormal renal function, proteinuria or haematuria
- patients with hypokalaemia off diuretic therapy
- BP begins to increase for uncertain reason after being well controlled
- Onset of hypertension is sudden.

Treatment of secondary hypertension depends on the cause of high blood pressure. Treatments associated with some specific conditions are given in Table 12.

Table 12: Secondary hypertension and their treatment

Chronic kidney diseases	ACE-I or/ and ARBs
Cushing Syndrome	Withdrawal of steroid treatment (If iatrogenic) Tumor resection
Hyperaldesteronism	Spironolactone and tumor resection
Pheochromocytoma	Tumor resection is specific treatment. To control hypertension alpha blocker should be started initially before starting Beta Blockers.
Renal Artery Stenosis or Coarctation of aorta	Angioplasty with stenting of stenotic segment; if it fails or not suitable, surgical correction may be done.

8.2.9 Management of resistant hypertension

Resistant hypertension is defined as high blood pressure that remains uncontrolled despite treatment with at least three antihypertensive agents (one of which is usually a diuretic) at highest tolerated doses. National Institute for Health and Clinical Excellence (NICE) guideline suggests that the three agents would usually be an angiotensin converting enzyme (ACE) inhibitor or an angiotensin receptor blocker plus a calcium channel blocker plus a thiazide-type diuretic.[8] A diagnosis of true resistant hypertension should be made only after a thorough assessment to exclude apparent or pseudo-resistant hypertension.[15,16]

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
    - o Inadequate doses
    - o Inappropriate combinations
    - o Poor patient adherence
    - o Complicated dosing schedules
- 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 tumours

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 ≤4.5 mmol/L. If Spironolactone causes painful gynaecomastia then Amiloride or Eplerenone can be considered as a substitute. Centrally acting α agonists (Methyldopa and Clonidine) or direct vasodilators (Hydralazine and Minoxidil) are further options. With direct vasodilators, concomitant high-dose beta-blockers (Metoprolol or Atenolol) 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. Trials have shown substantial blood pressure reductions in response to renal denervation, in the order of 30/15 mm Hg, maintained beyond two years on extended follow-up of the original study cohorts .[17]

9. The therapeutic approach in special situation

9.1 Hypertension in elderly

The definition of hypertension in the elderly is the same as the general adult population. The prevalence of hypertension increases with age. Hypertension in the elderly (i.e., above age 65) is an increasingly important public health concern as our population ages. According to the Bangladesh Non-communicable Disease (NCD) Risk Factor Survey 2010, prevalence of hypertension in adults aged ≥ 65 years, is 41.1 % in general, 38.6% in men and 47.1 % in women.[5] Other reports also stated that among the elderly, the prevalence of hypertension ranges from 40 to 65%.[3, 18-19]

Special features of hypertension in elderly

- Blood pressure may be falsely high due to excessive arterial stiffness (pseudohypertension).
- Isolated systolic hypertension is more common.
- White-coat hypertension is also more common in the elderly.
- Postural hypotension and hypertension are more commonly seen.
- Co-morbidities are common.
- Adverse effects of drugs are more probable.

Clinical assessment and diagnosis

Recommendations for BP measurements in the elderly patients are similar to 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.[12] Home BP measurements may be important to avoid potential hazards of excessive BP reduction in older people.

Management

Initial assessment

The elderly patient with known or suspected hypertension is to be evaluated for reversible and/or treatable causes, target organ damage, other cardiovascular risk factors, co-morbid conditions and barriers to treatment adherence. History and physical examination should focus on the duration, severity, causes, or exacerbations of high BP, current and previous treatments including adverse effects, assessment of target organ damage, and other CVD risk factors and co-morbidities. The recommended laboratory investigations include:

- fasting blood sugar;
- serum creatinine;
- fasting lipid profile;
- serum potassium;
- routine urinalysis
- Chest X ray
- electrocardiogram (ECG), and
- echocardiography, in selected elderly persons.

Initiation of treatment

In general, elderly hypertensive patients are to be treated with non pharmacological interventions; and when needed, drug therapy should be added.

Goals of treatment

The general recommended BP goal in uncomplicated hypertension is <140/90 mm Hg. However the recent JNC 8 recommended that in uncomplicated hypertension in elderly aged 60 years more the target BP is <150/90 mm Hg (JNC8).[14]

For those >80 years of age, systolic BP 140 to 145 mmHg, if tolerated, can be acceptable. Patients with diabetes mellitus, chronic kidney disease, coronary artery disease or heart failure should have a BP <130/80 mm Hg.[7, 19]

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

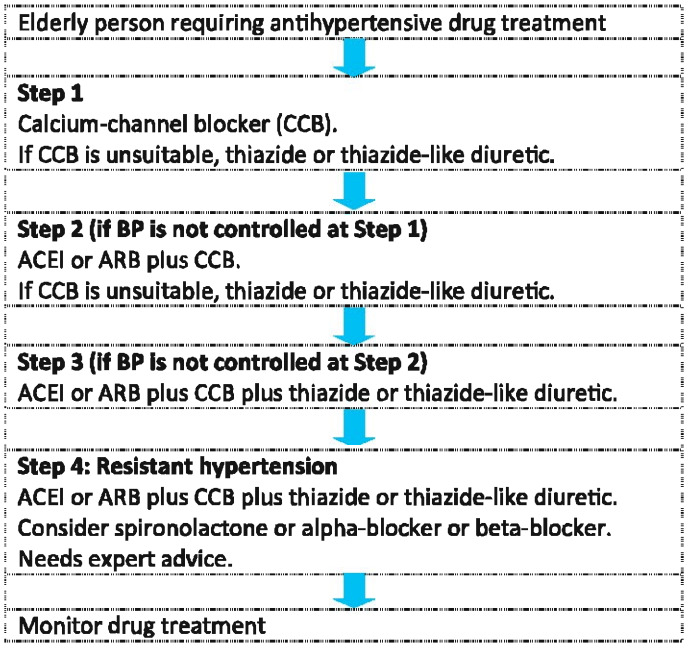
The initial antihypertensive drug is to be started at the lowest dose and gradually increased, depending on BP response, to the maximum tolerated dose. If the BP response is inadequate after reaching the optimum dose, a second drug from another class is to be added. If there are adverse effects or no therapeutic response, a drug from another class is to be substituted. If a diuretic is not the initial drug, it is usually indicated as the second drug. If the antihypertensive response is inadequate after reaching full doses of 2 classes of drugs, a third drug from another class is to be added.

When BP is >20/10 mm Hg above goal, therapy is to be initiated with 2 antihypertensive drugs.[19, 20]

For uncomplicated hypertension, thiazide or thiazide-like diuretics, calcium channel blockers (CCBs), angiotensin converting enzyme inhibitors (ACEIs), or angiotensin receptor blockers (ARBs) are preferred.[8,20] For complicated hypertension i.e. hypertension accompanied by co-morbidities, choice of antihypertensive drug depends on the specific co-morbidity.

Treatment needs to be individualized. Compliance of the patient should always be thought of, and the patient is to be counseled for motivation.

Fig. 2 Antihypertensive drug treatment in Elderly



Recommendations for hypertension in the very elderly (>80 years)[20]

- Initiate treatment with a single drug followed by a second drug if needed.
- Achieve systolic BP <140 to 145 mm Hg, if tolerated.
- Use low-dose thiazide or thiazide-like diuretics, CCBs, and ACEIs or ARBs.
- Let concomitant conditions dictate selection of the most appropriate drugs.
- Monitor the patient frequently with the medical history updated at each visit. Always check standing BP for excessive orthostatic decline.
- Avoid systolic BP <130 and diastolic BP <65 mmHg.

9.2 Hypertension in pregnancy

Hypertension in pregnancy can be classified in to three groups.

1. Pregnancy induces hypertension or gestational hypertension: New hypertension (≥140/90 mm Hg) developed after 20 weeks of pregnancy which may be normalized within 6 weeks of delivery.
   a) Pre-eclampsia:
      Hypertension with proteinuria after 20 weeks of pregnancy.
   1. Mild pre-eclampsia; DBP<110 mm Hg without significant proteinuria.
   2. Severe pre-eclampsia; DBP ≥ 110 mm of Hg with proteinuria (++)or
      DBP ≥ 90 mm of Hg with severe headache, blurring of vision, epigastric pain, or vomiting and proteinuria ++ or more
   b) Eclampsia: Pre-eclampsia complicated with convulsion and/or coma.
2. Chronic Hypertension: elevated blood pressure (≥ 140/90 mm Hg) diagnosed before pregnancy or developed during pregnancy before 20 weeks and after delivery it persists, known as chronic hypertension.
3. Pre-eclampsia/eclampsia superimposed on chronic hypertension. This can be diagnosed by the appearance of any of the following in a woman with chronic hypertension:

   i) De novo proteinuria after gestational week 20
   ii) A sudden increase in the severity of hypertension
   iii) Appearance of features of preeclampsia-eclampsia, and
   iv) A sudden increase in proteinuria in women who have preexisting proteinuria early in gestation

Investigation:

1. Urinalysis:
   a. If>1+ proteinuria on dipstick arrange for 24 hour collection to quantify proteinuria
2. Routine blood test:
   Hb%, CBC, Blood Glucose, Serum Creatinine, Serum Electrolytes, ALT & S. bilirubin

3. USG of lower abdomen for assessment of -
   a. Duration of gestation
   b. For assessment of fetal well being
   c. Amniotic fluid volume
   d. Placental localization and maturity.

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. Methyl dopa 250-500 mg tid or qid
- Tab. Labetalol 100 mg tid or qid
- Tab. Nifedipine 10-20 mg bid

Severe Pre-eclampsia
- Anti-hypertensive drugs (IV)
- Anti-convulsant (MgSO4 therapy for prevention of convulsion

Anti-hypertensive drugs:
- 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 mm Hg
  - IV infusion regime
    - Infection 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 mm Hg

- 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)

Pre-eclampsia with pulmonary edema:

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

Prevention of Pre-eclampsia (in those with past history)

- Low dose aspirin
- Calcium supplement

Key points in primary care practice [10]

Although women with hypertensive disorders of pregnancy should be managed by an obstetrician, the primary care physician plays an important role in preventing, detecting, monitoring and managing preeclampsia and its complications to a certain extent, both during the pre conceptional and antenatal periods:

1. Preconception counseling and adjustment of treatment in women with chronic hypertension.

Women with chronic hypertension may require a change in the type of antihypertensive agent used pre-pregnancy. The drugs of choice in pregnancy are still methyldopa and labetalol. Atenolol has been shown to lead to fetal growth restriction. The use of ARBs & ACEIs is contraindicated in pregnancy. In pregnancy, BP tends to drop in early pregnancy and is at its lowest mid-pregnancy. Subsequently it rises gradually to pre-pregnancy levels at term. There is inadequate evidence for or against continuing antihypertensive treatment in women with chronic hypertension when their BP drops naturally in pregnancy

2. Recognition of women at high risk of preeclampsia and referral in early pregnancy for screening and prophylaxis.
This includes women with

a. existing chronic medical disorders such as obesity, hypertension, diabetes mellitus, renal disease, connective tissue disease and thrombophilia
b. previous history of preeclampsia or eclampsia or intrauterine growth restriction (IUGR) or unexplained stillbirth
c. family history of preeclampsia or eclampsia
d. extremes of reproductive age (below 20 or above 40 years old)

They should be referred for specialist assessment and management before 16 weeks of pregnancy.

3. Nutritional supplementation for prevention of preeclampsia and/or its complications.

High calcium supplementation of 1.5 g/day significantly reduces the risk of eclampsia, severe gestational hypertension, and severe preeclamptic complication index in pregnant women with low dietary calcium intake (less than 600 mg/day).

4. Prevention of eclampsia and other complications of preeclampsia

Patient education with regard to disease symptomatolog, and medical staff awareness of symptoms and signs of severe disease are important. Early diagnosis and referral to an obstetrician for further management may prevent progression to eclampsia.

9.3 Hypertension in children and adolescents

High blood pressure affects people of all ages including young children. Prevalence of hypertension in children and adolescents is increasing with the increasing prevalence of obesity in this group of individuals. The definition of hypertension in children and adolescents is based on age, gender and height. Hypertension is defined as average systolic or diastolic BP >95th percentile for age, gender and height percentiles on at least 3 separate occasions. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents has provided normative tables of BP based on age and gender adjusted for height percentiles from the National Centre for Health Statistics (NCHS) growth chart12 This is to allow for a more precise classification of BP and avoids mislabeling children who are either too tall or too short. (Appendix 4)

Etiology

Hypertension can be primary (i.e. essential) or secondary. In general, the younger the child and the higher the BP, the greater the likelihood that hypertension is secondary to an identifiable cause (Table 15). A secondary cause of hypertension is most likely to be found before puberty; after puberty, hypertension is likely to be essential

Table 15.Common Causes of Hypertension in Children by Age

		Children	
Infants	1-6 years	7-12 years	Adolescents
Thrombosis of renal artery or vein	Essential hypertension	Renal artery stenosis	Coarctation of aorta
Congenital renal anomalies	Renal parenchymal disease	Renovascular abnormalities	Endocrine causes
Bronchopulmonary dysplasia	Endocrine causes	Wilms tumor	Essential hypertension
Coarctation of aorta	Renal parenchymal disease	Neuroblastoma	Renal parenchymal disease
		Coarctation of aorta	

In general the causes of hypertension in children are follows.

- Renal Cause:
  - Congenital dysplastic kidneys, Multicystic kidney disease, Polycystic kidney disease, Hydronephrosis, Renal artery stenosis, Renal vein thrombosis, Glomerulonephritis, Acute tubular necrosis, Hemolytic-Uremic syndrome, obstructive uropathy, Wilms tumor, Diabetic nephropathy and Pyelonephritis,
- Cardiovascular Cause:
  - Coarctation of aorta, Takayasu's arteritis,
- Endocrine Cause:
  - Cushing's syndrome, Hyperthyroidism, Hyperparathyroidism, Congenital adrenal hyperplasia and Pheochromocytoma.
- Medications, drugs and toxins/poisons:
  - Corticosteroids, Tacrolimus, Cyclosporine, Erythropoietin, Amphetamines, Oral contraceptives, Anabolic steroids, Phencyclidine, Vitamin D intoxication, Smoking, Lead, thallium and mercury toxicity.
- Central nervous system:
  - Brain tumors, intracranial hemorrhage, Raised ICP, Autonomic dysfunction, Neuroblastoma and Encephalitis,
- Autoimmune Cause:
  - Systemic lupus erythematosis, Polyarteritis nodosa, Rheumatoid arthritis, Connective tissue disorders.
- Miscellaneous:
  - Obesity, Hypocalcaemia, Hypervolemia.
- Genetic Cause:
  - Turner's syndrome, Syndrome, Friedreich's ataxia, Tuberous sclerosis complex,
  - Neurofibromatosis, Multiple endocrine neoplasia.

Classification of hypertension in children

To assist clinicians in the further evaluation and management of hypertensive children and adolescents, hypertension in this group has been arbitrarily divided into normal, pre hypertension, stage 1 and stage 2 hypertension.

Table 14. Classification of hypertension in children and adolescents with measurement frequency and recommended therapy

	SBP or DBP percentile	Frequency of BP measurement	Pharmacologic therapy*
Normal	<90th	No data available	-
Pre hypertension	90th to <95th or If BP >120/80 even if <90th percentile up to 95th percentile	Recheck 6 months	None unless compelling Indications e.g. CKD, DM, heart failure
Stage 1 hypertension	95th to 99th percentile plus 5 mmHg	Recheck in 1-2 week, sooner if symptomatic, refer within 1 month	Secondary or symptomatic hypertension, TOD or failed nonpharmacologic measures
Stage 2 hypertension	>99th percentile plus 5 mmHg	Immediately if symptomatic refer within a week	Initiate therapy

** nonpharmacologic measures recommended in all prehypertensives and hypertensive children.*

Assessment and evaluation

Measurement of BP in children follows the same principles as set out in the section on BP measurement. Special attention needs to be paid in the selection of an appropriate cuff size in relation to the child's right upper arm.

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,
- Failure to thrive

- History of head or abdominal trauma
- Family history of heritable diseases (e.g. neurofibromatosis & hypertension)
- Medications (eg, pressure substances, steroids, tricyclic antidepressants
- Episodes of pyelonephritis (perhaps suggested by unexplained fevers) that may, result in renal scarring
- Dietary history, including caffeine, more 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.

Physical Examination

Measurement and recording of blood pressure:

Medical care includes yearly measurement of blood pressure (BP) in every child older than 3 years, preferably by means of auscultation with a mercury gravity manometer. Proper cuff size is essential for accurate measurement of BP. The width of the rubber bladder inside the cloth should cover at least 40% of the patient arm circumference at a point mid way before the olecranon and acromion. The length of the bladder in the cuff should 80-100% of the circumference of the arm. The child should be sitting relaxed in a comfortable position. In case of suspected coarctation of the aorta, blood pressure to be measured in the leg.

Signs and symptoms that should alert the physician to the possibility of hypertension in neonates include the following:

- 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 all of the above, as well as the following:

- Headache
- Shortness of breath

- Chest pain
- Vomiting
- Fatigue
- Blurred vision
- Epistaxis
- Bell's palsy

Investigations

Complete blood count, Basic metabolic panel including magnesium and phosphate, Serum uric acid, Fasting lipid profile, Fasting blood glucose, Urine analysis/culture, Urine electrolytes, creatinine, protein, Chest X-ray, ECG and echocardiogram, Renal ultrasound with Doppler.
Further workup if needed depending upon the etiology.

Management

Once a child is diagnosed with hypertension, he should be referred to a paediatrician for further evaluation and management. Non-pharmacologic management particularly weight reduction in those who are obese is recommended in all children with hypertension as well as those with BP in the 90th to 95thpercentile. The recommendations for drug therapy in children are similar as for adults, with children requiring more careful dose adjustment. The goal of pharmacologic therapy is to reduce BP to lower than 95th percentile in uncomplicated primary hypertension and <90th percentile for children with TOD, CKD and diabetes mellitus.

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 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, child's high blood pressure persists into adulthood, the child could be at risk of: Stroke, Heart attack, Heart failure, Kidney disease

9.4 Stroke

Stroke is recognized as third most common cause of mortality and most common cause of disability worldwide. The prevalence of stroke in different parts of the world is 4.7-10.2/1000 population[20]. The prevalence of stroke in Bangladesh is from 3-9 per 1000[21-22]. Hypertension is the most common and very important risk factor for stroke of any type[23]. In addition to degree and duration of hypertension both systolic and diastolic BP are also equally responsible for stroke[23]. As stroke occurs commonly in elderly, systolic BP is more related to stroke in that age group. About 60-70% of stroke patient have hypertension at the time of admission and 70-80% may have high BP immediately after the stroke. Incidence of stroke is 3 times higher in persons with stage 2 or stage 3 hypertension and reduction of systolic BP 10-12 mmHg and diastolic BP 5-6 mmHg is associated with 38% reduction of stroke incidence[24].

Treatment of hypertension in acute stroke is still a persistent controversy. 10-20% of patients with acute stroke may have reactionary high BP for initial 5-7 days after onset of stroke[25]. Usually the level of this reactionary blood pressure within mild to moderate range and does not need treatment. Large fall or increase in BP is associated with poor outcome in acute stroke. High BP (220/110mm Hg) during acute stroke aggravates cerebral edema and leading to reduction in cerebral perfusion pressure that results in more ischemia. On the other hand lower pressure (<100/60mm Hg) aggravates ischemic Penumbra so judicious approach is necessary for the treatment of hypertension in acute stroke[23]. The basic issues need to be considered in the management of hypertension in acute stroke are the following.

- Timing of treatment initiation
- Type of stroke
- Target of BP
- Presence of co-morbid disease
- Ways of BP reduction
- Drug selection
- Whether a candidate for rt PA or not
- Duration of treatment

Timing of treatment initiation: This depends on the level of BP, whether patient is a known hypertensive or not & whether on any medication or not. If there is mild to moderate rise e.g. up to 180/110 mmHg, It is better to wait for 5-7 days, particularly if the patient is not known hypertensive. If the patient is known hypertensive and on drug or not then either start the treatment or continue the previous medication. But always keep eye on the level of BP. So that it does not fall drastically e.g. reduce BP slowly over 2-3 days[23]. If the patient is not known hypertensive and if there is no target organ involvement, then treatment should be started after 5-7 days. If there is target organ involvement - then should be started immediately but slowly buildup dose for gradual reduction of BP. If there is severe hypertension (>220/120 mm Hg), immediate reduction of BP is necessary but not more than 20% within first 24-hrs e.g. slow reduction of BP. The preferred agents are I / V Labetalol, Nitrupruside, Hydralazine, Nicardipine etc. but sublingual Nifidipine is not recommended[26].

Type of stroke: Stroke is basically of two types – ischemic (80-85%) and haemorrhagic (15-20%). Haemorrhage stroke is again two types intracerebral haemorrhage (ICH) (80-85%) and subarachnoid haemorrhage (SAH) (15-20%)[20]. The treatment strategy differs according to type of stroke. 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. In intracerebral haemorrhage: the strategy is similar like ischemia stroke but the targeted BP is less – than the ischemic stroke. In subarachnoid haemorrhage, the targeted mean arterial pressure (MAP) is more than the ischemia stroke.

Target of BP[26]: In ischemic stroke MAP is to be kept around 105-110 mmHg but if there is target organ involvement MAP should be around 90-95 mmHg. In haemorrhagic stroke the target BP is 5mm more in SAH and 5mm less in ICH compared to ischemic stroke.

Presence of any co-morbid disease: If there is any other co-morbid disease e.g. renal failure, diabetes mellitus, cardiac failure , then these should be kept in mind during selection of drug. The targeted BP is around 100 mmHg [26]

Ways of BP reduction: It is a rule to reduce BP slowly in the treatment of 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 hrs. Always oral agents are preferred.

Drug Selection: It is very important to select drug judiciously.[27] There are many groups of anti-hypertensive agents in the market but not all are equally preferred in stroke. There are few multicentric trials those showed ARB, ACEI, has additional benefit in stroke. Among all the groups of drugs according to priority ARB, ACEI, Calcium Channel blocker, Alpha blocker, Beta-blocker, Diuretics are used4. The use of diuretics needs special attention, because sometimes the stroke patient may be dehydrated and may have hyponatremia. The use of diuretics may aggravate the situation.

Whether a candidate for rTPA or not: If the patient is a candidate for rtPA, then there is necessary for intervention because high BP >180 / 110 mm Hg is a contraindication for rt PA in ischemia stroke. The approach is same for ischemia stroke.[23]

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 in among general population such as, some people may have an idea that if drug treatment started then It will have to continue for lifelong so it is better not to start, somebody feels that with medication if the BP is control, then drug can be stopped, somebody feels that it is better if drug is taken when the symptom appears, but actually all these are harmful. He is wise who start treatment, continue treatment, because if the BP is kept under control many serious complications of hypertension may be avoided.

9.5 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

Pharmacological treatment should be initiated in patients with diabetes when the BP is persistently >130 mmHg systolic and/or >80 mmHg diastolic.[6] 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.[6] 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 at 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
- Dyslipidaemia 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. ARBs have been reported to be superior to conventional non-ACEI antihypertensive drugs in terms of slowing the progress of nephropathy at the microalbuminuric stage as well as the overt nephropathy stage in type 2 diabetic patients. 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. However, 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 nondihydropyridine 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.

9.6 Kidney diseases

Chronic Kidney disease (CKD) is a world-wide threat to public health. The disease is increasing more rapidly in developing rather than in developed nation. CKD progresses to end stage renal disease (ESRD) unless it is detected and treated at early stage. The commonest cause of CKD in Bangladesh is Glomerular and tubulo-interstitial disease, diabetes mellitus and hypertension. Hypertension is also a complication of CKD. Renal disease is the most important cause of secondary hypertension. Hypertension in renal disease is often associated with an elevated serum creatinine, proteinuria and/or haematuria. Approximately 50- 75% of individuals with GFR<60 ml/min/1.72m^2 (CKD stages 3-5) have hypertension. Hypertension accelerates the progression of renal disease and may lead to end stage renal disease (ESRD). Tight control of BP is therefore important.

Non diabetic kidney disease

Non diabetic Kidney disease includes glomerular kidney disease without diabetes, vascular disease other than renal artery stenosis, tubulo interstitial disease and cystic disease. Glomerular diseases are associated with higher level of protenuria and with faster progression of kidney disease and risk of CVD. Target blood pressure in non diabetic kidney disease should be <130/80 mmHg for those with proteinuria of < 1g/24 hours and <125/75 mmHg for those with proteinuria of > 1g/24 hours. However, recent JNC8 guideline recommend to have target level in CKD patients as <140/90 mmHg.

In the management of hypertension in renal disease, control of BP and proteinuria are the most important factors in terms of retarding the progression of renal disease.[10, 13] Antihypertensive agents that reduce proteinuria thus have an advantage.

Meta-analyses of comparative trials concluded that ACEI conferred an anti-proteinuric effect greater than other anti-hypertensive drugs. Overall 30% reduction in incidence of ESRD with ACEI can be expected. The anti-proteinuric effect and reduction in ESRD was beyond that attributable to the BP lowering effect. ARBs are similar to ACEI in lowering BP and reducing proteinuria. The combination of ACEIs and ARBs has also been proven to reduce the rate of doubling of serum creatinine and ESRD more than monotherapy with either agent in nondiabetic proteinuric renal disease.

Renal insufficiency should not be a contraindication to starting ACEI or ARB therapy, nor should it be a reason for discontinuing therapy. Serum creatinine level should be checked within the first two weeks of initiation of therapy. If there is a persistent rise of serum creatinine of

30% from baseline within two months, ACEIs should be stopped. Similar caution should be exercised with the use of ARBs. In patients with renal disease and hypertension with an elevated serum creatinine of >200 mcmol/L, thiazide diuretics may not be effective antihypertensive agents and therefore loop diuretics are preferred. Concurrent diuretic therapy will often be necessary in patients with renal insufficiency since salt and water retention is an important determinant of hypertension in this setting. CCBs may be used in renal disease. In those with proteinuria, the non-dihydropyridine group of CCBs namely diltiazem or verapamil are preferred, as they have an additional antiproteinuric effect. The combination of an ACEI and a non-dihydropyridine CCB is more anti-proteinuric than either drug alone.

Diabetic kidney disease

Diabetes mellitus is the commonest cause of CKD in Bangladesh. Diabetic kidney disease is characterized by the early onset albumenuria, hypertension and high risk of progression of kidney disease and coexistent or subsequent CVD.

a. Target blood presser in diabetic kidney disease should be 130/80 mm Hg.
b. Patients with diabetic kidney disease with or without hypertension should be treated with ACE inhibitor or an ARB.

9.7 Coronary artery diseases and heart failure

Ischemic heart disease (IHD) is the most common form of target organ damage associated with hypertension. In patients with hypertension and stable angina pectoris, the first drug of choice is usually a beta-blocker; alternatively, long-acting calcium channel blocker (CCB) can be used. In patients with acute coronary syndromes (unstable angina or myocardial infarction), hypertension should be treated initially with BBs and angiotensin converting enzyme inhibitors (ACEI), with addition of other drugs as needed for BP control. In patients with post myocardial infarction, ACEIs, BBs, and aldosterone antagonists have proven to be most beneficial[6].

After a myocardial infarction the risk of a subsequent fatal or non-fatal coronary event is greater if blood pressure is raised. Immediately or sometime after a myocardial infarction, beta-blockers, ACE-inhibitors

and ARBs have been proven to be useful with significant reductions in cardiovascular morbidity or mortality. The following table shows choice of antihypertensive agents in IHD & heart failure (Table-21)

Table 15: Selection of antihypertensive agent in IHD & Heart Failure (JNC-7)

Compelling indication	Diuretic	BB	ACEI	ARB	CCB	Aldo Ant
Heart failure	*	*	*	*		*
Postmyocardial infarction		*	*			*
High coronary disease risk	*	*	*		*	

*Compelling indications for antihypertensive drugs are based on benefits from outcome studies or existing clinical guidelines; the compelling indication is managed in parallel with the BP.

* Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; Aldo ANT, aldosterone antagonist; BB, beta-blocker; CCB, calcium channel blocker.
* Conditions for which clinical trials demonstrate benefit of specific classes of antihypertensive drugs

Heart Failure

Heart failure (HF), in the form of systolic or diastolic ventricular dysfunction, results primarily from systolic hypertension and IHD. BP and cholesterol control are the primary preventive measures for those at high risk for HF.

Raised blood pressure is infrequently seen in patients with overt heart failure because of pump failure and reduction in cardiac output. A number of randomized trials has shown improved survival or less hospitalization by the administration of antihypertensive drugs. Treatment includes thiazide and loop diuretics, as well as b-blockers, antialdosterone drugs, ACE inhibitors and angiotensin receptor blockers administered on top of diuretic therapy. In asymptomatic individuals with demonstrable ventricular dysfunction, ACEIs and BBs are recommended. For those with

symptomatic ventricular dysfunction or end-stage heart disease, ACEIs, BBs, ARBs and aldosterone blockers are recommended along with loop diuretics[1]. In patients with heart failure, if hypertension persists after the use of these agents, dihydropridine calcium antagonists can be added, particularly if there is concomitant angina. Summary of BP management in IHD & heart failure is shown below: (ESC Guidelines 2007)[7]

- In patients surviving a myocardial infarction, early administration of beta-blockers, ACE inhibitors or angiotensin receptor blockers reduces the incidence of recurrent myocardial infarction and death. These beneficial effects are due to the specific protective properties of these drugs but possibly also to the associated small BP reduction.
- Antihypertensive treatment is also beneficial in hypertensive patients with chronic coronary heart disease. The benefit can be obtained with different drugs and drug combinations (including calcium antagonists) and appears to be related to the degree of BP reduction. A beneficial effect has been demonstrated also when initial BP is 140/90 mmHg and for achieved BP around 130/80 mmHg or less[1]
- A history of hypertension is common while a raised BP is relatively rare in patients with congestive heart failure. In these patients, treatment includes thiazide and loop diuretics, as well as of beta-blockers, ACE inhibitors, angiotensin receptor blockers and antialdosterone drugs on top of diuretics. Calcium antagonists should be avoided unless needed to control BP or anginal symptoms.
- Diastolic heart failure is common in patients with a history of hypertension and has an adverse prognosis. There is at present no evidence on the superiority of specific antihypertensive drugs.

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

প্রাইমারি কেয়ার স্তরে চিকিৎসা সহকারী ও কমিনিউটি হেলথ কেয়ার প্রভাইডারদের জন্য 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 ধরে একই ভাবে বৃদ্ধি পেয়ে থাকে তখন এই রক্তচাপকে উচ্চ রক্ত চাপ বা হাইপারটেনশন বলে। সকল বয়সের লোকেরই এই উচ্চ রক্তচাপ হতে পারে। প্রায় দুই-তৃতীয়াংশ লোকই জানে না যে তাদের উচ্চ রক্তচাপ আছে। দৈনন্দিন জীবন যাপনের অথবা প্রয়োজন ভেদে ঔষদের মাধ্যমে উচ্চ রক্ত চাপ প্রতিরোধ অথবা নিয়ন্ত্রণ করা যায়। রক্ত চাপ সাধারণতঃ দুইটি পরিমাপের মাধ্যমে প্রকাশ বা লিপিবদ্ধ করা হয়। প্রথম এবং উপরের পরিমাপকে সিস্টোলিক (Systolic) এবং শেষ বা নীচের পরিমাপ ডায়াস্টলিক (Diastolic) ব্লাড প্রেসার বলা হয়।

পূর্ণ বয়স্কদের ক্ষেত্রে সিস্টোলিকরক্ত চাপ ১৪০ মিমি মার্কারী অথবা এর উপরে অথবা ডায়াস্টলিক রক্ত চাপ ৯০মিমি মাকরী অথবা এর উপরে হলে উচ্চ রক্ত চাপ ধরা হয়ে থাকে। সিষ্টোলিক রক্ত চাপ ১২০ মিমি মার্কারী এর কম এবং ডায়াস্টলিক রক্ত চাপ ৮০ মিমি মার্কারীর কম রাখাটা কাম্য । সিস্টোলিকরক্তচাপ ১২০-১৩৯ মিমি মাকরী অথবা ডায়াস্টলিক রক্ত চাপ ৮০-৯০ মিমি মাকরী হলে, এই গ্রুপের রুগীদের ভবিষ্যতে উচ্চ রক্ত চাপ হওয়া সম্ভাবনা বেশী ।

যদিও সিস্টোলিকএবং ডায়াস্টলিক রক্তচাপ দুটি ভিন্ন জাতের রক্ত চাপ তথাপিও যে কোন একটির বৃদ্ধিকে উচ্চ রক্ত চাপ বলা হয়। যেমন কোন ব্যক্তির সিস্টোলিকরক্ত চাপ স্বাভাবিক মাত্রার চেয়ে বেশি হলেও তাকে উচ্চ রক্ত চাপ বলা হয়। এৰেত্রে একে সিস্টোলিকউচ্চ রক্ত চাপ বলা হয়। উচ্চ রক্তচাপ রোগী নির্ণয়ের পুর্বে বিভিন্ন সময়ে কমপক্ষে দুইবা ততোধিকবার উচ্চ রক্তচাপ পাওয়া বাঞ্চনীয়।

উচ্চ রক্ত চাপের প্রকারভেদঃ

ক) এসেনশিয়াল হাইপারটেনশন (Essential hypertension) ঃ শতকরা প্রায় ৯৫ ভাগ রোগীর উচ্চ রক্তচাপের কোন কারণ খুজেঁ পাওয়া যায় না। এই ধরণের উচ্চ রক্তচাপকে এসেনশিয়াল হাইপারটেনশন বলে।

খ) সেকেন্ডারী হাইপারটেনশন (Secondary hypertension) ঃ কিছু ক্ষেত্রে উচ্চ রক্তচাপের সুনির্দিষ্ট কারণ খুজেঁ পাওয়া যায়। এই জাতীয় উচ্চ রক্ত চাপকে 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 সাধারণতঃ রক্তচাপ মাপার যন্ত্র (Sphygmomnometer) এর মাধ্যমে মাপা হয়। এই যন্ত্র রক্তচাপকে মিমি মাকরী (mm of Hg) হিসাবে প্রকাশ করে। বিভিন্ন প্রকার যন্ত্রের সাহায্যে রক্তচাপ মাপা যায়, যেমন-মার্কারী, অ্যানরয়েড, ডিজিটাল।

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 যাদেও Postural hypotension আছে বলে মনে হয় তাদের ক্ষেত্রে দাঁড়ানো অবস্থাতেও রক্ত চাপ মাপতে হবে।

- ❖ বাহু থেকে শক্ত ভাবে এটে থাকা কাপড় সরাতে হবে।
- ❖ বাহুকে হার্টের সমান সমতলে রাখতে হবে।
- ❖ যথাযথ মাপার কাপ (Cuff) ব্যবহার করতে হবে। রক্ত চাপ মাপার যন্ত্রের ব্লাডার, বাহুর দুই তৃতীয়াংশের বেশি জায়গা জড়িয়ে থাকতে হবে।

উচ্চ রক্তচাপের উপসর্গগুলি কি?

উচ্চ রক্ত চাপকে অনেক সময় "নিরব ঘাতক" বলা হয়, কারণ বেশিরভাগ সময় তেমন কোন উপসর্গই থাকে না । তাই অনেকে মনে করে তার কোন উচ্চ রক্ত চাপ সমস্যা নেই। তাই নিয়মিত রক্তচাপ পরীক্ষা করার মাধ্যমেই এই রোগ নির্ণীত হয়ে থাকে।

ল্যাবরেটরী পরীক্ষাঃ

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

১. প্রস্রাবের রুটিন পরীক্ষা
২. রক্তে গ্লুকোজের পরিমাণ
৩. রক্তে ক্রিয়াটেনিন মাত্রা
৪. রক্তে কোলেস্টেরল মাত্রা
৫. বুকের এক্স-রে
৬. ইসিজি (ইলেক্ট্রোকার্ডিওগ্রাম)

এ ছাড়া কিছু ক্ষেত্রে অন্যান্য পরীক্ষা নিরীক্ষার প্রয়োজন হতে পারে।

উচ্চ রক্তচাপের চিকিৎসাঃ

উচ্চ রক্তচাপের চিকিৎসাঃ প্রধানত দুই প্রকার-

১. জীবন শৈলীর পরিবর্তনের মাধ্যমে
২. ঔষধের মাধ্যমে

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

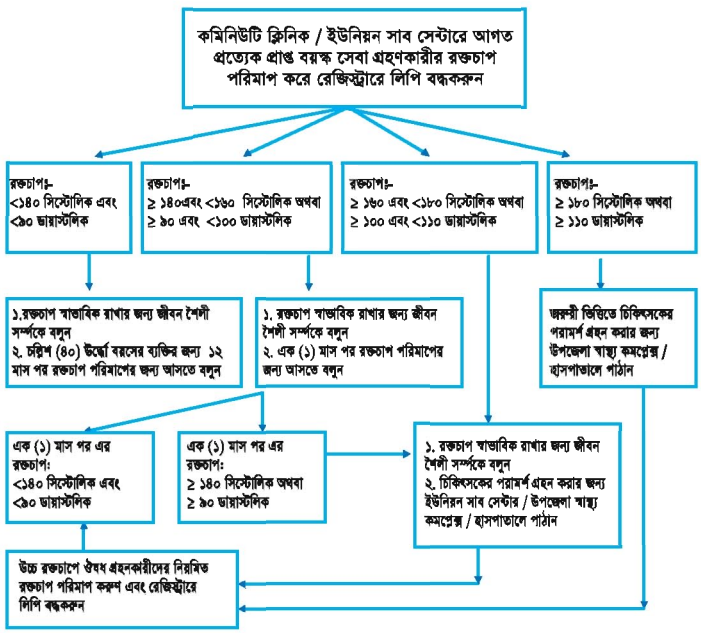
উচ্চ রক্ত চাপ ব্যবস্থাপনায় জীবন যাত্রার মানের পরিবর্তনে কার্যকর পদ্ধতি সমূহঃ

পরিবর্তন	নির্ধারিত মাত্রা
ওজন কমানো	শারীরিক স্বাভাবিক ওজন বজায় রাখা (BMI ১৮.৫-২৪.৯ কেজি/মিটার)
স্বাস্থ্য সম্মত খাবারের অভ্যস্ত হওয়া	তাজা ফলমুল, শাকসব্জি বেশী খাওয়া এবং চর্বি জাতীয় খাবার কম খাওয়া
খাবারেও লবণ কমানো	খাওয়ার লবন কম করে খেতে হবে। প্রতিদিন ৫ গ্রাম এর কম লবণ খেতে হবে। পাতে লবণ পরিহার করতে হবে।
শারীরিক পরিশ্রম	নিয়মিত কায়িক পরিশ্রম বা ব্যায়াম করতে হবে। যেমন- দৌড়ানো, হাঁটা, সাঁতার কাটা ইত্যাদি । দৈনিক কমপক্ষে ৩০মিনিট করে সপ্তাহে পাঁচদিন হাঁটলেই যথেষ্ট।
ধূমপান ও তামাকজাত দ্রব্য পরিহার	বিড়ি, সিগারেট, জর্দা, সাদাপাতা, গুল, ইত্যাদি সকল প্রকার দ্রব্য পরিহার করা।
মদ্যপান পরিত্যাগ করা	মদ্যপান পরিত্যাগ করতে হবে। অপারগতার ক্ষেত্রে প্রতিদিন দুইবার পান করে ১ আউন্স অথবা ৩০মি.লি. ইথানল অর্থ্যাৎ ২৪ আউন্স বিয়ার, ৩ আউন্স হুইস্কি ইত্যাদির কম খেতে হবে।

প্রাইমারি কেয়ার স্তরে উচ্চ রক্তচাপ নির্ণয় ও রেফারেলঃ

চিকিৎসা সহকারী ও কমিনিউটি হেলথ কেয়ার প্রভাইডার স্বাস্থ্য ব্যবস্থার একেবারেই প্রথমিক স্তর থেকেই উচ্চ রক্তচাপের নিয়ন্ত্রনে গুরুত্ব পূর্ণ ভুমিকা রাখতে পারে। কেন্দ্রে আগত সকল প্রাপ্ত বয়স্ক সেবা গ্রহণকারীর রক্তচাপ পরিমাপ করে একটি আলাদা রেজিস্ট্রারে লিপি বদ্ধ করা প্রয়োজন । নিম্নের ছকে বর্ণিত রক্তচাপের স্তর অনুযায়ী ব্যবস্থা গ্রহন করুন

প্রাইমারি কেয়ার স্তরে উচ্চ রক্তচাপ নির্ণয় ও রেফারেলের প্রবাহ চিত্র
চিকিৎসা সহকারী ও কমিনিউটি হেলথ কেয়ার প্রভাইডার (সি. এইচ. সি. পি.) এর ক্ষেত্রে প্রযোজ্য



উচ্চ রক্তচাপের চিকিৎসায় ব্যবহৃত ঔষধসমূহঃ

উচ্চ রক্তচাপ চিকিৎসায় বিভিন্ন ধরনের 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) ডাইইউরেটিক্স (Diuretics)ঃ এটা কিডনীর উপর কাজ করে শরীরের অতিরিক্ত পানি এবং লবণ নিস্কাশন করে উচ্চ রক্তচাপ কমায়। ফ্রুসেমাইড (Frusemide),থায়াজাইড, স্পাইরোনোলেকটোন, ইনডেপামাইড ইত্যাদি একক ভাবে অথবা অন্য ওষুধের সঙ্গে ব্যবহার করা যেতে পারে।

(খ) বিটা ব্লকার (Beta blockers)ঃ ইহা হার্টের স্পন্দন কমায় যেমন- প্রোপানোলল, এটিনোলল, কার্ভিডিলোন ইত্যাদি। হাঁপানি, COPD এবং হার্ট ফেইলিওর রুগীর এই ঔষধ ব্যবহার করা উচিত নয়।

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

(ঘ) এনজিওটেনসিন রিসেপ্টর ব্লকার (ARB)ঃ এই ওষুধ সমূহ অত্যন্ত কার্যকর ও নিরাপদ। লোসারটন, ভালসারটান, কেন্ডেসারটান ইত্যাদি। গর্ভবস্থায় এই ওষুধ সমূহ নিষিদ্ধ।

(ঙ) ক্যালসিয়াম চ্যানেল ব্লকারস (Calcium channel blocker)ঃ রক্তনালী প্রসারণের মাধ্যমে এই ওষুধগুলো রক্তচাপ কমায়। যেমন- নিফিডিপিন, এমলোডিপিন, ভেরাপামিল ইত্যাদি। হার্টফেইলিওর রুগীকে এই সাবধানে ব্যবহার ব্যবহার করা উচিত।

উচ্চ রক্ত চাপের ফলাফলঃ

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

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

11. References

1. World Health Organization (2013). Global brief on hypertension. Silent killer, Global public health crises. Geneva 2013
2. Zaman MM and Rouf MA. Prevalence of hypertension in a Bangladesh adult population. Journal of Human Hypertension 1999;13: 547-549
3. Moniruzzaman, Taleb A, Rahman S, Acharya A, Islam FA, Ahmed MSA M, Zaman MM. Prevalence of hypertension among the Bangladeshi adult population a meta-analysis. Regional Health Forum 2013; 17:15-19 (http://www.searo.who.int/publications/journals/regional_health_ forum/rhfv17n1/en/)
4. Islam AKMM, Majumder AAS. Hypertension in Bangladesh. A review. Indian Heart Journal 6403 (2012) 319–323
5. World Health Organization, Non communicable diseases risk factor survey 2010, Bangladesh. Dhaka 2011 (http://www.searo.who.int/bangladesh/publications/ncd_risk_ractor_survey_report_ban_2010.pdf?ua=1)
6. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. NIH Publication No. 03-5233, December 2003 (http://www.nhlbi.nih.gov/guidelines/hypertension/express.pdf)
7. The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). 2007 Guidelines for the management of arterial hypertension. European Heart Journal (2007) 28, 1462–1536 (http://eurheartj.oxfordjournals.org/content/28/12/1462.full.pdf+html)
8. National Institute for Heath and Clinical Excellence. NICE clinical guideline 127. Hypertension: clinical management of primary hypertension in adults. 2011. (Downloaded from (www.nice.org.uk/guidance/CG127)
9. Seedat KY, Renner BL. South African Hypertension Guideline 2011. S Afr Med J 2012;102:57-84.
10. Ministry of Health Malaysia (2008). Clinical Practice Guidelines. Management of Hypertension (3rd Edition). Putrajaya, Malaysia
11. 2003 World Health Organization and International Society of Hypertension (ISH) Statement on management of hypertension. World Health Organization and International Society of Hypertension writing group. J Hypertens 2003; 21:1983-1992.
12. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. Pediatrics 2004;114: 555- 576.
13. Kidney Disease: Improving Global Outcomes (KDIGO) Blood Pressure Work Group. KDIGO Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease. Kidney inter., Suppl. 2012; 2: 337–414.

14. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). JAMA. doi:10.1001/jama. 2013.284427. (Published online December 18, 2013)
15. De la Sierra A, Segura J, Banegas JR, Gorostidi M, de la Cruz JJ, Armario P et al. Clinical features of 8295 patients with resistant hypertension classified on the basis of ambulatory blood pressure monitoring. Hypertension 2011;57:898-902
16. Daugherty SL, Powers JD, Magid DJ, Tavel HM, Masoudi FA, Margolis KL, et al. Incidence and prognosis of resistant hypertension in hypertensive patients. Circulation 2012;125:1635-42.
17. Myat A, Redwood SR, Qureshi AC, Spertus JA, Williams B. BMJ. 2012 Nov 20;345:e7473
18. Queasem I, Shetye SM, Alex SC, et al. Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India. Bull World Health Organ 2001;76:490–500.
19. Aronow WS, Fleg JL, Pepine CJ, et al. ACCF/AHA 2011 expert consensus document on hypertension in the elderly: A report of the American College of Cardiology Foundation Task Force on Clinical Expert Consensus Documents. J Am Coll Cardiol 2011;57(20):2037-114. doi:10.1016/j.jacc.2011.01.008.
20. VL Feigin, CMM Lawes, DA Bennett, CS Anderson. Stroke epidemiology: a review of population based studies of incidence, prevalence, and case-fatality in the late 20th century. Stroke : Lancet Neurology 2003; 2: 43–53
21. Zaman MM. Choudhury SR. Ahmed J, Hossain SMA, Sobhan SMM, Turin TC. Prevalence of stroke in a rural population of Bangladesh. Global Heart 2014 DOI:10.1016/j.gheart.2014.04.007
22. Mohammad QD, Habib M, Hoque A, Alam B, Haque B, Hossain S, Rahman KM, Khan SU. Prevalence of storke above forty years Mymensingh Med J: 2011.20 640-44
23. Dand SJ. Treating hypertension in acute ischemic stroke: from the stroke prevention and atherosclerosis research centre: University of Western Ontario, London. Circulation: 2008;118: 176-87
24. JhompSon G, Robinson; Potter F. Blood pressure in acute stroke. Age and Aging 2004; 33:6-12
25. Tonya NT, Achraf A- Risk factors associated with severity and location of intracerebral arterial stenosis. Stroke: 2010:41: 1636-1640,
26. Harrintion HC. Managing hypertension in patients with stroke. Critical Care Nurse 2003;23: 30-38
27. Goldstein BP, Cherge D B, Guidelines for primary prevention of stroke; (from American Heart & Stroke Association), Stroke 2011; 42: 517-584.

12. Annex

12.1 Annex 1: List of commonly used antihypertensive drugs and dosages

Table: Commonly used drugs for the treatment of hypertension

Anti hypertensive agents	Starting Dose	Maximum Daily Dose
Thiazide diuretics		
Chlorothiazide	250 mg od	500 mg od
Hydrochlorothiazide	25 mg od	200 mg od
Chlorthalidone	50 mg od	200 mg od
Indapamide SR	1.5 mg od	1.5 mg od
Indapamide	2.5 mg od	2.5 mg od
Beta Blockers		
Acebutolol	200 mg bd	400 mg bd
Atenolol	50 mg od	100 mg od
Bisoprolol	5 mg od	10 mg od
Metoprolol	50 mg bd	200 mg bd
Propranolol	40 mg bd	320 mg bd
Calcium-channel Blockers (CCB)		
Amlodipine	5 mg od	10 mg od
Diltiazem	30 mg tds	60 mg tds
Diltiazem SR	90 mg bd	90 mg bd
Felodipine	2.5 mg od	10 mg od
Isradipine	1.5 mg bd	2.5 mg bd
Lacidipine	2 mg	od 6 mg od
Lercanidipine	10 mg od	20 mg od
Nicardipine	10 mg tds	20 mg tds
Nifedipine SR	30 mg od	120 mg od
Nifedipine	SR 30 mg od	120 mg od
Verapamil	80 mg bd	240 mg tds
Verapamil	80 mg bd	240 mg tds

12.2 Annex 2: BP tables for children and adolescents *

Table: BP Levels for Boys by Age and Height Percentile

Age, y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	80	81	83	85	87	88	89	34	35	36	37	38	39	39
	90th	94	95	97	99	100	102	103	49	50	51	52	53	53	54
	95th	98	99	101	103	104	106	106	54	54	55	56	57	58	58
	99th	105	106	108	110	112	113	114	61	62	63	64	65	66	66
2	50th	84	85	87	88	90	92	92	39	40	41	42	43	44	44
	90th	97	99	100	102	104	105	106	54	55	56	57	58	58	59
	95th	101	102	104	106	108	109	110	59	59	60	61	62	63	63
	99th	109	110	111	113	115	117	117	66	67	68	69	70	71	71
3	50th	86	87	89	91	93	94	95	44	44	45	46	47	48	48
	90th	100	101	103	105	107	108	109	59	59	60	61	62	63	63
	95th	104	105	107	109	110	112	113	63	63	64	65	66	67	67
	99th	111	112	114	116	118	119	120	71	71	72	73	74	75	75
4	50th	88	89	91	93	95	96	97	47	48	49	50	51	51	52
	90th	102	103	105	107	109	110	111	62	63	64	65	66	66	67
	95th	106	107	109	111	112	114	115	66	67	68	69	70	71	71
	99th	113	114	116	118	120	121	122	74	75	76	77	78	78	79
5	50th	90	91	93	95	96	98	98	50	51	52	53	54	55	55
	90th	104	105	106	108	110	111	112	65	66	67	68	69	69	70
	95th	108	109	110	112	114	115	116	69	70	71	72	73	74	74
	99th	115	116	118	120	121	123	123	77	78	79	80	81	81	82
6	50th	91	92	94	96	98	99	100	53	53	54	55	56	57	57
	90th	105	106	108	110	111	113	113	68	68	69	70	71	72	72
	95th	109	110	112	114	115	117	117	72	72	73	74	75	76	76
	99th	116	117	119	121	123	124	125	80	80	81	82	83	84	84
7	50th	92	94	95	97	99	100	101	55	55	56	57	58	59	59
	90th	106	107	109	111	113	114	115	70	70	71	72	73	74	74
	95th	110	111	113	115	117	118	119	74	74	75	76	77	78	78
	99th	117	118	120	122	124	125	126	82	82	83	84	85	86	86
8	50th	94	95	97	99	100	102	102	56	57	58	59	60	60	61
	90th	107	109	110	112	114	115	116	71	72	72	73	74	75	76
	95th	111	112	114	116	118	119	120	75	76	77	78	79	79	80
	99th	119	120	122	123	125	127	127	83	84	85	86	87	87	88

Table: BP Levels for Boys by Age and Height Percentile (Cont)

Age,y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
9	50th	95	96	98	100	102	103	104	57	58	59	60	61	61	62
	90th	109	110	112	114	115	117	118	72	73	74	75	76	76	77
	95th	113	114	116	118	119	121	121	76	77	78	79	80	81	81
	99th	120	121	123	125	127	128	129	84	85	86	87	88	88	89
10	50th	97	98	100	102	103	105	106	58	59	60	61	61	62	63
	90th	111	112	114	115	117	119	119	73	73	74	75	76	77	78
	95th	115	116	117	119	121	122	123	77	78	79	80	81	81	82
	99th	122	123	125	127	128	130	130	85	86	86	88	88	89	90
11	50th	99	100	102	104	105	107	107	59	59	60	61	62	63	63
	90th	113	114	115	117	119	120	121	74	74	75	76	77	78	78
	95th	117	118	119	121	123	124	125	78	78	79	80	81	82	82
	99th	124	125	127	129	130	132	132	86	86	87	88	89	90	90
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91
13	50th	104	105	106	108	110	111	112	60	60	61	62	63	64	64
	90th	117	118	120	122	124	125	126	75	75	76	77	78	79	79
	95th	121	122	124	126	128	129	130	79	79	80	81	82	83	83
	99th	128	130	131	133	135	136	137	87	87	88	89	90	91	91
14	50th	106	107	109	111	113	114	115	60	61	62	63	64	65	65
	90th	120	121	123	125	126	128	128	75	76	77	78	79	79	80
	95th	124	125	127	128	130	132	132	80	80	81	82	83	84	84
	99th	131	132	134	136	138	139	140	87	88	89	90	91	92	92
15	50th	109	110	112	113	115	117	117	61	62	63	64	65	66	66
	90th	122	124	125	127	129	130	131	76	77	78	79	80	80	81
	95th	126	127	129	131	133	134	135	81	81	82	83	84	85	85
	99th	134	135	136	138	140	142	142	88	89	90	91	92	93	93
16	50th	111	112	114	116	118	119	120	63	63	64	65	66	67	67
	90th	125	126	128	130	131	133	134	78	78	79	80	81	82	82
	95th	129	130	132	134	135	137	137	82	83	83	84	85	86	87
	99th	136	137	139	141	143	144	145	90	90	91	92	93	94	94
17	50th	114	115	116	118	120	121	122	65	66	66	67	68	69	70
	90th	127	128	130	132	134	135	136	80	80	81	82	83	84	84
	95th	131	132	134	136	138	139	140	84	85	86	87	87	88	89
	99th	139	140	141	143	145	146	147	92	93	93	94	95	96	97

Table: BP Levels for Girls by Age and Height Percentile

Age,y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	83	84	85	86	88	89	90	38	39	39	40	41	41	42
	90th	97	97	98	100	101	102	103	52	53	53	54	55	55	56
	95th	100	101	102	104	105	106	107	56	57	57	58	59	59	60
	99th	108	108	109	111	112	113	114	64	64	65	65	66	67	67
2	50th	85	85	87	88	89	91	91	43	44	44	45	46	46	47
	90th	98	99	100	101	103	104	105	57	58	58	59	60	61	61
	95th	102	103	104	105	107	108	109	61	62	62	63	64	65	65
	99th	109	110	111	112	114	115	116	69	69	70	70	71	72	72
3	50th	86	87	88	89	91	92	93	47	48	48	49	50	50	51
	90th	100	100	102	103	104	106	106	61	62	62	63	64	64	65
	95th	104	104	105	107	108	109	110	65	66	66	67	68	68	69
	99th	111	111	113	114	115	116	117	73	73	74	74	75	76	76
4	50th	88	88	90	91	92	94	94	50	50	51	52	52	53	54
	90th	101	102	103	104	106	107	108	64	64	65	66	67	67	68
	95th	105	106	107	108	110	111	112	68	68	69	70	71	71	72
	99th	112	113	114	115	117	118	119	76	76	76	77	78	79	79
5	50th	89	90	91	93	94	95	96	52	53	53	54	55	55	56
	90th	103	103	105	106	107	109	109	66	67	67	68	69	69	70
	95th	107	107	108	110	111	112	113	70	71	71	72	73	73	74
	99th	114	114	116	117	118	120	120	78	78	79	79	80	81	81
6	50th	91	92	93	94	96	97	98	54	54	55	56	56	57	58
	90th	104	105	106	108	109	110	111	68	68	69	70	70	71	72
	95th	108	109	110	111	113	114	115	72	72	73	74	74	75	76
	99th	115	116	117	119	120	121	122	80	80	80	81	82	83	83
7	50th	93	93	95	96	97	99	99	55	56	56	57	58	58	59
	90th	106	107	108	109	111	112	113	69	70	70	71	72	72	73
	95th	110	111	112	113	115	116	116	73	74	74	75	76	76	77
	99th	117	118	119	120	122	123	124	81	81	82	82	83	84	84
8	50th	95	95	96	98	99	100	101	57	57	57	58	59	60	60
	90th	108	109	110	111	113	114	114	71	71	71	72	73	74	74
	95th	112	112	114	115	116	118	118	75	75	75	76	77	78	78
	99th	119	120	121	122	123	125	125	82	82	83	83	84	85	86

Table: BP Levels for Girls by Age and Height Percentile (Cont)

Age, y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
9	50th	96	97	98	100	101	102	103	58	58	58	59	60	61	61
	90th	110	110	112	113	114	116	116	72	72	72	73	74	75	75
	95th	114	114	115	117	118	119	120	76	76	76	77	78	79	79
	99th	121	121	123	124	125	127	127	83	83	84	84	85	86	87
10	50th	98	99	100	102	103	104	105	59	59	59	60	61	62	62
	90th	112	112	114	115	116	118	118	73	73	73	74	75	76	76
	95th	116	116	117	119	120	121	122	77	77	77	78	79	80	80
	99th	123	123	125	126	127	129	129	84	84	85	86	86	87	88
11	50th	100	101	102	103	105	106	107	60	60	60	61	62	63	63
	90th	114	114	116	117	118	119	120	74	74	74	75	76	77	77
	95th	118	118	119	121	122	123	124	78	78	78	79	80	81	81
	99th	125	125	126	128	129	130	131	85	85	86	87	87	88	89
12	50th	102	103	104	105	107	108	109	61	61	61	62	63	64	64
	90th	116	116	117	119	120	121	122	75	75	75	76	77	78	78
	95th	119	120	121	123	124	125	126	79	79	79	80	81	82	82
	99th	127	127	128	130	131	132	133	86	86	87	88	88	89	90
13	50th	104	105	106	107	109	110	110	62	62	62	63	64	65	65
	90th	117	118	119	121	122	123	124	76	76	76	77	78	79	79
	95th	121	122	123	124	126	127	128	80	80	80	81	82	83	83
	99th	128	129	130	132	133	134	135	87	87	88	89	89	90	91
14	50th	106	106	107	109	110	111	112	63	63	63	64	65	66	66
	90th	119	120	121	122	124	125	125	77	77	77	78	79	80	80
	95th	123	123	125	126	127	129	129	81	81	81	82	83	84	84
	99th	130	131	132	133	135	136	136	88	88	89	90	90	91	92
15	50th	107	108	109	110	111	113	113	64	64	64	65	66	67	67
	90th	120	121	122	123	125	126	127	78	78	78	79	80	81	81
	95th	124	125	126	127	129	130	131	82	82	82	83	84	85	85
	99th	131	132	133	134	136	137	138	89	89	90	91	91	92	93
16	50th	108	108	110	111	112	114	114	64	64	65	66	66	67	68
	90th	121	122	123	124	126	127	128	78	78	79	80	81	81	82
	95th	125	126	127	128	130	131	132	82	82	83	84	85	85	86
	99th	132	133	134	135	137	138	139	90	90	90	91	92	93	93
17	50th	108	109	110	111	113	114	115	64	65	65	66	67	67	68
	90th	122	122	123	125	126	127	128	78	79	79	80	81	81	82
	95th	125	126	127	129	130	131	132	82	83	83	84	85	85	86
	99th	133	133	134	136	137	138	139	90	90	91	91	92	93	93

* The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. Pediatrics 2004;114: 555- 576.

12.3 Annex 3: Members of the expert committee

Sl. No	Name and designation	Institute / Organization
1.	National Professor Brig. (Rtd.) Abdul Malik Secretary General	National Heart Foundation of Bangladesh
2.	Professor Dr. M. Amanullah, MP President, Bangladesh Cardiac Society	Bangladesh Cardiac Society
3.	National Professor M R Khan Chairman, Institute of Child Health & Shishu Sasthya Shishu Sasthya Foundation	Institute of Child Health & Shishu Sasthya Shishu Sasthya Foundation
4.	National Professor Dr Shahla Khatun Head & Professor of Obstetrics & Gynecology	Bangladesh Medical College & Hospital
5.	Professor R K Khandaker Vice President	National Heart Foundation of Bangladesh of Bangladesh
6.	Professor SM Keramat Ali Former Professor of Clinical Nutrition, Dhaka University	Daffodil University
7.	Professor Mohammad Nazul Islam Professor of Interventional Cardiology	Bangabandhu Sheikh Mujib Medical University
8.	Professor KMHS Sirajul Haque Former Chairman & Professor of Cardiology, Bangabandhu Sheikh Mujib Medical University	Anwar Khan Medical College
9.	Professor Dr. Harun-Or-Rashid Chief Consultant, Department of Nephrology,	Kidney Foundation Hospital & Research Institute`
10.	Professor AKM Rafique Uddin Professor of Medicine & Principal	Enam Medical College
11.	Professor M A Faiz Ex DG (Health) and Professor of Medicine	Sir Salimullah Medical College & Mitford Hospital, Dhaka
12.	Professor AKM Mohibullah, Senior Consultant & Head Department of Cardiology	BIRDEM Hospital, Shahbagh, Dhaka
13.	Professor Dr. Md. Abu Siddique Chairman & Professor	Bangabandhu Sheikh Mujib Medical University
14.	Professor Sajal Krishna Banerjee Professor of Cardiology	Bangabandhu Sheikh Mujib Medical University
15	Professor Abdullah Al Shaii Majumder Director & Professor, Department of Cardiology	National Institute of Cardiovascular Diseases
16.	Professor Dr. Quazi Deen Mohammad Principal cum Professor of Neurology	Dhaka Medical College & Hospital,
17.	Professor Kanu Bala Specialist in Gastroenterology & Hepatology Professor of Family Medicine	Bangladesh Institute of Family Medicine & Research
18.	Professor Waziul Alam Chowdhury Director, National Institute of Mental Health	National Institute of Mental Health
19.	Professor Redwanur Rahman Professor of Medicine	Shaheed Suhrawardy Medical College Hospital
20.	Professor Dr. H. I. Lutfur Rahman Khan Head of the Dept. of Cardiology	Dhaka Medical College, Dhaka
21.	Professor Mahmudur Rahman Director	Institute of Epidemiology, Disease Control & Rsearch
22.	Professor Dr. Noor Hossain Manik Professor of Cardiology	National Institute of Cardiovascular Diseases

23.	Professor M Maksumul Haq Head & Senior Consultant, Department of Cardiology	Ibrahim Cardiac Hospital & Research Institute
24.	Dr. M Serajul Islam Joint Secretary General National Heart Foundation of Bangladesh	National Heart Foundation of Bangladesh
25.	Professor ATM Khalilur Rahman Professor & Chief , Department of Cardiac Anesthesia	National Heart Foundation Hospital & Research Institute
26.	Professor Farooque Ahmed Professor & Chief Cardiac Surgeon	National Heart Foundation Hospital & Research Institute
27.	Dr. M Mostafa Zaman National Professional Officer (NCD)	World Health Organization, Bangladesh Country Office
28.	Professor Fazila-Tun-Nesa Malik Chief & Professor of Cardiology	National Heart Foundation Hospital & Research Institute
29.	Professor Md. Mujibur Rahman Professor of Medicine	Shaheed Suhrawardi Medical College Hospital
30.	Professor Dr. Md. Zakir Hossain Professor, Department of Medicine	Rangpur Medical College
31.	Professor Sohel Reza Choudhury Department of Epidemiology & Research	National Heart Foundation Hospital & Research Institute
32.	Dr. Md. Saleh Uddin Director	National Centre for Control of Rheumatic Fever & Rheumatic Heart Diseases
33.	Dr Dewan Shamsul Alam Associate Scientist Centre for Control of Chronic Diseases (CCCD)	ICDDR.B
34.	Dr AKM Jafar Ullah, Assistant Director & Deputy Program Manager, Non Communicable Disease, DGHS	Directorate General of Health Services
35.	Dr Md Moslem Uddin Assistant Director (Hospital-2), DGHS	Directorate General of Health Services
36.	Dr Abu Jafar Syed Md. Musa Director, Primary Health Care & Line Director, MN&CH, DGHS	Directorate General of Health Services
37.	Dr Md Nasir Uddin Asst Professor, Dept of Biochemistry National Institute of Cardiovascular Diseases	National Institute of Cardiovascular Diseases
38.	Dr M G Azam Asst Professor, Dept of Cardiology National Institute of Cardiovascular Diseases	National Institute of Cardiovascular Diseases
39	Representative from Community Clinic Program	Directorate General of Health Services

12.4 Annex 4: List of contributors to the chapters

	Chapter	Contributor
1	Introduction /Purpose/Epidemiology	Professor Dr. Sohel Reza Choudhury
2	Blood pressure measurement	Professor Dr. R K Khandaker
3	Definition and classification of hypertension	Professor Dr. Md Mujibur Rahman
4	Evaluation of patients with confirmed hypertension	Professor Dr. Fazila-Tun-Nesa Malik
5	Management of hypertension: Life style modification	Professor Dr. SM Keramat Ali
6	Management of hypertension : Drug treatment	Professor Dr Mohammad Nazrul Islam
7	Hypertensive emergencies	Professor Dr. Md. Zakir Hossain
8	Treatment of secondary hypertension	Dr. Ashok Kumar Dutta
9	Resistant hypertension	Dr. Tawfiq Shahriar Huq
	The therapeutic approach in special situation	
10	Hypertension in elderly	Professor Dr. Abdullah Al Shafi Majumder
11	Hypertension in pregnancy	National Professor Dr. Shahla Khatun
12	Hypertension in children and adolescents	National Professor Dr MR Khan
13	Stroke	Professor Dr. Quazi Deen Mohammad
14	Kidney diseases	Professor Dr. Harun-Or-Rashid
15	Diabetes mellitus	Professor Dr. Hajera Mahtab
16	Coronary artery diseases and heart failure	Professor Dr. Sajal Krishna Banerjee
17	Information for medical assistants and CHCPs	Dr. AKM Jafur Ullah